DS #: 4884

APN: 137-24-799-005

PROJECT: Drainage Analysis for the 90% Summerlin Pkwy - Traffic Capacity and Safety Improvements Ph 3

SUBMITTAL: 1st Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

GCW
ENGINEERS \ SURVEYORS

412-658-3

MEMORANDUM

To: Peter Jackson, CFM

From: Rachael R. Dennis, PE,
Project Manager
GCW Flood Control Division

Date: December 1, 2016

Re: Drainage Analysis for the 90% Summerlin Parkway - Traffic Capacity and Safety Improvements Phase 3

The City of Las Vegas (CLV) has contracted with GCW, Inc. (GCW) to provide engineering and design services for roadway improvements along Summerlin Parkway between CC-215 and Durango Drive. Phase 3 of the project includes the following improvements:

- Eastbound auxiliary lane between Northbound CC215 to Eastbound Summerlin Parkway ramp and Anasazi Drive off-ramp.
- Eastbound auxiliary lane between Town Center Drive on-ramp and Rampart Boulevard off-ramp.
- Eastbound auxiliary lane between Rampart Boulevard on-ramp and Buffalo Drive off-ramp. Reconfigure existing Durango Drive on-ramp/auxiliary lane as needed.
- Westbound auxiliary lane between Rampart Boulevard on-ramp and Town Center Drive off-ramp.

The widening of the auxiliary lanes includes the addition of cable rail, guard rail, or concrete barrier rail. We are submitting this memorandum to address the drainage design for the proposed Summerlin Parkway roadway improvements that encroach into the existing roadside drainage areas adjacent to the added travel lanes. The watershed, drainage patterns, and flows between CC-215 and Town Center Drive have been referenced and/or revised from the following studies:

- *Technical Drainage Study for Durango Drive – Westcliff Drive to Vegas Drive (November 2003)*, by GCW (hereinafter referred to as the Durango Drive Study)
- *Anasazi Drive Overpass Summerlin Parkway Technical Drainage Study (June 2003),* by VTN Nevada (hereinafter referred to as the Anasazi Drive Study)
- *Drainage Study for Summerlin Village 11/12 Offsite Channel (November 1997)*, by GCW (hereinafter referred to as the Offsite Channel Study)
- *Hydraulic Analysis for Summerlin Village 11/12 Offsite Storm Drain (March 1997), by GCW (hereinafter referred to as the Offsite Storm Drain Study)*

The methodology presented in this study is in compliance with the *Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual* (hereinafter referred to

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as the Manual) and the Nevada Department of Transportation Drainage Manual (NDOT Manual). Pertinent reference material has been included in Appendix C.

The watersheds for the proposed improvements between CC-215 and Durango Drive shown on Exhibit 1 were modeled using the SCS Unit Hydrograph method within the *U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package* (HEC-1). Since the drainage area for the project is less than 8 square miles, an SDN 3 design storm was selected for use in the HEC-1 computer model.

The project site and tributary drainage areas lie both in and outside the McCarran Rainfall Area as identified in the Manual. Rainfall depths for the project site were referenced from the Anasazi and Durango Drive Studies or were calculated utilizing GIS data distributed by the Clark County GISMO (Geographic Information Systems Management Office). The GIS rainfall depths were extracted from the NOAA Rainfall Atlas and have been adjusted according to the approach outlined in Section 500 of the Manual. The adjusted point precipitation values for Summerlin Parkway during the 100-year storm event range from 2.77 to 3.15 for the onsite drainage subbasins. The adjusted point precipitation values during the 10-year storm event range from 1.58 to 1.80 for onsite drainage subbasins. A portion of the NOAA Rainfall Atlas containing the project site and offsite drainage basins has been included in the Appendix A. Pertinent reference material has been included in Appendix C.

Curve Number (CN) values were determined from the appropriate columns of Tables 602 of the Manual. Curve numbers ranging from 88 to 98 have been determined for the proposed onsite subbasins. The land uses or land covers used include Streets (Paved) and Desert Shrub (poor condition). Weighted curve number calculations conservatively based on a Hydrologic Soil Group D for the ultimate conditions subbasins have been included in Appendix A. The weighted curve number calculations and land covers are consistent with the approved Durango Drive Study. Pertinent reference material has been included in Appendix C.

The subbasins and flow patterns used for the hydrologic modeling were determined from digital files for the proposed Summerlin Parkway roadway improvements between CC-215 and Durango Drive.

The lag time (TLAG) is described as the time between the center of mass of rainfall and the time of peak discharge from a basin. Lag time can be related to time of concentration (T_c) by the following relationship: TLAG = 0.6 (T_c). The time of concentration (T_c) is defined as the time required for runoff to flow from the most hydraulically distant area of the basin to the outlet of the basin or a design point. The procedure for calculating (T_c) is outlined in Section 602 of the Manual. Lag time calculations for the drainage subbasins are included in Appendix A on Standard Form 4.

Exhibit 1, Ultimate Conditions Drainage Map, depicts the subbasins and drainage patterns used in the ultimate condition hydrologic analysis for this project. The results of the ultimate conditions HEC-1 model are summarized in Table 1. Hydrologic calculations have been included in Appendix A. Table 2 summarizes the prorated flows impacting the proposed project. Referenced hydrologic calculations have been included in Appendix C.

TABLE 1 SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL			
SB OR CP[1]	AREA (AC)	100 YR (CFS)	10 YR (CFS)
A3A	0.69	3	2
A6A**	0.88	4	2
ON1	3.38	10	5
ON2	3.03	9	5
ON3	3.43	10	6
ON4	2.53	6	2
ON5	1.99	5	2
ON6	1.66	5	3
CP1	-	10	5
ON1A	2.46	5	2
ON2A	1.30	3	1
ULT5A	3.84	11	5
ULT5B	6.69	17	8
ULT5*	3.50	12	6

[1] See Exhibit 1.

* Referenced from the Durango Study.

** Referenced from the Anasazi Overpass Study.

TABLE 2 ULTIMATE CONDITION PRORATED FLOW SUMMARY			
Ultimate Onsites			
Subbasin[1]	Q_{100} (cfs)	Area (acres)	cfs/acre
A6A**	4	0.88	4.55
ULT5*	12	3.50	3.43
ULT5A	11	3.84	2.86
ON1	10	3.38	2.96
ON2	9	3.03	2.97
ON6	5	1.66	3.01
ON3	10	3.43	2.92
A6B	1.4	0.45	3.13
Ultimate Onsite Prorated Basins			
Subbasin[1]	Q_{100} (cfs)	Area (acres)	cfs/acre
A6A-1	1.1	0.24	4.55
A6A-1A	0.8	0.17	4.55
A6A-2	2.1	0.47	4.55
TOTAL	**4.0**	**0.88**	-

TABLE 2
ULTIMATE CONDITION
PRORATED FLOW SUMMARY

Ultimate Onsites			
Subbasin[1]	Q_{100} (cfs)	Area (acres)	cfs/acre
A6B-1	0.5	0.17	3.13
A6B-2	0.9	0.28	3.13
TOTAL	**1.4**	**0.45**	-
ULT5-1	0.7	0.20	3.43
ULT5-2	2.4	0.70	3.43
ULT5-3	8.9	2.60	3.43
TOTAL	**12.0**	**3.50**	-
ULT5A-1	10.0	3.49	2.86
ULT5A-2	1.0	0.35	2.86
TOTAL	**11.0**	**3.84**	-
ON1-1	1.9	0.64	2.96
ON1-2	0.9	0.30	2.96
ON1-3	0.6	0.21	2.96
ON1-4	0.5	0.18	2.96
ON1-5	2.6	0.89	2.96
ON1-6	3.1	1.04	2.96
ON1-7	0.4	0.12	2.96
TOTAL	**10.0**	**3.38**	-
ON2-1	2.0	0.68	2.97
ON2-2	1.4	0.48	2.97
ON2-2A	2.4	0.82	2.97
ON2-3	2.5	0.81	2.97
ON2-4	0.7	0.24	2.97
TOTAL	**9.0**	**3.03**	-
ON6-1	0.6	0.21	3.01
ON6-2	1.1	0.37	3.01
ON6-3	3.3	1.08	3.01
TOTAL	**5.0**	**1.66**	-
ON3-1	0.9	0.30	2.92
ON3-2	1.2	0.40	2.92
ON3-3	7.9	2.73	2.92
TOTAL	**10.0**	**3.43**	-

[1] See Exhibit 1.

* Referenced from the Durango Study.

** Referenced from the Anasazi Overpass Study.

During existing conditions, flows generated within the Summerlin Parkway right-of-way are collected and conveyed within adjacent roadside and median swales to existing channel or storm drain systems. Proposed roadway improvements have been designed to perpetuate existing conditions drainage patterns where possible and provide storm drain and swale conveyance. The proposed discharge points are generally consistent with the previously approved referenced drainage studies.

Station "SP" 341+00 to 359+00 (Eastbound)

Currently, flows generated by Subbasin A3A, Subbasin A6A and prorated Subbasin A6B are conveyed within adjacent roadside swales and/or the existing Offsite Channel located between Summerlin Parkway and the existing development to the south. Ultimately, these flows are collected and conveyed east via the existing 48-inch RCP Offsite Storm Drain to the existing CCRFCD Facility APSP 0177 in Anasazi Drive south of the eastbound Anasazi Drive off-ramp.

Due to the addition of pavement and barrier rail along the eastbound Summerlin Parkway and Anasazi Drive off-ramp between approximate Stations "SP" 341+00 and 359+00, flows generated by Subbasin A3A, Subbasin A6A and prorated Subbasin A6B will be conveyed within the shoulder of the roadway and within a proposed drainage swale located along the southern boundary of the proposed barrier rail. Ultimately, the flows generated by Subbasin A3A and portions of Subbasin A6A and prorated Subbasin A6B will be collected and conveyed east and south by proposed storm drain facilities discharging into the existing 48-inch RCP Offsite Storm Drain system. Per the Offsite Storm Drain Study, the existing 48-inch RCP storm drain was designed to accept a total offsite flowrate of 117 cfs which has been significantly reduced due to development north of the Summerlin Parkway. Since the total flow rate of 5.4 cfs discharging into the existing Offsite Storm Drain system is less than the offsite design flows, the proposed 18-inch RCP storm drain system will collect flows along Summerlin Parkway and behind the proposed barrier rail, and will discharge flows south into the existing 48-inch RCP Offsite Storm Drain system. Impacts to the existing 48-inch RCP Offsite Storm Drain system are considered to be negligible and will not pose an adverse impact on downstream facilities or properties. During the 100-year storm event, flows along the proposed barrier rail will be contained within the 9.8-foot wide shoulder and will not spread into the adjacent travel lane. The Standard Form 6 calculation for the proposed 18-inch RCP storm drain system has been included in Appendix B.

Station "SP" 439+00 to 488+00 (Westbound)

Currently, flows generated by Subbasins ON1, ON1A, ON2 and ON2A are conveyed within the area between westbound Summerlin Parkway and the existing development to the north. Ultimately, these flows are collected and conveyed east to an existing concrete flume and ultimately east into the existing Angel Park North Wash (CCRFCD Facility APNO 0013).

Due to the addition of pavement and barrier rail along westbound Summerlin Parkway between approximate Stations "SP" 439+00 to 488+00, flows generated by Subbasins ON1, ON1A, ON2 and ON2A will be conveyed within the shoulder of the roadway and within a proposed storm drain system. A proposed 18-inch to 30-inch RCP storm drain system will collect and convey flows along Summerlin Parkway adjacent to the proposed barrier rail and will discharge flows east and north into the Angel Park North Wash (APNO 0013) via the existing concrete flume. Impacts to the existing Angel Park North Wash are considered to be negligible and will not pose an adverse impact on downstream facilities or properties. During the 100-year storm event, flows along the proposed

barrier rail will be contained within the 10-foot to 24-foot wide shoulder and will not spread into the adjacent travel lane. The Standard Form 6 calculations for the proposed 18-inch to 30-inch RCP storm drain system has been included in Appendix B.

Station "SP" 451+00 to 463+00 (Eastbound)

Currently, flows generated by Subbasins ON5 and ON6 are conveyed south via existing drop inlets and an 18-inch RCP storm drain system. Ultimately, these flows are collected and conveyed south into the existing Summerlin Parkway Channel (CCRFCD Facility APSP 0002).

Due to the addition of pavement and barrier rail along eastbound Summerlin Parkway between approximate Stations "SP" 451+00 to 463+00, flows generated by Subbasins ON5 and ON6 will be conveyed within the shoulder of the roadway and within a proposed storm drain system. A proposed 18-inch RCP storm drain system will collect and convey flows along Summerlin Parkway adjacent to the proposed barrier rail and will discharge flows south into the Summerlin Parkway Channel (APSP 0002) via the existing 18-inch RCP storm drain system. Impacts to the existing Summerlin Parkway Channel are considered to be negligible and will not pose an adverse impact on downstream facilities or properties. During the 100-year storm event, flows along the proposed barrier rail will be contained within the 12-foot wide shoulder and will not spread into the adjacent travel lane. The Standard Form 6 calculation for the proposed 18-inch RCP storm drain system has been included in Appendix B.

Station "SP" 463+00 to 488+00 (Eastbound)

Currently, flows generated by Subbasins ON3 and ON4 are conveyed north via existing median inlets and an 18-inch RCP storm drain system. Ultimately, these flows are collected and conveyed north via an existing 12-foot wide by 4-foot high RCB culvert (CCRFCD Facility APNO 0015) into the existing Angel Park North Wash (CCRFCD Facility APNO 0013).

Due to the addition of pavement and barrier rail along eastbound Summerlin Parkway between approximate Stations "SP" 463+00 to 488+00, flows generated by Subbasins ON3 and ON4 will be conveyed within the shoulder of the roadway and within a proposed storm drain system. A proposed 18-inch RCP storm drain system will collect and convey flows along Summerlin Parkway adjacent to the proposed barrier rail and within the median discharging flows north into the existing 18-inch RCP storm drain system. Impacts to the existing Angel Park North Wash (APNO 0013) are considered to be negligible and will not pose an adverse impact on downstream facilities or properties. During the 100-year storm event, flows along the proposed barrier rail will be contained within the 6.3-foot wide shoulder and will not spread into the adjacent travel lane. The Standard Form 6 calculation for the proposed 18-inch RCP storm drain system has been included in Appendix B.

Station "SP" 500+00 to 526+00 (Eastbound)

Currently, flows generated by a majority of Subbasin ULT5A and Subbasin ULT5B will be collected and conveyed by existing storm drain systems discharging into the Angel Park Detention Basin. Flows generated by the remaining portion of Subbasin ULT5A and Subbasin ULT5 are conveyed east via existing roadside swales and an 18-inch RCP storm drain system. Ultimately, these flows are collected and conveyed east via an existing 18-inch RCP storm drain system in Durango Drive south of the eastbound Durango Drive on-ramp.

Due to the addition of pavement and barrier rail along eastbound Summerlin Parkway between approximate Stations "SP" 500+00 to 526+00, flows generated by flows generated by Subbasin ULT5B will be conveyed east via a proposed swale behind the barrier rail to an existing drop inlet and 18-inch RCP storm drain system. Flows from Subbasin ULT5B will combine with a portion of Subbasin ULT5A and will ultimately discharge flows into the existing Angel Park Detention Basin. The remaining portion of Subbasin ULT5A and Subbasin ULT5 will be conveyed within the shoulder of the roadway and within a proposed drainage swale located along the southern boundary of the proposed barrier rail into a proposed storm drain system. A proposed 18-inch RCP storm drain system will collect and convey flows along Summerlin Parkway adjacent to the proposed barrier rail discharging flows east into the existing 18-inch RCP storm drain system. Impacts to the existing Durango Drive storm drain system are considered to be negligible and will not pose an adverse impact on downstream facilities or properties. During the 100-year storm event, flows along the proposed barrier rail will be contained within the 12-foot wide shoulder and will not spread into the adjacent travel lane. The Standard Form 6 calculation for the proposed 18-inch RCP storm drain system has been included in Appendix B.

Exhibit 1 shows the locations of the tributary subbasins corresponding to the calculations included in Tables 3 and 4. Facility names in the calculations correspond with the tributary offsite subbasin and the facility location. Hydraulic calculations have been included in Appendix B.

The resulting street flow data, based on the flows established from the ultimate conditions HEC-1 model is presented in Table 3. Based on the calculated street flow characteristics, the Manual criteria for Depth (D) and Velocity (V) multiplication (D*V) during the 100-year and 10-year storm events will be met.

All existing and proposed flood control facilities have been shown on Exhibit 1 and the plans included herewith. All proposed facilities have been sized to convey ultimate conditions flow rates. Generally, proposed drop inlets have been sized to collect flows and discharge them into existing or proposed storm drain systems within or adjacent to the proposed Summerlin Parkway improvements. The drop inlets have been analyzed in accordance with HEC-22, Urban Drainage Design Manual, FHWA. The drop inlet and street normal depth calculations were prepared using the FHWA Hydraulic Toolbox Software. Table 3 summarizes the street drop inlet calculations. The drop inlet calculations have been included in Appendix B.

TABLE 3
100-YEAR STREET FLOW CHARACTERISTICS AND DROP INLET CALCULATIONS
ULTIMATE CONDITIONS

Alignment	Station	Tributary	Q_{100} (cfs)	Q intercept (cfs)	Q bypass (cfs)	Longitudinal Slope (%)	Cross Slope (%)	Flow Depth (ft)	Velocity (ft/s)	D*V	Shoulder (SH) Width (ft)	Spread (ft)	Drop Inlet Size
SEB	354+95	A3A + A6A-1	4.1	4.1	0.0	5.72	4.26	0.25	5.71	1.4	9.8	5.8	NDOT Type 2 (Triple)
SEB	355+98	A6A-1A	1.3	1.3	0.0	-	-	0.23	-	-	-	-	NDOT Type 2A
SWB	444+83	ON1-1	1.9	1.6	0.3	1.35	2.00	0.18	2.30	0.4	10	9.1	NDOT Type 2 (Double)
SWB	446+23	$ON1\text{-}1_{BYP}$ + ON1-2	1.2	1.0	0.2	0.62	2.00	0.18	1.53	0.3	10	8.9	NDOT Type 2 (Double)
SWB	447+49	$ON1\text{-}2_{BYP}$ + ON1-3	0.8	0.7	0.1	0.15	2.00	0.20	0.81	0.2	10	9.9	NDOT Type 2 (Double)
SWB	448+68	$ON1\text{-}3_{BYP}$ + ON1-4	0.6	0.5	0.1	0.15	2.00	0.18	0.76	0.1	10	8.9	NDOT Type 2 (Double)
SWB	452+82	$ON1\text{-}4_{BYP}$ + ON1-5	2.7	2.4	0.3	0.65	2.00	0.24	1.91	0.5	12	11.9	NDOT Type 2 (Triple)
SWB	461+32	$ON1\text{-}5_{BYP}$ + ON1-6	3.4	3.0	0.4	1.01	2.00	0.24	2.38	0.6	12	12.0	NDOT Type 2 (Triple)
SWB	462+35	ON1A	5.0	5.0	0.0	-	-	0.33	-	-	-	-	NDOT Type 2A
SWB	462+52	$ON1\text{-}6_{BYP}$ + ON1-7	0.8	0.7	0.1	1.06	2.00	0.14	1.69	0.2	12	6.9	NDOT Type 2 (Double)
SWB	465+27	$ON1\text{-}7_{BYP}$ + ON2-1	2.1	1.7	0.4	1.15	2.00	0.20	2.22	0.4	12	9.7	NDOT Type 2 (Double)
SWB	468+41	$ON2\text{-}1_{BYP}$ + ON2-2	1.8	1.8	0.0	1.79	4.00	0.22	2.97	0.7	24	5.5	NDOT Type 2 (Triple)
SWB	475+27	ON2A	3.0	3.0	0.0	-	-	0.24	-	-	-	-	NDOT Type 2A
SWB	475+33	ON2-2A	2.4	1.9	0.5	3.02	4.00	0.22	3.88	0.9	12	5.6	NDOT Type 2 (Single)
SWB	481+87	$ON2\text{-}2A_{BYP}$ + ON2-3	3.0	3.0	0.0	2.13	4.00	0.26	3.60	0.9	24	6.5	NDOT Type 2 (Triple)
SWB	483+75	ON2-4	0.7	0.7	0.0	2.01	4.00	0.15	2.45	0.4	9	3.8	NDOT Type 2 (Double)
SEB	462+02	ON6-2	1.1	1	0.1	0.86	2.00	0.16	1.69	0.3	12	8.1	NDOT Type 2 (Double)
SEB	463+00	$ON6\text{-}2_{BYP}$ + ON6-1	0.7	0.5	0.2	0.55	1.00	0.11	1.08	0.1	12	11.4	NDOT Type 2 (Double)
SP	484+92	ON3-1	0.9	0.7	0.2	1.24	4.00	0.18	2.17	0.4	6.3	4.6	NDOT Type 2 (Double)
SP	486+60	ON4	6.0	6.0	0.0	-	-	0.38	-	-	-	-	NDOT Type 2A
SEB1	521+14	ULT5B	17.0	17.0	0.0	-	-	1.03	-	-	-	-	EX. NDOT Type 2A
SEB1	524+90	ULT5-1 + ULT5A-2	1.7	1.7	0.0	3.02	3.08	0.18	3.35	0.6	12	5.8	NDOT Type 2 (Triple)
SEB1	525+21	ULT5-2	2.4	2.4	0.0	-	-	0.20	-	-	-	-	EX. NDOT Type 2A

[1] See Exhibit 1.

The proposed roadside ditches have been set at a minimum depth of twice the depth of flow where calculated flow depths are less than one foot deep. Where the calculated flow depths are greater that one foot deep, the proposed ditches will have a minimum freeboard of 1 foot above the calculated water surface elevation. All roadside ditches are summarized in Table 6. Ditch calculations have been included in Appendix B.

TABLE 4
100-YEAR STREET FLOW CHARACTERISTICS AND DROP INLET CALCULATIONS
ULTIMATE CONDITIONS

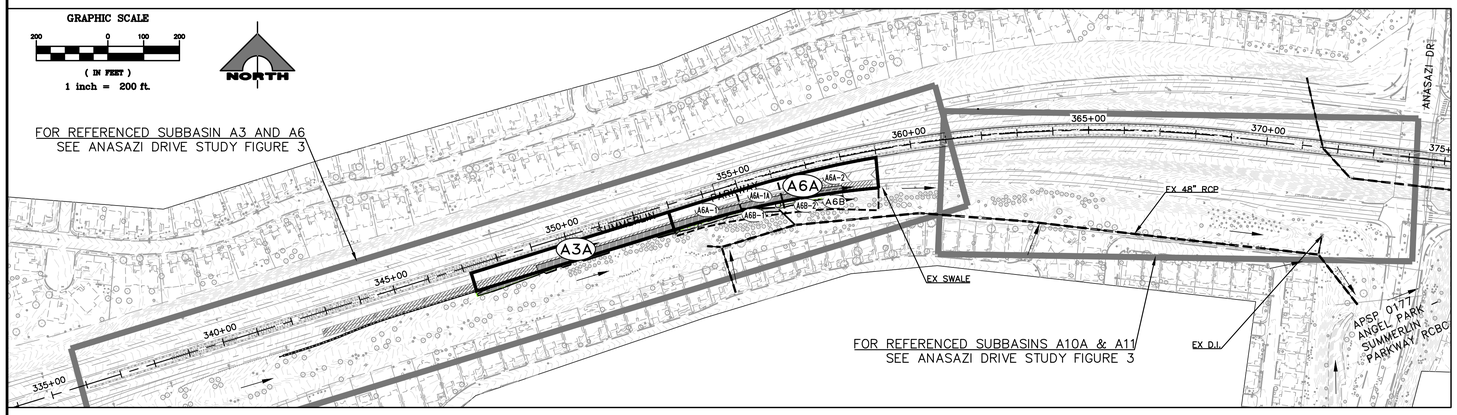
Location[1]	Station	Slope (%)	Side Slopes	Q_{100} (cfs)	Flow Depth (ft)	Total Depth (ft)	Velocity (ft/s)	Lining
A6B-1	"SP" 352+97 to 354+93	5.50	3:1/2:1	0.5	0.32	1.00	3.91	N/A
A6A-1A	"SP" 354+93 to 355+97	5.50	10:1/2:1	1.3	0.23	1.00	3.24	N/A
A6B-2	"SP" 355+97 to 358+90	5.50	10:1/ 2:1	3	0.34	1.00	4.26	N/A
ULT5B	"SP" 515+33 to 521+04	2.54	8:1/0:1	17	1.03	2.00	4.02	8
ULT5-2	"SP" 521+29 to 525+12	3.43	10:1/2:1	2.4	0.32	1.00	3.23	N/A

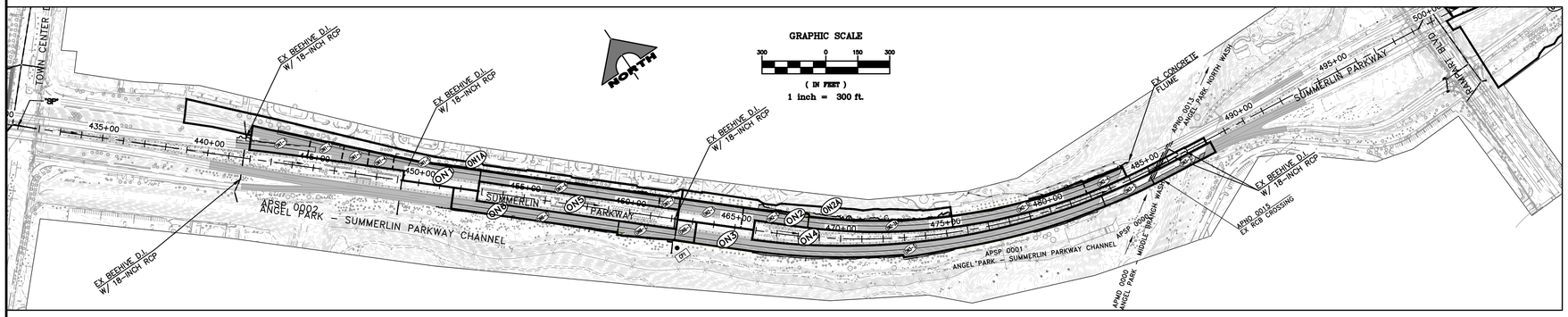
[1] See Exhibit 1.

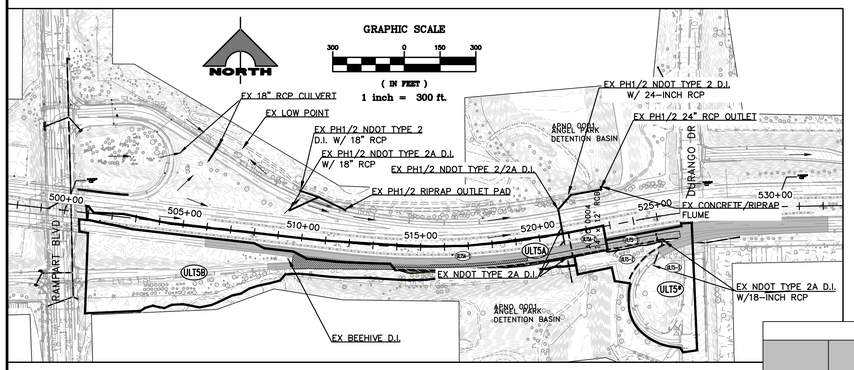
If you have any questions or require additional information, please contact me at 702-804-2248.

RRD/vlr

c: Oh Sang Kwon, CLV
Tim McCoy, GCW
John Tobin, GCW
Ryan Belsick, GCW
Johnnie Pate, GCW







LEGEND

- BASN1 — SUBBASIN NAME
- BASN1A — PRORATED SUBBASIN NAME
- SUBBASIN BOUNDARY
- PRORATED SUBBASIN BOUNDARY
- FLOW DIRECTION
- LOCATION OF REFERENCED SUBBASINS
- CP1 — CONCENTRATION POINT

SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL

SB OR CP	AREA (AC)	100 YR (CFS)	10 YR (CFS)
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ON2	3.03	9	5
ON3	3.43	10	6
ON4	2.53	6	2
ON5	1.99	5	2
ON6	1.66	5	3
CP1	-	10	5
ON1A	2.46	5	2
ON2A	1.30	3	1
ULT5A	3.84	11	5
ULT5B	6.69	17	8
ULT5*	3.50	12	6

* Referenced from the Durango Study.

** Referenced from the Anasazi Overpass Study.

ULTIMATE CONDITION PRORATED FLOW SUMMARY

Ultimate Onsites			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
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ON6	5	1.66	3.01
ON3	10	3.43	2.92
A6B	1.4	0.45	3.13
Ultimate Onsite Prorated Basins			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
A6A-1	1.1	0.24	4.55
A6A-1A	0.8	0.17	4.55
A6A-2	2.1	0.47	4.55
TOTAL	**4.0**	**0.88**	**-**
A6B-1	0.5	0.17	3.13
A6B-2	0.9	0.28	3.13
TOTAL	**1.4**	**0.45**	**-**
ULT5-1	0.7	0.20	3.43
ULT5-2	2.4	0.70	3.43
ULT5-3	8.9	2.60	3.43
TOTAL	**12.0**	**3.50**	**-**
ULT5A-1	10.0	3.49	2.86
ULT5A-2	1.0	0.35	2.86
TOTAL	**11.0**	**3.84**	**-**
ON1-1	1.9	0.64	2.96
ON1-2	0.9	0.30	2.96
ON1-3	0.6	0.21	2.96
ON1-4	0.5	0.18	2.96
ON1-5	2.6	0.89	2.96
ON1-6	3.1	1.04	2.96
ON1-7	0.4	0.12	2.96
TOTAL	**10.0**	**3.38**	**-**
ON2-1	2.0	0.68	2.97
ON2-2	1.4	0.48	2.97
ON2-2A	2.4	0.82	2.97
ON2-3	2.5	0.81	2.97
ON2-4	0.7	0.24	2.97
TOTAL	**9.0**	**3.03**	**-**
ON6-1	0.6	0.21	3.01
ON6-2	1.1	0.37	3.01
ON6-3	3.3	1.08	3.01
TOTAL	**5.0**	**1.66**	**-**
ON3-1	0.9	0.30	2.92
ON3-2	1.2	0.40	2.92
ON3-3	7.9	2.73	2.92
TOTAL	**10.0**	**3.43**	**-**

*Referenced from the Durango Drive Study.

** Referenced from the Anasazi Overpass Study.

100-YEAR DITCH CHARACTERISTICS ADJACENT TO PROPOSED PAVEMENT

Location	Station	Slope (%)	Side Slopes	Q_{100} (cfs)	Flow Depth (ft)	Total Depth (ft)	Velocity (ft/s)	Lining d50 (in)
A6B-1	"SP" 352+97 to 354+93	5.50	3:1/2:1	0.5	0.32	1.00	3.91	N/A
A6A-1A	"SP" 354+93 to 355+97	5.50	10:1/2:1	1.3	0.23	1.00	3.24	N/A
A6B-2	"SP" 355+97 to 358+90	5.50	10:1/ 2:1	3	0.34	1.00	4.26	N/A
ULT5B	"SP" 515+33 to 521+04	2.54	8:1/0:1	17	1.03	2.00	4.02	8
ULT5-2	"SP" 521+29 to 525+12	3.43	10:1/2:1	2.4	0.32	1.00	3.23	N/A

SUMMARY - DROP INLET CALCULATIONS

Alignment	Station	Tributary	Q_{100} (cfs)	$Q_{intercept}$ (cfs)	Q_{bypass} (cfs)	Longitudinal Slope (%)	Cross Slope (%)	Flow Depth (ft)	Velocity (ft/s)	D*V	Shoulder (SH) Width (ft)	Spread (ft)	Drop Inlet Size	Inlet Type*
SEB	354+95	A3A + A6A-1	4.1	4.1	0.0	5.72	4.26	0.25	5.71	1.4	9.8	5.8	NDOT Type 2 (Triple)	EOB
SEB	355+98	A6A-1A	1.3	1.3	0.0	-	-	0.23	-	-	-	-	NDOT Type 2A	SUMP
SWB	444+83	ON1-1	1.9	1.6	0.3	1.35	2.00	0.18	2.30	0.4	10	9.1	NDOT Type 2 (Double)	Capacity
SWB	446+23	ON1-1_{BYP} + ON1-2	1.2	1.0	0.2	0.62	2.00	0.18	1.53	0.3	10	8.9	NDOT Type 2 (Double)	Capacity
SWB	447+49	ON1-2_{BYP} + ON1-3	0.8	0.7	0.1	0.15	2.00	0.20	0.81	0.2	10	9.9	NDOT Type 2 (Double)	Capacity
SWB	448+68	ON1-3_{BYP} + ON1-4	0.6	0.5	0.1	0.15	2.00	0.18	0.76	0.1	10	8.9	NDOT Type 2 (Double)	Capacity
SWB	452+82	ON1-4_{BYP} + ON1-5	2.7	2.4	0.3	0.65	2.00	0.24	1.91	0.5	12	11.9	NDOT Type 2 (Triple)	Capacity
SWB	461+32	ON1-5_{BYP} + ON1-6	3.4	3.0	0.4	1.01	2.00	0.24	2.38	0.6	12	12.0	NDOT Type 2 (Triple)	Capacity
SWB	462+35	ON1A	5.0	5.0	0.0	-	-	0.33	-	-	-	-	NDOT Type 2A	SUMP
SWB	462+52	ON1-6_{BYP} + ON1-7	0.8	0.7	0.1	1.06	2.00	0.14	1.69	0.2	12	6.9	NDOT Type 2 (Double)	Capacity
SWB	465+27	ON1-7_{BYP} + ON2-1	2.1	1.7	0.4	1.15	2.00	0.20	2.22	0.4	12	9.7	NDOT Type 2 (Double)	Capacity
SWB	468+41	ON2-1_{BYP} + ON2-2	1.8	1.8	0.0	1.79	4.00	0.22	2.97	0.7	24	5.5	NDOT Type 2 (Triple)	EOB
SWB	475+27	ON2A	3.0	3.0	0.0	-	-	0.24	-	-	-	-	NDOT Type 2A	SUMP
SWB	475+33	ON2-2A	2.4	1.9	0.5	3.02	4.00	0.22	3.88	0.9	12	5.6	NDOT Type 2 (Single)	Capacity
SWB	481+87	ON2-2A$_{BYP}$ + ON2-3	3.0	3.0	0.0	2.13	4.00	0.26	3.60	0.9	24	6.5	NDOT Type 2 (Triple)	EOB
SWB	483+75	ON2-4	0.7	0.7	0.0	2.01	4.00	0.15	2.45	0.4	9	3.8	NDOT Type 2 (Double)	BRIDGE
SEB	462+02	ON6-2	1.1	1	0.1	0.86	2.00	0.16	1.69	0.3	12	8.1	NDOT Type 2 (Double)	Capacity
SEB	463+00	ON6-2_{BYP} + ON6-1	0.7	0.5	0.2	0.55	1.00	0.11	1.08	0.1	12	11.4	NDOT Type 2 (Double)	SER
SP	484+92	ON3-1	0.9	0.7	0.2	1.24	4.00	0.18	2.17	0.4	6.3	4.6	NDOT Type 2 (Double)	SER
SP	486+60	ON4	6.0	6.0	0.0	-	-	0.38	-	-	-	-	NDOT Type 2A	SUMP
SEB1	521+14	ULT5B	17.0	17.0	0.0	-	-	1.03	-	-	-	-	EX. NDOT Type 2A	SUMP
SEB1	524+90	ULT5-1 + ULT5A-2	1.7	1.7	0.0	3.02	3.08	0.18	3.35	0.6	12	5.8	NDOT Type 2 (Triple)	EOB
SEB1	525+21	ULT5-2	2.4	2.4	0.0	-	-	0.20	-	-	-	-	EX. NDOT Type 2A	SUMP

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PROJECT NO. 412-658-3
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 12-01-16
PLOT TIME: 11:03:17

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP	DATE:

% COMPLETE

F:\Projects\400\412-658\Division\Fet\Exhibits\PHASE3\Exhibit 1.dwg
Nelson Boggs

CITY OF LAS VEGAS

SUMMERLIN PARKWAY TRAFFIC CAPCACITY AND SAFETY IMPROVEMENTS PHASE 3

EXHIBIT 1

ULTIMATE CONDITIONS DRAINAGE MAP

DRAWING
EXH-1
OF SHTS

LD #:

HTE: 00-00000

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS
PHASE 3
APPENDIX LAYOUT

Appendix A. Hydrologic Calculations and Information

1. Table 602 – 1 of 4 from the CCRFCD Manual
2. Table 602 – 4 of 4 from the CCRFCD Manual
3. Composite Curve Number Calculations
4. Rainfall Exhibit
5. Ultimate Conditions Standard Form 4
6. Ultimate Conditions HEC-1 Model

Appendix B. Hydraulic Calculations

1. Normal Depth Calculations
   a. Street Normal Depth Calculations
   b. Ditch Calculations
2. Drop Inlet Calculations
3. Standard Form 6 Calculations
4. Manning's N Calculation
5. D-Load Calculations

Appendix C. Referenced Material (On CD)

1. 2013 Las Vegas Valley Flood Control Master Plan Update
   a. Figure F-24 Flood Control Facility and Inventory
   b. Figure F-25 Flood Control Facility and Inventory
   c. Figure H-24 Hydrologic Summary
   d. Figure H-25 Hydrologic Summary

2. Technical Drainage Study for Durango Drive – Westcliff Drive to Vegas Drive
   a. Excerpts from text regarding existing gore inlet
   b. Ultimate Conditions Standard Form 4
   c. Ultimate Conditions HEC-1 Model
   d. Figure 6A – Interim/Ultimate Overall Drainage Patterns
   e. Figure 8 – Interim Storm Flows Exhibit
   f. Improvement Plans (Sheets G-1, TY-2, SD-7, SD-15 & SD-18)

3. Anasazi Drive Overpass Addendum – Summerlin
   a. Weighted Curve Number Calculations
   b. Proposed Conditions Standard Form 4
   c. Proposed Conditions HEC-1 Model
   d. Figure 3 – Drainage Basin Map
   e. Improvement Plans (Sheets E-1, E-2, E-3, E-4, TY-1, C-1, C-2, C-3, C-4 & C-5)

4. Drainage Study for Summerlin Village 11/12 Offsite Channel
   a. CLV Approval Letter
   b. Excerpt from text describing the existing 42-inch RCP stub and current flowrate
   c. Inlet Control Calculation

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS
PHASE 3
APPENDIX LAYOUT

d. Excerpt from text describing the existing 42-inch RCP stub design flowrate
e. Figure 5 –Drainage Map
f. Improvement Plans (Sheets C-1, C-2, C-3 & C-4)

5. Hydraulic Analysis for Summerlin Village 11/12 Offsite Storm Drain
   a. CLV Approval Letter
   b. Excerpt from text describing the existing 48-inch RCP storm drain and design flowrate
   c. Figure 5 – Proposed Storm Drain
   d. WSPG Model
   e. Improvement Plans (Sheets 1, 5 & 6)

6. Summerlin Parkway – Western Beltway to Town Center Drive and Interchange with Town Center Drive Improvement Plans (Sheets 1, C-32, & C-33)

7. Husite Parkway Construction Drawings: From El Capitan to Husite Parkway Interchange (Sheets 1, 6 & 17)

8. Husite Parkway Construction Drawings: From Town Center Drive Entrance to El Capitan Way (Sheets 1, 4, 9, 11, 12, 14, 21 & 22)

APPENDIX A

Hydrologic Calculations and Information

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

RUNOFF CURVE NUMBERS
(SEMIARID RANGELANDS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

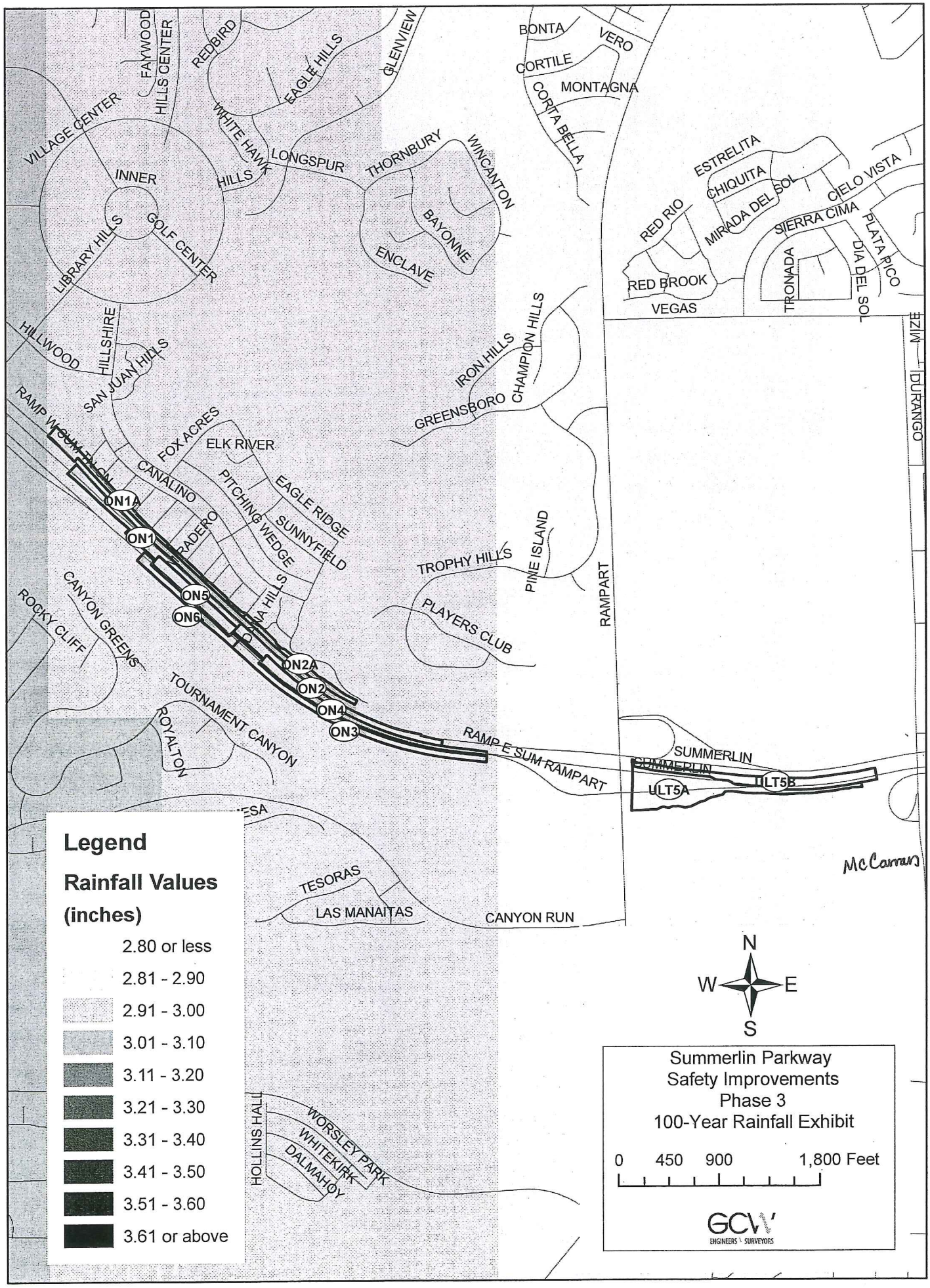
[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

Revision	Date

Ultimate Conditions Weighted Curve Number Table				
Basin	**Soil**	**Percent**	**CN**	**WCN**
ON1	Streets (Paved)	88.9%	98	97
	Desert Shrub (Poor)	11.1%	88	
ON2	Streets (Paved)	87.4%	98	97
	Desert Shrub (Poor)	12.6%	88	
ON3	Streets (Paved)	89.7%	98	97
	Desert Shrub (Poor)	10.3%	88	
ON4	Streets (Paved)	0.0%	98	88
	Desert Shrub (Poor)	100.0%	88	
ON5	Streets (Paved)	0.0%	98	88
	Desert Shrub (Poor)	100.0%	88	
ON6	Streets (Paved)	91.6%	98	97
	Desert Shrub (Poor)	8.4%	88	
ULT5A	Streets (Paved)	35.8%	98	92
	Desert Shrub (Poor)	64.2%	88	
ULT5B	Streets (Paved)	25.4%	98	91
	Desert Shrub (Poor)	74.6%	88	


BONTA
VERO
CORTILE
MONTAGNA
CORTA BELLA
FAYWOOD
HILLS CENTER
REDBIRD
EAGLE HILLS
GLENVIEW
VILLAGE CENTER
INNER
GOLF CENTER
LIBRARY HILLS
WHITE HAWK
HILLS
LONGSPUR
THORNBURY
WINCANTON
BAYONNE
ENCLAVE
ESTRELITA
CHIQUITA
MIRADA DEL SOL
CIELO VISTA
RED RIO
SIERRA CIMA
PLATA RICO
RED BROOK
VEGAS
TRONADA
DIA DEL SOL
HILLWOOD
HILLSHIRE
SAN JUAN HILLS
IRON HILLS
CHAMPION HILLS
GREENSBORO
DURANGO
FOX ACRES
ELK RIVER
CANALINO
PITCHING WEDGE
EAGLE RIDGE
SUNNYFIELD
RADERO
ON1A
ON1
ON5
ON6
ON2A
ON2
ON4
ON3
TROPHY HILLS
PINE ISLAND
RAMPART
PLAYERS CLUB
ROCKY CLIFF
CANYON GREENS
TOURNAMENT CANYON
ROYALTON
RAMP E SUM-RAMPART
SUMMERLIN
ULT5A
ULT5B
TESORAS
LAS MANAITAS
CANYON RUN
HOLLINS HALL
WORSLEY PARK
WHITEKIRK
DALMAHOY
McCarran
N
W
E
S
Legend
Rainfall Values
(inches)
2.80 or less
2.81 - 2.90
2.91 - 3.00
3.01 - 3.10
3.11 - 3.20
3.21 - 3.30
3.31 - 3.40
3.41 - 3.50
3.51 - 3.60
3.61 or above
Summerlin Parkway
Safety Improvements
Phase 3
100-Year Rainfall Exhibit
0 450 900 1,800 Feet
GCW
ENGINEERS · SURVEYORS

HYDROLOGIC CRITERIA AND DESIGN MANUAL

TIME OF CONCENTRATION

GCW ENGINEERS \ SURVEYORS

Summerlin Parkway Traffic Capacity and Safety Improvements Phase 3
Ultimate Conditions

Project No: 412-658
Date: 26-Sep-16
Calculated by: mmc/rrd/nb

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANIZED BASINS		Tc	Tlag	REMARKS
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Sq Mi	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY fps	V2 VELOCITY fps	Tt Min	TOTAL LENGTH Feet	Tc = (L/180)+10 Min	Min	Tlag = 0.6Tc/60 Hours	Remarks: Rainfall:
(1)		(16)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(11)	(12)	(13)	(14)	(15)	
Anasazi Drive Sta. 341+50 to 359+00																		
A3A	D	98.0	0.9036	0.69	0.0011	52	2.00	2.0	580	4.90	4.5	6.8	2.1	632	13.5	4.1	0.050	3.15
A6A	D	98.0	0.9036	0.88	0.0014	52	2.50	1.9	585	5.20	4.6	7.0	2.0	637	13.5	3.9	0.050	3.15
Town Center Drive to Rampart Boulevard Sta. 442+00 to 488+00																		
ON1	D	97.0	0.8904	3.38	0.0053	100	3.00	2.6	2040	0.70	1.7	2.6	15.0	2140	21.9	17.6	0.176	2.98
ON1A	D	88.0	0.7716	2.46	0.0038	105	11.00	2.7	2335	0.20	0.9	1.4	31.6	2440	23.6	34.3	0.236	2.98
ON2	D	97.0	0.8904	3.03	0.0047	100	2.00	3.0	2120	2.10	2.9	4.4	8.9	2220	22.3	11.9	0.119	2.93
ON2A	D	88.0	0.7716	1.30	0.0020	150	0.70	8.2	1110	2.10	2.9	4.4	5.1	1260	17.0	13.3	0.133	2.93
ON3	D	97.0	0.8904	3.43	0.0054	100	2.00	3.0	2600	1.90	2.8	4.2	11.3	2700	25.0	14.3	0.143	2.93
ON4	D	88.0	0.7716	2.53	0.0039	50	1.00	4.2	2200	2.00	2.9	4.3	9.5	2250	22.5	13.6	0.136	2.93
ON5	D	88.0	0.7716	1.99	0.0031	50	5.00	2.4	940	0.90	1.9	2.9	6.9	990	15.5	9.3	0.093	2.96
ON6	D	97.0	0.8904	1.66	0.0026	100	3.00	2.6	1055	0.70	1.7	2.6	8.5	1155	16.4	11.2	0.112	2.97
Rampart to Durango Drive Sta. 500+00 to 527+00																		
ULT5A	D	92.0	0.8244	3.84	0.0060	35	3.00	2.0	2200	2.90	3.4	5.2	7.9	2235	22.4	9.9	0.099	2.84
ULT5B	D	91.0	0.8112	6.69	0.0105	60	1.70	3.4	2060	3.00	3.5	5.3	7.3	2120	21.8	10.7	0.107	2.81
ULT5*	D	96.0	0.8772	3.50	0.0055	36	2.00	1.9	1100	3.03	3.5	5.3	4.2	1136	16.3	6.2	0.062	2.77
*Referenced/Revised from the Durango Drive Study.																		

Tc = Ti + Tt Tlag = 0.6 Tc
Ti = 1.8 (1.1 - K) $L^{1/2}$ / $S^{1/3}$
K = 0.0132 (CN) - 0.39

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: V1 = 14.8*(S/100)$^{1/2}$ V2 = 29.4*(S/100)$^{1/2}$

Developed: V1 = 20.2*(S/100)$^{1/2}$ V2 = 30.6*(S/100)$^{1/2}$

REFERENCE:

STANDARD FORM 4

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1****************************************
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*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*          VERSION 4.1                 *
*                                      *
*  RUN DATE   01DEC16  TIME  05:36:27  *
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
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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
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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

1 HEC-1 INPUT PAGE 1

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

                    *DIAGRAM
 *** FREE ***
               1    ID   ************************************************************
               2    ID   * ..................................................... *
               3    ID   * :                                                   : *
               4    ID   * :             SUMMERLIN PARKWAY                     : *
               5    ID   * :             SAFETY IMPROVEMENTS PHASE 3           : *
               6    ID   * :             PROPOSED CONDITIONS                   : *
               7    ID   * :.................................................... * *
               8    ID   * :             RETURN PERIOD_ _ _ _100 & 10 -YEAR    : *
               9    ID   * :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3       : *
              10    ID   * :             PROJECT NO_ _ _ _ _ 412.658           : *
              11    ID   * :             FILENAME_ _ _ _ _ SUMMPKWYPH3.DAT     : *
              12    ID   * :             DATE MODELED_ _ _ _ 9/26/2016         : *
              13    ID   * :             MODELED BY_ _ _ _ MMC/NB/RRD          : *
              14    ID   * :.................................................... * *
              15    ID   * :                                                   : *
              16    ID   * :.................................................... * *
              17    ID   ************************************************************
              18    ID
              19    ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
              20    ID
              21    ID                          AREA      DARF
              22    ID                        SQ.MI.
              23    ID
              24    ID                       0.0 - 0.5    1.00
              25    ID                       0.5 - 1.0    0.98
              26    ID                       1.0 - 2.0    0.95
              27    ID                       2.0 - 4.0    0.92
              28    ID                       4.0 - 6.0    0.91
              29    ID                       6.0 - 8.0    0.89
              30    ID
              31    IT       5       0       0     300
              32    IO       5       0       0
              33    IN       5       0       0
              34    JR    PREC       1    0.57
                    *
              35    KK     A3A
              36    KM  BEGIN STA. 341+50 TO 359+00 ANASAZI DRIVE SUBBASINS
              37    KM  ONSITE BASIN
              38    PB    3.15
              39    BA  0.0011
              40    PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
              41    PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
              42    PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
              43    PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
              44    PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
              45    PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
              46    PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
              47    PC   0.998   0.999   1.000
              48    LS       0    98.0
              49    UD    .050
                    *
```

1 HEC-1 INPUT PAGE 2

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

              50    KK     A6A
              51    KM  ONSITE BASIN
```

```
 52          PB    3.15
 53          BA  0.0014
 54          LS       0    98.0
 55          UD    .050
             *

 56          KK      CP
 57          KM  DUMMY
 58          HC       2
             *

 59          KK     ON1
 60          KM  BEGIN STA. 442+00 TO 488+00 TOWN CENTER DRIVE TO RAMPART BOULEVARD SUBBASINS
 61          KM  ONSITE BASIN
 62          PB    2.98
 63          BA  0.0053
 64          LS       0    97.0
 65          UD    .176
             *

 66          KK     ON2
 67          KM  ONSITE BASIN
 68          PB    2.93
 69          BA  0.0047
 70          LS       0    97.0
 71          UD    .119
             *

 72          KK     ON3
 73          KM  ONSITE BASIN
 74          PB    2.93
 75          BA  0.0054
 76          LS       0    97.0
 77          UD    .143
             *

 78          KK     ON4
 79          KM  ONSITE BASIN
 80          PB    2.93
 81          BA  0.0039
 82          LS       0    88.0
 83          UD    .136
             *

 84          KK     ON5
 85          KM  ONSITE BASIN
 86          PB    2.96
 87          BA  0.0031
 88          LS       0    88.0
 89          UD    .093
             *
```



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

 90          KK     ON6
 91          KM  ONSITE BASIN
 92          PB    2.97
 93          BA  0.0026
 94          LS       0    97.0
 95          UD    .112
             *

 96          KK     CP1
 97          KM  COMBINE SUBBASINS ON5 & ON6
 98          HC       2
             *

 99          KK    ON1A
100          KM  OFFSITE BASIN
101          PB    2.98
102          BA  0.0038
103          LS       0    88.0
104          UD    .236
             *

105          KK    ON2A
106          KM  OFFSITE BASIN
107          PB    2.93
108          BA  0.0020
109          LS       0    88.0
110          UD    .133
             *

111          KK      CP
112          KM  DUMMY
113          HC       2
             *

114          KK      CP
115          KM  DUMMY
116          HC       6
             *

117          KK   ULT5A
118          KM  BEGIN STA. 500+00 TO 527+00 RAMPART DRIVE TO DURANGO DRIVE SUBBASINS
119          KM  ONSITE BASIN
120          PB    2.84
```

```
 121          BA  0.0060
 122          LS       0     92.0
 123          UD    .099
              *

 124          KK   ULT5B
 125          KM  ONSITE BASIN
 126          PB    2.81
 127          BA  0.0105
 128          LS       0     91.0
 129          UD    .107
              *
1                                          HEC-1 INPUT                                                  PAGE  4

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

 130          KK    ULT5
 131          KM  REFERENCED FROM DURANGO DRIVE STUDY
 132          KM  ONSITE BASIN
 133          PB    2.77
 134          BA  0.0055
 135          LS       0     96.0
 136          UD    .062
              *

 137          KK      CP
 138          KM  DUMMY
 139          HC       3
              *
 140          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    35        A3A
                .
                .
    50          .         A6A
                .           .
                .           .
    56         CP............
                .
                .
    59          .         ON1
                .           .
                .           .
    66          .           .        ON2
                .           .          .
                .           .          .
    72          .           .          .        ON3
                .           .          .          .
                .           .          .          .
    78          .           .          .          .        ON4
                .           .          .          .          .
                .           .          .          .          .
    84          .           .          .          .          .        ON5
                .           .          .          .          .          .
                .           .          .          .          .          .
    90          .           .          .          .          .          .        ON6
                .           .          .          .          .          .          .
                .           .          .          .          .          .          .
    96          .           .          .          .          .        CP1............
                .           .          .          .          .          .
                .           .          .          .          .          .
    99          .           .          .          .          .          .        ON1A
                .           .          .          .          .          .          .
                .           .          .          .          .          .          .
   105          .           .          .          .          .          .          .        ON2A
                .           .          .          .          .          .          .          .
                .           .          .          .          .          .          .          .
   111          .           .          .          .          .          .         CP............
                .           .          .          .          .          .          .
                .           .          .          .          .          .          .
   114          .          CP..........................................................
                .           .
                .           .
   117          .           .      ULT5A
                .           .          .
                .           .          .
   124          .           .          .      ULT5B
                .           .          .          .
                .           .          .          .
   130          .           .          .          .        ULT5
                .           .          .          .          .
                .           .          .          .          .
   137          .           .         CP........................

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   01DEC16  TIME  05:36:27   *
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
```

```
*                                       *                                       *
*****************************************                                       *
                                                                                *
                                                                                *
                                                                                
```

				TIME	3.50	3.58
HYDROGRAPH AT						
+	ON3	.01	1	FLOW	10.	6.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ON4	.00	1	FLOW	6.	2.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ON5	.00	1	FLOW	5.	2.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ON6	.00	1	FLOW	5.	3.
				TIME	3.50	3.50
2 COMBINED AT						
+	CP1	.01	1	FLOW	10.	5.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ON1A	.00	1	FLOW	5.	2.
				TIME	3.67	3.67
HYDROGRAPH AT						
+	ON2A	.00	1	FLOW	3.	1.
				TIME	3.58	3.58
2 COMBINED AT						
+	CP	.01	1	FLOW	8.	3.
				TIME	3.58	3.58
6 COMBINED AT						
+	CP	.03	1	FLOW	52.	26.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ULT5A	.01	1	FLOW	11.	5.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT5B	.01	1	FLOW	17.	8.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT5	.01	1	FLOW	12.	6.
				TIME	3.50	3.50
3 COMBINED AT						
+	CP	.02	1	FLOW	40.	19.
				TIME	3.50	3.50

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

APPENDIX B

Hydraulic Calculations and Information

Channel Analysis: A6A-1 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 23.5000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0572 ft/ft

Manning's n: 0.0150

Flow: 4.1000 cfs

Result Parameters

Depth: 0.2471 ft

Area of Flow: 0.7176 ft^2

Wetted Perimeter: 6.0599 ft

Hydraulic Radius: 0.1184 ft

Average Velocity: 5.7135 ft/s

Top Width: 5.8075 ft

Froude Number: 2.8644

Critical Depth: 8.5023 ft

Critical Velocity: 0.0048 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 1173844538.53 ft

Calculated Max Shear Stress: 0.8821 lb/ft^2

Calculated Avg Shear Stress: 0.4227 lb/ft^2

Channel Analysis: ON1-1 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0135 ft/ft

Manning's n: 0.0150

Flow: 1.9000 cfs

Result Parameters

Depth: 0.1819 ft

Area of Flow: 0.8272 ft^2

Wetted Perimeter: 9.2785 ft

Hydraulic Radius: 0.0891 ft

Average Velocity: 2.2970 ft/s

Top Width: 9.0948 ft

Froude Number: 1.3423

Critical Depth: 5.3746 ft

Critical Velocity: 0.0026 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 3359095164.18 ft

Calculated Max Shear Stress: 0.1532 lb/ft^2

Calculated Avg Shear Stress: 0.0751 lb/ft^2

Channel Analysis: ON1-2 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0062 ft/ft

Manning's n: 0.0150

Flow: 1.2000 cfs

Result Parameters

Depth: 0.1772 ft

Area of Flow: 0.7846 ft^2

Wetted Perimeter: 9.0366 ft

Hydraulic Radius: 0.0868 ft

Average Velocity: 1.5295 ft/s

Top Width: 8.8576 ft

Froude Number: 0.9056

Critical Depth: 4.4721 ft

Critical Velocity: 0.0024 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 2795074356.30 ft

Calculated Max Shear Stress: 0.0685 lb/ft^2

Calculated Avg Shear Stress: 0.0336 lb/ft^2

Channel Analysis: ON1-3 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0015 ft/ft

Manning's n: 0.0150

Flow: 0.8000 cfs

Result Parameters

Depth: 0.1986 ft

Area of Flow: 0.9856 ft^2

Wetted Perimeter: 10.1280 ft

Hydraulic Radius: 0.0973 ft

Average Velocity: 0.8117 ft/s

Top Width: 9.9275 ft

Froude Number: 0.4540

Critical Depth: 3.8026 ft

Critical Velocity: 0.0022 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 2376604210.06 ft

Calculated Max Shear Stress: 0.0186 lb/ft^2

Calculated Avg Shear Stress: 0.0091 lb/ft^2

Channel Analysis: ON1-4 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0015 ft/ft

Manning's n: 0.0150

Flow: 0.6000 cfs

Result Parameters

Depth: 0.1782 ft

Area of Flow: 0.7943 ft^2

Wetted Perimeter: 9.0923 ft

Hydraulic Radius: 0.0874 ft

Average Velocity: 0.7554 ft/s

Top Width: 8.9123 ft

Froude Number: 0.4459

Critical Depth: 3.3892 ft

Critical Velocity: 0.0021 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 2118270253.24 ft

Calculated Max Shear Stress: 0.0167 lb/ft^2

Calculated Avg Shear Stress: 0.0082 lb/ft^2

Channel Analysis: ON1-5 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0065 ft/ft

Manning's n: 0.0150

Flow: 2.7000 cfs

Result Parameters

Depth: 0.2380 ft

Area of Flow: 1.4160 ft^2

Wetted Perimeter: 12.1401 ft

Hydraulic Radius: 0.1166 ft

Average Velocity: 1.9067 ft/s

Top Width: 11.8998 ft

Froude Number: 0.9741

Critical Depth: 6.1857 ft

Critical Velocity: 0.0028 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 3866040265.69 ft

Calculated Max Shear Stress: 0.0965 lb/ft^2

Calculated Avg Shear Stress: 0.0473 lb/ft^2

Channel Analysis: ON1-6 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0101 ft/ft

Manning's n: 0.0150

Flow: 3.4000 cfs

Result Parameters

Depth: 0.2389 ft

Area of Flow: 1.4269 ft^2

Wetted Perimeter: 12.1865 ft

Hydraulic Radius: 0.1171 ft

Average Velocity: 2.3828 ft/s

Top Width: 11.9452 ft

Froude Number: 1.2150

Critical Depth: 6.7832 ft

Critical Velocity: 0.0030 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 4239478470.82 ft

Calculated Max Shear Stress: 0.1506 lb/ft^2

Calculated Avg Shear Stress: 0.0738 lb/ft^2

Channel Analysis: ON1-7 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0106 ft/ft

Manning's n: 0.0150

Flow: 0.8000 cfs

Result Parameters

Depth: 0.1376 ft

Area of Flow: 0.4734 ft^2

Wetted Perimeter: 7.0194 ft

Hydraulic Radius: 0.0674 ft

Average Velocity: 1.6899 ft/s

Top Width: 6.8804 ft

Froude Number: 1.1354

Critical Depth: 3.8026 ft

Critical Velocity: 0.0022 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 2376604210.06 ft

Calculated Max Shear Stress: 0.0910 lb/ft^2

Calculated Avg Shear Stress: 0.0446 lb/ft^2

Channel Analysis: ON2-1 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0115 ft/ft

Manning's n: 0.0150

Flow: 2.1000 cfs

Result Parameters

Depth: 0.1946 ft

Area of Flow: 0.9469 ft^2

Wetted Perimeter: 9.9274 ft

Hydraulic Radius: 0.0954 ft

Average Velocity: 2.2178 ft/s

Top Width: 9.7308 ft

Froude Number: 1.2529

Critical Depth: 5.5941 ft

Critical Velocity: 0.0027 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 3496299154.90 ft

Calculated Max Shear Stress: 0.1397 lb/ft^2

Calculated Avg Shear Stress: 0.0684 lb/ft^2

Channel Analysis: ON2-2 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 25.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0179 ft/ft

Manning's n: 0.0150

Flow: 1.8000 cfs

Result Parameters

Depth: 0.2203 ft

Area of Flow: 0.6069 ft^2

Wetted Perimeter: 5.7334 ft

Hydraulic Radius: 0.1059 ft

Average Velocity: 2.9659 ft/s

Top Width: 5.5086 ft

Froude Number: 1.5747

Critical Depth: 6.0417 ft

Critical Velocity: 0.0039 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 944008496.65 ft

Calculated Max Shear Stress: 0.2461 lb/ft^2

Calculated Avg Shear Stress: 0.1182 lb/ft^2

Channel Analysis: ON2-2A - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 25.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0302 ft/ft

Manning's n: 0.0150

Flow: 2.4000 cfs

Result Parameters

Depth: 0.2225 ft

Area of Flow: 0.6189 ft^2

Wetted Perimeter: 5.7899 ft

Hydraulic Radius: 0.1069 ft

Average Velocity: 3.8777 ft/s

Top Width: 5.5629 ft

Froude Number: 2.0487

Critical Depth: 6.7785 ft

Critical Velocity: 0.0042 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 1059135190.17 ft

Calculated Max Shear Stress: 0.4193 lb/ft^2

Calculated Avg Shear Stress: 0.2014 lb/ft^2

Channel Analysis: ON2-3 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 25.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0213 ft/ft

Manning's n: 0.0150

Flow: 3.0000 cfs

Result Parameters

Depth: 0.2583 ft

Area of Flow: 0.8340 ft^2

Wetted Perimeter: 6.7211 ft

Hydraulic Radius: 0.1241 ft

Average Velocity: 3.5970 ft/s

Top Width: 6.4577 ft

Froude Number: 1.7639

Critical Depth: 7.4113 ft

Critical Velocity: 0.0044 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 1158018248.11 ft

Calculated Max Shear Stress: 0.3433 lb/ft^2

Calculated Avg Shear Stress: 0.1649 lb/ft^2

Channel Analysis: ON2-4 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 25.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0201 ft/ft

Manning's n: 0.0150

Flow: 0.7000 cfs

Result Parameters

Depth: 0.1513 ft

Area of Flow: 0.2862 ft^2

Wetted Perimeter: 3.9369 ft

Hydraulic Radius: 0.0727 ft

Average Velocity: 2.4462 ft/s

Top Width: 3.7826 ft

Froude Number: 1.5673

Critical Depth: 4.1408 ft

Critical Velocity: 0.0033 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 647002736.01 ft

Calculated Max Shear Stress: 0.1898 lb/ft^2

Calculated Avg Shear Stress: 0.0912 lb/ft^2

Channel Analysis: ON6-2 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 50.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0086 ft/ft

Manning's n: 0.0150

Flow: 1.1000 cfs

Result Parameters

Depth: 0.1613 ft

Area of Flow: 0.6501 ft^2

Wetted Perimeter: 8.2260 ft

Hydraulic Radius: 0.0790 ft

Average Velocity: 1.6920 ft/s

Top Width: 8.0631 ft

Froude Number: 1.0500

Critical Depth: 4.3191 ft

Critical Velocity: 0.0024 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 2699466494.31 ft

Calculated Max Shear Stress: 0.0865 lb/ft^2

Calculated Avg Shear Stress: 0.0424 lb/ft^2

Channel Analysis: ON6-1 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 100.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0055 ft/ft

Manning's n: 0.0150

Flow: 0.7000 cfs

Result Parameters

Depth: 0.1139 ft

Area of Flow: 0.6481 ft^2

Wetted Perimeter: 11.4999 ft

Hydraulic Radius: 0.0564 ft

Average Velocity: 1.0800 ft/s

Top Width: 11.3855 ft

Froude Number: 0.7977

Critical Depth: 3.1382 ft

Critical Velocity: 0.0014 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 7845381418.35 ft

Calculated Max Shear Stress: 0.0391 lb/ft^2

Calculated Avg Shear Stress: 0.0193 lb/ft^2

Channel Analysis: ON3-1 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 25.0000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0124 ft/ft

Manning's n: 0.0150

Flow: 0.9000 cfs

Result Parameters

Depth: 0.1820 ft

Area of Flow: 0.4141 ft^2

Wetted Perimeter: 4.7361 ft

Hydraulic Radius: 0.0874 ft

Average Velocity: 2.1733 ft/s

Top Width: 4.5504 ft

Froude Number: 1.2695

Critical Depth: 4.5787 ft

Critical Velocity: 0.0034 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 715424658.65 ft

Calculated Max Shear Stress: 0.1408 lb/ft^2

Calculated Avg Shear Stress: 0.0677 lb/ft^2

Channel Analysis: ULT5A-2 - Street Analysis

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 32.5000 ft/ft

Side Slope 2 (Z2): 0.0000 ft/ft

Longitudinal Slope: 0.0302 ft/ft

Manning's n: 0.0150

Flow: 1.7000 cfs

Result Parameters

Depth: 0.1768 ft

Area of Flow: 0.5079 ft^2

Wetted Perimeter: 5.9254 ft

Hydraulic Radius: 0.0857 ft

Average Velocity: 3.3470 ft/s

Top Width: 5.7459 ft

Froude Number: 1.9838

Critical Depth: 5.6032 ft

Critical Velocity: 0.0033 ft/s

Critical Slope: 0.0000 ft/ft

Critical Top Width: 1479600576.53 ft

Calculated Max Shear Stress: 0.3332 lb/ft^2

Calculated Avg Shear Stress: 0.1615 lb/ft^2

TRAPEZOIDAL CHANNEL

A6B-1

Flow "Q"	1	cfs
Manning's "n"	0.025	
Slope (%)	5.50	
Bottom Width	0.0	ft
Side Slope (Lt)	3.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.91	ft/sec
Depth	0.32	ft
Freeboard	1.07	ft
Total Depth	1.39	ft
Froude No.	1.72	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

A6A-1A

Flow "Q"	1	cfs
Manning's "n"	0.025	
Slope (%)	5.50	
Bottom Width	0.0	ft
Side Slope (Lt)	10.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.24	ft/sec
Depth	0.23	ft
Freeboard	1.05	ft
Total Depth	1.28	ft
Froude No.	1.68	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

A6B-2

Flow "Q"	3	cfs
Manning's "n"	0.025	
Slope (%)	5.50	
Bottom Width	0.0	ft
Side Slope (Lt)	10.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	4.26	ft/sec
Depth	0.34	ft
Freeboard	1.07	ft
Total Depth	1.41	ft
Froude No.	1.82	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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TRAPEZOIDAL CHANNEL

ULT5B

Flow "Q"	17	cfs
Manning's "n"	0.037	
Slope (%)	2.54	
Bottom Width	0.0	ft
Side Slope (Lt)	8.0	H:1V
Side Slope (Rt)	0.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	4.02	ft/sec
Depth	1.03	ft
Freeboard	0.75	ft
Total Depth	1.78	ft
Froude No.	0.99	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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RIPRAP CHANNEL

ULT5B

Flow "Q"	17	cfs
Manning's "n"	0.032	
Slope (%)	2.54	
Bottom Width	0.0	ft
Side Slope (Lt)	8.0	H:1V
Side Slope (Rt)	0.0	H:1V
Specific Gravity	2.50	

OUTPUT:

Velocity	4.49	ft/s
Depth	0.97	ft
Freeboard	1.11	ft
Total Depth	2.08	ft
Froude No.	1.14	
Riprap Size D50	3.5	in

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TRAPEZOIDAL CHANNEL

ULT5-2

Flow "Q"	2	cfs
Manning's "n"	0.025	
Slope (%)	3.43	
Bottom Width	0.0	ft
Side Slope (Lt)	10.0	H:1V
Side Slope (Rt)	2.0	H:1V
Radius	0.0	ft

OUTPUT:

Velocity	3.23	ft/sec
Depth	0.32	ft
Freeboard	1.06	ft
Total Depth	1.38	ft
Froude No.	1.42	ft
Superelevation	0.00	ft

Normal depth calculations using Manning's equation

Fb = 1+0.025Vd^(1/3) Supercritical; 0.5+V^2/2g Subcritical

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Curb and Gutter Analysis: A6A-1

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0572 ft/ft

Cross-Slope of Pavement: 0.0426 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 6.0000 ft

Width of Spread: 5.3686 ft

Gutter Result Parameters

Design Flow: 4.1000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.6139 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.7445 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 6.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 4.1000 cfs

Bypass Flow: 0.0000 cfs

Approach Velocity: 6.6784 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 1.0000

PROPOSED NDOT TYPE 2A DROP INLET

A6A-1A

	WEIR		ORIFICE
Q100 =	1.3	Q100 =	1.3
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	0.23	ASSUME H1 =	0.23
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	2.9	Q = CA(64.4 H)1/2	10.4

CONTROL = WEIR

Q INT = 2.9

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

Curb and Gutter Analysis: ON1-1

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0135 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 8.4609 ft

Gutter Result Parameters

Design Flow: 1.9000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.7159 ft^2

Eo (Gutter Flow to Total Flow): 0.8190

Gutter Depth at Curb: 2.0306 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.6284 cfs

Bypass Flow: 0.2716 cfs

Approach Velocity: 2.6541 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.8570

Curb and Gutter Analysis: ON1-2

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0062 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 8.2402 ft

Gutter Result Parameters

Design Flow: 1.2000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.6790 ft^2

Eo (Gutter Flow to Total Flow): 0.8303

Gutter Depth at Curb: 1.9777 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.0690 cfs

Bypass Flow: 0.1310 cfs

Approach Velocity: 1.7673 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.8908

Curb and Gutter Analysis: ON1-3

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0015 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 9.2355 ft

Gutter Result Parameters

Design Flow: 0.8000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.8529 ft^2

Eo (Gutter Flow to Total Flow): 0.7803

Gutter Depth at Curb: 2.2165 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.7357 cfs

Bypass Flow: 0.0643 cfs

Approach Velocity: 0.9379 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.9196

Curb and Gutter Analysis: ON1-4

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0015 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 8.2911 ft

Gutter Result Parameters

Design Flow: 0.6000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.6874 ft^2

Eo (Gutter Flow to Total Flow): 0.8277

Gutter Depth at Curb: 1.9899 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.5652 cfs

Bypass Flow: 0.0348 cfs

Approach Velocity: 0.8728 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.9420

Curb and Gutter Analysis: ON1-5

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0065 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 6.0000 ft

Width of Spread: 11.0703 ft

Gutter Result Parameters

Design Flow: 2.7000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 1.2255 ft^2

Eo (Gutter Flow to Total Flow): 0.8757

Gutter Depth at Curb: 2.6569 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 6.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 2.4554 cfs

Bypass Flow: 0.2446 cfs

Approach Velocity: 2.2031 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.9094

Curb and Gutter Analysis: ON1-6

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0101 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 6.0000 ft

Design Flow: 3.4000 cfs

Gutter Result Parameters

Width of Spread: 11.1126 ft

Gutter Depression: 0.0000 in

Area of Flow: 1.2349 ft^2

Eo (Gutter Flow to Total Flow): 0.8742

Gutter Depth at Curb: 2.6670 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 6.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 3.0576 cfs

Bypass Flow: 0.3424 cfs

Approach Velocity: 2.7533 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.8993

PROPOSED NDOT TYPE 2A DROP INLET

ON1A

	WEIR		ORIFICE
Q100 =	5	Q100 =	5
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	0.33	ASSUME H1 =	0.33
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	5.0	Q = CA(64.4 H)1/2	11.4

CONTROL = WEIR

Q INT = 5.0

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

Curb and Gutter Analysis: ON1-7

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0106 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 6.4008 ft

Gutter Result Parameters

Design Flow: 0.8000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.4097 ft^2

Eo (Gutter Flow to Total Flow): 0.9271

Gutter Depth at Curb: 1.5362 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.7650 cfs

Bypass Flow: 0.0350 cfs

Approach Velocity: 1.9526 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 0.9563

Curb and Gutter Analysis: ON2-1

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0115 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 9.0526 ft

Gutter Result Parameters

Design Flow: 2.1000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.8195 ft^2

Eo (Gutter Flow to Total Flow): 0.7892

Gutter Depth at Curb: 2.1726 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.7859 cfs

Bypass Flow: 0.3141 cfs

Approach Velocity: 2.5626 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 0.8504

Curb and Gutter Analysis: ON2-2

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0179 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 5.0991 ft

Gutter Result Parameters

Design Flow: 1.8000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.5200 ft^2

Eo (Gutter Flow to Total Flow): 0.9834

Gutter Depth at Curb: 2.4476 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 6.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.8000 cfs

Bypass Flow: 0.0000 cfs

Approach Velocity: 3.4614 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 1.0000

PROPOSED NDOT TYPE 2A DROP INLET

ON2A

	WEIR		ORIFICE
Q100 =	3	Q100 =	3
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	0.24	ASSUME H1 =	0.24
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	3.0	Q = CA(64.4 H)1/2	10.5

CONTROL = WEIR

Q INT = 3.0

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

Curb and Gutter Analysis: ON2-2A

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0302 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 5.1494 ft

Gutter Result Parameters

Design Flow: 2.4000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.5303 ft^2

Eo (Gutter Flow to Total Flow): 0.9818

Gutter Depth at Curb: 2.4717 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 2.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.9009 cfs

Bypass Flow: 0.4991 cfs

Approach Velocity: 4.5256 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 0.7920

Curb and Gutter Analysis: ON2-3

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0213 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 6.0000 ft

Width of Spread: 5.9776 ft

Gutter Result Parameters

Design Flow: 3.0000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.7146 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 2.8692 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 6.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 3.0000 cfs

Bypass Flow: 0.0000 cfs

Approach Velocity: 4.1980 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 1.0000

Curb and Gutter Analysis: ON2-4

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0201 ft/ft

Cross-Slope of Pavement: 0.0400 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 3.5014 ft

Gutter Result Parameters

Design Flow: 0.7000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.2452 ft^2

Eo (Gutter Flow to Total Flow): 1.0000

Gutter Depth at Curb: 1.6807 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 3.4000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.7000 cfs

Bypass Flow: 0.0000 cfs

Approach Velocity: 2.8549 ft/s

Splash-over Velocity: 10.6048 ft/s

Efficiency: 1.0000

Curb and Gutter Analysis: ON6-2

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0086 ft/ft

Cross-Slope of Pavement: 0.0200 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 7.5011 ft

Gutter Result Parameters

Design Flow: 1.1000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.5627 ft^2

Eo (Gutter Flow to Total Flow): 0.8693

Gutter Depth at Curb: 1.8003 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 1.0016 cfs

Bypass Flow: 0.0984 cfs

Approach Velocity: 1.9550 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.9106

Curb and Gutter Analysis: ON6-1

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0055 ft/ft

Cross-Slope of Pavement: 0.0100 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 10.6184 ft

Gutter Result Parameters

Design Flow: 0.7000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.5637 ft^2

Eo (Gutter Flow to Total Flow): 0.7170

Gutter Depth at Curb: 1.2742 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.5699 cfs

Bypass Flow: 0.1301 cfs

Approach Velocity: 1.2417 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.8141

Curb and Gutter Analysis: ON3-1

Notes:

Gutter Input Parameters

Longitudinal Slope of Road: 0.0124 ft/ft

Cross-Slope of Pavement: 0.0100 ft/ft

Uniform Gutter Geometry

Manning's n: 0.0150

Gutter Width: 4.0000 ft

Width of Spread: 10.0182 ft

Gutter Result Parameters

Design Flow: 0.9000 cfs

Gutter Depression: 0.0000 in

Area of Flow: 0.5018 ft^2

Eo (Gutter Flow to Total Flow): 0.7435

Gutter Depth at Curb: 1.2022 in

Inlet Input Parameters

Inlet Location: Inlet on Grade

Inlet Type: Grate

Grate Type: P - 1-7/8

Grate Width: 4.0000 ft

Grate Length: 2.9000 ft

Local Depression: 0.0000 in

Inlet Result Parameters

Intercepted Flow: 0.7182 cfs

Bypass Flow: 0.1818 cfs

Approach Velocity: 1.7935 ft/s

Splash-over Velocity: 9.8051 ft/s

Efficiency: 0.7980

PROPOSED NDOT TYPE 2A DROP INLET

ON4

	WEIR		ORIFICE
Q100 =	6	Q100 =	6
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	0.38	ASSUME H1 =	0.38
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	6.0	Q = CA(64.4 H)1/2	11.9

CONTROL = WEIR

Q INT = 6.0

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

EXISTING NDOT TYPE 2A DROP INLET

ULT5B

	WEIR		ORIFICE
Q100 =	17	Q100 =	17
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	1.03	ASSUME H1 =	1.03
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	27.3	Q = CA(64.4 H)1/2	17.0

CONTROL = ORIFICE

Q INT = 17.0

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

EXISTING NDOT TYPE 2A DROP INLET

ULT5-2

	WEIR		ORIFICE
Q100 =	2.4	Q100 =	2.4
L =	9.67	CLEAR AREA =	2.87
		C =	0.65
ASSUME H1 =	0.20	ASSUME H1 =	0.20
C (FOR H1) =	2.7		
$Q_F = CL(H)^{3/2}$	2.4	Q = CA(64.4 H)1/2	10.0

CONTROL = WEIR

Q INT = 2.4

Note: H1 is measured from the top of the grate. Orifice calculations accounts for the 3-inch thickness of the grate

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 353+00 | DATE: 12/01/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																														
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc					CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)			(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									3007.11																			Outlet K_o=		1.0															
2	100.00	169.49	R	18					1	3007.11	3007.93	69.5	1.18%	1.77	0.0049	5.4	3.06	0.15	0.0026	0.0026	0.18																									3008.76	3008.61			
3	169.49	173.49	T	18					1	3007.93	3008.03	4.0	2.50%	1.77	0.0049	4.1	2.32	0.08	0.0015	0.0015		0.01	45	0.46	0.07	45	0.50	0.10																0.00	3009.58	3009.43			PART	D/S
4	173.49	276.68	R	18					1	3008.03	3015.14	103.2	6.89%	1.77	0.0049	4.1	2.32	0.08	0.0015	0.0015	0.16																						0.18			3009.75	3009.67	FULL	U/S
5	276.68	276.68	R	18					1	3015.14	3015.14	0.0		1.77	0.0049	4.1	2.32	0.08	0.0015	0.0015	0.00									Ki=	0.4	0.03									0.00	3016.72	3016.64			PART	D/S
6																																							0.03			3016.76	3016.76	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	3007.11	3007.11	3008.76	3008.61	3014.96			OK	NO
169.49	3007.93	3009.43	3009.58	3009.43	3012.43			OK	NO
173.49	3008.03	3009.53	3009.75	3009.67	3012.43			OK	NO
276.68	3015.14	3016.64	3016.72	3016.64	3020.14			OK	NO
276.68	3015.14	3016.64	3016.76	3016.76	3020.14			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Mainline "SWB" 444+83 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																														
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend					Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/ Cont	K_f	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)			(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									2699.90																			Outlet K_c=	1.0												2702.87	2702.40		
2	100.00	130.34	R	30					1	2699.90	2700.44	30.3	1.78%	4.91	0.0049	27.0	5.50	0.47	0.0043	0.0043	0.13																			0.00	2703.41	2702.94			FULL	D/S
3	130.34	134.34	T	24					1	2700.44	2700.54	4.0	2.50%	3.14	0.0049	27.0	8.59	1.15	0.0142	0.0093		0.04	58	0.63	0.30														0.33			2703.74	2702.60	FULL	U/S
4	134.34	144.34	R	24					1	2700.54	2700.59	10.0	0.50%	3.14	0.0049	27.0	8.59	1.15	0.0142	0.0142	0.14																			0.00	2703.88	2702.74			FULL	U/S
5	144.34	148.34	T	24					1	2700.59	2700.69	4.0	2.50%	3.14	0.0049	26.3	8.37	1.09	0.0135	0.0138		0.06	65	0.85	0.97	45	0.50	0.60											1.63			2705.52	2704.43	FULL	U/S
6	148.34	333.50	R	24					1	2700.69	2703.56	185.2	1.55%	3.14	0.0049	26.3	8.37	1.09	0.0135	0.0135	2.49																			0.00	2708.01	2706.92			FULL	U/S
7	333.50	337.50	T	24					1	2703.56	2703.66	4.0	2.50%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0120		0.05	4	0.02	0.02	45	0.50	0.66											0.73			2708.74	2707.89	FULL	U/S
8	337.50	551.84	R	24					1	2703.66	2709.04	214.3	2.51%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0106	2.27																			0.00	2711.89	2711.04			PART	D/S
9	551.84	555.84	T	24					1	2709.04	2709.14	4.0	2.50%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0106		0.04	5	0.05	0.04														0.09			2711.99	2711.14	FULL	D/S
10	555.84	788.29	R	24					1	2709.14	2716.16	232.5	3.02%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0106	2.46																			0.00	2719.01	2718.16			PART	D/S
11	788.29	792.29	T	24					1	2716.16	2716.26	4.0	2.50%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0106		0.04	5	0.05	0.04														0.09			2719.11	2718.26	FULL	D/S
12	792.29	989.17	R	24					1	2716.26	2721.30	196.9	2.56%	3.14	0.0049	23.3	7.42	0.85	0.0106	0.0106	2.08																			0.00	2724.15	2723.30			PART	D/S
13	989.17	993.17	T	24					1	2721.30	2721.40	4.0	2.50%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0086		0.03	3	0.02	0.02	71	0.32	0.68											0.74			2724.89	2724.36	FULL	U/S
14	993.17	1220.62	R	24					1	2721.40	2728.36	227.5	3.06%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0066	1.50																			0.00	2730.89	2730.36			PART	D/S
15	1220.62	1224.62	T	24					1	2728.36	2728.46	4.0	2.50%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0066		0.03	5	0.05	0.03														0.05			2730.99	2730.46	FULL	D/S
16	1224.62	1451.14	R	24					1	2728.46	2733.67	226.5	2.30%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0066	1.49																			0.00	2736.20	2735.67			PART	D/S
17	1451.14	1455.14	T	24					1	2733.67	2733.77	4.0	2.50%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0066		0.03	5	0.05	0.03														0.05			2736.30	2735.77	FULL	D/S
18	1455.14	1681.88	R	24					1	2733.77	2738.01	226.7	1.87%	3.14	0.0049	18.4	5.86	0.53	0.0066	0.0066	1.50																			0.00	2740.54	2740.01			PART	D/S
19	1681.88	1685.88	T	24					1	2738.01	2738.11	4.0	2.50%	3.14	0.0049	16.6	5.28	0.43	0.0054	0.0060		0.02	3	0.02	0.01	45	0.50	0.32											0.35			2740.89	2740.46	FULL	U/S
20	1685.88	2000.62	R	24					1	2738.11	2743.02	314.7	1.56%	3.14	0.0049	16.6	5.28	0.43	0.0054	0.0054	1.69																			0.00	2745.45	2745.02			PART	D/S
21	2000.62	2004.62	T	24					1	2743.02	2743.12	4.0	2.50%	3.14	0.0049	14.9	4.74	0.35	0.0043	0.0048		0.02	0	0.02	0.01	45	0.50	0.26											0.29			2745.74	2745.39	FULL	U/S
22	2004.62	2280.26	R	24					1	2743.12	2745.27	275.6	0.78%	3.14	0.0049	14.9	4.74	0.35	0.0043	0.0043	1.19																			0.00	2747.62	2747.27			PART	D/S
23	2280.26	2284.26	T	18					1	2745.27	2745.87	4.0	15.00%	1.77	0.0049	9.2	5.21	0.42	0.0076	0.0060		0.02	0	0.02	0.01													0.62	0.65			2748.27	2747.85	FULL	U/S
24	2284.26	2397.90	R	18					1	2745.87	2747.62	113.6	1.54%	1.77	0.0049	9.2	5.21	0.42	0.0076	0.0076	0.87																			0.00	2749.54	2749.12			PART	D/S
25	2397.90	2401.90	T	18					1	2747.62	2747.72	4.0	2.50%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0056		0.02	0	0.02	0.01	45	0.50	0.33											0.36			2749.90	2749.71	FULL	U/S
26	2401.90	2684.04	R	18					1	2747.72	2749.30	282.1	0.56%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0035	0.98																			0.00	2750.99	2750.80			FULL	D/S
27	2684.04	2688.04	T	18					1	2749.30	2749.40	4.0	2.50%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0035		0.01	0	0.02	0.00														0.02			2751.09	2750.90	FULL	D/S
28	2688.04	2970.04	R	18					1	2749.40	2750.81	282.0	0.50%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0035	0.98																			0.00	2752.50	2752.31			PART	D/S
29	2970.04	2974.04	T	18					1	2750.81	2750.91	4.0	2.50%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0035		0.01	0	0.02	0.00														0.02			2752.60	2752.41	FULL	D/S
30	2974.04	3256.04	R	18					1	2750.91	2752.32	282.0	0.50%	1.77	0.0049	6.2	3.51	0.19	0.0035	0.0035	0.98																			0.00	2754.01	2753.82			PART	D/S
31	3256.04	3260.04	T	18					1	2752.32	2752.42	4.0	2.50%	1.77	0.0049	3.8	2.15	0.07	0.0013	0.0024		0.01	0	0.02	0.00	45	0.50	0.16											0.17			2754.18	2754.11	FULL	U/S
32	3260.04	3528.04	R	18					1	2752.42	2753.76	268.0	0.50%	1.77	0.0049	3.8	2.15	0.07	0.0013	0.0013	0.35																			0.00	2755.33	2755.26			PART	D/S
33	3528.04	3532.04	T	18					1	2753.76	2753.86	4.0	2.50%	1.77	0.0049	3.8	2.15	0.07	0.0013	0.0013		0.01	4	0.02	0.00														0.01			2755.43	2755.36	FULL	D/S
	3532.04	3676.04	R	18					1	2753.86	2754.58	144.0	0.50%	1.77	0.0049	3.8	2.15	0.07	0.0013	0.0013	0.19																			0.00	2756.15	2756.08			PART	D/S
	3676.04	3680.04	T	18					1	2754.58	2754.68	4.0	2.50%	1.77	0.0049	3.3	1.87	0.05	0.0010	0.0011		0.00	0	0.02	0.00	45	0.50	0.04											0.05			2756.23	2756.18	FULL	D/S
	3680.04	3798.04	R	18					1	2754.68	2755.27	118.0	0.50%	1.77	0.0049	3.3	1.87	0.05	0.0010	0.0010	0.12																			0.00	2756.82	2756.77			PART	D/S
	3798.04	3802.04	T	18					1	2755.27	2755.37	4.0	2.50%	1.77	0.0049	2.6	1.47	0.03	0.0006	0.0008		0.00	0	0.02	0.00	45	0.50	0.04											0.04			2756.90	2756.87	FULL	D/S
	3802.04	3928.04	R	18					1	2755.37	2756.00	126.0	0.50%	1.77	0.0049	2.6	1.47	0.03	0.0006	0.0006	0.08																			0.00	2757.53	2757.50			PART	D/S
	3928.04	3932.04	T	18					1	2756.00	2756.10	4.0	2.50%	1.77	0.0049	1.6	0.91	0.01	0.0002	0.0004		0.00	0	0.02	0.00	45	0.50	0.03											0.03			2757.61	2757.60	FULL	D/S

Summary of Results

						(Optional)		HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2699.9	2699.90	2702.87	2702.40	2702.40			HGL<1ft below FG	NO
130.34	2700.44	2702.94	2703.41	2702.94	2703.55			HGL<1ft below FG	NO
134.34	2700.54	2702.54	2703.74	2702.60	2703.55			HGL<1ft below FG	NO
144.34	2700.59	2702.59	2703.88	2702.74	2705.64			OK	NO
148.34	2700.69	2702.69	2705.52	2704.43	2705.64			OK	NO
333.50	2703.56	2705.56	2708.01	2706.92	2709.16			OK	NO
337.50	2703.66	2705.66	2708.74	2707.89	2709.16			OK	NO
551.84	2709.04	2711.04	2711.89	2711.04	2714.54			OK	NO
555.84	2709.14	2711.14	2711.99	2711.14	2714.54			OK	NO
788.29	2716.16	2718.16	2719.01	2718.16	2721.66			OK	NO
792.29	2716.26	2718.26	2719.11	2718.26	2721.66			OK	NO
989.17	2721.3	2723.30	2724.15	2723.30	2727.55			OK	NO
993.17	2721.4	2723.40	2724.89	2724.36	2727.55			OK	NO
1220.62	2728.36	2730.36	2730.89	2730.36	2733.86			OK	NO
1224.62	2728.46	2730.46	2730.99	2730.46	2733.86			OK	NO
1451.14	2733.67	2735.67	2736.20	2735.67	2739.17			OK	NO
1455.14	2733.77	2735.77	2736.30	2735.77	2739.17			OK	NO
1681.88	2738.01	2740.01	2740.54	2740.01	2743.61			OK	NO
1685.88	2738.11	2740.11	2740.89	2740.46	2743.61			OK	NO
2000.62	2743.02	2745.02	2745.45	2745.02	2748.62			OK	NO
2004.62	2743.12	2745.12	2745.74	2745.39	2748.62			OK	NO
2280.26	2745.27	2747.27	2747.62	2747.27	2751.47			OK	NO
2284.26	2745.87	2747.37	2748.27	2747.85	2751.47			OK	NO
2397.90	2747.62	2749.12	2749.54	2749.12	2752.72			OK	NO
2401.90	2747.72	2749.22	2749.90	2749.71	2752.72			OK	NO
2684.04	2749.3	2750.80	2750.99	2750.80	2755.04			OK	NO
2688.04	2749.4	2750.90	2751.09	2750.90	2755.04			OK	NO
2970.04	2750.81	2752.31	2752.50	2752.31	2756.85			OK	NO
2974.04	2750.91	2752.41	2752.60	2752.41	2756.85			OK	NO
3256.04	2752.32	2753.82	2754.01	2753.82	2758.44			OK	NO
3260.04	2752.42	2753.92	2754.18	2754.11	2758.44			OK	NO
3528.04	2753.76	2755.26	2755.33	2755.26	2760.05			OK	NO
3532.04	2753.86	2755.36	2755.43	2755.36	2760.05			OK	NO
3676.04	2754.58	2756.08	2756.15	2756.08	2760.49			OK	NO
3680.04	2754.68	2756.18	2756.23	2756.18	2760.49			OK	NO
3798.04	2755.27	2756.77	2756.82	2756.77	2760.67			OK	NO
3802.04	2755.37	2756.87	2756.90	2756.87	2760.67			OK	NO
3928.04	2756	2757.50	2757.53	2757.50	2761.10			OK	NO
3932.04	2756.1	2757.60	2757.61	2757.60	2761.10			OK	NO
4073.61	2757.36	2758.86	2758.87	2758.86	2762.36			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Mainline 2 "SP" 462+00 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S											Θ	K_{mh}	H_{mh}	Θ	K_i	H_i	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(S_f ft/ft)	H_f (ft)	H_f (ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									2746.90																		Outlet K_o=	1.0											2746.01	2745.80		
2	100.00	160.06	R	18					1	2746.90	2747.20	60.1	0.50%	1.77	0.0049	6.5	3.68	0.21	0.0038	0.0038	0.23																		0.00	2748.91	2748.70			PART	D/S
3	160.06	164.06	T	18					1	2747.20	2747.30	4.0	2.50%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0030		0.01	0	0.02	0.00	90	0.25	0.18												0.20			2749.11	2748.98	FULL	U/S
4	164.06	259.30	R	18					1	2747.30	2747.78	95.2	0.50%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.21																		0.00	2749.40	2749.28			FULL	D/S
5	259.30	259.30	R	18					1	2747.78	2747.78	0.0		1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.00							Ki=	0.4	0.05									0.05			2749.45	2749.45	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2746.9	2746.90	2746.01	2745.80	2748.72			OK	NO
160.06	2747.2	2748.70	2748.91	2748.70	2751.81			OK	NO
164.06	2747.3	2748.80	2749.11	2748.98	2751.81			OK	NO
259.30	2747.777	2749.28	2749.40	2749.28	2751.00			OK	NO
259.30	2747.777	2749.28	2749.45	2749.45	2751.00			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 462+00 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																					EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																									
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									2747.21																			Outlet K_o=		1.0											2748.98	2748.98		
2	100.00	197.90	R	18					1	2747.21	2747.60	97.9	0.40%	1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00																		0.00	2749.10	2749.10			FULL	D/S
3	197.90	197.90	R	18					1	2747.60	2747.60	0.0		1.77	0.0049	0.5	0.28	0.00	0.0000	0.0000	0.00								Ki=	0.4	0.00									0.00			2749.10	2749.10	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2747.21	2747.21	2748.98	2748.98	2751.81			OK	NO
197.90	2747.602	2749.10	2749.10	2749.10	2751.20			OK	NO
197.90	2747.602	2749.10	2749.10	2749.10	2751.20			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 462+17 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																												
STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S												Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(S_f)	(H_f)	(H_f)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
	100.00									2745.77																																			
																												Outlet K_o=		1.0															
100.00	119.50	R	18					1	2745.77	2745.87	19.5	0.50%	1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.04																		0.00	2748.02	2747.89			FULL	U/S
119.50	119.50	R	18					1	2745.87	2745.87	0.0		1.77	0.0049	5.0	2.83	0.12	0.0023	0.0023	0.00							Ki=	0.4	0.05									0.05			2748.07	2748.07	FULL	U/S

Date Printed 11/30/2016 SF6_lateral_462_17.xls

Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2745.77	2745.77	2747.97	2747.85	2751.47			OK	NO
119.50	2745.868	2747.37	2748.02	2747.89	2750.37			OK	NO
119.50	2745.868	2747.37	2748.07	2748.07	2750.37			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 475+21 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA								ENERGY LOSS DATA																						EGL & HGL				COMMENTS	
																			PIPE	TRANSITION																										
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc		CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S											Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_j	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(S_f)	(H_f)	(H_f)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)			(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									2721.90																		Outlet K_o=	1.0																
2	100.00	120.00	R	18					1	2721.90	2722.00	20.0	0.50%	1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.02																		0.00	2724.42	2724.38			FULL	U/S
3	120.00	120.00	R	18					1	2722.00	2722.00	0.0		1.77	0.0049	3.0	1.70	0.04	0.0008	0.0008	0.00							Ki=	0.4	0.02								0.02			2724.44	2724.44	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2721.9	2721.90	2724.40	2724.36	2727.55			OK	NO
120.00	2722	2723.50	2724.42	2724.38	2726.50			OK	NO
120.00	2722	2723.50	2724.44	2724.44	2726.50			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Mainline 3 "SP" 485+00 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA											FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																					PIPE	TRANSITION																												
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV		L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc			CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total	U/S	U/S	U/S	U/S	PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	(ft)	(ft)	EGL	HGL	EGL	HGL	FLOW	
1		100.00									2675.31																			Outlet K_o=		1.0															
2	100.00	154.60	R	18					1	2675.31	2699.17	54.6	43.69%	1.77	0.0049	6.7	3.79	0.22	0.0041	0.0041	0.22																				0.00	2700.89	2700.67			PART	D/S
3	154.60	158.60	T	18					1	2699.17	2700.07	4.0	22.60%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0037		0.01	55	0.63	0.14	90	0.25	0.18														0.33			2701.75	2701.57	PART	D/S
4	158.60	187.90	R	18					1	2700.07	2700.51	29.3	1.50%	1.77	0.0049	6.0	3.40	0.18	0.0032	0.0032	0.10																				0.00	2702.19	2702.01			PART	D/S
5	187.90	187.90	R	18					1	2700.51	2700.51	0.0		1.77	0.0049	6.0	3.40	0.18	0.0032	0.0032	0.00								Ki=	0.4	0.07										0.07			2702.26	2702.26	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2675.31	2675.31	2677.03	2676.81	2731.04			OK	NO
154.60	2699.166	2700.67	2700.89	2700.67	2703.61			OK	NO
158.60	2700.07	2701.57	2701.75	2701.57	2703.61			OK	NO
187.90	2700.51	2702.01	2702.19	2702.01	2702.67			HGL<1ft below FG	NO
187.90	2700.51	2702.01	2702.26	2702.26	2702.67			HGL<1ft below FG	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 485+00 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																														
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend				Misc					CONDUIT		TRANSITION		FULL/	
	FROM	TO	T/R	D	SPAN	RISE	AREA	HYD RAD		D/S	U/S									S_f	H_f	H_f	Θ	K_{mh}	H_{mh}	Θ	K_j	H_j	Inlet/	K_i	H_c	Θ	K_o	H_o	R_{bend}	Θ	K_b	H_b	H_m	Total					PART	CRTL
	(ft)	(ft)		(in)	(ft)	(ft)	(ft^2)	(ft)		(ft)	(ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft/s/ft)	(ft/ft)	(ft)	(ft)	(deg)		(ft)	(deg)		(ft)	Cont		(ft)	(deg)		(ft)	(ft)	(deg)		(ft)	(ft)	(ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	FLOW	
1		100.00									2700.04																			Outlet K_o=		1.0											2701.57	2701.57		
2	100.00	265.57	R	18					1	2700.04	2700.46	165.6	0.25%	1.77	0.0049	0.7	0.40	0.00	0.0000	0.0000	0.01																		0.00	2701.96	2701.96			PART	D/S
3	265.57	269.57	T	18					1	2700.46	2700.56	4.0	2.50%	1.77	0.0049	0.7	0.40	0.00	0.0000	0.0000		0.00	70	0.85	0.00													0.00			2702.06	2702.06	FULL	D/S
4	269.57	280.10	R	18					1	2700.56	2700.66	10.5	0.95%	1.77	0.0049	0.7	0.40	0.00	0.0000	0.0000	0.00																		0.00	2702.16	2702.16			FULL	D/S
5	280.10	280.10	R	18					1	2700.66	2700.66	0.0		1.77	0.0049	0.7	0.40	0.00	0.0000	0.0000	0.00							Ki=	0.4	0.00									0.00			2702.16	2702.16	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2700.04	2700.04	2701.57	2701.57	2703.61			OK	NO
265.57	2700.46	2701.96	2701.96	2701.96	2705.32			OK	NO
269.57	2700.56	2702.06	2702.06	2702.06	2705.32			OK	NO
280.10	2700.66	2702.16	2702.16	2702.16	2705.66			OK	NO
280.10	2700.66	2702.16	2702.16	2702.16	2705.66			OK	NO

Storm Drain Hydraulics Calculations

G.C. Wallace, Inc. | Summerlin Parkway PH3 - Lateral "SP" 525+00 | DATE: 11/30/16 | FILE: SF6.xls

Storm Drain Manning's n (typ=0.013)= 0.013 | Inlet Structure Type or K_i= d | Headwall:Square Edge (cut concrete and CMP)

	CONDUIT DATA										FLOW DATA									ENERGY LOSS DATA																								EGL & HGL				COMMENTS	
																				PIPE	TRANSITION																														
	STATION			PIPE	BOX		IRREG		#	INVERT ELEV	L	S	A	Φ	Q	V	V2/2g	Sf	Ave.	Frict	Frict	Manhole			Junction			Contraction/ Inlet			Expansion/Outlet			Bend					Misc			CONDUIT		TRANSITION		FULL/	
	FROM (ft)	TO (ft)	T/R	D (in)	SPAN (ft)	RISE (ft)	AREA (ft^2)	HYD RAD (ft)		D/S (ft)	U/S (ft)	(ft)	(%)	(ft^2)		(cfs)	(ft/s)	(ft)	(ft/ft)	S_f (ft/ft)	H_f (ft)	H_f (ft)	Θ (deg)	K_{mh}	H_{mh} (ft)	Θ (deg)	K_j	H_j (ft)	Inlet/ Cont	K_i	H_c (ft)	Θ (deg)	K_o	H_o (ft)	R_{bend} (ft)	Θ (deg)	K_b	H_b (ft)	H_m (ft)	Total (ft)	U/S EGL	U/S HGL	U/S EGL	U/S HGL	PART FLOW	CRTL
1		100.00									2605.30																		Outlet K_o=		1.0															
2	100.00	132.70	R	18					1	2605.30	2607.39	32.7	6.40%	1.77	0.0049	1.7	0.96	0.01	0.0003	0.0003	0.01																			0.00	2608.91	2608.89			PART	D/S
3	132.70	132.70	R	18					1	2607.39	2607.39	0.0		1.77	0.0049	1.7	0.96	0.01	0.0003	0.0003	0.00							Ki=	0.4	0.01										0.01			2608.91	2608.91	FULL	U/S
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Summary of Results

					(Optional)			HGL with respect	Pressure Gasket
STATION	INVERT	SOFFIT	EGL	HGL	GRADE	LOCATION	DESCRIPTION	to FG	Required?
100.00	2605.3	2605.30	2606.81	2606.80	2609.80			OK	NO
132.70	2607.393	2608.89	2608.91	2608.89	2612.34			OK	NO
132.70	2607.393	2608.89	2608.91	2608.91	2612.34			OK	NO

Mannings N Calculator Using Equation 732 in the HCDDM			
Channel	d_{50} (in)	d_{50} (ft)	n
-	8	0.666667	0.037

8320 old courthouse road • vienna, virginia 22180
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design data 7

american concrete pipe association

CONCRETE PIPE SELECTION: Trench Installations

Trench conduits are usually installed in relatively narrow trenches excavated in undisturbed soil and backfilled to the original ground surface.

When a rigid conduit is installed in a narrow trench and backfilled, the backfill material will tend to settle. This downward movement generates frictional forces along the trench walls, which act upward to help support the weight of the backfill material. The magnitude of the frictional forces depends on the unit weight of the backfill material w, the value of Rankine's lateral pressure ratio K, and the coefficient of sliding friction μ' between the backfill material and the trench walls.

The backfill load on a conduit installed in a trench condition is equal to the weight of the mass of fill material within the trench less the summation of the frictional load transfers, and is expressed by the equation:

$$W_d = C_d \, w \, B_d^2$$

where

W_d=backfill load, pounds per linear foot
C_d=load coefficient for trench condition
w=unit weight of backfill material, pounds per cubic foot
B_d=width of trench at the top of the conduit, feet

Figures 2 through 5, based on the above equation, enable a direct determination of backfill load for a given trench width and depth of cover. As the trench width increases for a given depth of cover and pipe diameter, a point is reached at which an embankment condition develops. The curves showing pipe size indicate the limiting trench width for each pipe diameter beyond which greater trench widths will not affect the load. When this condition occurs, the load on the conduit remains constant. This load should be determined by the intersection of the vertical line representing the depth of cover and the dashed line representing the particular pipe diameter under consideration. For intermediate pipe sizes not shown in *Figures 2 through 5*, interpolation should be used.

The field supporting strength of a concrete pipe line is dependent on the inherent strength of the pipe, the type of foundation on which the pipe is installed and the compaction of the sidefill material adjacent to the pipe. A common method used to determine the inherent strength of a pipe is the three-edge bearing test, in which the pipe is subjected to concentrated loads at the crown and invert. The load that a pipe will support under this condition of loading is called the *three-edge bearing strength* and is expressed in pounds per linear foot.

ASTM Specification C14 covers three strength classes for non-reinforced concrete pipe — Class 1, 2 and 3. These three classes are specified to meet ultimate loads, expressed in terms of minimum strength in three-edge-bearing as listed in *Table I*.

TABLE I: Strength Requirements Non-reinforced Concrete Pipe ASTM C14

Pipe Diameter, Inches	Minimum Three-Edge Bearing Strengths, Pounds per Linear Foot		
	Class 1	Class 2	Class 3
4	1500	2000	2400
6	1500	2000	2400
8	1500	2000	2400
10	1600	2000	2400
12	1800	2250	2600
15	2000	2600	2900
18	2200	3000	3300
21	2400	3300	3850
24	2600	3600	4400
27	2800	3950	4600
30	3000	4300	4750
33	3150	4400	4875
36	3300	4500	5000

Another means of expressing pipe strength is in terms of D-load. The D-load of a pipe is the supporting strength of a pipe loaded under three-edge-bearing test conditions expressed in pounds per linear foot per foot of inside diameter. Thus the bearing strength may be converted to D-load by dividing by the inside diameter in feet.

ASTM Specification C76 specifies five strength classes reinforced concrete pipe. These strength classes are expressed in terms of D-load at 0.01-inch crack and for ultimate load. The D-load to produce the 0.01-inch crack $D_{0.01}$ is the maximum load applied to the concrete pipe before a crack occurs having a width of 0.01-inch measured at close intervals, throughout a length of at least 1-foot. The D-load to produce ultimate load D_u is the maximum three-edge-bearing test load carried by a pipe, expressed as D-load. *Table II* lists 0.01-inch crack and ultimate D-loads for the strength classes covered by ASTM Specification C76.

TABLE II: Strength Requirements Reinforced Concrete Pipe ASTM C76

Strength Class	Minimum D-Load in Three-Edge Bearing Pounds per Linear Foot per Foot of Internal Diameter	
	0.01 Inch Crack-$D_{0.01}$	Ultimate-D_u
I	800	1200
II	1000	1500
→ III	1350	2000
IV	2000	3000
V	3000	3750

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 18 IN. DIAMETER CIRCULAR PIPE

****

P I P E D A T A

DIAMETER (in.)	18.00
WALL B, THICKNESS (in.)	2.500

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	5.90
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

R E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
      SS    AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

Program SAMM computes earth loads on concrete pipe in accordance with the methods presented in the Concrete Pipe Design Manual (March 1990) and the Concrete Pipe Handbook (January 1988), published by the American Concrete Pipe Association. The user must select input values suitable to his specific installation. The information presented in the computer output is for review, interpetation, application and approval by a qualified engineer who must assume full responsibility for verifying that said output is appropriate and correct. There are no express or implied warranties. The use of this product does not constitute endorsement by ACPA or any other agents.

PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.11	Y	297.	2603.	0.	2900.	1.90	1018.	1527.
1.5	1.17	Y	470.	1971.	0.	2440.	1.90	856.	1284.
2.0	1.23	Y	660.	1455.	0.	2115.	1.90	742.	1113.
2.5	1.30	Y	871.	1032.	0.	1903.	1.90	668.	1002.
3.0	1.37	Y	1104.	751.	0.	1855.	1.90	651.	976.
3.5	1.45	Y	1362.	616.	0.	1978.	1.90	694.	1041.
4.0	1.47	Y	1573.	516.	0.	2089.	1.90	733.	1100.
4.5	1.47	Y	1776.	439.	0.	2215.	1.90	777.	1166.
5.0	1.48	Y	1979.	378.	0.	2357.	1.90	827.	1241.
5.5	1.48	Y	2185.	329.	0.	2514.	1.90	882.	1323.
6.0	1.48	Y	2387.	290.	0.	2677.	1.90	939.	1409.
6.5	1.48	Y	2590.	257.	0.	2847.	1.90	999.	1498.
7.0	1.49	Y	2792.	229.	0.	3022.	1.90	1060.	1590.
7.5	1.49	Y	2995.	206.	0.	3201.	1.90	1123.	1685.
8.0	1.49	Y	3197.	186.	0.	3384.	1.90	1187.	1781.
8.5	1.49	Y	3400.	169.	0.	3569.	1.90	1252.	1879.
9.0	1.49	Y	3602.	155.	0.	3757.	1.90	1318.	1977.
9.5	1.49	Y	3805.	142.	0.	3947.	1.90	1385.	2077.
10.0	1.49	Y	4008.	130.	0.	4138.	1.90	1452.	2178.
10.5	1.49	Y	4210.	120.	0.	4330.	1.90	1519.	2279.
11.0	1.50	Y	4413.	111.	0.	4524.	1.90	1587.	2381.
11.5	1.50	Y	4616.	103.	0.	4719.	1.90	1656.	2484.
12.0	1.50	Y	4818.	96.	0.	4915.	1.90	1724.	2587.
12.5	1.49	Y	5014.	90.	0.	5103.	1.90	1791.	2686.
13.0	1.50	Y	5216.	84.	0.	5300.	1.90	1860.	2789.
13.5	1.50	Y	5418.	79.	0.	5497.	1.90	1929.	2893.

14.0	1.50	Y	5620.	74.	0.	5694.	1.90	1998.	2997.
14.5	1.50	Y	5823.	70.	0.	5892.	1.90	2067.	3066.
15.0	1.50	Y	6025.	66.	0.	6091.	1.90	2137.	3132.
15.5	1.50	Y	6227.	62.	0.	6289.	1.90	2207.	3196.
16.0	1.50	Y	6429.	59.	0.	6488.	1.90	2277.	3257.
16.5	1.50	Y	6632.	56.	0.	6687.	1.90	2346.	3316.
17.0	1.50	Y	6834.	53.	0.	6887.	1.90	2416.	3373.
17.5	1.50	Y	7036.	50.	0.	7087.	1.90	2487.	3427.
18.0	1.50	Y	7239.	48.	0.	7287.	1.90	2557.	3479.
18.5	1.50	Y	7441.	46.	0.	7487.	1.90	2627.	3529.
19.0	1.50	Y	7644.	43.	0.	7687.	1.90	2697.	3576.
19.5	1.50	Y	7846.	41.	0.	7887.	1.90	2768.	3620.
20.0	1.50	Y	8048.	40.	0.	8088.	1.90	2838.	3662.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 24 IN. DIAMETER CIRCULAR PIPE

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P I P E D A T A

DIAMETER (in.)	24.00
WALL B, THICKNESS (in.)	3.000

I N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	6.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.0165
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

E S U L T S O F A N A L Y S I S

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
      SS    AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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P R O G R A M S A M M

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

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PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.08	Y	378.	3008.	0.	3386.	1.90	891.	1337.
1.5	1.12	Y	591.	2400.	0.	2991.	1.90	787.	1181.
2.0	1.17	Y	820.	1781.	0.	2600.	1.90	684.	1026.
2.5	1.22	Y	1067.	1269.	0.	2336.	1.90	615.	922.
3.0	1.27	Y	1334.	927.	0.	2261.	1.90	595.	893.
3.5	1.33	Y	1623.	763.	0.	2386.	1.90	628.	942.
4.0	1.38	Y	1935.	641.	0.	2575.	1.90	678.	1017.
4.5	1.44	Y	2272.	546.	0.	2818.	1.90	742.	1112.
5.0	1.46	Y	2562.	472.	0.	3034.	1.90	798.	1197.
5.5	1.47	Y	2827.	412.	0.	3239.	1.90	852.	1278.
6.0	1.47	Y	3091.	363.	0.	3454.	1.90	909.	1363.
6.5	1.47	Y	3356.	322.	0.	3678.	1.90	968.	1452.
7.0	1.48	Y	3625.	288.	0.	3913.	1.90	1030.	1545.
7.5	1.48	Y	3889.	260.	0.	4149.	1.90	1092.	1638.
8.0	1.48	Y	4153.	235.	0.	4388.	1.90	1155.	1732.
8.5	1.48	Y	4417.	214.	0.	4631.	1.90	1219.	1828.
9.0	1.49	Y	4682.	195.	0.	4877.	1.90	1283.	1925.
9.5	1.49	Y	4946.	179.	0.	5125.	1.90	1349.	2023.
10.0	1.49	Y	5210.	165.	0.	5375.	1.90	1414.	2122.
10.5	1.49	Y	5474.	152.	0.	5627.	1.90	1481.	2221.
11.0	1.49	Y	5738.	141.	0.	5880.	1.90	1547.	2321.
1.5	1.49	Y	6003.	131.	0.	6134.	1.90	1614.	2421.
12.0	1.49	Y	6267.	122.	0.	6389.	1.90	1681.	2522.
12.5	1.49	Y	6531.	114.	0.	6645.	1.90	1749.	2623.
13.0	1.49	Y	6795.	107.	0.	6902.	1.90	1816.	2725.
13.5	1.49	Y	7060.	100.	0.	7160.	1.90	1884.	2826.

14.0	1.49	Y	7324.	94.	0.	7418.	1.90	1952.	2928.
14.5	1.50	Y	7588.	89.	0.	7677.	1.90	2020.	3020.
15.0	1.50	Y	7853.	84.	0.	7937.	1.90	2089.	3087.
15.5	1.50	Y	8117.	79.	0.	8196.	1.90	2157.	3151.
16.0	1.49	Y	8369.	75.	0.	8444.	1.90	2222.	3210.
16.5	1.49	Y	8633.	71.	0.	8704.	1.90	2291.	3269.
17.0	1.50	Y	8897.	68.	0.	8964.	1.90	2359.	3327.
17.5	1.50	Y	9160.	64.	0.	9225.	1.90	2428.	3382.
18.0	1.50	Y	9424.	61.	0.	9485.	1.90	2496.	3435.
18.5	1.50	Y	9688.	58.	0.	9746.	1.90	2565.	3485.
19.0	1.50	Y	9952.	56.	0.	10008.	1.90	2634.	3533.
19.5	1.50	Y	10216.	53.	0.	10269.	1.90	2702.	3579.
20.0	1.50	Y	10480.	51.	0.	10530.	1.90	2771.	3622.

PROGRAM SAMM
D-LOAD REQUIREMENTS FOR A 30 IN. DIAMETER CIRCULAR PIPE

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' I P E D A T A

DIAMETER (in.)	30.00
WALL B, THICKNESS (in.)	3.500

: N S T A L L A T I O N C O N D I T I O N S

MINIMUM DEPTH OF FILL (ft.)	1.00
MAXIMUM DEPTH OF FILL (ft.)	20.00
SOIL DENSITY (lb/cu. ft.)	140.0
SPECIFIED BEDDING FACTOR	1.90
INSTALLATION TYPE	TRENCH
TRENCH WIDTH (ft.)	7.10
SOIL LATERAL PRESSURE/FRICTION TERM (KMU')	0.1650
PARAMETERS TO COMPUTE TRANSITION WIDTH	
POSITIVE PROJECTION RATIO	1.00
POSITIVE SETTLEMENT RATIO	0.50
SOIL LATERAL PRESSURE/FRICTION TERM (KMU)	0.1924
SOIL LATERAL PRESSURE COEFICIENT	0.33

A D D I T I O N A L L O A D S

LIVE LOAD	AASHTO HS-20
NO SURCHARGE LOAD	

F A C T O R S O F S A F E T Y

FACTOR OF SAFETY ON 0.01 INCH CRACK D-LOAD (EARTH,LIVE)	1.00; 1.00
FACTOR OF SAFETY ON ULTIMATE LOAD (EARTH,LIVE) IN ACCORDANCE WITH ASTM C 76	
DL.01 LESS THAN 2000 LBS/FT/FT	1.5
DL.01 GREATER THAN 3000 LBS/FT/FT	1.25
DL.01 BETWEEN 2000 AND 3000 LBS/FT/FT	INTERPOLATED

RESULTS OF ANALYSIS

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SSSSSSSSS   AAAAAAAAA   MMM   MMM   MMM   MMM
SS          AA     AA   MM M M MM   MM M M MM
SSSSSSSSS   AAAAAAAAA   MM  M  MM   MM  M  MM
      SS    AA     AA   MM     MM   MM     MM
SSSSSSSSS   AA     AA   MM     MM   MM     MM
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PROGRAM SAMM

AMERICAN CONCRETE PIPE ASSOCIATION
VERSION 2.0 - 1 SEPTEMBER 1990

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PIPE DEPTH (ft.)	EARTH LOAD ARCHING FACTOR	>TRANS	EARTH LOAD (lb/ft)	LIVE LOAD (lb/ft)	SURCH LOAD (lb/ft)	TOTAL LOAD (lb/ft)	BED FACT	REQUIRED D-LOAD 0.01 in. (lb/ft/ft)	ULT. (lb/ft/ft)
1.0	1.07	Y	460.	2830.	0.	3290.	1.90	693.	1039.
1.5	1.10	Y	712.	2777.	0.	3489.	1.90	734.	1102.
2.0	1.14	Y	981.	2069.	0.	3050.	1.90	642.	963.
2.5	1.17	Y	1266.	1480.	0.	2746.	1.90	578.	867.
3.0	1.21	Y	1571.	1084.	0.	2655.	1.90	559.	838.
3.5	1.25	Y	1895.	896.	0.	2790.	1.90	587.	881.
4.0	1.30	Y	2239.	754.	0.	2993.	1.90	630.	945.
4.5	1.34	Y	2606.	644.	0.	3250.	1.90	684.	1026.
5.0	1.39	Y	2997.	558.	0.	3554.	1.90	748.	1122.
5.5	1.44	Y	3412.	488.	0.	3900.	1.90	821.	1232.
6.0	1.46	Y	3783.	431.	0.	4214.	1.90	887.	1331.
6.5	1.47	Y	4115.	383.	0.	4498.	1.90	947.	1420.
7.0	1.47	Y	4441.	343.	0.	4784.	1.90	1007.	1511.
7.5	1.47	Y	4767.	310.	0.	5077.	1.90	1069.	1603.
8.0	1.47	Y	5093.	281.	0.	5374.	1.90	1131.	1697.
8.5	1.48	Y	5427.	255.	0.	5682.	1.90	1196.	1794.
9.0	1.48	Y	5753.	234.	0.	5986.	1.90	1260.	1890.
9.5	1.48	Y	6079.	215.	0.	6293.	1.90	1325.	1987.
10.0	1.48	Y	6404.	198.	0.	6602.	1.90	1390.	2085.
10.5	1.48	Y	6730.	183.	0.	6913.	1.90	1455.	2183.
11.0	1.49	Y	7056.	170.	0.	7226.	1.90	1521.	2282.
11.5	1.49	Y	7382.	158.	0.	7540.	1.90	1587.	2381.
12.0	1.49	Y	7708.	147.	0.	7855.	1.90	1654.	2480.
12.5	1.49	Y	8034.	138.	0.	8171.	1.90	1720.	2580.
13.0	1.49	Y	8359.	129.	0.	8488.	1.90	1787.	2681.
13.5	1.49	Y	8685.	121.	0.	8806.	1.90	1854.	2781.

14.0	1.49	Y	9011.	114.	0.	9125.	1.90	1921.	2882.
14.5	1.49	Y	9337.	107.	0.	9444.	1.90	1988.	2982.
15.0	1.49	Y	9663.	101.	0.	9764.	1.90	2056.	3055.
15.5	1.49	Y	9989.	96.	0.	10085.	1.90	2123.	3119.
16.0	1.49	Y	10315.	91.	0.	10405.	1.90	2191.	3182.
16.5	1.49	Y	10641.	86.	0.	10727.	1.90	2258.	3242.
17.0	1.49	Y	10967.	82.	0.	11048.	1.90	2326.	3299.
17.5	1.49	Y	11293.	78.	0.	11370.	1.90	2394.	3355.
18.0	1.50	Y	11619.	74.	0.	11693.	1.90	2462.	3408.
18.5	1.50	Y	11945.	71.	0.	12015.	1.90	2530.	3459.
19.0	1.50	Y	12271.	67.	0.	12338.	1.90	2598.	3508.
19.5	1.50	Y	12597.	64.	0.	12661.	1.90	2666.	3555.
20.0	1.49	Y	12904.	62.	0.	12965.	1.90	2730.	3596.

APPENDIX C

Referenced Material and Supporting Documents

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 24

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

- 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

PROJ SITE

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

	2	3							A1	A2		
4	5	6							A3	A4		
	7	8	9	10	A5	A6						
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									

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		ANGEL PARK - ALTA DRIVE BRANCH						
0044	E	11' X 8' RCAP	1565	3140	CSWAA-3	ALLGOW4	8.26	4.24
0073	E	11' X 8' RCAP	2220	2917	CSWAA-2	ALLGOW3	7.68	3.50
0146	E	10' X 8' RCB	3010	2220	CSWAA-1	ALLGOW3	6.98	4.40
0203	E	2: 7' X 5.5' RCB	1136	2220	CSWAA-1	ALLGOW3	6.98	5.28
0225	E	2: 7' X 5.5' RCB Outlet	380	2149	SUM5DB	ALLGOW3	6.74	3.40
APBE		ANGEL PARK - BELTWAY BRANCH						
0013	E	3: 12' X 8' RCB	489	4060	CSWFH-9	ALLGOW3	2.65	6.50
0022	E	Conc Chnl 20'W 7'D 2:1 SS	1556	4060	CSWFH-9	ALLGOW3	2.65	1.81
0051	E	Conc Chnl 20'W 7'D 2:1 SS	1583	4060	CSWFH-9	ALLGOW3	2.65	2.77
0081	E	8' X 8' RCBC @ Far Hills	777	423	SWFH-9	ALLGOW3	0.17	2.32
0094	E	Conc Chnl 10'W 5'D 2:1 SS	1465	423	SWFH-9	ALLGOW3	0.17	1.88
0122	E	Conc Chnl 10'W 4'D 2:1 SS	1409	423	SWFH-9	ALLGOW3	0.17	0.80
APCH		ANGEL PARK - CARRIAGE HILL BRANCH						
0000	E	8' X 6' RCB	152	585	SWFH-8	ALLGOW3	0.29	0.87
0003	P0	8' X 7' RCB	1461	585	SWFH-8	ALLGOW3	0.29	2.39
0031	P0	8' X 5' RCB	896	585	SWFH-8	ALLGOW3	0.29	0.60
APD2		ANGEL PARK - DESERT FOOTHILLS 2 BRANCH						
0002	P0	7' X 7' RCB	964	948	SWAA-2	ALLGOW3	0.70	2.00
APD5		ANGEL PARK - DESERT FOOTHILLS 5 BRANCH						
0000	P0	8' X 6' RCB	685	1701	CSWFH-2	ALLGOW3	1.09	1.89
0013	P0	72" RCP	1436	1701	CSWFH-2	ALLGOW3	1.09	4.18
APD6		ANGEL PARK - DESERT FOOTHILLS 6 BRANCH						
0000	P0	6' X 6' RCB	2604	1076	CSWFH-6	ALLGOW3	0.56	6.15
APDF		ANGEL PARK - DESERT FOOTHILLS BRANCH						
0000	P0	12' X 10' RCB	1356	2897	CSWFH-7	ALLGOW3	1.81	2.20
0026	P0	12' X 10' RCB	2463	1962	CSWFH-3	ALLGOW3	1.25	1.62
0073	P0	10' X 8' RCB	2679	1962	CSWFH-3	ALLGOW3	1.25	4.10
0123	P0	6' X 5' RCB	5355	1701	CSWFH-2	ALLGOW3	1.09	6.53
APF2		ANGEL PARK - FAR HILLS 2 BRANCH						
0000	P0	8' X 6' RCB	1046	669	CSWFH-5	ALLGOW3	0.38	1.00
APFH		ANGEL PARK - FAR HILLS BRANCH						
0000	E	2: 8' X 8' RCB	995	3862	CSWFH-8	ALLGOW3	2.48	3.50
0019	E	2: 8' X 8' RCB	250	3392	CCSWFH-7	ALLGOW3	2.18	4.19
0024	E	16' X 8' RCAP	1943	3392	CCSWFH-7	ALLGOW3	2.18	5.10
0061	P0	8' X 6' RCB	1492	669	CSWFH-5	ALLGOW3	0.38	2.00
0089	P0	8' X 6' RCB	2902	669	CSWFH-5	ALLGOW3	0.38	2.00
0144	P0	7' X 6' RCB	1556	669	CSWFH-5	ALLGOW3	0.38	5.50
APM5		ANGEL PARK - MIDDLE 5 BRANCH						
0000	E	384 ac-ft Detention Basin #5		7001	SUM5IN	ALLGOW3	6.74	
0001	E	12,153 cfs PMF Spillway		12153	SUM5IN	ALLGOW3	6.74	
0008	P0	Conc Chnl 50'W 4.5'D 2:1 SS	2102	3725	CDB54-6R	ALLGOW3	4.30	5.20
0009	P0	Conc Chnl 50'W 4.5'D 2:1 SS	4180	3624	CDB55-8	ALLGOW3	2.45	5.80
0047	E	Diversion Berm with Gabion Bank Protection	1000	3725	CDB54-6R	ALLGOW3	4.30	1.30
0056	P0	Conc Chnl 80'W 4'D 2:1 SS	264	3725	CDB54-6R	ALLGOW3	4.30	1.30
0057	P0	Conc Chnl 50'W 3'D 2:1 SS	9922	1821	CDB54-4	ALLGOW3	1.01	6.80
0059	P0	Conc Chnl 100'W 3'D 2:1 SS	8923	2358	CDB54-5	ALLGOW3	2.45	7.00
0212	P0	Conc Chnl 30'W 3.5'D 2:1 SS	6695	1238	CDB55-2	ALLGOW3	0.74	7.50
0213	P0	Conc Chnl 50'W 2.5'D 2:1 SS	6522	1125	CDB55-5	ALLGOW3	0.62	7.30
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0135	E	Conc Chnl 10'W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
0177	E	9' X 8' RCBC @ Anasazi	330	867	C11B-1	ALLGOW3	0.84	1.70
0183	E	Conc Chnl 10'W 6'D 2:1 SS	1680	867	C11B-1	ALLGOW3	0.84	1.70
GO02		GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0257	E	Conc Chnl 10'W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GOB2		GOWAN LONE MOUNTAIN SYST. 2 BELTWAY						
0000	P0	36" RCP Outlet	118	75	DET22	ALLGOW3	0.76	6.76
0001	P0	123 ac-ft Village 22 Detention Basin		1344	CSV22-DB	ALLGOW3	0.76	
0020	P0	8' X 7' RCB	657	1247	SV22-2	ALLGOW3	0.70	8.30
0033	P0	8' X 6' RCB	3359	1247	SV22-2	ALLGOW3	0.70	6.90
0096	P0	6' X 5' RCB	1332	1247	SV22-2	ALLGOW3	0.70	6.00
GOB3		GOWAN LONE MOUNTAIN SYST. 3 BELTWAY						
0000	P0	66" RCP	1877	530	SV22-3	ALLGOW3	0.28	6.60
0035	P0	54" RCP	965	530	SV22-3	ALLGOW3	0.28	6.40
GOBE		GOWAN LONE MOUNTAIN SYST. BELTWAY						
0000	E	20' X 10' RCBC @ Access Rd	30	958	CSV22-3	GW3SC	0.28	5.67
0001	E	Conc Chnl 20'W 5'D 2:1 SS	3355	958	CSV22-3	GW3SC	0.28	6.50
0065	E	Conc Chnl 20'W 6'D 2:1 SS	1220	958	CSV22-3	GW3SC	0.28	1.90
0088	E	2: 10'X9' RCBC @ Lake Mead	400	471	CDET22	ALLGOW3	0.96	0.50
0096	E	Conc Chnl 20'W 9'D 2:1 SS	627	471	CDET22	ALLGOW3	0.96	0.50
0108	E	Conc Chnl 20'W 6'D 2:1 SS	1021	471	CDET22	ALLGOW3	0.96	0.50
0127	E	Conc Chnl 20'W 6'D 2:1 SS	638	442	SV22-1	ALLGOW3	0.20	0.50
0139	E	Conc Chnl 10'W 5.5'D 2:1 SS	1500	442	SV22-1	ALLGOW3	0.20	1.02
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0010	E	Conc Chnl 20'W 10'D 0:1 SS	3037	2946	CRCLMT1R	GW3SC	2.61	2.78
0068	E	Transition Structure	100	2946	CRCLMT1R	GW3SC	2.61	3.50
0070	E	20' X 6' RCBC @ Cliff Shadows	350	1162	CRCSV223	ALLGOW3	5.68	2.44
0077	E	Conc Chnl 20'W 6'D 0:1 SS	1229	1162	CRCSV223	ALLGOW3	5.68	6.11
0100	E	Conc Chnl 20'W 10'D 0:1 SS	200	1162	CRCSV223	ALLGOW3	5.68	5.67
0115	E	66" RCP Outlet	670	679	DET26	ALLGOW3	4.43	
0128	E	333 ac-ft Village 26 Detention Basin		3767	VIL26IN	ALLGOW3	4.43	
0137	P0	14' X 14' RCB	4335	3767	VIL26IN	ALLGOW3	4.43	0.50
0216	P0	Conc Chnl 50'W 4.5'D 2:1 SS	3761	3693	CSV26-1	ALLGOW3	4.15	6.08
0289	P0	Conc Chnl 50'W 3.5'D 2:1 SS	6215	2396	30	ALLGOW3	2.51	7.95
0290	E	Natural Wash 363'W	4850	1465	SV26-1	ALLGOW3	1.64	22.50
0370	E	Natural Wash 450'W	7000	2396	30	ALLGOW3	2.51	8.50
GOL4		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4						
0000	E	14' X 8' RCB	554	2257	CLMT1R	ALLGOW3	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2257	CLMT1R	ALLGOW3	2.33	4.74
0025	E	Soil Cement Chnl 60'W 8'D 3-4:1 SS	320	2257	CLMT1R	ALLGOW3	2.33	2.00
0026	E	Soil Cement Chnl 42'W 6'D 3-4:1 SS	700	2257	CLMT1R	ALLGOW3	2.33	1.00

** 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

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 24

LEGEND

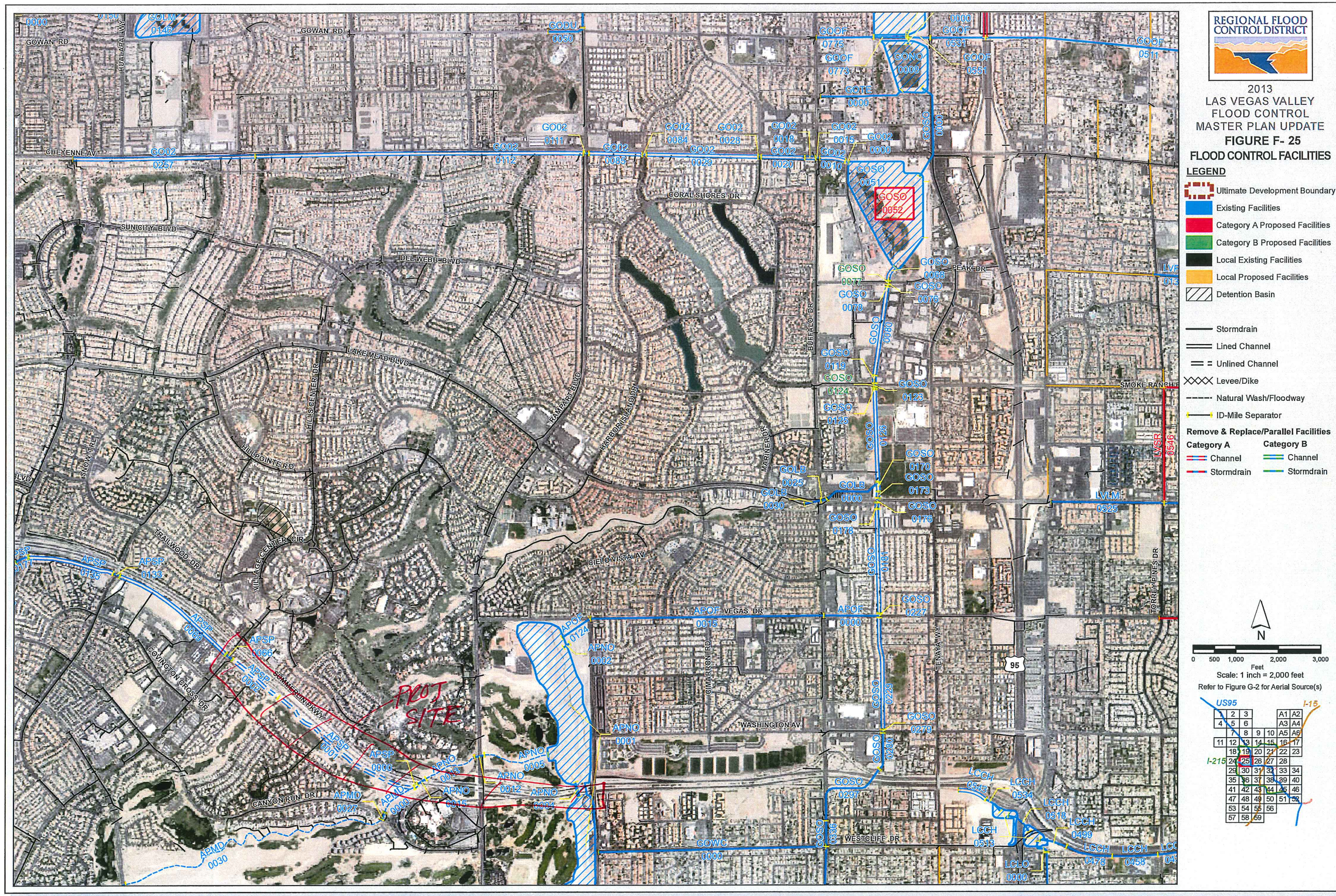
ID (Facility Identifier) AABB
Parent Stream Name
Stream Name
River Mile 0000
Distance Above Confluence with Parent Stream (Miles)
Miles in Hundredths

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


REGIONAL FLOOD CONTROL DISTRICT
2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F- 25
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
Stormdrain
Lined Channel
Unlined Channel
Levee/Dike
Natural Wash/Floodway
ID-Mile Separator
Remove & Replace/Parallel Facilities
Category A
Channel
Stormdrain
Category B
Channel
Stormdrain
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
PROJ SITE
GOWAN RD
CHEYENNE AV
SUN CITY BLVD
DEL WEBB BLVD
LAKE MEAD BLVD
CORAL SHORES DR
PEAK DR
SMOKE RANCH
HILLPOINTE RD
TRAILWOOD DR
VILLAGE CENTER CIR
CIELO VISTA AV
VEGAS DR
WASHINGTON AV
WESTCLIFF DR
CANYON RUN DR
COVINGTON CROSS DR
SUMMERLIN PKWY
TORREY PINES DR
TENAYA WY
CIMARRON RD
BUFFALO DR
MARINER DR
HARBOR ISLAND DR
RAMPART BLVD
HILLS CENTER DR
HUALAPAI WY
SNOW TRL
95

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APMD		ANGEL PARK - MIDDLE BRANCH						
0000	E	Natural Wash	940	6048	C11A-3*	ALLGOW4	11.31	2.90
0027	E	1: 12' X 10' and 2: 12' X 2' RCBC @ Canyon Run	170	6048	C11A-3*	ALLGOW4	11.31	3.00
0030	E	Natural Wash	7000	6048	C11A-3*	ALLGOW4	11.31	3.00
0132	E	2: 12'x10' RCBC @ Hualapai	120	6048	C11A-3*	ALLGOW4	11.31	1.00
APNO		ANGEL PARK NORTH						
0001	E	1,512 ac-ft Angel Park Detention Basin		9199	ANGLPKIN	ALLGOW5	21.99	
0002	E	2: 33" & 1: 42" RCP Emergency Outlet	190	406	ANGLPKDB	ALLGOW5	21.99	
0004	E	14' X 12' RCB Connector Pipe under Summerlin Pkwy	380	9199	ANGLPKIN	ALLGOW5	21.99	1.00
0005	E	Natural Wash	1559	7988	CC3B-2B*	GW3SC	7.68	2.00
0012	E	3: 12' X 10' RCBC @ Rampart	232	7988	CC3B-2B*	GW3SC	7.68	1.00
0013	E	Natural Wash	1283	7988	CC3B-2B	GW3SC	7.68	1.40
0015	E	Two Span Bridge 28' W 14'D @ Summerlin Pkwy	236	7988	CC3B-2B	GW3SC	7.68	1.00
APOF		ANGEL PARK OUTFALL						
0000	E	66" RCP	1297	728	CGD34AC	GW3SC	0.65	1.90
0015	E	60" RCP	5472	454	CGD34AB	ALLGOW5	22.25	2.20
0124	E	54" RCP Outlet	810	406	ANGLPKDB	ALLGOW5	21.99	2.50
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0000	E	Concrete Chute Drop	103	7988	CC3B-2B	GW3SC	7.68	3.00
0001	E	Unlined Chnl with Gabion Drops 20'W Depth Varies 2:1 SS	3924	2746	C3B-2B	ALLGOW3	2.67	3.00
0002	E	Unlined Chnl with Gabion Drops 50'W 3:1 SS	1424	2746	C3B-2B	ALLGOW3	2.67	3.50
0066	E	5: 8' X 4' RCBC @ Town Center Dr.	200	1697	C8B-2	ALLGOW3	1.56	2.40
0069	E	Conc Chnl 10'W 6'D 2:1 SS	3195	1697	C8B-2	ALLGOW3	1.56	2.40
0133	E	3: 9'X4' RCBC @ Crestdale	180	1173	C8B-1	ALLGOW3	1.14	2.33
0135	E	Conc Chnl 10'W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
GO02		GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0000	E	Free Span Bridge 34'W 9.25'D @ Ronemus	100	4978	C16-C	ALLGOW3	7.09	0.50
0010	E	Conc Chnl 30'W 9'D 0:1 SS	600	4978	C16-C	ALLGOW3	7.09	0.50
0015	E	Free Span Bridge 31'W 7.25'D @ Buffalo	102	4978	C16-C	ALLGOW3	7.09	1.40
0018	E	Conc Chnl 30'W 9'D 0:1 SS	250	4978	C16-C	ALLGOW3	7.09	1.50
0020	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1000	4978	C16-C	ALLGOW3	7.09	1.50
0028	E	Free Span Bridge 35'W 7'D @ Soft Breezes	72	4800	CC7-C	ALLGOW3	6.78	2.20
0029	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	2700	4800	CC7-C	ALLGOW3	6.78	1.50
0084	E	Free Span Bridge 35'W 7'D @ Soaring Gulls	95	4657	CCB-C	ALLGOW3	6.07	1.30
0085	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1240	4657	CCB-C	ALLGOW3	6.07	1.50
0111	E	Free Span Bridge 35'W 7'D @ Rampart	127	4657	CCB-C	ALLGOW3	6.07	2.90
0112	E	Conc Chnl 10'W 7'D 1.5:1 SS	7640	4225	CC-C	ALLGOW3	5.42	2.30
0257	E	Conc Chnl 10'W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GO95		GOWAN OUTFALL - U.S. 95 CHANNEL						
0000	P1	Conc Chnl 12'W 4'D 2:1 SS	2640	299	GD17BG-C	ALLGOW3	0.36	0.30
GODU		GOWAN NORTH - DURANGO BRANCH						
0000	E	12' X 6' RCB	2629	1150	CLV14-C	ALLGOW3	1.40	0.91
0050	E	9' X 6' RCB	865	835	CLV20-C	ALLGOW3	0.97	1.50
GOLB		GOWAN LAKE MEAD-BUFFALO						
0000	E	12' X 6' RCB	1294	1071	CCVILL23	ALLGOW3	1.46	1.50
0025	E	10' X 7' RCB	145	1071	CCVILL23	ALLGOW3	1.46	0.50
0030	E	2: 8' X 4' RCB	408	1071	CCVILL23	ALLGOW3	1.46	0.85
GOLM		GOWAN LONE MOUNTAIN SYSTEM						
0146	E	888 ac-ft Lone Mountain Detention Basin		7252	LMTNIN	GW3SC	6.13	
GONO		GOWAN NORTH SYSTEM						
0000	E	8' X 8' RCB Outlet	184	558	GWNNDB	ALLGOW5	68.49	0.51
0001	E	8' X 8' RCB Outlet	156	558	GWNNDB	ALLGOW5	68.49	0.63
0006	E	30,780 cfs PMF Spillway		30780	GWNNDB	ALLGOW5	68.49	
0008	E	921 ac-ft Gowan North Detention Basin		4937	CCLV43-C*	GW4SC	11.93	
GOOF		GOWAN OUTFALL FACILITIES						
0511	E	8' X 5' RCB	8390	699	CPT6B-C	GW3SC	1.08	0.50
0531	E	8' X 5' RCB	1300	558	GWNNDB	ALLGOW5	68.49	0.50
0551	E	72" RCP	524	558	GWNNDB	ALLGOW5	68.49	0.62
0773	E	60" RCP	803	286	LV30-C	ALLGOW3	0.42	1.40
0775	E	60" RCP	1300	286	LV30-C	ALLGOW3	0.42	1.00

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOSO		GOWAN SOUTH FACILITIES						
0000	E	72" RCP Outlet	2303	454	GWNSDB	GW5SC	12.13	0.53
0050	E	39,030 cfs PMF Spillway		39030	GWNSIN	GW5SC	12.13	
0051	E	624 ac-ft Gowan South Detention Basin		5625	GWNSIN	GW5SC	12.13	
0052	P1	Upgrade to 686 ac-ft Gowan South Detention Basin		5625	GWNSIN	GW5SC	12.13	
0068	E	Conc Chnl 15'W 7'D 2:1 SS	380	3796	CBUF01-C	GW3SC	4.88	0.40
0076	E	2: 10' X 7' RCBC @ Peak Dr	80	2119^	CBUF01-C^	GW3SC	4.88	0.56
0077	P0	Add 2: 14' X 7' RCBC @ Peak Dr	80	1677^	CBUF01-C^	GW3SC	4.88	0.56
0078	E	Conc Chnl 22'W 10'D 0:1 SS	60	3796	CBUF01-C	GW3SC	4.88	0.56
0080	E	Conc Chnl 12'W 7'D 2:1 SS	2078	3796	CBUF01-C	GW3SC	4.88	0.56
0119	E	Conc Chnl 22'W 10'D 0:1 SS	180	3587	CCCVIL23	GW3SC	4.52	0.95
0123	E	2: 10' X 7' RCBC @ Smoke Ranch	100	2229^	CCCVIL23^	GW3SC	4.52	0.62
0124	P0	Add 2: 10' X 7' RCBC @ Smoke Ranch	100	1358^	CCCVIL23^	GW3SC	4.52	0.62
0125	E	Conc Chnl 22'W 9'D 0:1 SS	50	3587	CCCVIL23	GW3SC	4.52	0.62
0126	E	Conc Chnl 12'W 7'D 2:1 SS	2155	3587	CCCVIL23	GW3SC	4.52	0.62
0170	E	Conc Chnl 12'W 7'D 2:1 SS	220	2657	CCGD34AC	GW3SC	3.06	0.62
0173	E	Conc Chnl 22'W 7'D 0:1 SS	158	2657	CCGD34AC	GW3SC	3.06	0.62
0176	E	2: 10' X 7' RCBC @ Lake Mead	100	2657	CCGD34AC	GW3SC	3.06	0.62
0178	E	Conc Chnl 22'W 7'D 0:1 SS	150	2657	CCGD34AC	GW3SC	3.06	1.00
0181	E	Conc Chnl 12'W 7'D 2:1 SS	2429	2657	CCGD34AC	GW3SC	3.06	0.58
0227	E	2 : 10' X 7' RCBC @ Vegas Drive	100	2065	CGD34AA	ALLGOW3	2.41	1.36
0229	E	Conc Chnl 12'W 7'D 1:1 SS	2649	2065	CGD34AA	ALLGOW3	2.41	1.36
0279	E	12' X 7' RCB	80	2065	CGD34AA	ALLGOW3	2.41	1.36
0280	E	12' X 8' RCB	875	2065	CGD34AA	ALLGOW3	2.41	0.34
0297	E	12' X 7' RCB	2124	1825	CW1BB-C	ALLGOW3	2.14	1.60
0336	E	12' X 7' RCB	602	1593	C1-WESTC	ALLGOW3	1.84	3.40
0352	E	2: 8' X 5' RCB	2740	1374	C1-DUCHC	ALLGOW3	1.60	0.73
GOTE		GOWAN -TENAYA BRANCH						
0000	E	60" RCP	1954	272	LV29-C	ALLGOW3	0.28	1.30
GOWC		GOWAN SOUTH FACILITIES - WEST CLIFF						
0000	E	24" RCP	5400	257	1-WEST-C	ALLGOW3	0.24	1.67
LCCH		LAS VEGAS CREEK CHANNEL						
0438	E	60" RCP	1090	162	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	162	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
0499	E	42" RCP Outlet	660	85	RAINBWDB	SW3	1.11	1.88
0513	E	102 ac-ft Rainbow Detention Basin		970	RAINBWIN	SW3	1.11	
0518	E	60" RCP Connector Pipe Under Rainbow Blvd	670	970	RAINBWIN	SW3	1.11	1.85
0534	E	60" RCP	460	279	AL00A-C	SW3	0.23	5.38
0543	E	Conc Chnl 10'W 4'D 0:1 SS	700	279	AL00A-C	SW3	0.23	1.88
LCLO		LAS VEGAS CREEK - LORENZI						
0000	P3	7' X 6' RCB	445	265	DAL00A	SW3	0.41	3.37
0008	P3	7' X 6' RCB	2415	265	DAL00A	SW3	0.41	0.40
LVLM		LAS VEGAS WASH - LAKE MEAD						
0475	E	48" RCP	2632	235	LM02-C	NW3	0.29	1.24
0525	E	48" RCP	2600	542	CLM01-C	NW3	0.64	1.24
LVOW		OWENS AVENUE SYSTEM						
0460	P1	7' X 6' RCB	2700	616	CVG03-C	NW3	0.95	1.48
LVPK		PEAK DRIVE SYSTEM						
0130	E	7' X 5' RCB	1435	400	CPD01-C	NW3	0.67	0.61
LVSR		LAS VEGAS WASH - SMOKE RANCH						
0496	P1	10' X 7' RCB	2855	1245	CSR02E	NW3	1.64	1.27
0546	P1	8' X 8' RCB	2640	758	CSR00A	NW3	1.01	0.57

** 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

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 25

LEGEND

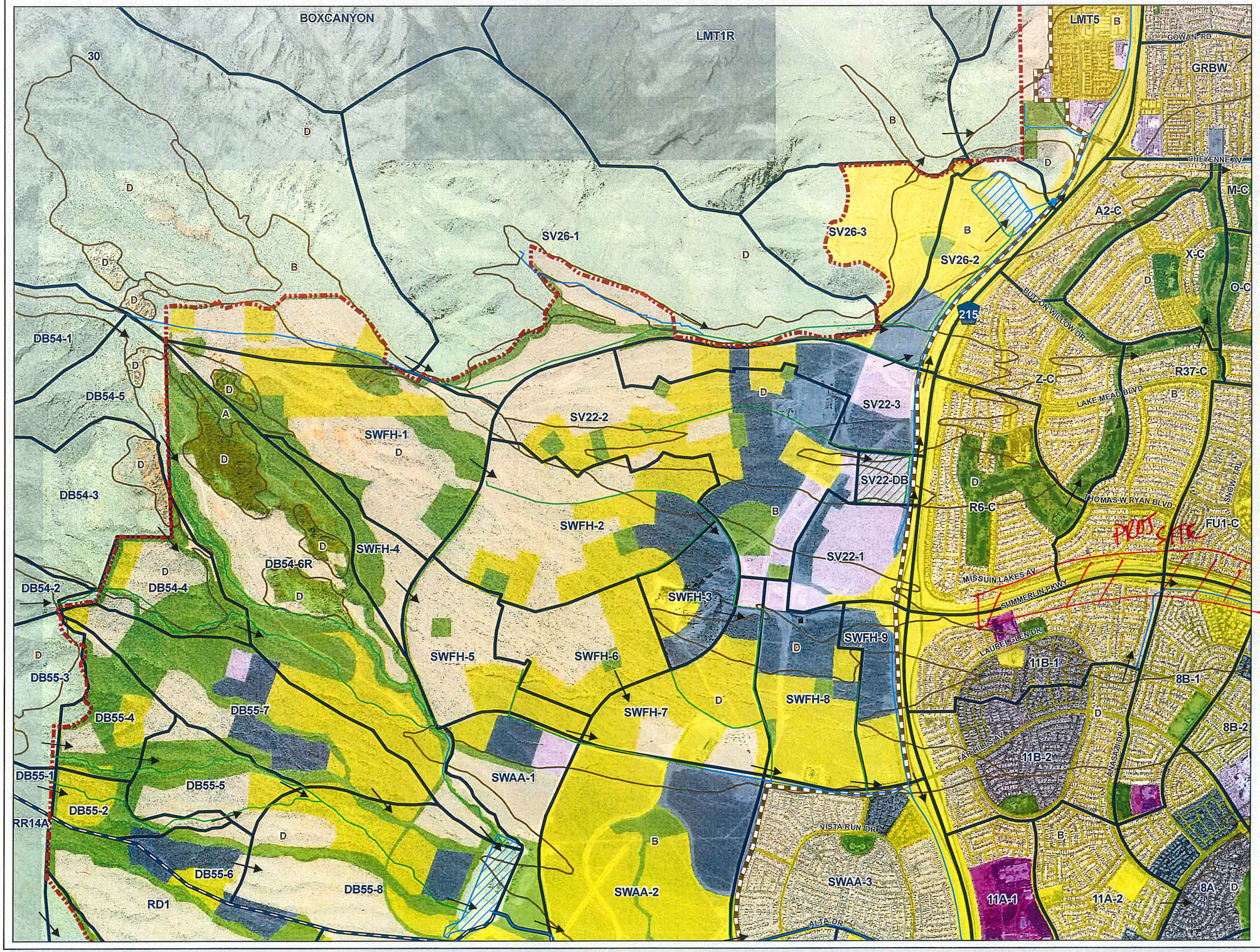
ID (Facility Identifier) AABB
Parent Stream Name
Stream Name
River Mile 0000
Distance Above Confluence with Parent Stream (Miles)
Miles in Hundredths

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



REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H-24
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary (ID)
- 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

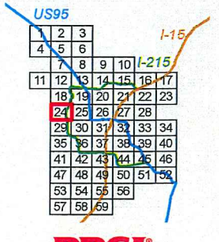
* Drought Ordinance Applied

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)



PBS&J
PB

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H- 25
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
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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)

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

RESPONSE TO COMMENTS ON THE TECHNICAL DRAINAGE STUDY FOR DURANGO DRIVE – WESTCLIFF DRIVE TO VEGAS DRIVE PRE-DESIGN DRAINAGE REPORT AND 50% IMPROVEMENTS

412.416

November 2003

Prepared for:

City of Las Vegas
731 South Fourth Street
Las Vegas, Nevada 89101

Prepared by:

G. C. Wallace, Inc.
1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
Phone: (702) 804-2000
Fax: (702) 804-2297

G. C. WALLACE, INC.
Engineers/Planners/Surveyors

shown to coordinate design elevations."

Response: Noted.

Comment: "5. Provide detailed grading of the improvements along the Summerlin Parkway. The location of the on and off ramps impacts the existing drainage. Provide detailed design of the proposed Summerlin Parkway facilities and size the system to convey the 100-year flow at the ramps."

Response: The proposed storm drain facilities in the Summerlin Parkway alignment have been sized to convey the 100-year storm flows. An NDOT Type 2A drop inlet will intercept the 100-year storm runoff (1/2 of Subbasin ULT5) at a ponding depth of 0.6 feet and convey the intercepted runoff downstream under the proposed east bound on ramp. The downstream storm drain is proposed to be an 18-inch RCP. A 6-foot long Modified NDOT Type 2A drop inlet will intercept the 100-year storm runoff (Subbasin ULT8) at a ponding depth of 1.0 feet and convey the intercepted runoff downstream under the proposed west bound off ramp. The downstream storm drain is proposed to be a 24-inch RCP. Inlet calculations are enclosed in the Appendix. The storm drain systems in Summerlin Parkway have not been profiled for this submittal. HGL's will be calculated and drafted onto the plans for the next submittal.

Comment: "6. The proposed storm drain system pipe sizes must be evaluated based upon the 10-year flow conveyed within the pipes. The inlet capacities and the storm drain lateral sizes will be reviewed for compliance with the RTC drainage criteria based upon on inlet and outlet control at the next submittal."

Response: The proposed storm drain facilities in Durango Drive are sized to convey the 10-year storm ultimate conditions storm flows. Drop inlet calculations are enclosed in the Appendix. A detailed description of the runoff that is intercepted by the drop inlets is addressed in Response to Comments No. 1. The Type CM drop inlet calculations in a sump condition are based on the interception rate of the grates only with no clogging factor applied. The curb opening portion of the drop inlet is provided as a clogging factor for the drop inlet. The Type CM drop inlet calculations for inlets on a continuous grade take into account the interception of runoff for the grate and curb opening with a 50 percent clogging factor applied. All storm drains have been sized based on normal depth calculations. Standard Form 6 spreadsheets and HGL's on the plans will be provided for the next submittal.

Comment: "7. The Engineer must label the 10-year flow within the laterals and pipes and provide the HGL on the storm drain plan and profile sheets as a part of the

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

G.C.Wallace Inc.
File: durango-ULT.xls
Project No.: 412-416

Durango Road - Westcliff Drive to Vegas Drive
Ultimate Conditions

BY: RJR

SUBBASIN DATA							INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc CHECK URBANNIZED BASINS		Tc	Tlag	REMARKS
Subbasin Name (1)	DEV./EX. (D or E)	Soil Type	CN	K	Area (a.c.) (3)	Area mi2	Initial Length (ft) (4)	Slope % (5)	Ti min (6)	Travel Length (ft) (7)	Slope % (8)	V1 Velocity fps (9a)	V2 Velocity fps (9b)	Tt min (10)	Total Length ft (11)	Tc= (L/180+10) min (12)	Tc Calc. (13)	Tlag= 0.6Tc/60 hours	Rainfall Inches 100-year
ULT1	D	D	98	0.9036	5.03	0.00786	36	2.00	1.7	2360	1.42	2.41	3.54	12.0	2396	23.3	13.7	0.137	2.77/1.58
ULT2	D	D	87	0.7584	28.73	0.04489	255	8.24	4.9	2360	1.18	2.19	3.32	13.1	2615	24.5	18.0	0.180	2.77/1.58
ULT3	D	D	98	0.9036	3.05	0.00477	36	2.00	1.7	1241	2.63	3.28	4.96	5.0	1277	17.1	6.7	0.067	2.77/1.58
ULT4	D	D	87	0.7584	6.77	0.01058	228	8.30	4.6	1241	2.63	3.28	4.96	5.0	1469	18.2	9.6	0.096	2.77/1.58
ULT5	D	D	96	0.8772	3.56	0.00556	36	2.00	1.9	1100	3.03	3.52	5.33	4.2	1136	16.3	6.2	0.062	2.77/1.58
ULT6	D	D	98	0.9036	3.13	0.00489	36	2.00	1.7	1420	1.59	2.55	3.86	7.2	1456	18.1	8.9	0.089	2.77/1.58
ULT7	D	D	94	0.8508	4.51	0.00705	325	4.00	5.1	1020	1.00	2.02	3.06	7.0	1345	17.5	12.1	0.121	2.77/1.58
ULT8	D	D	96	0.8772	7.67	0.01198	30	2.00	1.7	2480	1.59	2.55	3.86	11.8	2510	23.9	13.6	0.136	2.77/1.58

Tc = Ti + Tt
Ti = 1.8 (1.1 - K) L^1/2/S^1/3
K = 0.0132 (CN) - 0.39

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing V1 = 14.8*(S/100)^1/2
Existing V2 = 29.4*(S/100)^1/2

Developed V1 = 20.2(S/100)^1/2
Developed V2 = 30.6*(S/100)^1/2

REFERENCE: STANDARD FORM 4

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   28APR03  TIME  13:01:02   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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
    1         ID   ********************************************************************
    2         ID   * ..................................................................... *
    3         ID   * :              DURANGO DRIVE                                      : *
    4         ID   * :              WESTCLIFF DRIVE TO VEGAS DRIVE                       *
    5         ID   * :                  ULTIMATE CONDITION                             : *
    6         ID   * :                                                                 : *
    7         ID   * :.................................................................: *
    8         ID   * :              RETURN PERIOD_ _ _ _100-YEAR/10-YEAR               : *
    9         ID   * :              DISTRIBUTION_ _ _ _6-HOUR SDN3                     : *
   10         ID   * :                                                                 : *
   11         ID   * :              FILENAME_ _ _ _ _ _416-ULT.H1                      : *
   12         ID   * :              DATE MODELED_ _ _ _04/25/03                        : *
   13         ID   * :              MODELED BY_ _ _ _ _RJR                             : *
   14         ID   * :                                                                 : *
   15         ID   * :.................................................................: *
   16         ID   ********************************************************************
   17         ID
   18         IT      5       0       0     300
   19         IO      5
   20         IN      5       0       0
   21         JR   PREC       1     .57
              *
   22         KK    ULT1
   23         BA  .00786
   24         PB    2.77
   25         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
   26         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
   27         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
   28         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
   29         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
   30         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
   31         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
   32         PC    .998    .999   1.00
   33         LS       0      98
   34         UD   0.137
              *
   35         KK    ULT2
   36         BA  .04489
   37         LS       0      87
   38         UD    .180
              *
   39         KK     PT1
   40         KM   COMBINE SUBBASINS ULT1 AND ULT2
   41         HC       2
              *
```



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

   42         KK    ULT3
   43         BA  .00477
   44         LS       0      98
   45         UD    .067
              *
   46         KK    ULT4
   47         BA  .01058
   48         LS       0      87
   49         UD    .096
              *
   50         KK     PT2
   51         KM   COMBINE SUBBASINS ULT3 AND ULT4
   52         HC       2
              *
   53         KK    ULT5
```

```
54          BA  .00556
55          LS       0      96
56          UD    .062
                  *

57          KK    ULT6
58          BA  .00489
59          LS       0      98
60          UD    .089
                  *

61          KK    ULT7
62          BA  .00705
63          LS       0      94
64          UD    .121
                  *

65          KK     PT3
66          KM   COMBINE SUBBASINS ULT6 AND ULT7
67          HC       2
                  *

68          KK    ULT8
69          BA  .01198
70          LS       0      96
71          UD    .136
                  *
72          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    22       ULT1
               .
               .
    35         .       ULT2
               .         .
               .         .
    39        PT1.....
               .
               .
    42         .       ULT3
               .         .
               .         .
    46         .         .       ULT4
               .         .         .
               .         .         .
    50         .       PT2.....
               .         .
               .         .
    53         .         .       ULT5
               .         .         .
               .         .         .
    57         .         .         .       ULT6
               .         .         .         .
               .         .         .         .
    61         .         .         .         .       ULT7
               .         .         .         .         .
               .         .         .         .         .
    65         .         .         .       PT3.....
               .         .         .         .
               .         .         .         .
    68         .         .         .         .       ULT8
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1
```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   28APR03  TIME  13:01:02   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
************************************************************
* ........................................................ *
* :              DURANGO DRIVE                           : *
* :              WESTCLIFF DRIVE TO VEGAS DRIVE            *
* :                 ULTIMATE CONDITION                   : *
* :                                                      : *
* :......................................................: *
* :              RETURN PERIOD_ _ _ _100-YEAR/10-YEAR    : *
* :              DISTRIBUTION_ _ _ _ 6-HOUR SDN3         : *
* :                                                      : *
* :              FILENAME_ _ _ _ _ _ 416-ULT.H1          : *
* :              DATE MODELED_ _ _ _ 04/25/03            : *
* :              MODELED BY_ _ _ _ _ RJR                 : *
* :                                                      : *
* :......................................................: *
************************************************************
```

```
 19 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

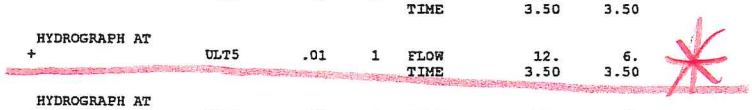
      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE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

 JP          MULTI-PLAN OPTION
                NPLAN              1  NUMBER OF PLANS

 JR          MULTI-RATIO OPTION
                RATIOS OF PRECIPITATION
             1.00       .57
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 1.00	RATIO 2 .57
HYDROGRAPH AT						
+	ULT1	.01	1	FLOW	15.	8.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ULT2	.04	1	FLOW	55.	21.
				TIME	3.58	3.58
2 COMBINED AT						
+	PT1	.05	1	FLOW	69.	29.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ULT3	.00	1	FLOW	10.	6.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT4	.01	1	FLOW	15.	6.
				TIME	3.50	3.50
2 COMBINED AT						
+	PT2	.02	1	FLOW	26.	12.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT5	.01	1	FLOW	12.	6.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT6	.00	1	FLOW	10.	6.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT7	.01	1	FLOW	12.	6.
				TIME	3.58	3.58
2 COMBINED AT						
+	PT3	.01	1	FLOW	22.	11.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	ULT8	.01	1	FLOW	21.	11.
				TIME	3.58	3.58



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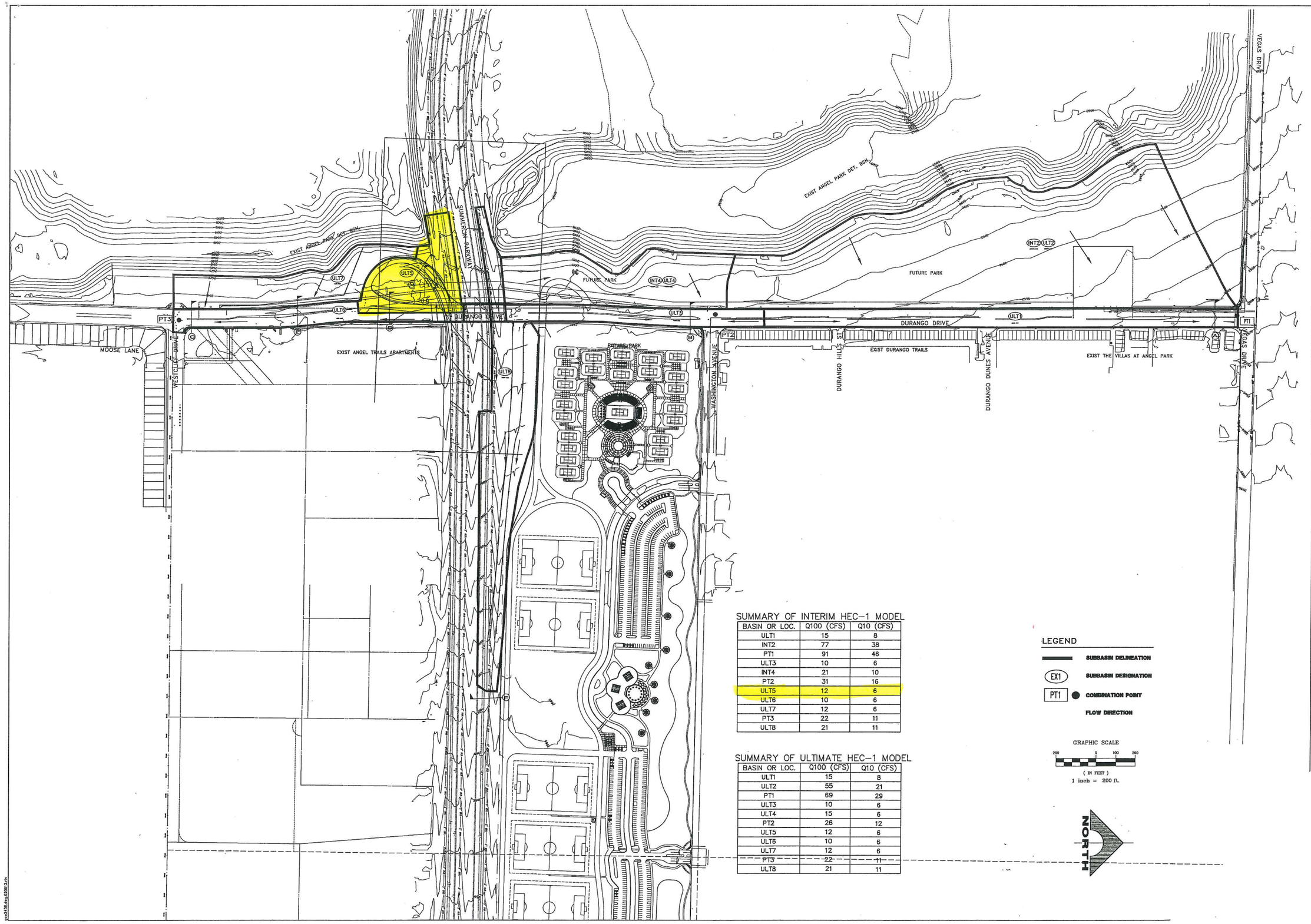


SUMMARY OF INTERIM HEC-1 MODEL

BASIN OR LOC.	Q100 (CFS)	Q10 (CFS)
ULT1	15	8
INT2	77	38
PT1	91	46
ULT3	10	6
INT4	21	10
PT2	31	16
ULT5	12	6
ULT6	10	6
ULT7	12	6
PT3	22	11
ULT8	21	11

SUMMARY OF ULTIMATE HEC-1 MODEL

BASIN OR LOC.	Q100 (CFS)	Q10 (CFS)
ULT1	15	8
ULT2	55	21
PT1	69	29
ULT3	10	6
ULT4	15	6
PT2	26	12
ULT5	12	6
ULT6	10	6
ULT7	12	6
PT3	22	11
ULT8	21	11

LEGEND

SUBBASIN DELINEATION

EX1 SUBBASIN DESIGNATION

PT1 COMBINATION POINT

FLOW DIRECTION

GRAPHIC SCALE

200 0 100 200

(IN FEET)

1 inch = 200 ft.

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE: 01-07-15
PLOT TIME: 09:57:29

REV DATE DESCRIPTION DATE AGEN. APP DATE GCW. APP DATE:

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299
R:\Pending_2008\412-416\drainage\Figures\FIG-6.dwg Rdennis

'S VEGAS, NEVADA
/ESTCLIFF TO VEGAS
REVISED
L DRAINAGE PATTERNS

REMOVE 3 EXIST 4' TYPE 'A' D.I.'S AND REPLACE WITH ONE 5.0' AND ONE 5.0' TYPE 'CM' DROP INLETS

CONSTRUCT 18" L.A.C.

EXIST. RCP

MOOSE LANE

D10-3 CFS
V=2.54 FPS
D=0.54
2 FOOT DRY LANE

D10-3 CFS
V=2.17 FPS
D=0.36
12 FOOT DRY LANE

D10-3 CFS
V=2.17 FPS
D=0.36
12 FOOT DRY LANE

D100=24 CFS

DURANGO DRIVE

6' MOD NDOT TYPE 2A
STA 60+62
D100=24 CFS

D10-3 CFS
V=2.13 FPS
D=0.30
12 FOOT DRY LANE

2.5' CM DI
STA 73+92
D=1.83 CFS

6' MOD NDOT TYPE 2A
STA 73+92
D100=24 CFS
0 BYPASS

5.0' TYPE CM DI
STA 73+92
0 BYPASS

D100=6 CFS
0 BYPASS
12 FOOT DRY LANE

10 CFS
18" RCP

2.5' TYPE CM DI
NUISANCE FLOW=3
STA 82+30±

2.5' TYPE CM DI
NUISANCE FLOW=3
STA 90+30±

10 CFS
IN 18" RCP

EX 39" NEENAH INLET
STA 99+30±
(3 GRATES)
0 BYPASS

EX 3' TYPE 'C'
(1 GRATE)

D10-42 CFS
V=4.71
D=0.71
12 FOOT DRY LANE

RELOCATE EXISTING
15' TYPE CM DI
CONSTRUCT 30" RCP

DURANGO HILLS DRIVE

WASHINGTON AVENUE

DURANGO DUNES AVENUE

D10-8 CFS SURFACE FLOW

D10-54 CFS
V=4.81
D=0.97
12 FOOT DRY LANE

EX 60" RCP

EXISTING 132" RCP

REMOVE EXISTING
CB #39 & 40

NDOT TYPE 2A
STA 105+00

NORTH

LEGEND

- PROPOSED STORM DRAIN FACILITIES
- DROP INLETS
- NDOT TYPE 2A
- SD — EXISTING STORM DRAIN FACILITIES

GRAPHIC SCALE

200 0 100 200

(IN FEET)

1 inch = 200 ft.

REV	DATE	DESCRIPTION	DATE	AGEN.	APP	DATE	AGEN.	APP.

DESIGN:
DRAWN:
CHECK:
ISSUE DATE:
ISSUE EDITOR:
PLOT DATE:01-07-15
PLOT TIME: 08:48:33

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE (702) 804-2000 • FAX (702) 804-2099
R:\Pending_2008\412-416\Ardmore\Figures\FIG-8.dwg Ardmore

CITY OF LAS VEGAS

DURANGO DRIVE – WESTCLIFF TO VEAS DRIVE

FIGURE 8

10-YEAR INTERIM STORM FLOWS EXHIBIT

SHEET
FIG8
1 OF SHTS

sp-x436.dwg 020313.dn

KEVIN

~~BID SET~~

CONSTRUCTION SET

IMPROVEMENT PLANS
FOR
DURANGO DRIVE
WESTCLIFF DRIVE TO VEGAS DRIVE

CITY OF LAS VEGAS
STATE OF NEVADA

Mayor:
Oscar B. Goodman

Councilmen:
Gary Reese (Mayor Pro-Tem)
Larry Brown
Lynette B. McDonald
Lawrence Weekly
Michael Mack
Janet Moncrief

City Manager:
Douglas A. Selby

Director of Public Works:
Richard D. Goecke

City Engineer:
Charles Kajkowski, Jr., P.E.

CITY OF LAS VEGAS NEVADA

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS, NV 89101
(702) 229-6276

FUNDED BY:
REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA
CITY OF LAS VEGAS

REVIEWED BY:

CLV City Engineer	4/26/2004 Date
CLV Engineering Design Program Manager	4/27/04 Date
CLV Construction Management	4/27/04 Date
CLV Traffic Engineer/TEFO	4/27/04 Date
Regional Transportation Commission of So. Nevada	4-27-04 Date
Sprint	04.01.04 Date
Las Vegas Valley Water District Sht. 1,3,10,11,12,14,21-32,52,53,54, 66-73,75,80,81,84	4/27/04 Date
Nevada Power Company Sandy Larsen	4-1-04 Date
Southwest Gas Company Nastrin Houston	3/29/04 Date
Cox Communication Las Vegas, Inc.	4/7/04 Date

THE SIGNATURE ABOVE ACKNOWLEDGES THAT THE UTILITY COMPANY REPRESENTATIVE HAS REVIEWED THE PLANS, AND THAT TO THE BEST OF HIS OR HER KNOWLEDGE THE UTILITY LINES ARE SHOWN IN THE CORRECT LOCATIONS AND ARE THE CORRECT SIZES. WHILE SUCH DATA HAS BEEN COLLECTED WITH REASONABLE CARE, THERE IS NO EXPRESSED OR IMPLIED GUARANTEE THAT THE LOCATIONS ARE EXACT. THE CONTRACTOR SHALL BEAR THE RESPONSIBILITY OF OBTAINING THE ACTUAL FIELD LOCATIONS.

THE SIGNATURE ABOVE FURTHER ACKNOWLEDGES THAT THE UTILITY COMPANY DOES NOT ANTICIPATE CONSTRUCTION OR MAINTENANCE IN THE PROJECT AREA FOR FIVE (5) YEARS IN CONFORMANCE WITH THE CLV NO-CUT POLICY.

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

THE AFFIXED SPRINT NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

DATE	BY	REVISION

DURANGO DRIVE – WESTCLIFF DRIVE TO VEGAS DRIVE

DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS NEVADA, NV 89101
(702) 229-6276

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-

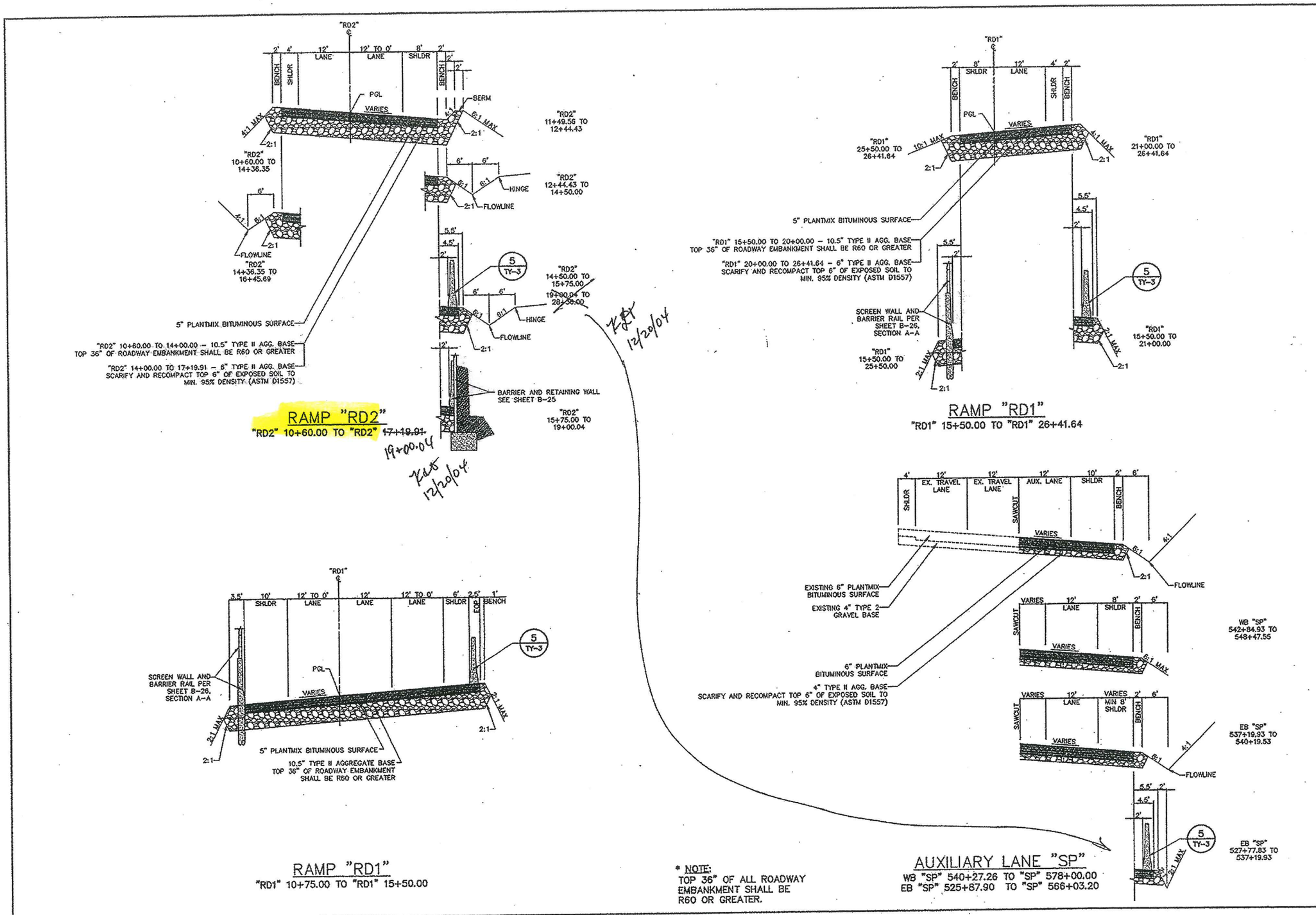
SHEET: COVER SHEET

TITLE: DURANGO DRIVE WESTCLIFF DRIVE TO VEGAS DRIVE

DRAWN BY: KLT
DESIGNED BY: KLT
CHECKED BY: KLT
PROJECT NO: 412.416
SCALE: AS SHOWN/HORIZ AS SHOWN VERT

SEAL
PROFESSIONAL ENGINEER STATE OF NEVADA
KEVIN L. TOMLINSON
Exp. 06/30/2004
CIVIL
No. 14967
3/29/04

SHEET G-1
1 OF 188 SHEET
DRAWING NO. 107V3756



RAMP "RD2"
"RD2" 10+60.00 TO "RD2" ~~17+19.91~~ 19+00.04

RAMP "RD1"
"RD1" 15+50.00 TO "RD1" 26+41.64

RAMP "RD1"
"RD1" 10+75.00 TO "RD1" 15+50.00

AUXILIARY LANE "SP"
WB "SP" 540+27.26 TO "SP" 578+00.00
EB "SP" 525+87.90 TO "SP" 566+03.20

* NOTE:
TOP 36" OF ALL ROADWAY EMBANKMENT SHALL BE R60 OR GREATER.

REV	DATE	BY	REVISION

DURANGO DRIVE – WESTCLIFF DRIVE TO VEGAS DRIVE

DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS NEVADA, NV 89101
(702) 229-6276

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

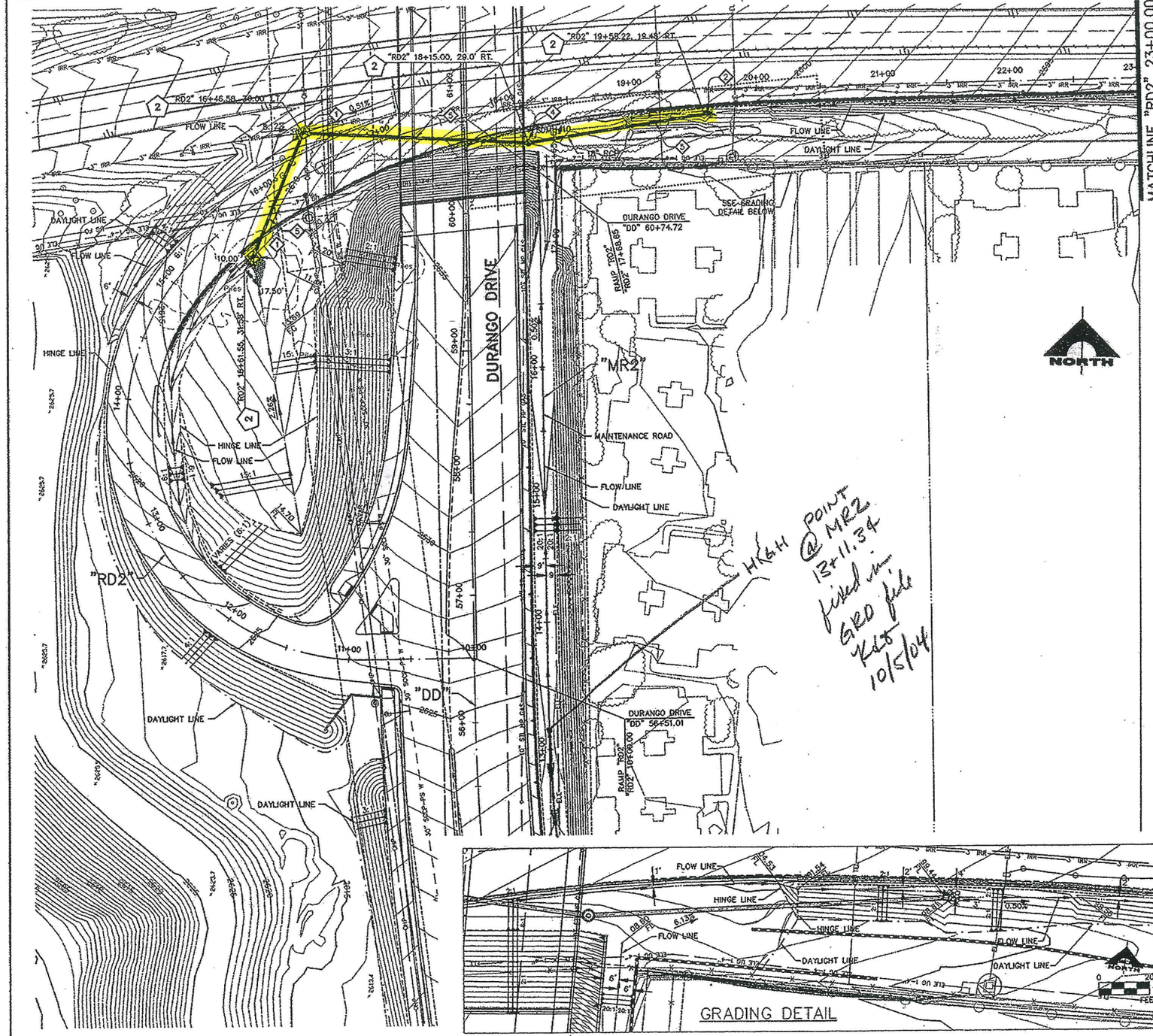
SHEET TYPICAL SECTIONS

TITLE DURANGO DRIVE
WESTCLIFF DRIVE TO VEGAS DRIVE

DRAWN BY: DPH/KLT
DESIGNED BY: KLT
CHECKED BY: KLT/MDM
PROJECT NO: 412.416
SCALE: AS SHOWN HORIZ AS SHOWN VERT

SEAL
PROFESSIONAL ENGINEER STATE OF NEVADA
KEVIN L. TOMLINSON
Exp. 06/30/2004
CIVIL
No. 14967
4/9/04

SHEET
TY-2
8 OF 188 SHEETS
DRAWING NO.
107V3756



STORM DRAIN NOTES

1. CONSTRUCT NDOT TYPE 2A DI W/CONCRETE APRON PER STD DWG PLAN R-4.2.1
2. INSTALL 18" RCP END SECTION PER NDOT STD DWG PLAN R-2.3.1 INSTALL RIP-RAP APRON PER NDOT STD DWG PLAN R-3.1.4
3. CONSTRUCT DI TYPE CM2 SEE DETAIL SHEET SD-17
4. CONSTRUCT TYPE I (48") MANHOLE
5. CONSTRUCT STORM DRAIN PER STD DWG 504 (TYPICAL)
6. CONSTRUCT SAFETY SLOPE END SECTION PER NDOT STD DWG PLAN R-2.2.2 INSTALL RIP-RAP APRON PER NDOT STD DWG PLAN R-3.1.4
7. CONSTRUCT MODIFIED NDOT TYPE 2A DI W/CONCRETE APRON SEE DETAIL 1 SHEET SD-18
8. REMOVE STORM DRAIN (SEE R-SHEETS)

KEVIN L. TOMLINSON, Exp. 06/30/2006, CIVIL, No. 14987, STATE OF NEVADA, PROFESSIONAL ENGINEER
4/9/04
FOR GRADING ONLY

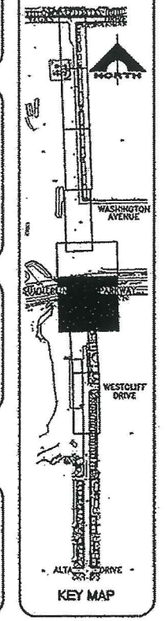
LATERAL RUN PROFILE INDEX	
LATERAL RUN NO	SEE SHEET
1 THRU 6	SD-15
7 THRU 9	SD-16

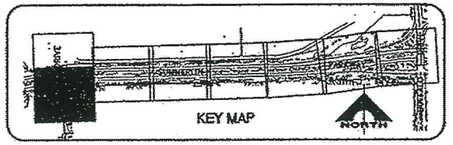
STORM DRAIN NOTES:
1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
3. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

Robert J. Morgan 4/23/04
LVVWD SIGNATURE DATE

40 0 40 80
SCALE FEET

Call before you Dig. 1-800-227-2600





DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS NEVADA, NV 89101
(702) 229-6276

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

REV	DATE	BY	REVISION

DURANGO DRIVE – WESTCLIFF DRIVE TO VEGAS DRIVE

DRAWN BY: MDM
DESIGNED BY: MDM
CHECKED BY: RJR
PROJECT NO: 412.416
SCALE: AS SHOWN/HORZ AS SHOWN VERT

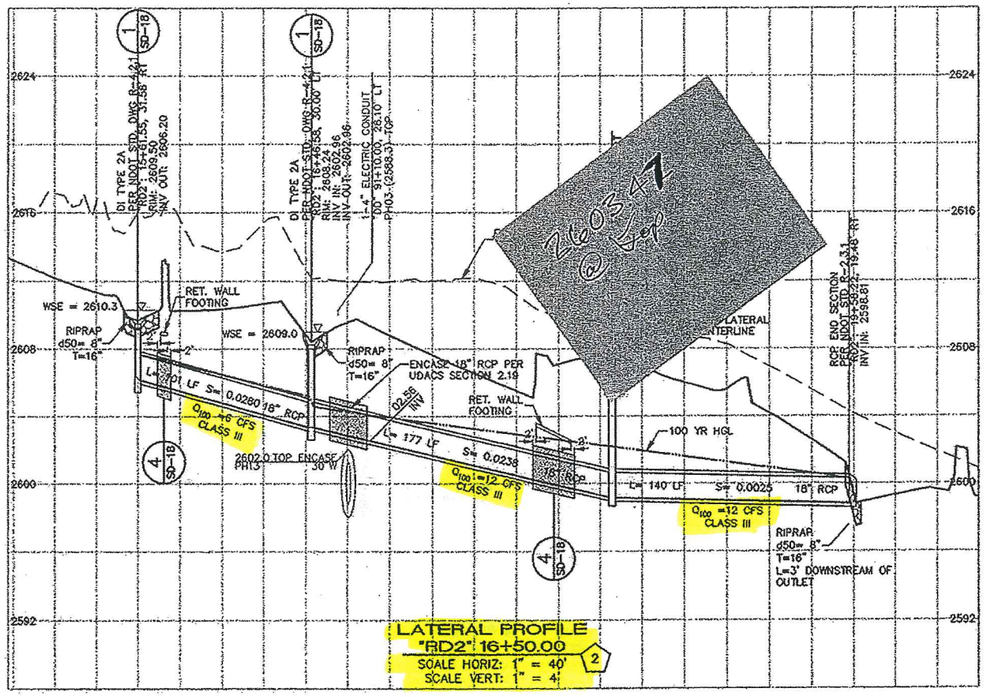
SEAL

RICK J. READ, Exp. 12/31/2005, CIVIL, No. 15280, STATE OF NEVADA, PROFESSIONAL ENGINEER
4/9/04

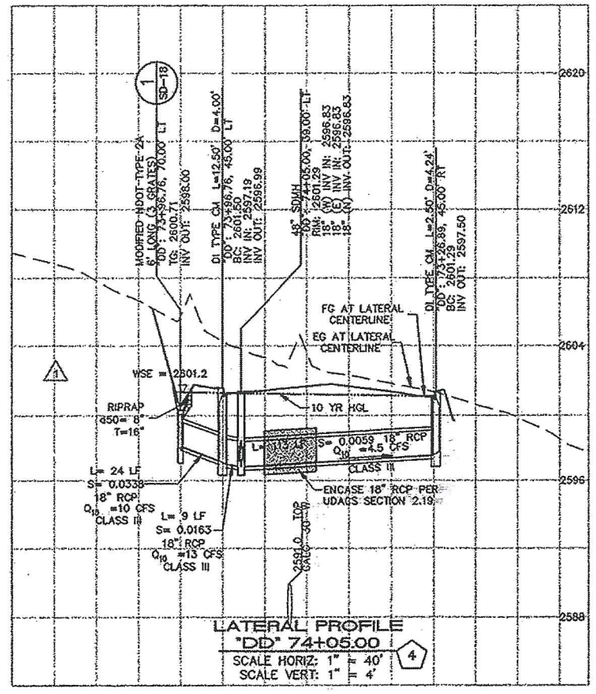
SHEET: GRADING AND DRAINAGE PLAN "RD2" 10+00.00 TO "RD2" 23+00.00

TITLE: DURANGO DRIVE WESTCLIFF DRIVE TO VEGAS DRIVE

SHEET SD-7
72 OF 188 SHEETS
DRAWING NO. 107V3756



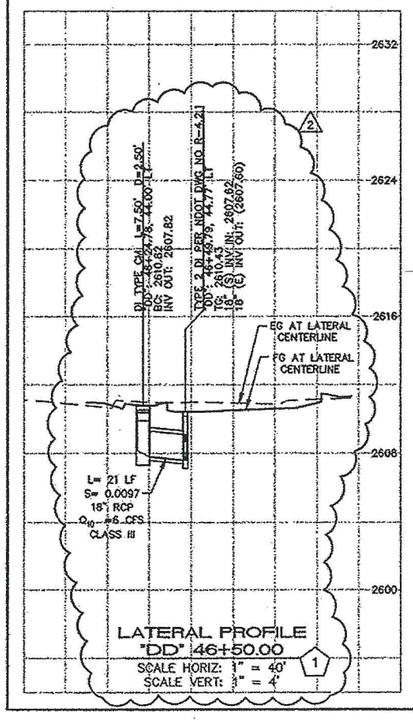
LATERAL PROFILE
"RD2" 16+50.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
2



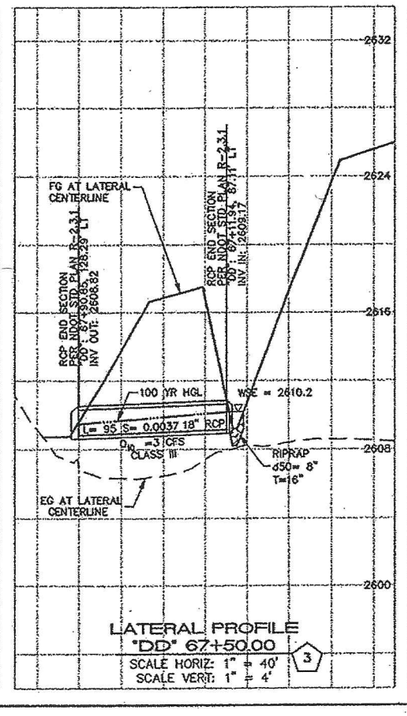
LATERAL PROFILE
"DD" 74+05.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
4

STORM DRAIN NOTES

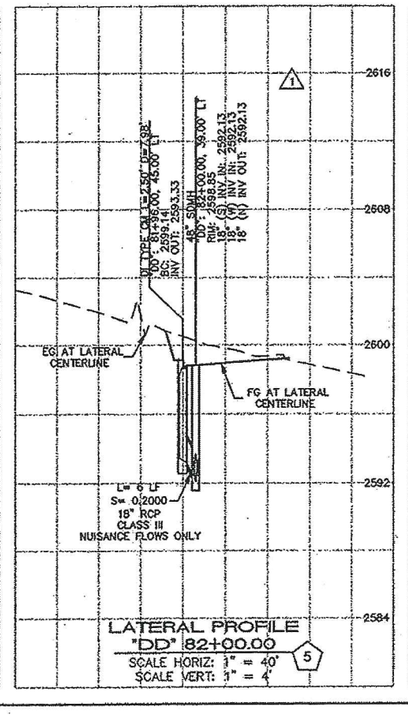
1. CONSTRUCT NDOT TYPE 2A DI W/CONCRETE APRON PER STD DWG PLAN R-4.2.1
2. INSTALL 18" RCP END SECTION PER NDOT STD DWG PLAN R-2.3.1 INSTALL RIP-RAP APRON PER NDOT STD DWG PLAN R-3.1.4
3. CONSTRUCT DI TYPE CM2 SEE DETAIL SHEET SD-17
4. CONSTRUCT TYPE I (48") MANHOLE
5. CONSTRUCT STORM DRAIN PER STD DWG 504 (TYPICAL)
6. CONSTRUCT SAFETY SLOPE END SECTION PER NDOT STD DWG PLAN R-2.2.2 INSTALL RIP-RAP APRON PER NDOT STD DWG PLAN R-3.1.4
7. CONSTRUCT MODIFIED NDOT TYPE 2A DI W/CONCRETE APRON SEE DETAIL 1 SHEET SD-18
8. REMOVE STORM DRAIN (SEE R-SHEETS)



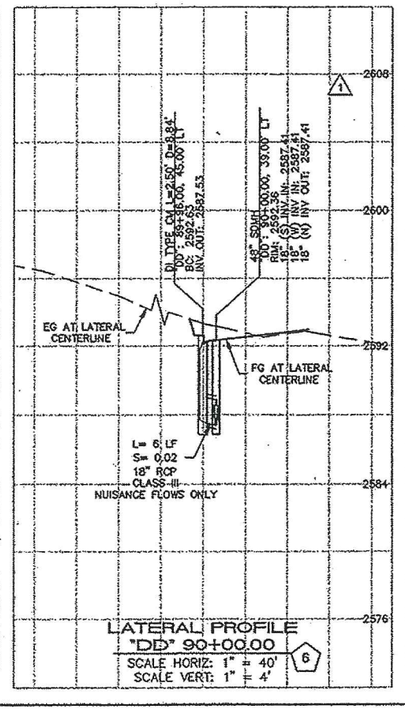
LATERAL PROFILE
"DD" 46+50.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
1



LATERAL PROFILE
"DD" 67+50.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
3



LATERAL PROFILE
"DD" 82+00.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
5



LATERAL PROFILE
"DD" 90+00.00
SCALE HORIZ: 1" = 40'
SCALE VERT: 1" = 4'
6

STORM DRAIN NOTES:

1. ALL PIPE LENGTHS MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR GRADE BREAK OR TO INSIDE EDGE OF DI, RCB, OR STRUCTURE.
2. STORM DRAIN MANHOLES AS SHOWN IN PROFILE SHALL BE CONSTRUCTED PER "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION, OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" LATEST EDITION, UNLESS OTHERWISE NOTED.
3. ALL STORM DRAIN PIPE IS CLASS III UNLESS OTHERWISE NOTED.

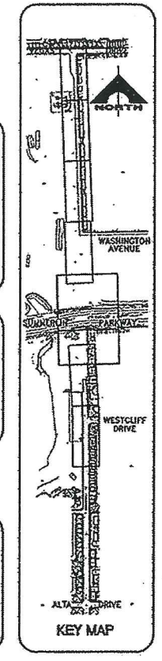
1ST APP'D 4/27/04

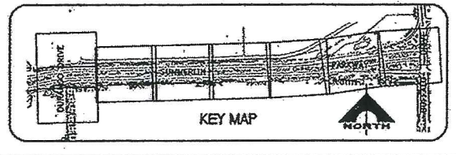
LVVWD SIGNATURE — DATE 12/10/04

SCALE: 40 0 40 80 FEET

ADD NOTING DEPTH FOUND UNDER ITS CASE
CALL BEFORE YOU DIG OVERHEAD
1-702-593-6111

Add notice underground utility lines. Not nearby
Call before you Dig.
1-800-227-2600
UNDERGROUND SERVICE (USA)





NO	DATE	BY	REVISION
1	12/7/04	KLT	REVISE STORM DRAIN
2	8/30/04		REVISE MANHOLE SCHEDULE

DURANGO DRIVE – WESTCLIFF DRIVE TO VEGAS DRIVE

DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS NEVADA, NV 89101
(702) 229-6276

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE: (702) 804-2000 • FAX: (702) 804-2299

SHEET: STORM DRAIN LATERALS

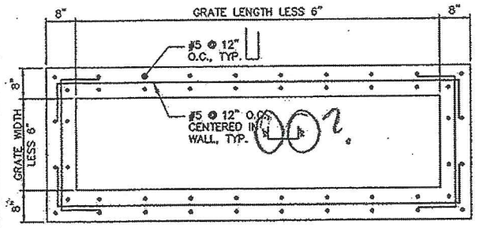
TITLE: DURANGO DRIVE WESTCLIFF DRIVE TO VEGAS DRIVE

DRAWN BY: JPJ
DESIGNED BY: JPJ
CHECKED BY: KLT
PROJECT NO: 412.416
SCALE: AS SHOWN HORIZ AS SHOWN VERT

SEAL

JERRY E. PRUITT
Exp. 12/31/2005
CIVIL
No. 11902
STATE OF NEVADA
PROFESSIONAL ENGINEER
12-10-04

SHEET SD-15
80 OF 188 SHEETS
DRAWING NO. 107V3756

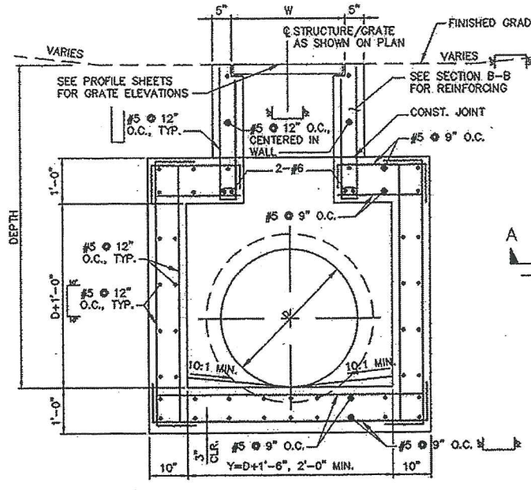


SECTION B–B

DIMENSION TABLE

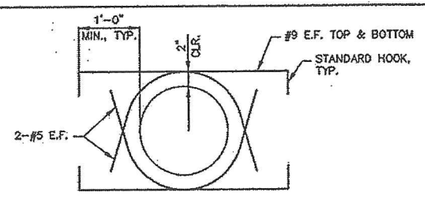
STATION	OFFSET	GRATE SIZE	X	Y	D	GRATE WIDTH
"DD" 73+96.76	70.00' LT.	2.5' X 6.0'	5'–0"	3'–0"	18"	2'–6"
"RD1" 24+06.98	27.98' RT.	2.5' X 6.0'	5'–0"	3'–6"	24"	2'–6"
"SP" 555+64.07	105.83' RT.	4.0' X 7.5'	6'–5"	4'–0"	24"	4'–0"

MODIFIED TYPE 2A INLET

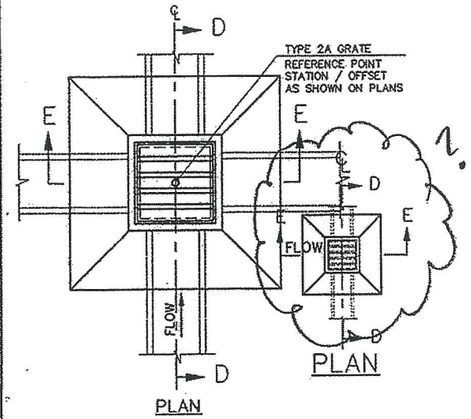


SECTION C–C

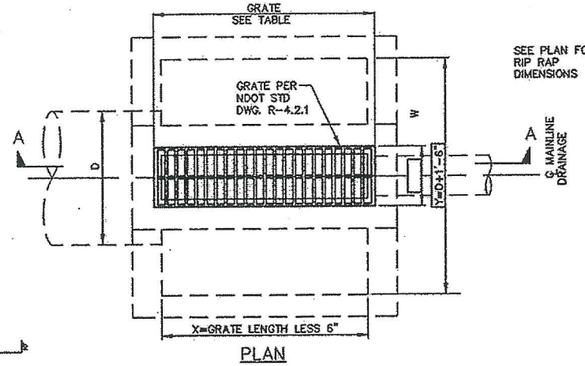
NOTE:
FIELD CUT ALL TYPICAL REINFORCING STEEL 2" CLEAR OF ALL PIPE PENETRATIONS.



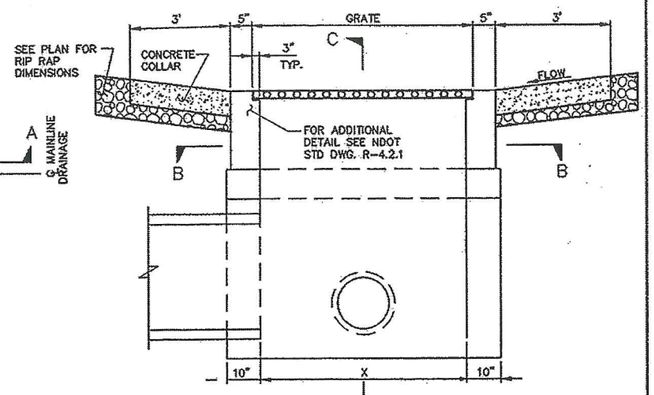
REINFORCING @ OPENING



PLAN



PLAN



SECTION A–A

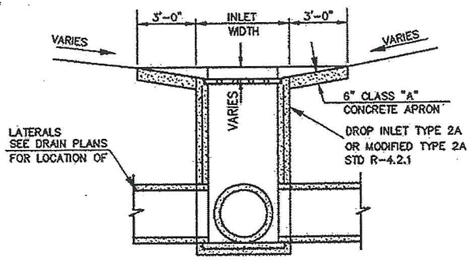
GENERAL NOTES:

CONCRETE: ALL CONCRETE SHALL BE CLASS D WITH A MINIMUM ULTIMATE COMPRESSIVE STRENGTH f'c=4000psi AT 28 DAYS. ALL CONCRETE SHALL BE MADE USING TYPE V CEMENT. ALL EXPOSED CORNERS SHALL BE BEVELED 3/4" UNLESS OTHERWISE NOTED.

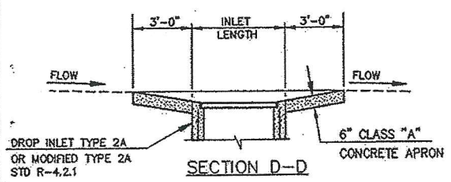
REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615, GRADE 60. DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER. BENDING DIMENSIONS ARE FROM OUT TO OUT OF BARS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 2" UNLESS OTHERWISE NOTED. HOOKS MAY BE ROTATED OR TILTED, AS NECESSARY, TO PROVIDE PROPER CLEARANCES

BEDDING MATERIAL: BEDDING MATERIAL SHALL BE 6" OF CLARK COUNTY TYPE II AGGREGATE. THE BEDDING LAYER SHALL BE COMPACTED TO AT LEAST 90 PERCENT OF THE MAXIMUM DRY DENSITY AS ESTABLISHED BY ASTM TEST METHOD D–1557.

EXISTING UTILITIES: THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES WITHIN THE WORK AREA, AND PROVIDING PROTECTION FOR THE VARIOUS UTILITIES AFFECTED, BEFORE PROCEEDING WITH THE WORK.

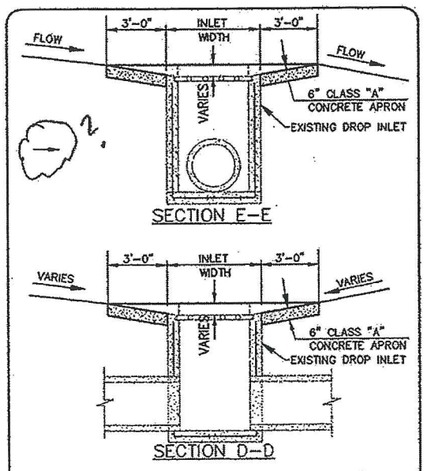


SECTION E–E



SECTION D–D

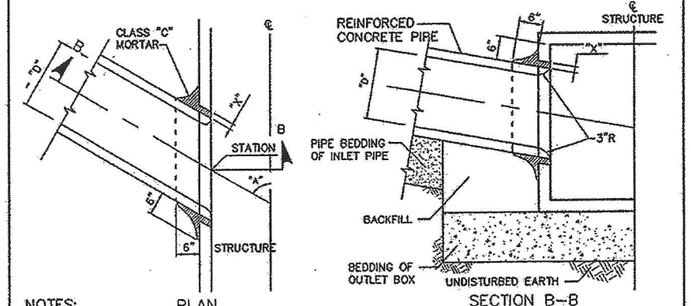
CONCRETE APRON DETAIL



CONCRETE APRON

NOT TO SCALE

2 SD–18



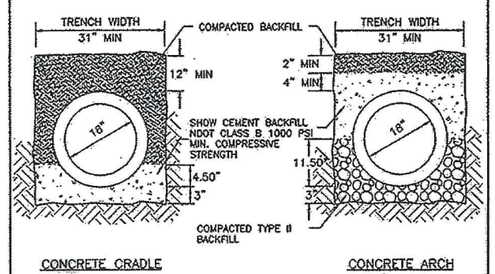
NOTES:

1. ANGLE "A" SHALL BE BETWEEN 90° AND 45°.
2. DIMENSION "D" SHALL BE EQUAL TO OR LESS THAN 1/2 THE INSIDE DIMENSION OF THE MAINLINE BOX.
3. DIMENSION "X" SHALL BE 1" MINIMUM AND 3" MAXIMUM.
4. BURN OR CHIP END OF INLET PIPE FLUSH WITH INNER SURFACE OF MAINLINE. ROUND EDGES OF MAINLINE AND INLET PIPE.

INLET PENETRATION DETAL

NOT TO SCALE

3 SD–18



CONCRETE PIPE ENCASEMENT

NOT TO SCALE

4 SD–18

STORM DRAIN DETAILS

NO SCALE

1 SD–18

DEPARTMENT OF PUBLIC WORKS
400 EAST STEWART
LAS VEGAS NEVADA, NV 89101
(702) 229–6276

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146
TELEPHONE (702) 804–2000 • FAX (702) 804–2099

REV	DATE	BY	REVISION

SHEET: STORM DRAIN DETAILS

TITLE: DURANGO DRIVE
WESTCLIFF DRIVE TO VEGAS DRIVE

DRAWN BY: BJR
DESIGNED BY: RJR
CHECKED BY: BJR
PROJECT NO: 2746-15
SCALE: AS SHOWN/HORIZ AS SHOWN VERT

SEAL

PROFESSIONAL ENGINEER
RICK J. READ
Exp. 12/31/2008
CIVIL
No. 15280
STATE OF NEVADA

SHEET
SD-18
83 OF 188 SHEETS

DRAWING NO.
107V3756

ANASAZI DRIVE
OVERPASS ADDENDUM

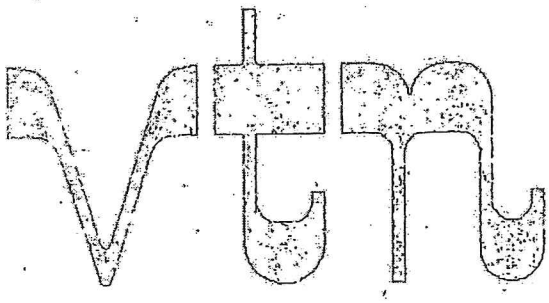
100% Submittal

SUMMERLIN PARKWAY
TECHNICAL DRAINAGE STUDY

Submitted to:

CITY OF LAS VEGAS

Submitted by:



June 2003

ANASAZI DRIVE OVERPASS
BASIN AREAS AND LAG TIMES FOR HEC-1 MODEL
BASIN AREAS < 1 MI^2

SUB-BASIN DATA				INITIAL/OVERLAND TIME			TRAVEL TIME				CONC.	t_c CHECK		FINAL	LAG
				t_i			t_t				TIME	(URBANIZED BASINS)		CONC.	TIME
DESIG.	AREA mi^2	CN	K[1]	LENGH L_i(ft)	SLOPE S_i(%)	t_i[2] (min.)	LENGTH L(ft)	SLOPE S_t(%)	VELOCITY V(fps)[3]	t_t[4] (min.)	t_c[5] (min.)	TOTAL LENGTH	t_c[6] (min.)	t_c (min.)	t_{LAG}[7] (hours)
A1	0.0083	86.95	0.7577	90	7.80	2.9	1,700	4.90	4.3	6.6	9.6	1,790	19.9	9.6	0.096
A2	0.0023	81.95	0.6917	19	10.00	1.5	1,700	4.90	2.8	10.1	11.6	1,719	19.6	11.6	0.116
A3	0.0114	85.21	0.7348	65	3.10	3.6	1,700	4.90	3.3	8.6	12.2	1,765	19.8	12.2	0.122
A4	0.0026	81.95	0.6917	40	2.50	3.4	775	4.52	1.8	7.3	10.7	815	14.5	10.7	0.107
A5	0.0026	91.54	0.8184	65	1.54	3.5	750	5.10	3.1	4.1	7.6	815	14.5	7.6	0.076
A6	0.0050	87.53	0.7654	45	2.20	3.1	750	4.80	3.3	3.8	6.9	795	14.4	6.9	0.069
A7	0.0058	81.95	0.6917	50	3.00	3.6	885	4.97	3.2	4.7	8.3	935	15.2	8.3	0.083
A8A	0.0031	89.50	0.7914	38	4.90	2.0	1,081	5.90	4.7	3.8	5.9	1,119	16.2	5.9	0.059
A8B	0.0013	90.90	0.8099	31	1.50	2.5	789	4.10	5.6	2.4	4.9	820	14.6	4.9	0.049
A9A	0.0030	90.00	0.7980	58	4.90	2.4	1,055	5.90	4.3	4.1	6.5	1,113	16.2	6.5	0.065
A9B	0.0006	90.00	0.7980	52	4.90	2.3	220	4.10	2.4	1.5	3.8	272	11.5	3.8	0.038
A10A	0.0045	87.70	0.7676	53	8.00	2.2	1,146	5.90	4.8	4.0	6.1	1,199	16.7	6.1	0.061
A10B	0.0006	86.80	0.7558	65	40.00	1.5	128	4.10	2.4	0.9	2.3	193	11.1	2.3	0.023
A10C	0.0013	86.80	0.7558	67	35.00	1.6	301	2.30	2.6	1.9	3.5	368	12.0	3.5	0.035
A11	0.0072	85.15	0.7472	38	2.00	3.1	1,290	3.10	3.1	6.9	10.0	1,328	17.4	10.0	0.100
A12	0.0101	81.95	0.6917	135	13.40	3.6	2,070	3.90	3.5	10.0	13.6	2,205	22.3	13.6	0.136
A13	0.0058	88.50	0.7782	30	1.50	2.8	142	3.00	3.0	0.8	3.6	172	11.0	3.6	0.036
A14	0.0040	90.00	0.7980	50	4.90	2.3	1,311	3.00	3.6	6.0	8.3	1,361	17.6	8.3	0.083
A15	0.0040	88.40	0.7769	57	50.00	1.2	1,165	3.00	3.6	5.3	6.5	1,222	16.8	6.5	0.065
A16	0.0027	91.71	0.8206	50	4.00	2.2	765	3.40	3.2	4.0	6.3	815	14.5	6.3	0.063
A17	0.0078	89.32	0.7890	38	2.00	2.7	2,300	4.70	5.9	6.5	9.3	2,338	23.0	9.3	0.093
TWA	0.0093	89.28	0.7886	36	2.00	2.7	870	3.00	3.4	4.3	7.0	906	15.0	7.0	0.070
S1	0.0160	83.77	0.7158	38	2.00	3.4	1,726	5.10	4.4	6.6	9.9	1,764	19.8	9.9	0.099
1CLM	0.0029	91.76	0.8213	38	5.90	1.7	1,300	5.20	3.4	6.4	8.1	1,338	17.4	8.1	0.081
INTR	0.0150	85.76	0.7617	36	2.00	2.7	2,000	3.21	5.5	6.1	8.8	2,036	21.3	8.8	0.088

NOTE:

(1) $K = 0.0132C_n - 0.39$

(2) $t_i = \dfrac{1.8(1.1-K)L_i^{1/2}}{S_i^{1/3}}$

(3) $V = CS t^{1/2}$

(4) $t = \dfrac{L}{60V}$

(5) $t_c = t_i + t_t$

(6) $t_c = \dfrac{L}{180} + 10$

(7) $t_{LAG} = 0.6t_c$

WHERE:

C = 20.2 for D = 0.3 ft and n = 0.016 (Urbanized Areas)
C = 30.6 for D = 0.5 ft and n = 0.016 (Urbanized Areas)
C = 14.8 for D = 0.25 ft and n = 0.04 (Non-Urbanized Areas)
C = 29.4 for D = 0.70 ft and n = 0.04 (Non-Urbanized Areas)
(See CCRFCD Manual pp606)

ANASAZI DRIVE - SUMMERLIN PARKWAY
HYDROLOGY

BASIN NUMBER	AREA		PAVED AREA NUMBER	PAVED AREA		NO PAVED AREA		AVE CN
	(SF)	(SQMI)		(SF)	(SQMI)	(SF)	(SQMI)	
A1	232520.64	0.0083	PA1	72441.56	0.003	160079.08	0.006	87.0
A2	64827.08	0.0023	PA2			64827.08	0.002	82.0
A3	318354.91	0.0114	PA3	64734.56	0.002	253620.35	0.009	85.2
A4	73106.43	0.0026	PA4			73106.43	0.003	82.0
A5	73098.99	0.0026	PA5	43688.32	0.002	29410.67	0.001	91.5
A6	138935.86	0.0050	PA6	48285.77	0.002	90650.09	0.003	87.5
A7	161602.35	0.0058	PA7			161602.35	0.006	82.0
A8A	86261	0.0031	PA8A	40355.38	0.001	45905.62	0.002	89.5
A8B	36502.51	0.0013	PA8A	20306.22	0.001	16196.29	0.001	90.9
A9A	82986.39	0.0030	PA9A	41784.66	0.001	41201.73	0.001	90.0
A9B	16251.55	0.0006	PA9B	8125.98	0.000	8125.57	0.000	90.0
A10A	125400.94	0.0045	PA10A	44894.82	0.002	80506.12	0.003	87.7
A10B	15522.37	0.0006	PA10B	4655.66	0.000	10866.71	0.000	86.8
A10C	36822.75	0.0013	PA10C	11230.88	0.000	25591.87	0.001	86.8
A11	201750.47	0.0072	PA11	52827.95	0.002	148922.52	0.005	86.2
A12	282679.11	0.0101	PA12			282679.11	0.010	82.0
A13	162756.2	0.0058	PA13	66307.17	0.002	96449.03	0.003	88.5
A14	111179.07	0.0040	PA14	55545.7	0.002	55633.37	0.002	90.0
A15	111106.07	0.0040	PA15	44589.3	0.002	66516.77	0.002	88.4
A16	73952.78	0.0027	PA16	44966.81	0.002	28985.97	0.001	91.7
A17	216867.16	0.0078	PA17	99579.05	0.004	117288.11	0.004	89.3
TWA	260159	0.0093	PTWA	55887	0.002	204272	0.007	89.3
S1	445328	0.0160	PS1	50628	0.002	394700	0.014	83.8
1CLM	80792	0.0029	P1CLM	49400	0.002	31392	0.001	91.8
INTR	418941	0.0150	PINTR	177800	0.006	241141	0.009	88.8

UNPAVED AREA CN CALCULATION

SUBBASINS A1-A17, S1, 1CLM, INTR

Soil	Group	Percent	CN*	Composite CN
Canutio	B	55	77	81.95
Cave	D	45	88	

SUBBASIN TWA

Soil	Group	Percent	CN*	Composite CN
Canutio	B	10	77	86.9
Cave	D	90	88	

*CN values from Table 602 of the County Design Manual based on desert shrub cover in poor condition.

PAVED AREA CN CALCULATION

From Table 602 of the County Design Manual, paved streets and roads have a CN = 98

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  RUN DATE  06/06/2003  TIME  10:16:02 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*          (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

```
1                                    HEC-1 INPUT                                    PAGE  1

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

                    *DIAGRAM
 *** FREE ***
          1         ID   ____________________________________________________________________
          2         ID
          3         ID       ANASAZI DRIVE OVERPASS HEC-1 ANALYSIS FOR PROPOSED CONDITIONS
          4         ID
          5         ID       EVENT:  100 YEAR  6 HOUR  SDN3
          6         ID       VTN PROJECT NO:  6190
          7         ID       FILE NAME:  ANASAZI1
          8         ID       DATE:  JUNE 2003
          9         ID       MODELED BY:  LL/LG
         10         ID   ____________________________________________________________________
         11         ID
         12         IT      2       0       0     300
         13         IO      5       0       0
         14         IN      5       0       0
         15         JR   PREC       1     .99
                    *
         16         KK    TWA
         17         BA  .0093
         18         PB   3.15
         19         PC  0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
         20         PC  0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
         21         PC  0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
         22         PC  0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
         23         PC  0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
         24         PC  0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
         25         PC  0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
         26         PC  0.998   0.999   1.000
         27         LS      0    89.3
         28         UD  0.070
                    *
         29         KK     K1
         30         KM       ROUTE BASIN TWA TO POINT S1
         31         RD   1500    .051    .025       0    TRAP      30       4
                    *
         32         KK    S1A
         33         KM       SOUTHERN DITCH PORTION OF THE SUMMERLIN PARKWAY
         34         BA  .0160
         35         LS      0    83.8
         36         UD   .099
                    *
         37         KK   CS1A
         38         KM       COMBINE BASINS TWA AND S1A IN THE OFFSITE CHANNEL
         39         KM       STA SP 336+00                 46          BA   .0114
```

Rainfall

```
KM        STA SP 336+00
HC       2
*
```

1
PAGE 2

HEC-1 INPUT

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

KK    RCS1A
KM        ROUTE POINT CS1A THROUGH BASIN A3
RD    1700    .049    .025       0    TRAP       30        4
*

KK      A3
KM        SOUTHERN DITCH PORTION OF THE SUMMERLIN PARKWAY
BA    .0114
LS       0     85.2
UD    .122
*

KK     CA3
KM        COMBINE FLOW FROM POINT CS1A WITH BASIN A3 IN THE SUMMERLIN PKWY DITCH
KM        TOTAL FLOW AT THE ENTRANCE TO THE 48" STUB AT STA SP 354+22.35
HC       2
*

KK      A6
KM        FLOW TO THE SOUTH DITCH FROM STA SP 353+00 TO STA 360+32
BA    .005
LS       0     87.5
UD    0.069
*

KK     RA6
KM        ROUTE FLOW FROM BASIN A6 THROUGH BASIN A11
RD    1200    .031    .035       0    TRAP        0        4
*

KK     A11
KM        FLOW TO THE SOUTH DITCH FROM STA SP 360+32 TO STA 373+70 (ANASAZI DRIVE)
BA    .0072
LS       0     86.2
UD    .100
*

KK    CA11
KM        COMBINE FLOW FROM A6 WITH FLOW FROM A11 FOR TOTAL FLOW IN
KM        SUMMERLIN PKWY SOUTH DITCH AT STATION SP 373+70 (ANASAZI DRIVE)
HC       2
*

KK    INTR
KM        NORTHEAST CORNER OF THE WESTERN BELTWAY/SUMMERLIN PKWY INTERCHANGE
KM        TOTAL FLOW TO THE NORTHERN DITCH AT STA SP 336+00
BA    .0150
LS       0     88.8
UD    .088
*
```

1
PAGE 3

HEC-1 INPUT

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

KK    RINTR
KM        ROUTE FLOW FROM BASIN INTR THROUGH BASIN A1
RD    1700    .051    .025       0    TRAP        0       10
*

KK      A1
KM        FLOW TO THE NORTHERN DITCH FROM STA SP 336+00 TO STA 353+00
BA    .0083
LS       0     87.0
UD    .096
*

KK     CA1
KM        TOTAL FLOW TO THE NORTHERN DITCH AT STA SP 353+00
HC       2
*

KK    RCA1
KM        ROUTE FLOW FROM POINT CA1 THROUGH BASIN A4
RD     770    .046    .025       0    TRAP        0       10
*

KK      A4
KM        FLOW TO THE NORTHERN DITCH FROM STA SP 353+00 TO STA 360+60
BA    .0026
LS       0     82.0
UD    0.107
*

KK     CA4
KM        TOTAL FLOW TO THE NORTHERN DITCH AT STATION SP 360+60
HC       2
*
```

```
 98          KK    RCA4
 99          KM        ROUTE FLOW THROUGH BASIN A7
100          RD    1300    .046    .025      0    TRAP      0      10
             *

101          KK      A7
102          KM        FLOW TO THE NORTHERN DITCH FROM STA SP 360+60 TO STA 373+70
103          BA    .0058
104          LS       0    82.0
105          UD    0.083
             *

106          KK     CA7
107          KM        TOTAL FLOW TO THE NORTHERN DITCH AT STATION SP 373+70 (ANASAZI DR)
108          HC       2
             *
```

1
PAGE 4

HEC-1 INPUT

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

109          KK     A8A
110          KM        FLOW TO THE DITCH LOCATED NORTH OF THE CENTERLINE AND
111          KM        SOUTH OF RAMP "RA4" FROM STA SP 360 TO STA 372+50
112          BA    .0031
113          LS       0    89.5
114          UD    0.059
             *

115          KK    CA8A
116          KM        COMBINE FLOW FROM POINT CA7 WITH FLOW FROM BASIN A8A
117          HC       2
             *

118          KK    1CLM
119          KM        TOTAL FLOW TO THE CENTERLINE MEDIAN DITCH AT STA 336+00.
120          BA    .0029
121          LS       0    91.8
122          UD    .081
             *

123          KK    R1CLM
124          KM        ROUTE FLOW FROM BASIN 1CLM THROUGH BASIN A2
125          RD    1700    .049    .035      0    TRAP      0      10
             *

126          KK      A2
127          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 336+00 TO STA 353+00
128          BA    .0023
129          LS       0    82.0
130          UD    .116
             *

131          KK     CA2
132          KM        TOTAL FLOW IN THE CENTERLINE DITCH AT STA SP 353+00
133          HC       2
             *

134          KK    RCA2
135          KM        ROUTE FLOW FROM POINT CA2 THROUGH BASIN A5
136          RD     770    .050    .035      0    TRAP      0       4
             *

137          KK      A5
138          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 353+00 TO STA 360+70
139          BA    .0026
140          LS       0    91.5
141          UD    0.076
             *
```

1
PAGE 5

HEC-1 INPUT

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

142          KK     CA5
143          KM        TOTAL FLOW IN THE CENTERLINE MEDIAN DITCH AT STA SP 360+70
144          HC       2
             *

145          KK    RCA5
146          KM        ROUTE FLOW FROM POINT CA5 THROUGH BASIN A9
147          RD    1300    .046    .035      0    TRAP      0       4
             *

148          KK     A9A
149          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 360+70 TO STA 373+70
150          BA    .0030
151          LS       0    90.0
152          UD    0.065
             *

153          KK    CA9A1
154          KM        TOTAL FLOW IN THE CENTERLINE MEDIAN DITCH AT STA SP 373+70 (ANASAZI DRIV
155          HC       2
             *

156          KK    CA9A2
```

```
157          KM        COMBINE FLOW FROM POINT CA9A1 WITH POINT CA8 FOR TOTAL FLOW AT
158          KM        CENTERLINE MEDIAN DITCH AT STA SP 373+70 (ANASAZI DRIVE)
159          HC      2
             *
160          KK    A10A
161          KM        FLOW TO THE DITCH LOCATED SOUTH OF THE CENTERLINE AND
162          KM        NORTH OF RAMP "RA1" FROM STA SP 360+32 TO STA 372+50
163          BA   .0045
164          LS      0     87.7
165          UD   0.061
             *
166          KK    CA10A
167          KM        COMBINE FLOW FROM CA9A2 WITH FLOW FROM A10A FOR TOTAL FLOW AT
168          KM        STA SP 373+70 (ANASAZI DR) PROPOSED TO BE DIVERTED SOUTH TO
169          KM        SUMMERLIN PKWY CHANNEL
170          HC      2
             *
171          KK    A10B
172          KM        FLOW TO THE DITCH LOCATED SOUTH OF THE CENTERLINE AND
173          KM        NORTH OF RAMP "RA1" FROM STA 372+50 (ANASAZI DRIVE) TO STA 377+50
174          BA   .0006
175          LS      0     86.8
176          UD   0.023
             *
1                                        HEC-1 INPUT
PAGE  6

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

177          KK    A10C
178          KM        FLOW TO THE DITCH LOCATED SOUTH OF THE CENTERLINE AND
179          KM        NORTH OF RAMP "RA1" FROM STA SP 372+50 TO STA 373+70 (ANASAZI DRIVE)
180          BA   .0013
181          LS      0     86.8
182          UD   0.035
             *
183          KK   CA10C1
184          KM        COMBINE FLOW FROM A10B WITH A10C AT STA SP 377+50
185          HC      2
             *
186          KK   CA10C2
187          KM        COMBINE FLOW FROM CA10C1 AND A10C IN PROPOSED STORM DRAIN
188          HC      2
             *
189          KK     A15
190          KM        FLOW TO THE DITCH LOCATED SOUTH OF THE CENTERLINE AND
191          KM        NORTH OF RAMP "RA2" FROM STA SP 377+50 TO 391+20
192          BA    .004
193          LS      0     88.4
194          UD    .082
             *
195          KK    RA15
196          KM        ROUTE FLOW FROM BASIN A15 THROUGH BASIN A17
197          RD     550    .030    .035       0    TRAP       0       4
             *
198          KK     A17
199          KM        FLOW TO THE SOUTH DITCH FROM STA SP 373+70 TO STA 396+77 (CRESTDALE LN)
200          BA   .0078
201          LS      0     89.3
202          UD   0.065
             *
203          KK    CA17
204          KM        COMBINE FLOW FROM POINT SM2 WITH FLOW FROM 3SDCH FOR TOTAL FLOW IN THE
205          KM        SUMMERLIN PKWY SOUTH DITCH AT STA SP 396+77 (CRESTDALE LN)
206          HC      2
             *
207          KK     A8B
208          KM        FLOW TO THE DITCH LOCATED NORTH OF THE CENTERLINE AND
209          KM        SOUTH OF RAMP "RA3" FROM STA SP 371+50 TO STA 373+70 (ANASAZI DRIVE)
210          BA   .0013
211          LS      0     90.9
212          UD    .049
             *
1                                        HEC-1 INPUT
PAGE  7

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

213          KK     A13
214          KM        FLOW TO THE DITCH LOCATED NORTH OF THE CENTERLINE AND
215          KM        SOUTH OF RAMP "RA3" FROM STA SP 373+70 TO 390+20
216          BA   .0058
217          LS      0     88.5
218          UD    .036
             *
219          KK    CA13
```

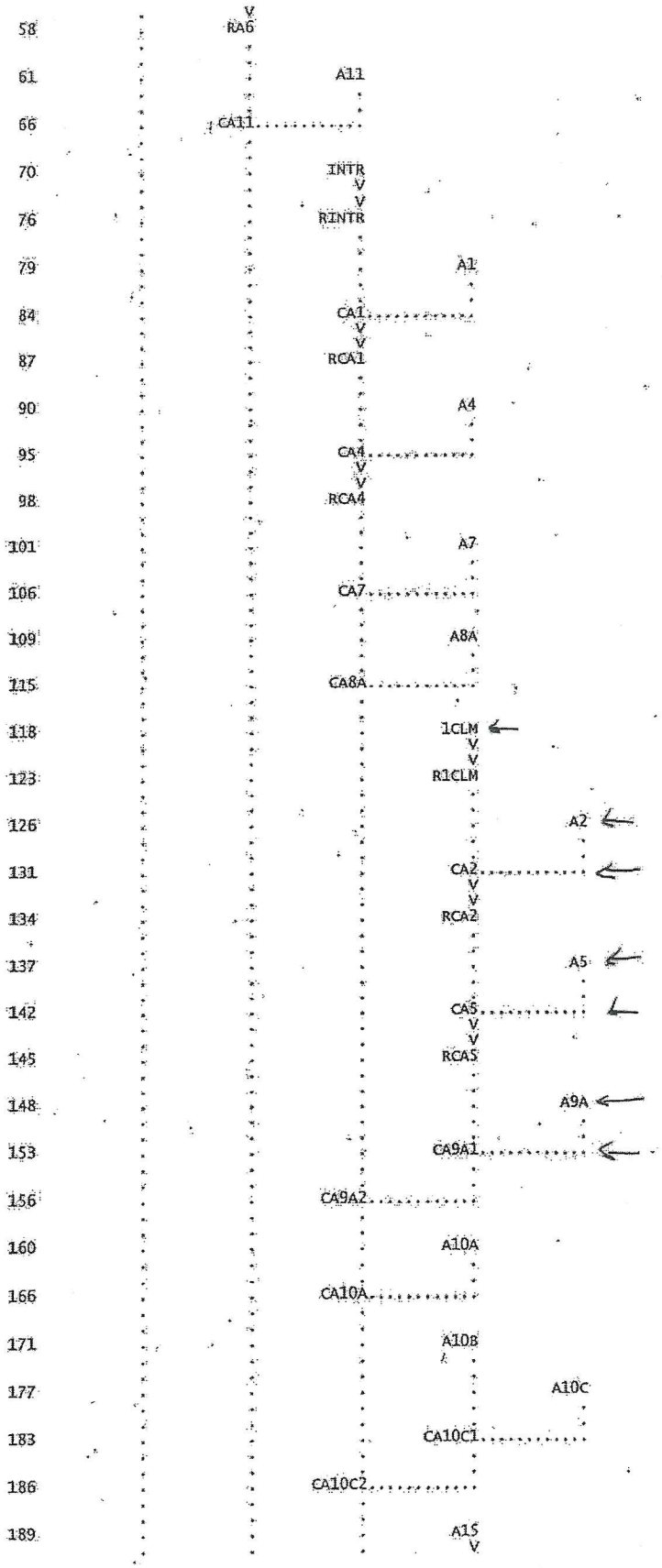
```
220          KM        COMBINE FLOW FROM A8B AND A13 AT 2-30" EQUIV HERCP
221          HC       2
             *
222          KK    RA13
223          KM        ROUTE FLOW FROM BASIN A13 THROUGH BASIN A12
224          RD     650    .035    .035       0    TRAP      10       4
             *
225          KK     A12
226          KM        FLOW TO THE NORTHERN DITCH FROM STA SP 373+70 TO STA 396+77 (CRESTDALE L
227          BA   .0101
228          LS       0    82.0
229          UD    .136
             *
230          KK    CA12
231          KM        TOTAL FLOW TO THE NORTHERN DITCH AT CRESTDALE LN (STA SP 396+77)
232          HC       2
             *
233       -->KK     A9B
234          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 371+50 TO STA 373+70
235          BA   .0006
236          LS       0    90.0
237          UD    .038
             *
238       -->KK     A14
239          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 374+50 TO STA 389+00
240          BA   .0040
241          LS       0    90.0
242          UD    .083
             *
243       -->KK    CA9B
244          KM        TOTAL FLOW IN CENTERLINE MEDIAN DITCH AT STA 389+00
245          HC       2
             *
1                                        HEC-1 INPUT
PAGE  8

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

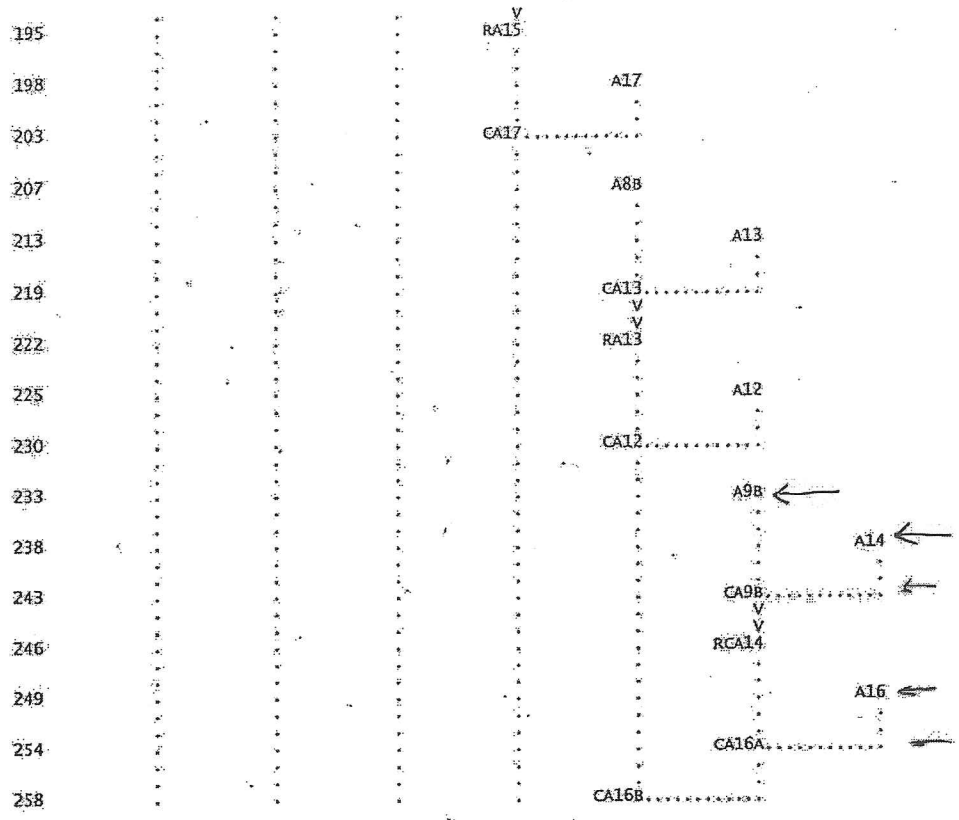
246          KK    RCA14
247          KM        ROUTE FLOW FROM BASIN A14 THROUGH BASIN A16
248          RD     700    .034    .035       0    TRAP       0       4
             *
249          KK     A16
250          KM        FLOW TO THE CENTERLINE MEDIAN DITCH FROM STA SP 389+00 TO STA 396+77
251          BA   .0027
252          LS       0    91.7
253          UD    .063
             *
254          KK   CA16A
255          KM        COMBINE FLOW FROM BASIN A16 WITH BASIN A14 IN CENTERLINE MEDIAN DITCH
256          KM        AT CRESTDALE LN
257          HC       2
             *
258          KK   CA16B
259          KM        COMBINE FLOW FROM POINT CA12 AND POINT CA16A AT CENTERLINE MEDIAN DITCH
260          KM        AT CRESTDALE LN, DISCHARGE INTO SUMMERLIN PKWY CHANNEL
261          HC       2
             *
262          ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   16        TWA
              V
              V
   29         K1
              .
              .
   32         .          S1A
              .           .
              .           .
   37        CS1A.........
              V
              V
   41       RCS1A
              .
              .
   44         .           A3
              .           .
              .           .
   49        CA3..........
              .
              .
   53         .           A6
              .            V
              .
```


58
RA6
61
A11
66
CA11
70
INTR
76
RINTR
79
A1
84
CA1
87
RCA1
90
A4
95
CA4
98
RCA4
101
A7
106
CA7
109
A8A
115
CA8A
118
1CLM
123
R1CLM
126
A2
131
CA2
134
RCA2
137
A5
142
CA5
145
RCA5
148
A9A
153
CA9A1
156
CA9A2
160
A10A
166
CA10A
171
A10B
177
A10C
183
CA10C1
186
CA10C2
189
A15

```
                                                  V
195                                              RA15
                                                  .
198                                                  .        A17
                                                  .          .
203                                              CA17.........
                                                  .
207                                                  .        A8B
                                                  .          .
213                                                  .          .        A13
                                                  .          .          .
219                                                  .        CA13.........
                                                  .          V
                                                  .          V
222                                                  .        RA13
                                                  .          .
225                                                  .          .        A12
                                                  .          .          .
230                                                  .        CA12.........
                                                  .          .
233                                                  .          .        A9B <-
                                                  .          .          .
238                                                  .          .          .        A14 <-
                                                  .          .          .          .
243                                                  .          .        CA9B.........
                                                  .          .          V
                                                  .          .          V
246                                                  .          .        RCA14
                                                  .          .          .
249                                                  .          .          .        A16 <-
                                                  .          .          .          .
254                                                  .          .        CA16A.........
                                                  .          .          .
258                                                  .        CA16B.........
```



```
(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*****************************************
*                                       *                                       *
*                                       *                                       *   U.S. ARMY CORPS
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *   HYDROLOGIC
OF ENGINEERS                            *
*              SEPTEMBER 1990           *                                       *        609 SECOND
ENGINEERING CENTER                      *
*              VERSION 4.0              *                                       *
STREET                                  *                                       *      DAVIS,
*                                       *                                       *
CALIFORNIA 95616                        *                                       *        (916)
*  RUN DATE  06/06/2003  TIME  10:16:02 *
756-1104                                *                                       *
*                                       *
*****************************************
*****************************************
```

ANASAZI DRIVE OVERPASS HEC-1 ANALYSIS FOR PROPOSED CONDITIONS

EVENT: 100 YEAR 6 HOUR SDN3
VTN PROJECT NO: 6190
FILE NAME: ANASAZI1
DATE: MARCH 2003
MODELED BY: LL

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

   IT        HYDROGRAPH TIME DATA
                   NMIN          2  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1   0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1   0  ENDING DATE
                 NDTIME       0958  ENDING TIME
                  ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .03 HOURS
```

TOTAL TIME BASE 9.97 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
1.00 .99

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 1.00	RATIO 2 .99
HYDROGRAPH AT	TWA	.01	1	FLOW	20.	19.
+				TIME	3.53	3.53
ROUTED TO	K1	.01	1	FLOW	19.	19.
+				TIME	3.60	3.60
HYDROGRAPH AT	S1A	.02	1	FLOW	26.	26.
+				TIME	3.53	3.53
2 COMBINED AT	CS1A	.03	1	FLOW	44.	44.
+				TIME	3.57	3.57
ROUTED TO	RCS1A	.03	1	FLOW	44.	43.
+				TIME	3.63	3.63
HYDROGRAPH AT	A3	.01	1	FLOW	19.	18.
+				TIME	3.57	3.57
2 COMBINED AT	CA3	.04	1	FLOW	61.	60.
+				TIME	3.60	3.60
HYDROGRAPH AT	A6	.00	1	FLOW	10.	10.
+				TIME	3.53	3.53
ROUTED TO	RA6	.00	1	FLOW	10.	10.
+				TIME	3.60	3.60
HYDROGRAPH AT	A11	.01	1	FLOW	13.	13.
+				TIME	3.53	3.53
2 COMBINED AT	CA11	.01	1	FLOW	22.	22.
+				TIME	3.57	3.57
HYDROGRAPH AT	INTR	.01	1	FLOW	30.	30.
+				TIME	3.53	3.53
ROUTED TO	RINTR	.01	1	FLOW	30.	29.
+				TIME	3.60	3.60
HYDROGRAPH AT	A1	.01	1	FLOW	15.	15.
+				TIME	3.53	3.53
2 COMBINED AT	CA1	.02	1	FLOW	44.	43.
+				TIME	3.57	3.57
ROUTED TO	RCA1	.02	1	FLOW	43.	42.
+				TIME	3.60	3.60
HYDROGRAPH AT	A4	.00	1	FLOW	4.	4.
+				TIME	3.53	3.53
2 COMBINED AT	CA4	.03	1	FLOW	47.	46.
+				TIME	3.60	3.60

+ ROUTED TO	RCA4	.03	1	FLOW	47.	46.
				TIME	3.63	3.63
+ HYDROGRAPH AT	A7	.01	1	FLOW	9.	9.
				TIME	3.53	3.53
+ 2 COMBINED AT	CA7	.03	1	FLOW	53.	52.
				TIME	3.60	3.60
+ HYDROGRAPH AT	A8A	.00	1	FLOW	7.	7.
				TIME	3.50	3.50
+ 2 COMBINED AT	CA8A	.03	1	FLOW	56.	55.
				TIME	3.60	3.60
+ HYDROGRAPH AT	1CLM	.00	1	FLOW	6.	6.
				TIME	3.53	3.53
+ ROUTED TO	R1CLM	.00	1	FLOW	6.	6.
				TIME	3.63	3.63
+ HYDROGRAPH AT	A2	.00	1	FLOW	3.	3.
				TIME	3.57	3.57
+ 2 COMBINED AT	CA2	.01	1	FLOW	9.	9.
				TIME	3.60	3.60
+ ROUTED TO	RCA2	.01	1	FLOW	9.	9.
				TIME	3.63	3.63
+ HYDROGRAPH AT	A5	.00	1	FLOW	6.	6.
				TIME	3.53	3.53
+ 2 COMBINED AT	CA5	.01	1	FLOW	13.	13.
				TIME	3.57	3.57
+ ROUTED TO	RCA5	.01	1	FLOW	13.	13.
				TIME	3.60	3.60
+ HYDROGRAPH AT	A9A	.00	1	FLOW	6.	6.
				TIME	3.50	3.50
+ 2 COMBINED AT	CA9A1	.01	1	FLOW	18.	17.
				TIME	3.57	3.57
+ 2 COMBINED AT	CA9A2	.05	1	FLOW	74.	73.
				TIME	3.57	3.57
+ HYDROGRAPH AT	A10A	.00	1	FLOW	9.	9.
				TIME	3.50	3.50
+ 2 COMBINED AT	CA10A	.05	1	FLOW	81.	80.
				TIME	3.57	3.57
+ HYDROGRAPH AT	A10B	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
+ HYDROGRAPH AT	A10C	.00	1	FLOW	3.	3.
				TIME	3.50	3.50
+ 2 COMBINED AT	CA10C1	.00	1	FLOW	4.	4.
				TIME	3.50	3.50
+ 2 COMBINED AT	CA10C2	.05	1	FLOW	84.	82.
				TIME	3.53	3.53
+ HYDROGRAPH AT	A15	.00	1	FLOW	8.	8.
				TIME	3.53	3.53
+ ROUTED TO	RA15	.00	1	FLOW	8.	8.
				TIME	3.57	3.57
+ HYDROGRAPH AT	A17	.01	1	FLOW	16.	16.

				TIME	3.50	3.50
2 COMBINED AT						
+	CA17	.01	1	FLOW	24.	24.
				TIME	3.53	3.53
HYDROGRAPH AT						
+	A8B	.00	1	FLOW	3.	3.
				TIME	3.50	3.50
HYDROGRAPH AT						
+	A13	.01	1	FLOW	13.	13.
				TIME	3.50	3.50
2 COMBINED AT						
+	CA13	.01	1	FLOW	16.	16.
				TIME	3.50	3.50
ROUTED TO						
+	RA13	.01	1	FLOW	16.	16.
				TIME	3.53	3.53
HYDROGRAPH AT						
+	A12	.01	1	FLOW	14.	14.
				TIME	3.57	3.57
2 COMBINED AT						
+	CA12	.02	1	FLOW	29.	29.
				TIME	3.53	3.53
HYDROGRAPH AT						
+	A9B	.00	1	FLOW	1.	1. ←
				TIME	3.50	3.50
HYDROGRAPH AT						
+	A14	.00	1	FLOW	8.	8. ←
				TIME	3.53	3.53
2 COMBINED AT						
+	CA9B	.00	1	FLOW	10.	9. ←
				TIME	3.53	3.53
ROUTED TO						
+	RCA14	.00	1	FLOW	10.	9.
				TIME	3.57	3.57
HYDROGRAPH AT						
+	A16	.00	1	FLOW	6.	6. ←
				TIME	3.50	3.50
2 COMBINED AT						
+	CA16A	.01	1	FLOW	15.	15. ←
				TIME	3.53	3.53
2 COMBINED AT						
+	CA16B	.02	1	FLOW	45.	44.
				TIME	3.53	3.53

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING

(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
K1	MANE	2.00	19.38	216.00	2.06	2.00	19.38	216.00	2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1023E+01 EXCESS= .0000E+00 OUTFLOW= .1024E+01 BASIN STORAGE= .1309E-02
PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00									
K1	MANE	2.00	19.14	216.00	2.04	2.00	19.14	216.00	2.04

REVISIONS			
No.	Date		APPD

50% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
MAR. 18, 2003

DESIGNED: LL
DRAWN: LG
CHECKED: EPM
JOB NO: 6190
HORIZ: 1" = 120'
VERT: –
DATE: 3-18-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

vtn nevada
• CONSULTING ENGINEERS
• PLANNERS
• LAND SURVEYORS
2727 S. RAINBOW BLVD.
LAS VEGAS, NEVADA 89146
PHONE (702) 873-7450
FAX (702) 362-2597

PROJECT: ANASAZI DRIVE OVERPASS

DESCRIPTION: DRAINAGE BASIN MAP
FIGURE 3

I:\6190\Varg\EXHIBITS\BA01.dwg

LEGEND

- GRAVEL MULCH
- RIP-RAP
- NEW PAVEMENT
- RESTORE LANDSCAPING (SEE LANDSCAPING PLANS)

CONSTRUCTION NOTES

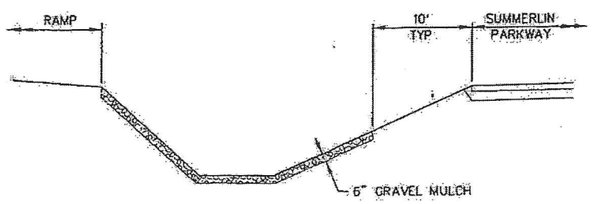
1. GRAVEL MULCH (6" DEPTH)
2. RIP-RAP CLASS 150

NORTH

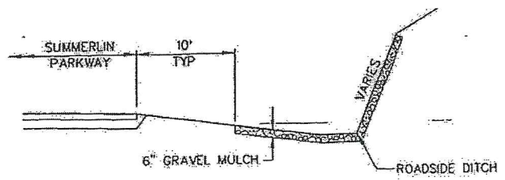
BEGIN CONSTRUCTION
"SP" 358+00.00

EXISTING R/W

"RA4"
188.14'
N75° 49'05"E
45+00
"RA4" +74.51 EP
23.00' RT
50+00
"SWB"
"SP"
360+00
"SWB" +74.77
8.00' RT
SUMMERLIN PKWY
365+00
"RA4" +90.00
44.00' LT
360+00
365+00
360+00
SEB +66.96
8.00' LT
"SEB"
"SEB" +00.00
43.50' RT
366+00
"RA1" +04.50 EP
28.00' LT
15+00
"RA1"
"RA1" +01.93 EP
28.50' LT
20+00
NPC EASEMENT
MATCH EXIST GRAVEL MULCH
MATCHLINE "SP" 367+00, SEE SHEET E-2
EXISTING R/W



GRAVEL MULCH DETAIL @ FILL AREA



GRAVEL MULCH DETAIL @ CUT AREA

GRAPHIC SCALE
40 30 20 10 0 20 40 80

Call before you Dig Underground 1.702.598.5511

SAFETY ALERT Call before you Overhead 1.702.593.6111

Call before you Dig Underground 1.702.598.5511

REVISIONS			
No.	Date		APP'D

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED:	PLC
DRAWN:	CPT
CHECKED:	KLN
JOB NO.:	P10-645545
HORIZ.:	1"=40'
VERT.:	NONE
DATE:	6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 South Rancho Drive - Ste. 340, Las Vegas, NV 89106
(702) 435-7116 FAX (702) 435-8412

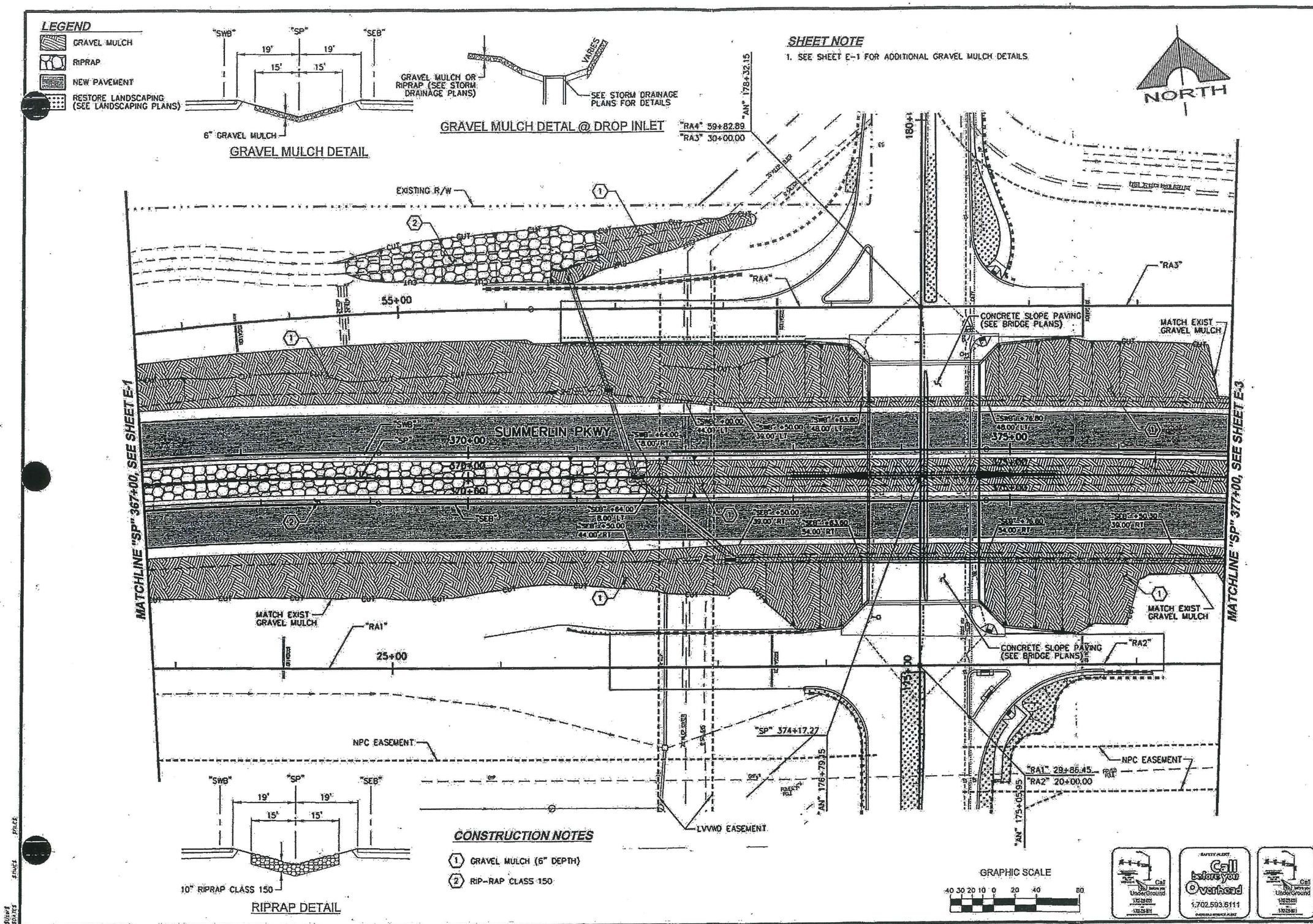
PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: EROSION CONTROL PLAN
"SP" 357+00 TO "SP" 367+00

DRAWING NO. 107V3690

SHEET E-1
XXX OF XXX

\\pw0018\61\05/7/2003 02:17:20 PM\projects\164545\vegas\version enviro\345-e01.dgn


LEGEND
GRAVEL MULCH
RIPRAP
NEW PAVEMENT
RESTORE LANDSCAPING (SEE LANDSCAPING PLANS)
"SWB"
"SP"
"SEB"
19'
19'
15'
15'
6" GRAVEL MULCH
GRAVEL MULCH DETAIL
GRAVEL MULCH OR RIPRAP (SEE STORM DRAINAGE PLANS)
VARIES
SEE STORM DRAINAGE PLANS FOR DETAILS
GRAVEL MULCH DETAL @ DROP INLET
SHEET NOTE
1. SEE SHEET E-1 FOR ADDITIONAL GRAVEL MULCH DETAILS.
NORTH
"RA4" 59+82.89
"RA3" 30+00.00
"AN" 178+32.15
EXISTING R/W
55+00
"RA4"
"RA3"
CONCRETE SLOPE PAVING (SEE BRIDGE PLANS)
MATCH EXIST GRAVEL MULCH
SUMMERLIN PKWY
370+00
375+00
MATCHLINE "SP" 367+00, SEE SHEET E-1
MATCHLINE "SP" 377+00, SEE SHEET E-3
MATCH EXIST GRAVEL MULCH
"RA1"
25+00
CONCRETE SLOPE PAVING (SEE BRIDGE PLANS)
"RA2"
NPC EASEMENT
"SP" 374+17.27
"AN" 176+79.15
"RA1" 29+86.45
"RA2" 20+00.00
"AN" 175+05.95
LVVWD EASEMENT
10" RIPRAP CLASS 150
RIPRAP DETAIL
CONSTRUCTION NOTES
1 GRAVEL MULCH (6" DEPTH)
2 RIP-RAP CLASS 150
GRAPHIC SCALE
40 30 20 10 0 20 40 80
Call before you Overhead
1.702.593.6111
REVISIONS
No.
Date
APPD
90% SUBMITTAL
PRELIMINARY
NOT FOR
CONSTRUCTION
JUNE 2, 2003
DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: PTG-645545
HORIZ: 1"=40'
VERT: NONE
DATE: 6-2-03
CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272
PARSONS
840 GRIER DRIVE, STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8412
PROJECT:
ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05
DESCRIPTION:
EROSION CONTROL PLAN
"SP" 367+00 TO "SP" 377+00
DRAWING NO.
107V3690
SHEET
E-2
XXX OF XXX

LEGEND

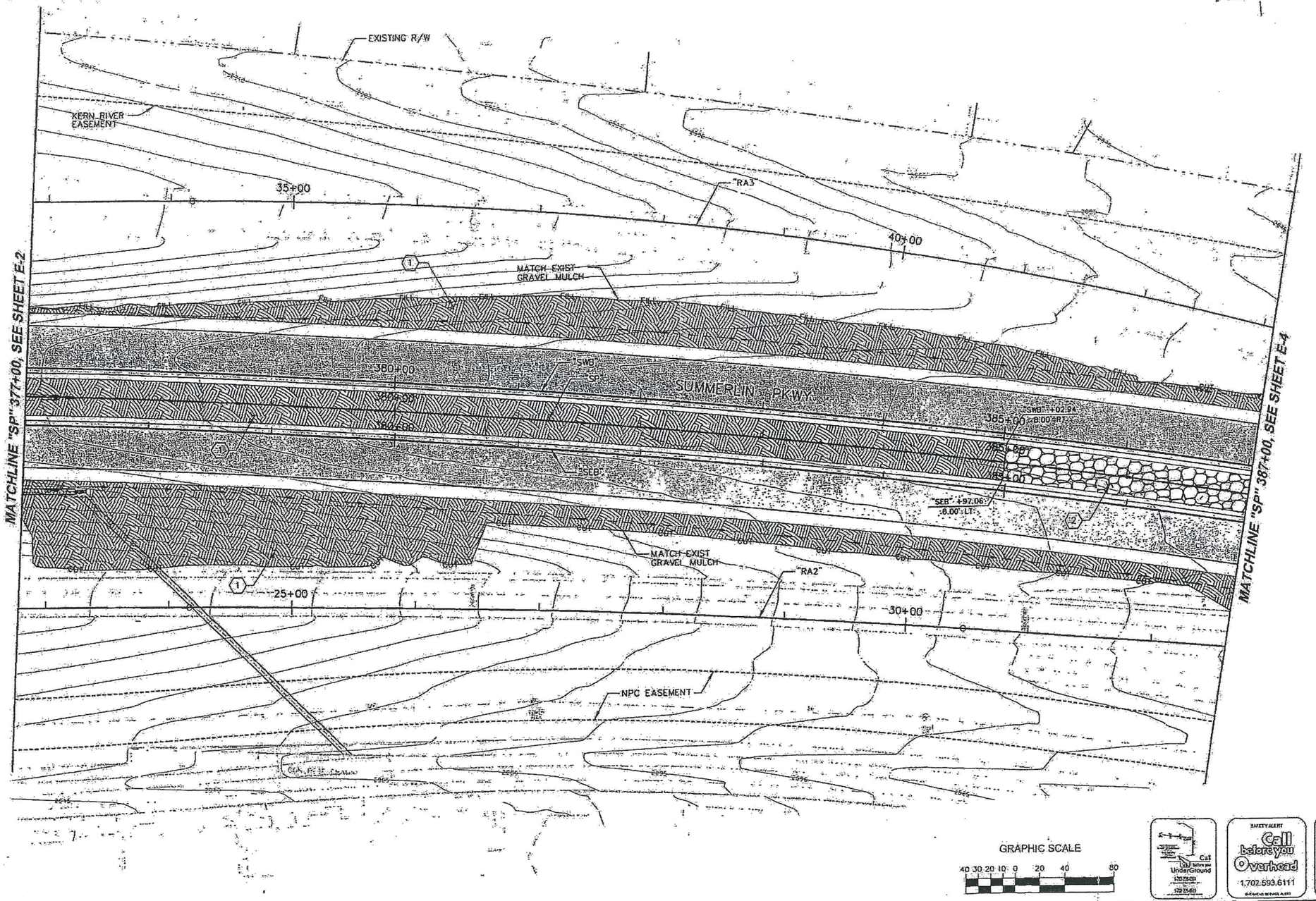
- GRAVEL MULCH
- RIP-RAP
- NEW PAVEMENT
- RESTORE LANDSCAPING (SEE LANDSCAPING PLANS)

CONSTRUCTION NOTES

1. GRAVEL MULCH (6" DEPTH)
2. RIP-RAP CLASS 150

SHEET NOTE

1. SEE SHEETS E-1 AND E-2 FOR GRAVEL MULCH DETAILS.



REVISIONS

No.	Date	APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR
CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: PTC-645545
HORIZ: 1"=40'
VERT: NON
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 GRIER DRIVE, STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-6412

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: EROSION CONTROL PLAN
"SP" 377+00 TO "SP" 387+00

DRAWING NO. 107V3690

SHEET E-3

XXX OF XXX

Call before you Overhead 1.702.593.6111

LEGEND

- GRAVEL MULCH
- RIP-RAP
- NEW PAVEMENT
- RESTORE LANDSCAPING (SEE LANDSCAPING PLANS)

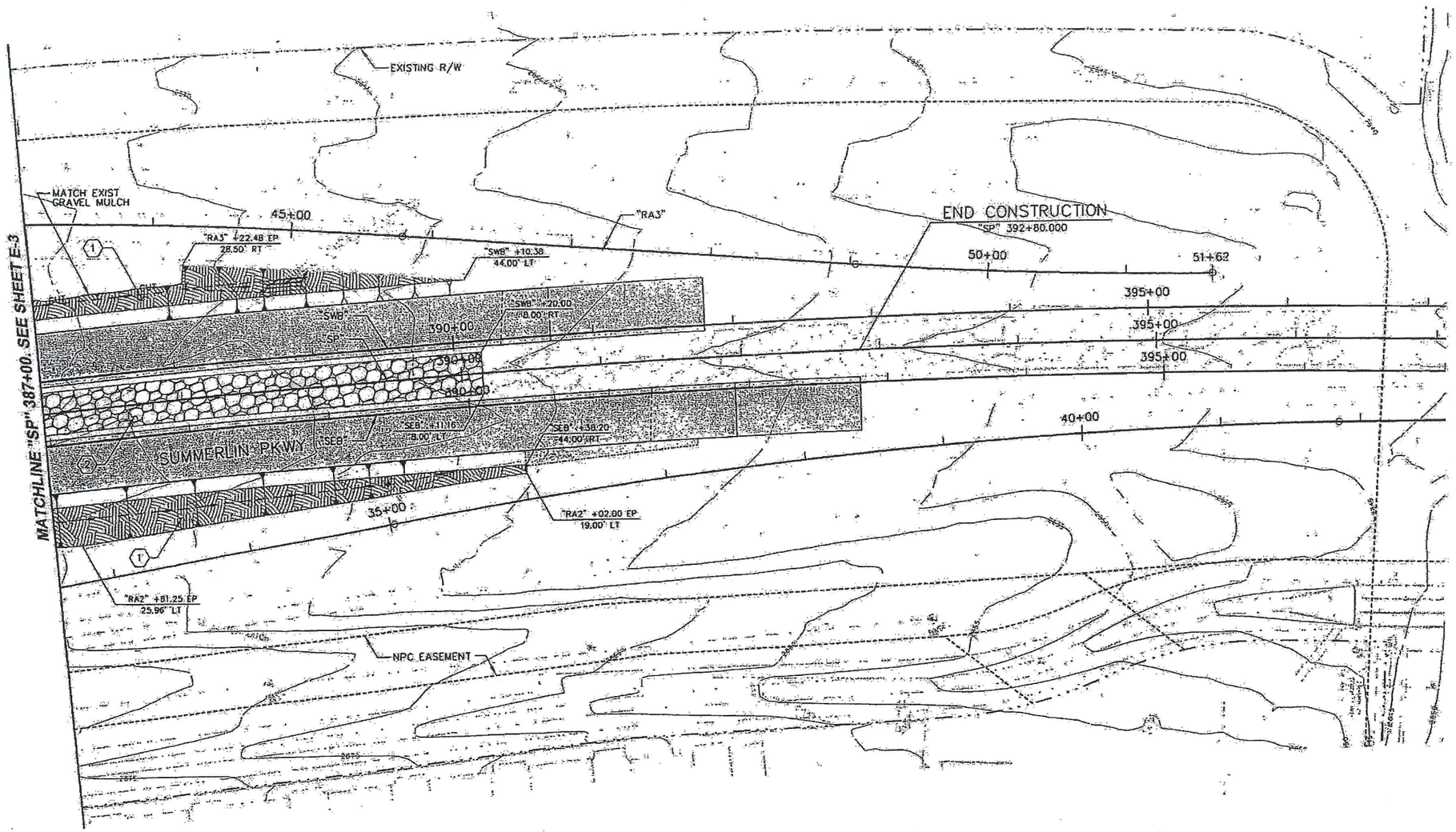
CONSTRUCTION NOTES

1. GRAVEL MULCH (6" DEPTH)
2. RIP-RAP CLASS 150

SHEET NOTE

1. SEE SHEETS E-1 AND E-2 FOR GRAVEL MULCH DETAILS.

NORTH



GRAPHIC SCALE

40 30 20 10 0 20 40 80

Call before you UnderGround 1.702.8811

SAFETY ALERT
Call before you Overhead
1.702.593.8111

Call before you UnderGround 1.702.8811

REVISIONS			
No.	Date		APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: P10-645545
HORIZ: 1"=40'
VERT: NONE
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 CRICK DRIVE, STE. 140, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8442

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04-1730.05

DESCRIPTION: EROSION CONTROL PLAN
"SP" 387+00 TO "SP" 397+00

DRAWING NO. 107V3690

SHEET E-4

XXX OF XXX

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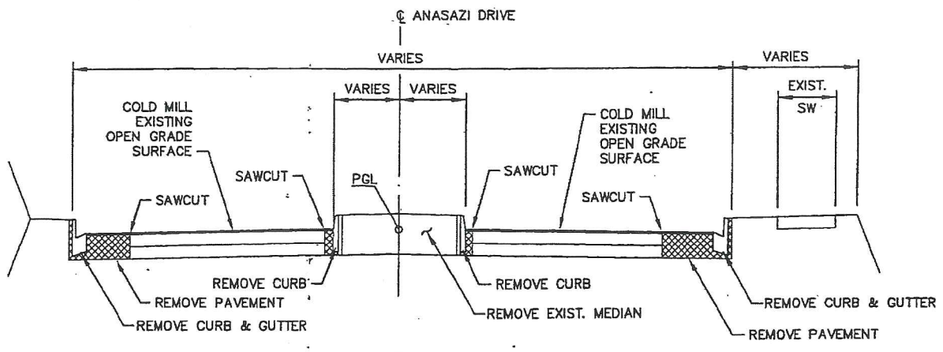
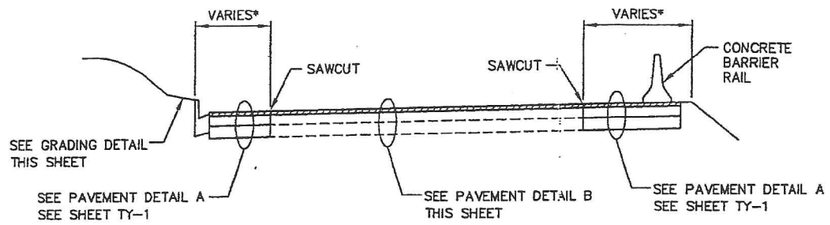


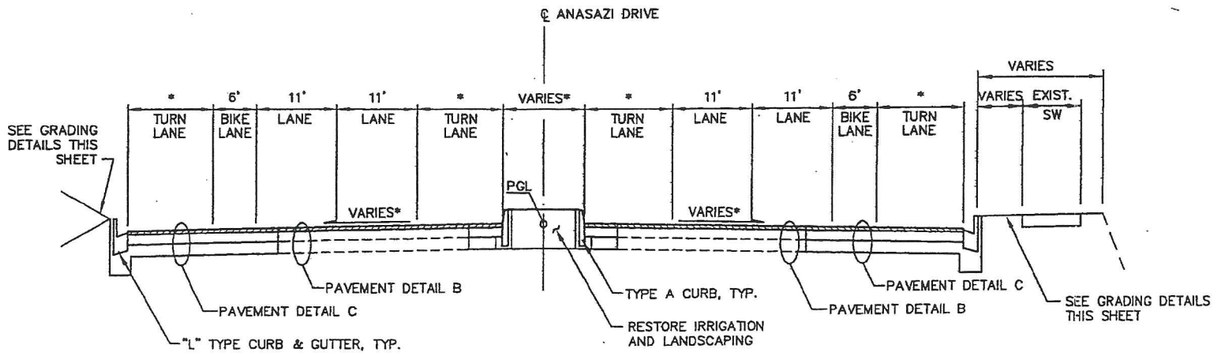
ANASAZI DRIVE EXISTING CONDITION

"AN" 170+00.00 TO "AN" 175+32.76
"AN" 178+07.15 TO "AN" 182+75.00



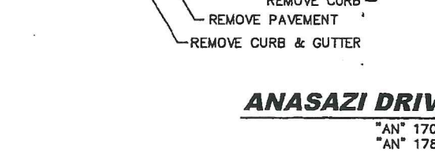
RAMP SECTION

"RA1" 27+00.00 TO "RA1" 29+39.43
"RA2" 20+53.48 TO "RA2" 22+25.00
"RA3" 30+50.00 TO "RA3" 31+50.00
"RA4" 56+50.00 TO "RA4" 59+35.87

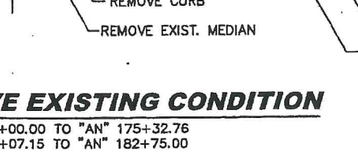


ANASAZI DRIVE SECTION OF IMPROVEMENT

"AN" 170+00.00 TO "AN" 175+32.76
"AN" 175+32.76 TO "AN" 178+07.15 (BRIDGE I-2762)
"AN" 178+07.15 TO "AN" 182+75.00



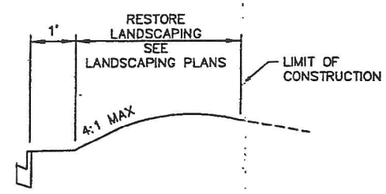
PAVEMENT DETAIL B



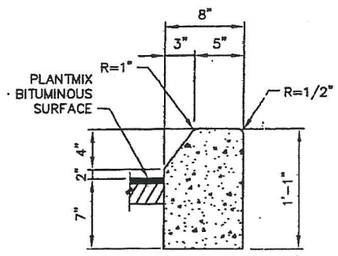
PAVEMENT DETAIL C

SHEET NOTES:

1. FOR TURN LANE LOCATIONS SEE INTERSECTION DETAIL SHEETS. BIKE LANE WIDTHS ADJACENT TO RIGHT TURN LANES DECREASE TO 4-FEET.
2. FOR STREET CROSS SLOPES AND ELEVATION GRADES SEE THE ROADWAY PROFILES AND CONSTRUCTION PLANS.
3. THE PROFILE GRADE LINE (PGL) CONTROL IS TO THE TOP OF THE PLANMIX BITUMINOUS SURFACING LAYER.
4. SAWCUT THE EXISTING PAVEMENT 1.0-FOOT FROM THE EDGE OF EXISTING CURB PRIOR TO REMOVING CURB. FOR LOCATIONS OF ADDITIONAL SAWCUT LINES SEE THE REMOVAL PLANS.
5. SEE REMOVAL PLANS FOR LIMITS OF COLD MILLING, MEDIAN, AND CURB REMOVALS
6. SEE CONSTRUCTION PLANS FOR CURBS, MEDIAN, AND SIDEWALK CONTROL INFORMATION.



GRADING DETAIL



SPECIAL CURB DETAIL

LEGEND

* SEE SHEET NOTES.

REVISIONS

No.	Date	APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED: KLN
DRAWN: GPT
CHECKED: KLN
JOB NO: PTG-645545
HORIZ: N/A
VERT: N/A
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

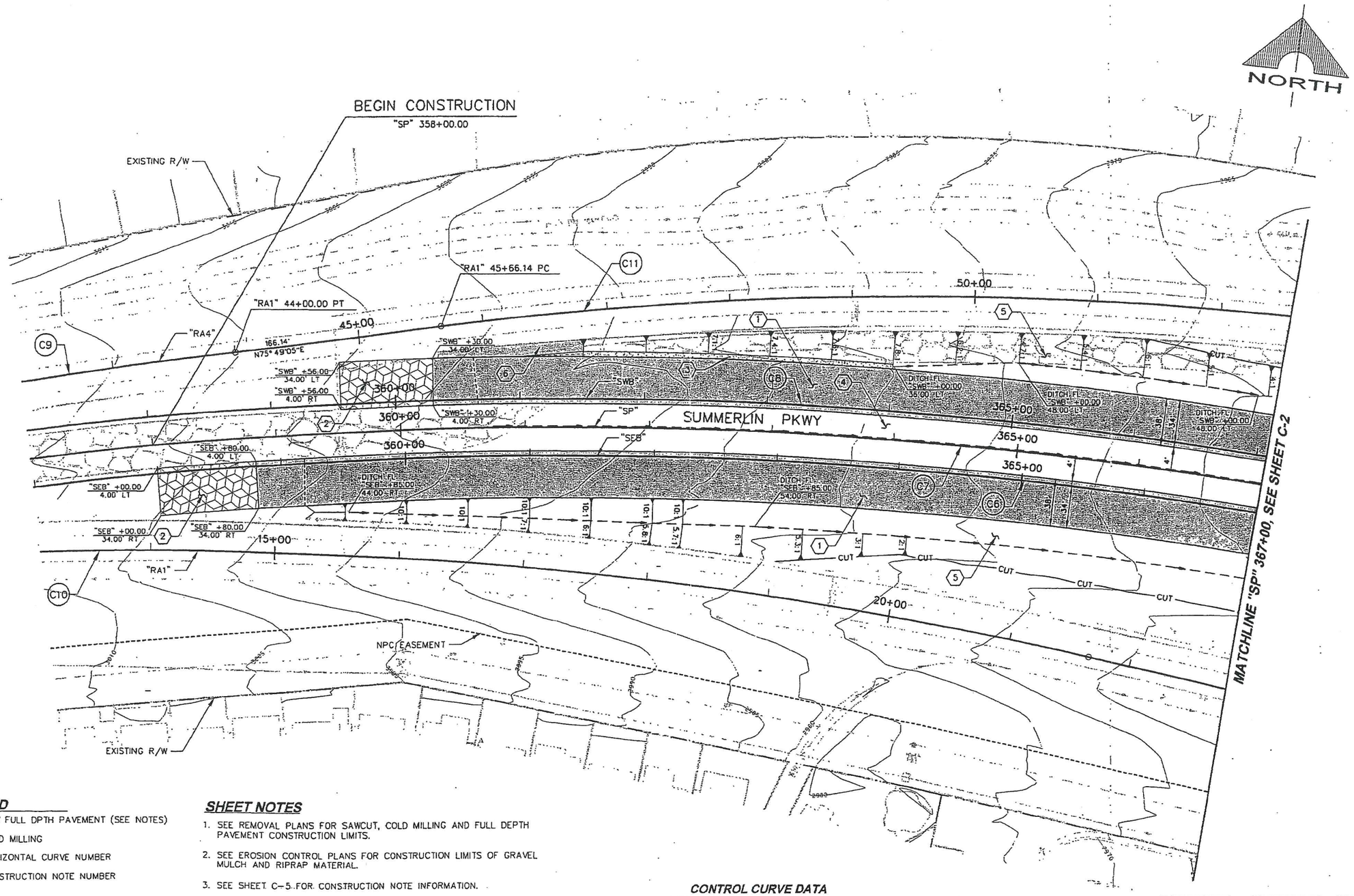
PARSONS
840 GREEN DRIVE, STE. 345, LAS VEGAS, NV 89119
(702) 433-2110 FAX (702) 433-9418

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: TYPICAL SECTIONS
ANASAZI DRIVE AND RAMPS

DRAWING NO. 107V3690

SHEET TY-2
XXX OF XXX



LEGEND

- NEW FULL DPTH PAVEMENT (SEE NOTES)
- COLD MILLING
- C22 HORIZONTAL CURVE NUMBER
- CONSTRUCTION NOTE NUMBER

SHEET NOTES

1. SEE REMOVAL PLANS FOR SAWCUT, COLD MILLING AND FULL DEPTH PAVEMENT CONSTRUCTION LIMITS.
2. SEE EROSION CONTROL PLANS FOR CONSTRUCTION LIMITS OF GRAVEL MULCH AND RIPRAP MATERIAL.
3. SEE SHEET C-5 FOR CONSTRUCTION NOTE INFORMATION.
4. ALL EXCAVATED SLOPES ON "SEB" AND "SWB" ARE AS SHOWN ON THE TYPICAL SECTIONS UNLESS NOTED ON THESE PLANS AND DETAIL SHEETS.
5. SEE THE STORM DRAINAGE PLANS FOR GRADING AND CONSTRUCTION OF INLETS, HEADWALLS, AND PIPES.
6. SEE SHEET C-12 FOR GORE AREA DETAILS AND GRADING SLOPES.

CONTROL CURVE DATA

CURVE	DESCRIPTION	DELTA	RADIUS	LENGTH	TANGENT
C6	"SEB"	23° 33'08"	3477.00'	1429.27'	724.87'
C7	"SP"	23° 33'08"	3500.00'	1438.72'	729.67'
C8	"SWB"	23° 33'08"	3523.00'	1448.18'	734.46'
C9	"RA4"	03° 22'13"	6800.00'	400.00'	200.06'
C10	"RA1"	19° 39'06"	3400.00'	1166.16'	588.86
C11	"RA4"	20° 10'55"	3000.00'	1056.72'	533.89'

GRAPHIC SCALE

40 30 20 10 0 20 40 80

Call before you UnderGround 1-702-229-6311

SAFETY ALERT Call before you Overhead 1.702.593.6111 OVERHEAD SERVICE ALERT

Call before you UnderGround 1-702-229-6311

REVISIONS

No.	Date		APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR
CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: PTG-645545
HORIZ: 1"=40'
VERT: NONE
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 GREER DRIVE, STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8412

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: CONSTRUCTION PLAN
"SP" 357+00 TO "SP" 367+00

DRAWING NO. 107V3690

SHEET C-1

XXX OF XXX

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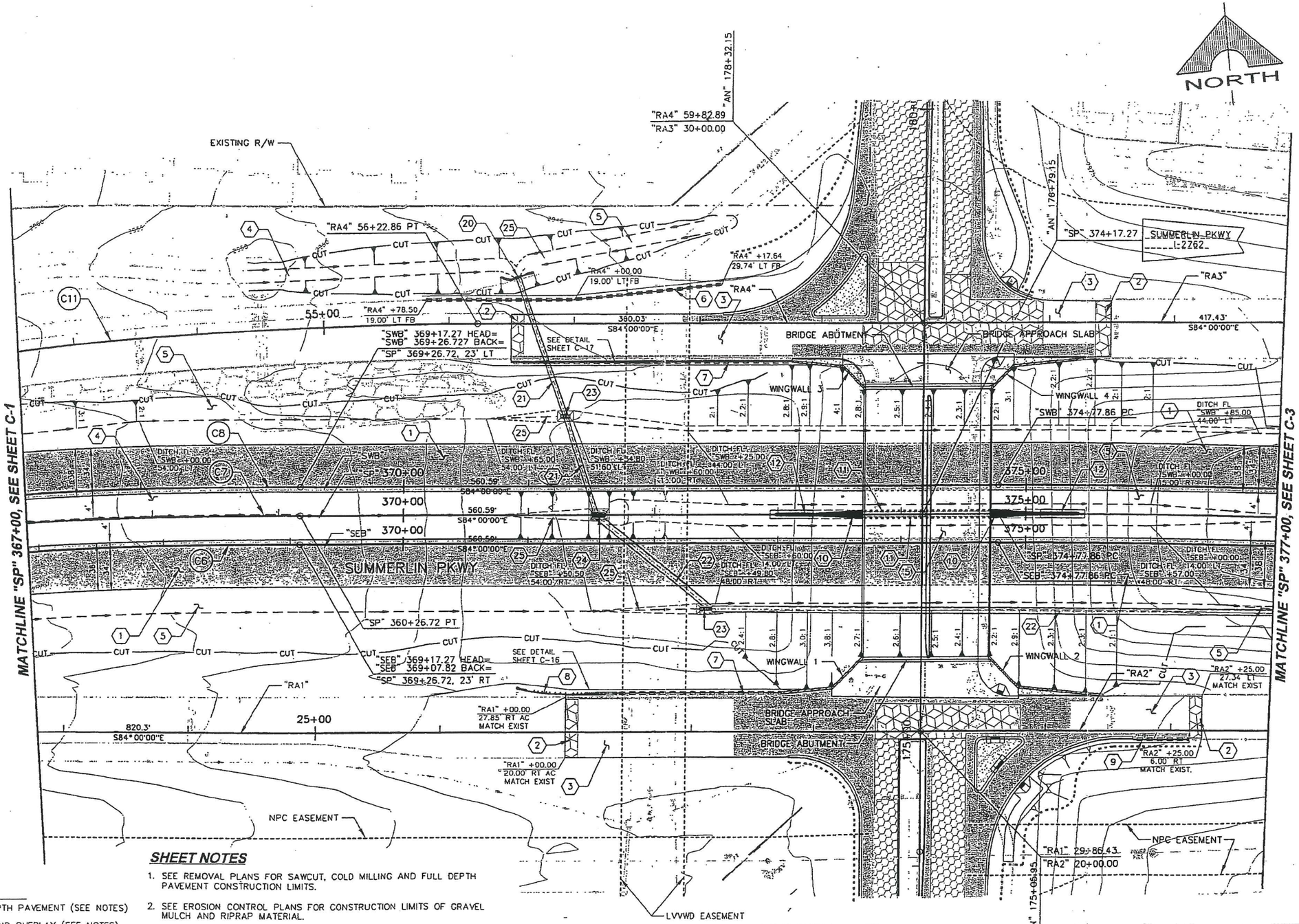

SHEET NOTES

1. SEE REMOVAL PLANS FOR SAWCUT, COLD MILLING AND FULL DEPTH PAVEMENT CONSTRUCTION LIMITS.
2. SEE EROSION CONTROL PLANS FOR CONSTRUCTION LIMITS OF GRAVEL MULCH AND RIPRAP MATERIAL.
3. SEE SHEET C-5 FOR CONSTRUCTION NOTE INFORMATION.
4. ALL EXCAVATED SLOPES ON "SEB" AND "SWB" ARE AS SHOWN ON THE TYPICAL SECTIONS UNLESS NOTED ON THESE PLANS AND DETAIL SHEETS.
5. SEE THE STORM DRAINAGE PLANS FOR GRADING AND CONSTRUCTION OF INLETS, HEADWALLS, AND PIPES.
6. SEE SHEET C-6 AND C-8 FOR ANASAZI AND RAMP CONSTRUCTION DETAILS.

LEGEND

- NEW FULL DPTH PAVEMENT (SEE NOTES)
- COLD MILL AND OVERLAY (SEE NOTES)
- COLD MILL 3/4" OPEN GRADE
- C22 HORIZONTAL CURVE NUMBER
- CONSTRUCTION NOTE NUMBER
- GRADING CONSTRUCTION LIMITS

CONTROL CURVE DATA

CURVE	DESCRIPTION	DELTA	RADIUS	LENGTH	TANGENT
C6	"SEB"	23° 33'08"	3477.00'	1429.27'	724.87
C7	"SP"	23° 33'08"	3500.00'	1438.72'	729.67
C8	"SWB"	23° 33'08"	3523.00'	1448.18'	734.46
C10	"RA1"	19° 39'06"	3400.00'	1166.16'	588.86
C11	"RA4"	20° 10'55"	3000.00'	1056.72'	533.89

GRAPHIC SCALE
40 30 20 10 0 20 40 80

LVVWD — DATE

SAFETY ALERT
Call before you Dig Underground
1.800.227.2600
811
Call before you Overhead
1.702.593.6111
OVERHEAD SERVICE ALWAYS
Call before you Dig Underground
1.800.227.2600
811

REVISIONS

No.	Date	APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: P10-645545
HORIZ: 1"=40'
VERT: NONE
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 PIER DRIVE., STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8412

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: CONSTRUCTION PLAN
"SP" 367+00 TO "SP" 377+00

DRAWING NO. 107V3690

SHEET C-2
XXX OF XXX

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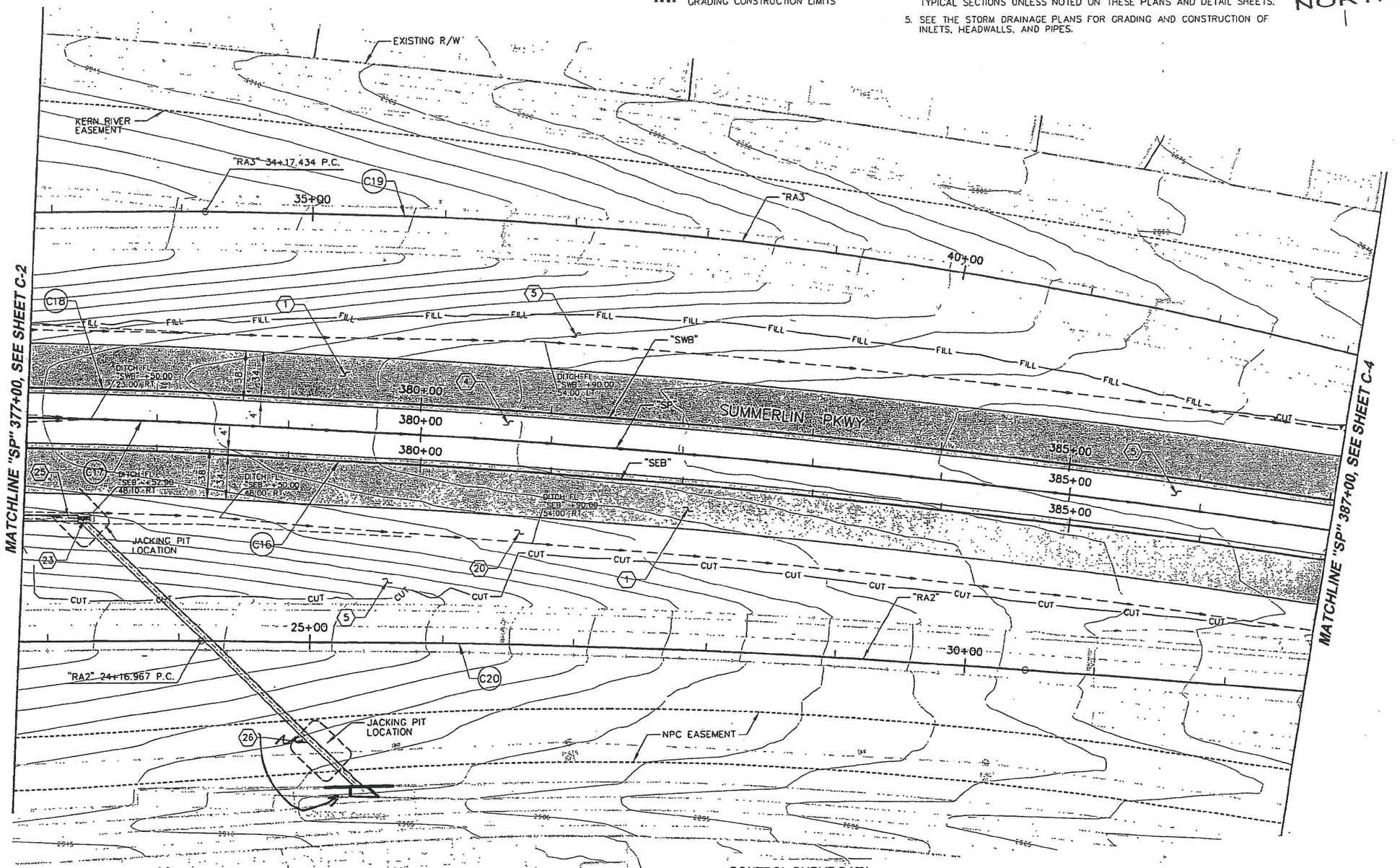
LEGEND

- NEW FULL DPTH PAVEMENT (SEE NOTES)
- COLD MILL AND OVERLAY (SEE NOTES)
- COLD MILL 3/4" OPEN GRADE
- C22 HORIZONTAL CURVE NUMBER
- CONSTRUCTION NOTE NUMBER
- GRADING CONSTRUCTION LIMITS

SHEET NOTES

1. SEE REMOVAL PLANS FOR SAWCUT, COLD MILLING AND FULL DEPTH PAVEMENT CONSTRUCTION LIMITS.
2. SEE EROSION CONTROL PLANS FOR CONSTRUCTION LIMITS OF GRAVEL MULCH AND RIPRAP MATERIAL.
3. SEE SHEET C-5 FOR CONSTRUCTION NOTE INFORMATION.
4. ALL EXCAVATED SLOPES ON "SEB" AND "SWB" ARE AS SHOWN ON THE TYPICAL SECTIONS UNLESS NOTED ON THESE PLANS AND DETAIL SHEETS.
5. SEE THE STORM DRAINAGE PLANS FOR GRADING AND CONSTRUCTION OF INLETS, HEADWALLS, AND PIPES.

NORTH



CONTROL CURVE DATA

CURVE	DESCRIPTION	DELTA	RADIUS	LENGTH	TANGENT
C16	"SEB"	36° 00'00"	7977.00'	5012.10'	2591.89'
C17	"SP"	36° 00'00"	8000.00'	5026.55'	2599.36'
C18	"SWB"	36° 00'00"	8023.00'	5041.01'	2606.84'
C19	"RA3"	19° 00'48"	3500.00'	1161.46'	586.12'
C20	"RA2"	04° 30'47"	8000.00'	630.14'	315.23'

GRAPHIC SCALE

40 30 20 10 0 20 40 80

Call before you UnderGround 1-702-278-6311

SAFETY ALERT Call before you Overhead 1.702.593.6111 OVERHEAD SERVICE ALERT

Call before you UnderGround 1-702-278-6311

REVISIONS

No.	Date		APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: PTG-645545
HORIZ: 1"=40'
VERT: NON
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 GRIER DRIVE, STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8412

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: CONSTRUCTION PLAN
"SP" 377+00 TO "SP" 387+00

DRAWING NO. 107V3690

SHEET C-3

XXX OF XXX

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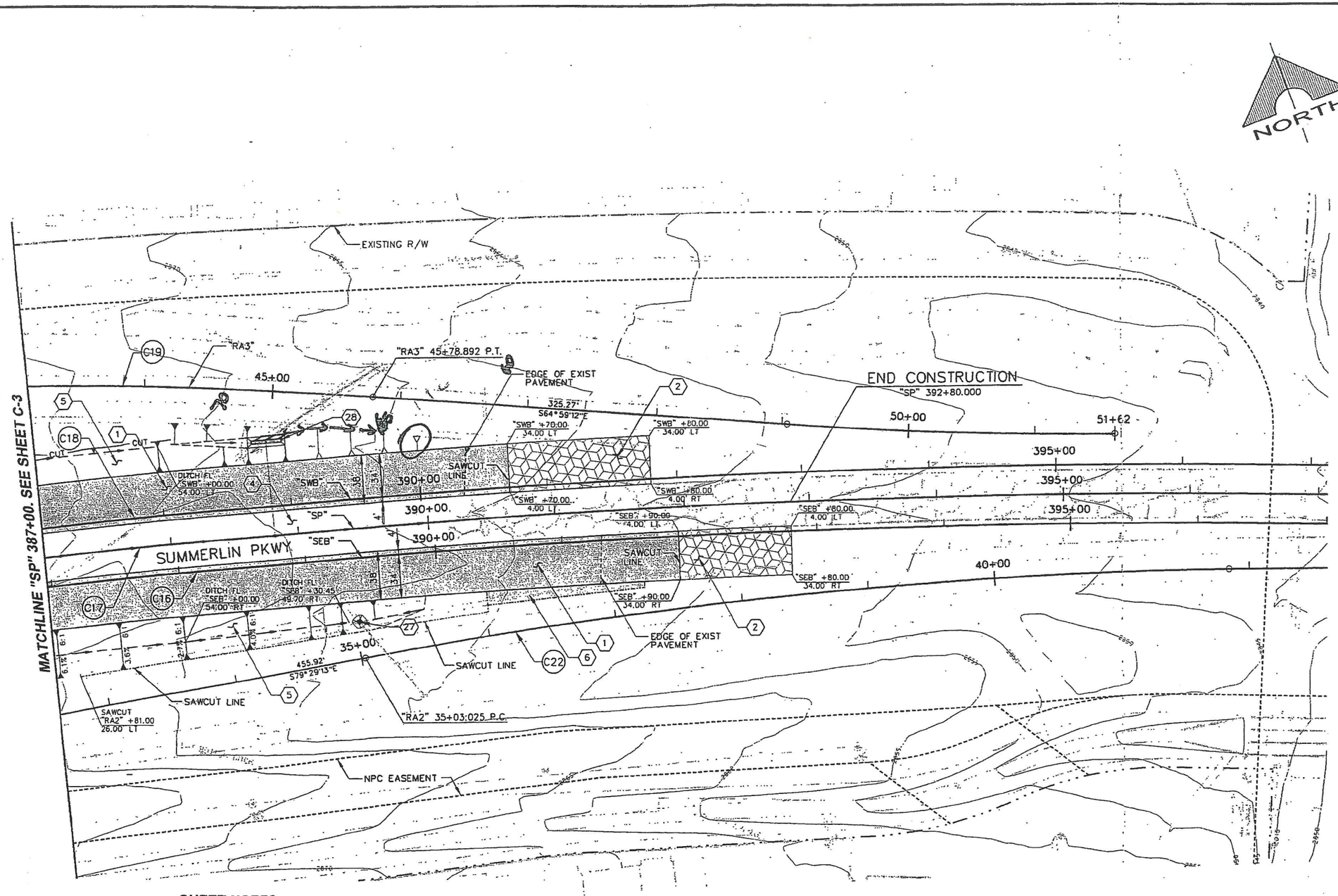

LEGEND

- NEW FULL DPTH PAVEMENT (SEE NOTES)
- COLD MILL AND OVERLAY (SEE NOTES)
- COLD MILL 3/4" OPEN GRADE
- (C22) HORIZONTAL CURVE NUMBER
- CONSTRUCTION NOTE NUMBER
- GRADING CONSTRUCTION LIMITS

SHEET NOTES

1. SEE REMOVAL PLANS FOR SAWCUT, COLD MILLING AND FULL DEPTH PAVEMENT CONSTRUCTION LIMITS.
2. SEE EROSION CONTROL PLANS FOR CONSTRUCTION LIMITS OF GRAVEL MULCH AND RIPRAP MATERIAL.
3. SEE SHEET C-5 FOR CONSTRUCTION NOTE INFORMATION.
4. ALL EXCAVATED SLOPES ON "SEB" AND "SWB" ARE AS SHOWN ON THE TYPICAL SECTIONS UNLESS NOTED ON THESE PLANS AND DETAIL SHEETS.
5. SEE THE STORM DRAINAGE PLANS FOR GRADING AND CONSTRUCTION OF INLETS, HEADWALLS, AND PIPES.
6. SEE SHEET C-13 FOR GORE AREA DETAILS AND GRADING SLOPES.

CONTROL CURVE DATA

CURVE	DESCRIPTION	DELTA	RADIUS	LENGTH	TANGENT
C16	"SEB"	36°00'00"	7977.00'	5012.10'	2591.89'
C17	"SP"	36°00'00"	8000.00'	5026.55'	2599.36'
C18	"SWB"	36°00'00"	8023.00'	5041.01'	2606.84'
C19	"RA3"	19°00'48"	3500.00'	1161.46'	586.12'
C20	"RA2"	04°30'47"	8000.00'	630.14'	315.23'

GRAPHIC SCALE

40 30 20 10 0 20 40 80

Call before you UnderGround 1-702-229-6211
SAFETY ALERT Call before you Overhead 1.702.593.6111
Call before you UnderGround 1-702-229-6211

REVISIONS			
No.	Date		APPD

90% SUBMITTAL PRELIMINARY NOT FOR CONSTRUCTION JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLM
JOB NO: P70-645545
HORIZ: 1"=40'
VERT: NONE
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 GREER DRIVE - STE. 340, LAS VEGAS, NV 89119
(702) 435-2118 FAX (702) 435-8412

PROJECT: ANASAZI DRIVE OVERPASS BID NO. 04.1730.05

DESCRIPTION: CONSTRUCTION PLAN "SP" 387+00 TO "SP" 397+00

DRAWING NO. 107V3690

SHEET C-4 XXX OF XXX

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CONSTRUCTION NOTES - SHEET C-1

1	"SEB" 358+80.00 TO "SEB" 367+00.00 "SWB" 360+30.00 TO "SWB" 367+00.00	CONSTRUCT FULL DEPTH PAVEMENT (SEE TYPICAL SECTIONS)
2	"SWB" 359+56.00 TO "SWB" 360+30.00 "SEB" 358+00.00 TO "SEB" 358+80.00	COLD MILL 1.5 INCHES OF EXISTING PAVEMENT PLACE 1.5 INCHES OF PLANTMIX BITUMINOUS SURFACING MEASURED AS MISCELLANEOUS COLD MILLING PER SQUARE YARD AND MISCELLANEOUS BITUMINOUS SURFACING PER TON
3	"SWB" 361+50.00 TO "SWB" 364+00.00	CONSTRUCT VALLEY GUTTER TYPE 2 (SEE NDOT STANDARD DRAWING R-5.1.1)
4	"SP" 360+70.00 TO "SP" 367+00.00	RELAY RIPRAP (SEE EROSION CONTROL PLANS FOR LIMITS)
5	"SEB" 360+00.00 RT TO "SEB" 367+00.00 RT "SWB" 361+50.00 LT TO "SWB" 367+00.00 LT	PLACE 6-INCH GRAVEL MULCH (SEE EROSION CONTROL PLANS FOR LIMITS)
6	"SWB" 360+35.05 LT TO "SWB" 361+50.00 LT	MISCELLANEOUS BITUMINOUS SURFACING

CONSTRUCTION NOTES - SHEET C-2

1	"SEB" 367+00.00 TO "SEB" 377+00.00 "SWB" 367+00.00 TO "SWB" 377+00.00	CONSTRUCT FULL DEPTH PAVEMENT (SEE TYPICAL SECTIONS)
2	"RA1" 27+00.00 TO "RA1" 27+10.00 "RA2" 22+15.00 TO "RA2" 22+25.00 "RA3" 31+40.00 TO "RA3" 31+50.00 "RA4" 56+50.00 TO "RA4" 56+60.00	COLD MILL EXISTING PAVEMENT TO PROVIDE TRANSITION FOR 3/4-INCH OPEN-GRADE SURFACING. COLD MILLING MEASURED AS MISCELLANEOUS COLD MILLING PER SQUARE YARD
3	"RA1" 27+00.00 TO "RA1" 29+39.43 "RA2" 20+53.48 TO "RA2" 22+25.00 "RA3" 30+50.00 TO "RA3" 31+50.00 "RA4" 56+50.00 TO "RA4" 59+35.87	CONSTRUCT PLANTMIX BITUMINOUS OPEN-GRADED SURFACE (3/4-INCH)
4	"SP" 367+00.00 TO "SP" 371+64.00 "RA4" 54+42.80 LT TO "RA4" 56+69.00 LT	PLACE RIPRAP (SEE EROSION CONTROL PLANS FOR LIMITS)
5	"SEB" 367+00.00 RT TO "SEB" 373+63.61 RT "SEB" 374+76.77 RT TO "SEB" 377+00.00 RT "SWB" 367+00.00 LT TO "SWB" 373+63.11 LT "SWB" 374+76.77 LT TO "SWB" 377+00.00 LT "RA4" 56+69.00 LT TO "RA4" 58+25.00 LT	PLACE 6-INCH GRAVEL MULCH (SEE EROSION CONTROL PLANS FOR LIMITS)
6	"RA4" 55+78.50, 19.00' LT TO "RA4" 58+17.53, 30.73' LT	PORTABLE PRECAST CONCRETE BARRIER RAIL
7	"RA1" 27+39.40, 31.00' LT TO "RA1" 28+73.46, 31.00' LT "RA4" 56+50.00, 30.00' RT TO "RA4" 58+75.95, 30.00' RT	CONCRETE BARRIER RAIL (TYPE A)
8	"RA1" 26+62.19, 30.00' LT TO "RA1" 27+40.77, 30.00' LT	GUARDRAIL TERMINAL (FLARED) GUARDRAIL- BARRIER RAIL CONNECTION (TRIPLE CORRUGATION) GALVANIZED GUARDRAIL (TRIPLE CORRUGATION)
9	"RA2" 27+39.40, 31.00' LT TO "RA2" 28+73.46, 31.00' LT	CONCRETE BARRIER RAIL (TYPE A-TRANSITION) SEE DETAIL SHEET C-10
10	"SP" 373+28.77, TO "SP" 373+68.77 "SP" 374+71.73, TO "SP" 375+11.77	CONCRETE BARRIER RAIL (TYPE FA - MODIFIED)
11	"SP" 373+68.77, 3.43' LT TO "SP" 374+71.77, 3.43' LT "SP" 373+68.77, 3.43' RT TO "SP" 374+71.77, 3.43' RT	CONCRETE BARRIER RAIL (TYPE FB)
16	"SP" 372+97.71 "SP" 375+42.82	IMPACT ATTENUATOR (70 MPH)
20	"SP" 370+89.47, 190.18' LT	CONSTRUCT HEADWALL SEE SHEET D-4
21	"SP" 370+89.47, 190.18' LT TO "SP" 371+28.33, 79.00' LT "SP" 371+28.33, 79.00' LT TO "SP" 371+54.41, 1.26' RT	CONSTRUCT 36-INCH CLASS III RCP SEE SHEET D-1 THRU D-5
22	"SP" 371+54.41, 1.26' RT TO "SP" 372+55.71, 75.50' RT "SP" 372+45.71, 75.50' RT TO "SP" 377+43.87, 75.50' RT	CONSTRUCT 48-INCH CLASS III RCP SEE SHEET D-1 THRU D-3 AND D-5 THUR D-9
23	"SP" 371+28.33, 79.00' LT "SP" 372+45.71, 75.50' RT	CONSTRUCT TYPE 2A DROP INLET (SPECIAL) SEE SHEET D-5 AND D-7
24	"SP" 371+54.41, 1.26' RT	CONSTRUCT TYPE 8 DROP INLET (SPECIAL) SEE SHEET D-6
25	"RA4" 54+42.79, 42.95' LT TO "RA4" 58+21.32, 80.2' LT "SEB" 371+50.50, 54.00' RT TO "SEB" 372+49.80, 48.00' RT "SWB" 370+65.00, 54.00' LT TO "SWB" 371+51.60, 51.60' LT "SP" 370+72.90 TO "SP" 371+54.00	GRADE DRAINAGE DITCH TO MATCH INLET ELEVATIONS SEE DRAINAGE SHEETS FOR GRADING DETAILS

CONSTRUCTION NOTES - SHEET C-3

1	"SEB:" 377+00.00 TO "SEB" 387+00.00 "SWB" 377+00.00 TO "SWB" 387+00.00	CONSTRUCT FULL DEPTH PAVEMENT (SEE TYPICAL SECTIONS)
4	"SP" 385+00.00 TO "SP" 387+00.00	RELAY RIPRAP (SEE EROSION CONTROL PLANS FOR LIMITS)
5	"SEB" 377+00.00 RT TO "SEB" 387+00.00 RT "SWB" 377+00.00 LT TO "SWB" 387+00.00 LT "SP" 377+00.00 TO "SP" 385+00.00	PLACE 6-INCH GRAVEL MULCH (SEE EROSION CONTROL PLANS FOR LIMITS)
22	"SP" 377+43.87, 75.50' RT TO "SP" 379+70.94, 267.23' RT	CONSTRUCT 48-INCH CLASS III RCP SEE SHEET D-1 THUR D-3, D-8 AND D-9
23	"SP" 377+43.87, 75.50' RT	CONSTRUCT TYPE 2A DROP INLET (SPECIAL) SEE SHEET D-5 AND D-7
25	"SEB" 376+57.00, 48.00' RT TO "SEB" 377+52.90, 48.10' RT	GRADE DRAINAGE DITCH TO MATCH INLET ELEVATIONS SEE DRAINAGE SHEETS FOR GRADING DETAILS
26	"SP" 379+70.94, 267.23' RT	CONSTRUCT SPECIAL CONCRETE OUTLET SEE SHEET D-9, D-10 AND D-11

CONSTRUCTION NOTES - SHEET C-4

1	"SEB:" 387+00.00 TO "SEB" 391+64.67 "SWB" 387+00.00 TO "SWB" 390+70.00	CONSTRUCT FULL DEPTH PAVEMENT (SEE TYPICAL SECTIONS)
2	"SWB" 390+70.00 TO "SWB" 391+80.00 "SEB" 391+90.00 TO "SEB" 392+80.00	COLD MILL 1.5 INCHES OF EXISTING PAVEMENT PLACE 1.5 INCHES OF PLANTMIX BITUMINOUS SURFACING MEASURED AS MISCELLANEOUS COLD MILLING PER SQUARE YARD AND MISCELLANEOUS PAVEMENT PER TON
4	"SP" 387+00.00 TO "SP" 390+10.00	PLACE RIPRAP (SEE EROSION CONTROL PLANS FOR LIMITS)
5	"SEB" 387+00.00 RT TO "SEB" 390+38.20 RT "SWB" 387+00.00 LT TO "SWB" 390+10.4 LT	PLACE 6-INCH GRAVEL MULCH (SEE EROSION CONTROL PLANS FOR LIMITS)
6	"SEB" 390+37.84 RT TO "SEB" 391+62.14 LT	MISCELLANEOUS BITUMINOUS SURFACING
27	"SEB" 389+38.35, 49.60' RT	CONSTRUCT NDOT TYPE 2A DROP INLET SEE SHEET D-13 AND NDOT STD PLAN R-4.2.1
28	"SWB" 388+82.24, 51.00' LT	CONSTRUCT TYPE 2A DROP INLET (SPECIAL) SEE SHEET D-12

REVISIONS

No.	Date	APPD

90% SUBMITTAL
PRELIMINARY
NOT FOR CONSTRUCTION
JUNE 2, 2003

DESIGNED: PLC
DRAWN: GPT
CHECKED: KLN
JOB NO: PTG-645545
HORIZ: NONE
VERT: NONE
DATE: 6-2-03

CITY OF LAS VEGAS, NEVADA
DEPARTMENT OF PUBLIC WORKS
400 E. STEWART ST., LAS VEGAS, NV 89101
(702) 229-6272

PARSONS
840 GREB DRIVE, STE. 340, LAS VEGAS, NV 89119
(702) 435-2116 FAX (702) 435-8412

PROJECT: ANASAZI DRIVE OVERPASS
BID NO. 04.1730.05

DESCRIPTION: CONSTRUCTION NOTES
SHEETS C-1 THRU C-4

DRAWING NO. 107V3690

SHEET C-5
XXX OF XXX

a0006268
10/30/2003 11:18:31 P:\PROJECTS\645545\Design\Construction\545-c05.shl

AMENDMENT
TO THE
DRAINAGE STUDY
FOR
SUMMERLIN VILLAGE 11/12
OFFSITE CHANNEL

62011.218

November 1997

Prepared for:

The Howard Hughes Corporation
Summerlin Division
1645 Village Center Circle, Suite 200
Las Vegas, NV 89134
Phone: (702) 791-4300
Fax: (702) 791-4453

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM	DATE: November 26, 1997
TO: Barry Thompson, P.E. Land Development Services Department of Public Works	FROM: Dennis W. Stransky, P.E. Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: "OFFSITE CHANNEL" @ Summerlin Village 11/12 FILE NO. \\KHAN\FLOOD\DEPOT\DS2\DS2134C.DOC	COPIES TO: G. C. Wallace, Inc. The Howard Hughes Corporation John McNellis, P.E.

FEMA Flood Zone	YES		No	X
Proposed Storm Drain	YES	X	No	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	10/06/97	10/07/97	Conditional Acceptance	$250.00
2nd Submittal	10/08/97	10/10/97	Conditional Acceptance	N/C
3rd Submittal	11/19/97	11/26/97	See Comments Below	$100.00
			TOTAL FEES:	$350.00

REMARKS:

3rd Submittal (Amendment)

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the CLV Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS

gam

T/R/S: 20S/59E/23-24
AREA K-23 & 24

PLAN SENT TO LAND DEVELOPMENT yes (Initial).

G.C. WALLACE, INC.
Engineering/Architecture

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
MARIE RAINWATER
MICHAEL D. ROSS, PE
CHRISTOPHER W. ANDERSON, PE
CALVIN L. BLACK, PE, PLS
BENJAMIN C. SMITH, PE
SCOTT R. PLUMMER, PE

PAUL BURN, PLS
MICHAEL J. CSIZMADIA, PE
C. RUSSELL DAVIS, PE/SE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
MARVIN W. MAIZE
JACK H. MITCHELL, PE
GREGORY PATCH, PE
HOWARD K. VANDER MEER, PE
ARNE H. WAGLEY
EUGENE W. WRIGHT, PE

JOSEPH A. BODROG, PLS
GARY L. CARLSON, RA
BERT A. HUGHES, PE
JERRY D. JOHNSTON
NOEL C. LAUGHLIN, PE
DANNY S. McFADDEN, PE
WILLIAM NEIGHBORS, PE
ALLEN E. PAVELKA, PE
JEFF W. STAYTON, PE
RICHARD STEUBING, PLS
JOHN R. TOBIN, PE
SAUNDRA L. VANCE, CCS, CCCA
G. IRA WALLACE, PE

DOUGLAS F. AHLSTROM
SAMI F. ALHWAYEK, PE
CHRIS P. ALTURAS, PE
DANA A. AMES, PE/SE
JIM B. BAKKEDAHL, PE
DENNIS R. BROWN, PE
MYRON E. BROWNING, PE
ROY D. CLARK, PE
RICHARD G. CLARKE
HUBERTO DeLUNA, RA
THOMAS P. DYSON, PE
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ROBERT J. HERMAN
DANNY E. HILL, PLS
DON E. HOLLOWAY, PE
ROY G. HOLLOWELL, PLS
WILLIAM E. HUNTER, PE
MICHAEL KIDD, PLS
KRISTOFER D. KORPI
JIANG LI, PE
LLOYD B. MATHESON
DOUG McCARTNEY, PE
TIMOTHY A. McCOY, PE
RANDY W. MROWICKI, PLS
D. GREGORY NEEL, PLS
JOHNNIE R. PATE, JR., PE
JERRY E. PRUITT, PE
AL L. ROBINSON, PE
BRIAN L. SCHMIDT, PE
RICHARD A. E. STRUTZ
MILO L. TERZICH, PE
JOHN M. WALKER, PE
ROBERT WOODSON, PE

62011.218

November 17, 1997

City of Las Vegas
400 East Stewart Avenue
Las Vegas, NV 89101

Attention: Dennis Stransky, P.E.

Subject: Amendment to the Drainage Study for Summerlin Village 11/12 Offsite Channel

Gentlemen:

The drainage study for Summerlin Village 11/12 Offsite Channel was approved by the City of Las Vegas (CLV) on October 10, 1997. The purpose of this amendment is to analyze proposed modifications to the inlet structure at the downstream end of the channel.

The Summerlin Village 11/12 Offsite Channel is a temporary facility located within the future right-of-way for Summerlin Parkway west of Anasazi Drive. The original inlet structure consisted of extension of the 48-inch RCP lateral to the Village 11/12 Offsite Storm Drain and placement of grouted riprap around the storm drain entrance. With this submittal, the drawings are modified to show 42-inch RCP in place of the 48-inch RCP extension.

The original drainage study estimated a developed flow of 71 cfs will be intercepted by the storm drain during a 100-year storm event. A hydraulic calculation is attached showing that the reduced dimension storm drain still meets CCRFCD inlet criteria, i.e., the expected headwater is less than 1.5 times the diameter (5.25 feet).

PIPE CULVERT

Inlet control and outlet control.

Storm drain for Offsite Channel

INPUT VARIABLES:

Pipe diameter	42.00 in
Slope	40.00 %
Number of pipes	1
Manning's 'n'	0.013
Culvert length	40.00 ft
Discharge	71.00 cfs
Ent. Coef. (Ke)	0.35

OUTPUT VARIABLES:

INLET CONTROL HWo:	
Tapered throat	4.13 ft
45 degree bevels	4.29 ft
Sq. edge headwall	4.58 ft
Thin edge projecting	5.20 ft
OUTLET CONTROL HWo:	
HWo depth	-11.62 ft
Velocity	7.38 fps
Critical depth	2.58 ft

Note: 1. Outlet control assumes full pipe flow.
2. Critical depth can not exceed the pipe diameter.

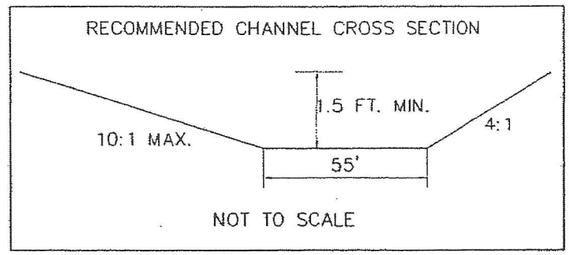
TABLE 1 SUMMERY OF HEC-1 MODEL - PROPOSED CONDITIONS		
Subbasin or Design Point*	Q_{10} (cfs)	Q_{100} (cfs)
TWA	22	33
S1	22	34
PT. 1	38	59
S2	10	16
PT. 2	43	71

*See Figure 5

The recommended channel section has a bottom width of 55 feet and a minimum depth of 1.5 feet. The minimum depth includes more than 1.2 feet of freeboard. A sketch of the proposed channel cross section is included on Figure 5. Hydraulic calculations indicate that non-erosive velocities ($V \leq 5$ fps) will be maintained in the channel with a longitudinal slope less than 4.7 percent. Hydraulic calculations are included in the Appendix.

Storm water confined to the proposed channel will discharge into an existing 48-inch stub approximately 2,800 feet west of Anasazi Drive. The area around the 48-inch stub will be protected with grouted riprap, d_{50} = 8-inch, thickness = 16 inches. The total 100-year offsite flow to the inlet is 71 cfs. According to the *Hydraulic Analysis for Summerlin Village 11/12 Offsite Storm Drain* (Reference 5), the existing storm drain was designed with an inflow from Summerlin Parkway at this point of 117 cfs. Therefore, the downstream storm drain facilities are sufficiently sized to convey the flow from the proposed channel.

The proposed earth-lined channel is a temporary facility designed to protect Summerlin Village 11/12 from offsite flows generated in the Summerlin Parkway right-of-way. Drainage facilities to protect Summerlin Village 11/12 will be finalized with the extension of Summerlin Parkway west to the Western Beltway.



BASIN OR LOC.	Q100 (CFS)
TWA	33
S1	35
PT.1	60
S2	16
PT.2	71

VILLAGE 10

SUMMERLIN PARKWAY

WESTERN BELTWAY

TWA

S1

S2

NEVADA POWER EASEMENT

330+00

335+00

340+00

345+00

350+00

355+00

360+00

1

2

TIE TO EXISTING
48-INCH RCP STUB

GROUTED RIP RAP
d50 = 8" , thickness = 16"

PROPOSED EARTH-LINED CHANNEL

VILLAGE 11

NORTH

SCALE: 1" = 300'

GRAPHIC SCALE

300 0 150 300

(IN FEET)

1 inch = 300 ft.

LEGEND

- S1 — BASIN
- 2 — CONCENTRATION POINT
- BASIN BOUNDARY
- FLOW DIRECTION
- PROPOSED OFFSITE CHANNEL

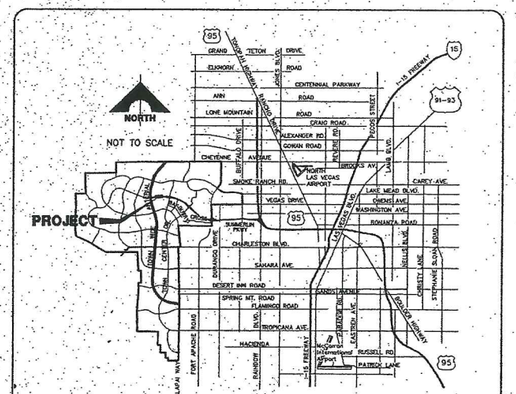
SUMMERLIN VILLAGE 11/12 OFFSITE CHANNEL

FIGURE 5

DRAINAGE MAP

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

SUMMERLIN
VILLAGE 11/12
OFF-SITE CHANNEL



VICINITY MAP

INDEX OF DRAWINGS

C-1	COVER SHEET
C-2	PLAN SHEET STA 10+00 TO 17+50.44
C-3	PLAN SHEET STA 17+50.44 TO 24+75.28
C-4	PROFILE SHEET STA 10+00 TO 24+75.28

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
OLV0019S4 RIVET & PLATE IN TOP OF CURB NW SIDE OF TOWN CENTER DRIVE & SOUTH CIRCLE ISLAND.
2725.923 NGVD 1929 DATUM
2728.37 NAVD 1988 DATUM (831.6074 M)
2726.19 SUMMERLIN DATUM

JOB NO. 62011.12B

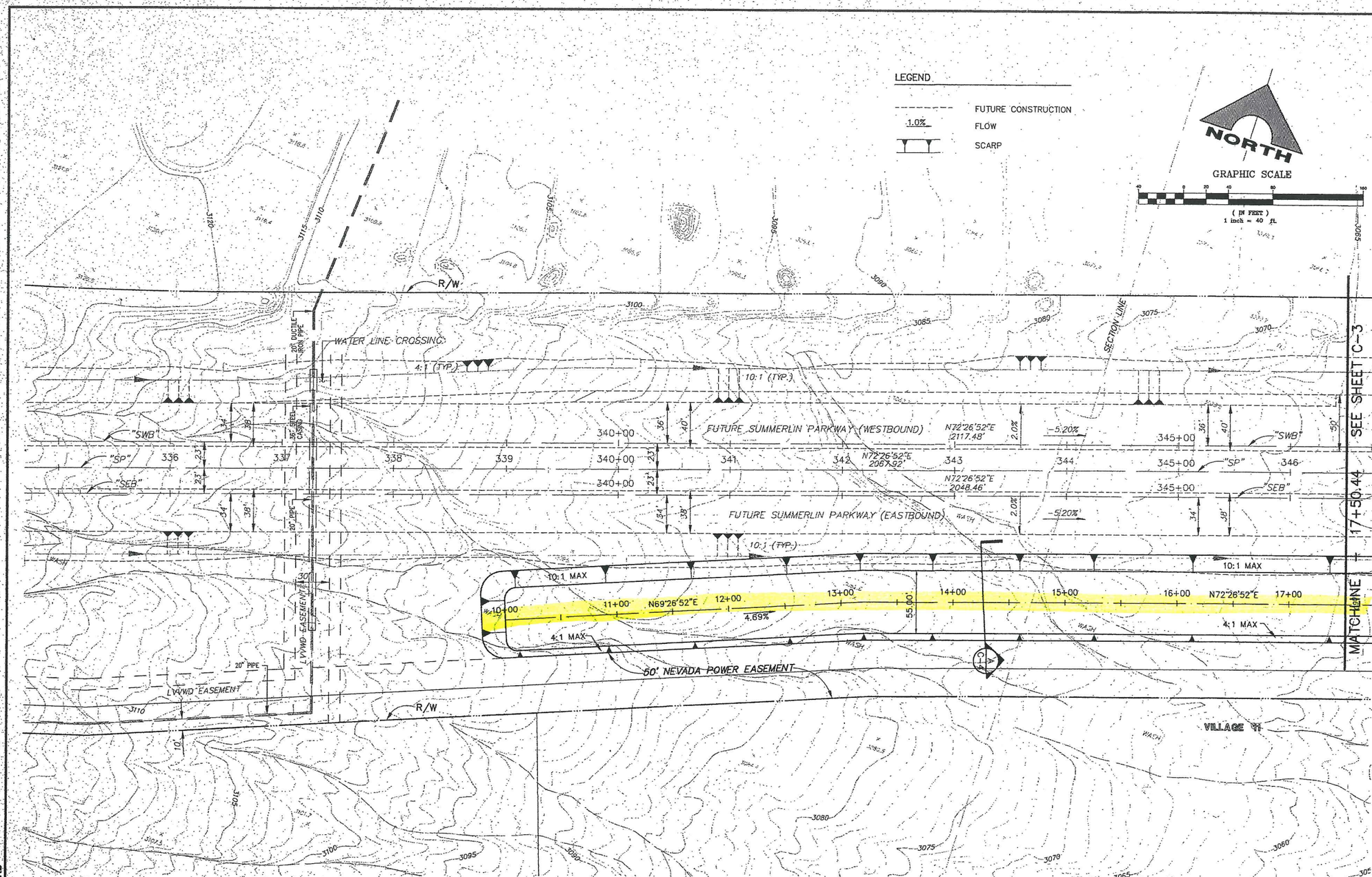
PA C-1.DWG 10/7/97

RECOMMENDED | R.P.E. NO. | DATE | REV. | DATE | DESCRIPTION | DATE | APPROVAL

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

CITY OF LAS VEGAS
VILLAGE 11/12 OFF-SITE CHANNEL
COVER SHEET

SHEET
C-1
SHT 1 OF 4



VILLLAGE 11/12 OFF-SITE CHANNEL

JOB NO. 62011.21B

PA 10/7/97 C-1.DWG

REV.	DATE	DESCRIPTION	DATE	APPROVAL

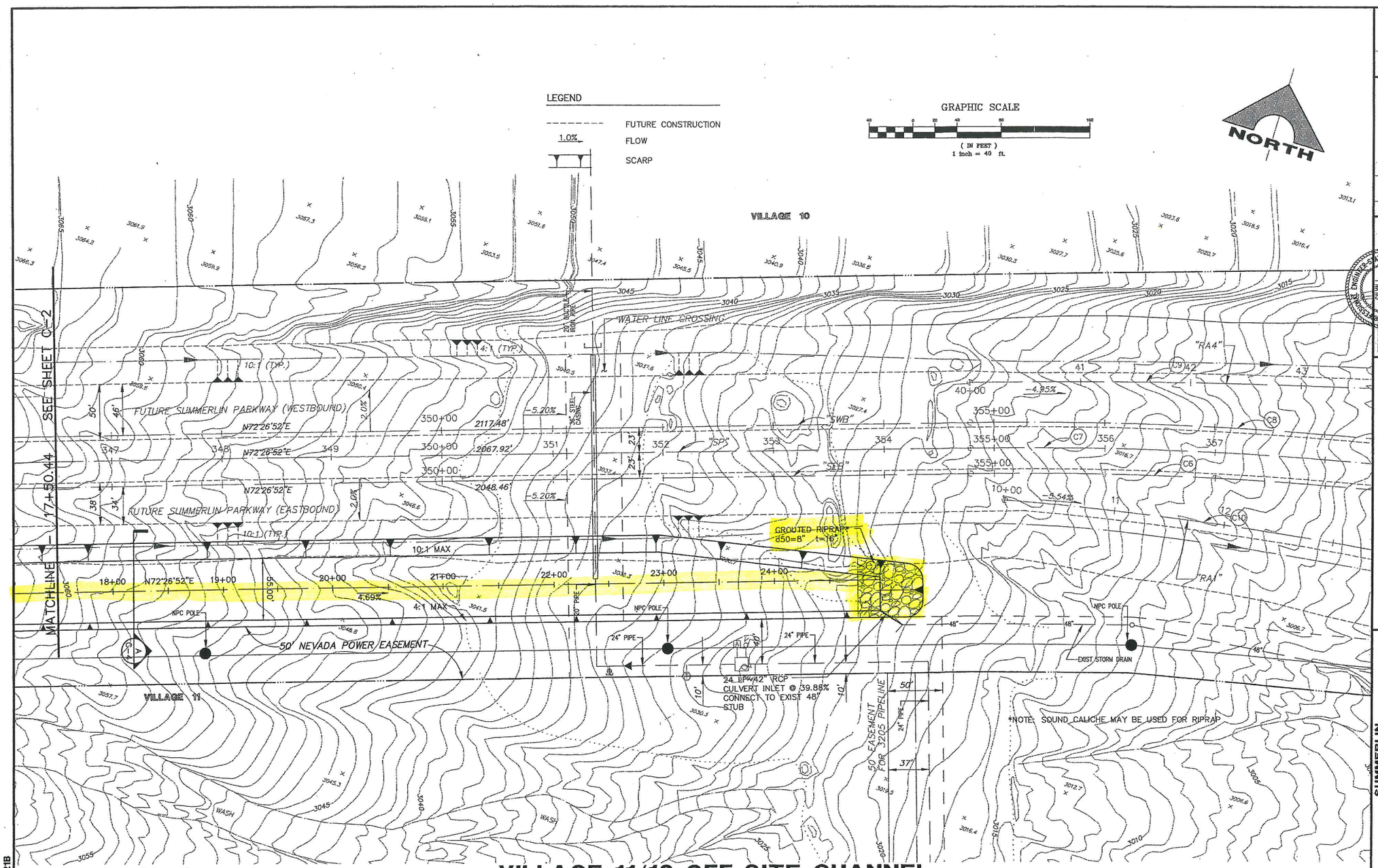
RECOMMENDED

R.P.E. NO. DATE

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

SUMMERLIN
VILLAGE 11/12 OFF-SITE CHANNEL
CONSTRUCTION PLAN
STA 10+00 TO STA 17+50.44

SHEET
C-2
SHT 2 OF 4



VILLAGE 11/12 OFF-SITE CHANNEL

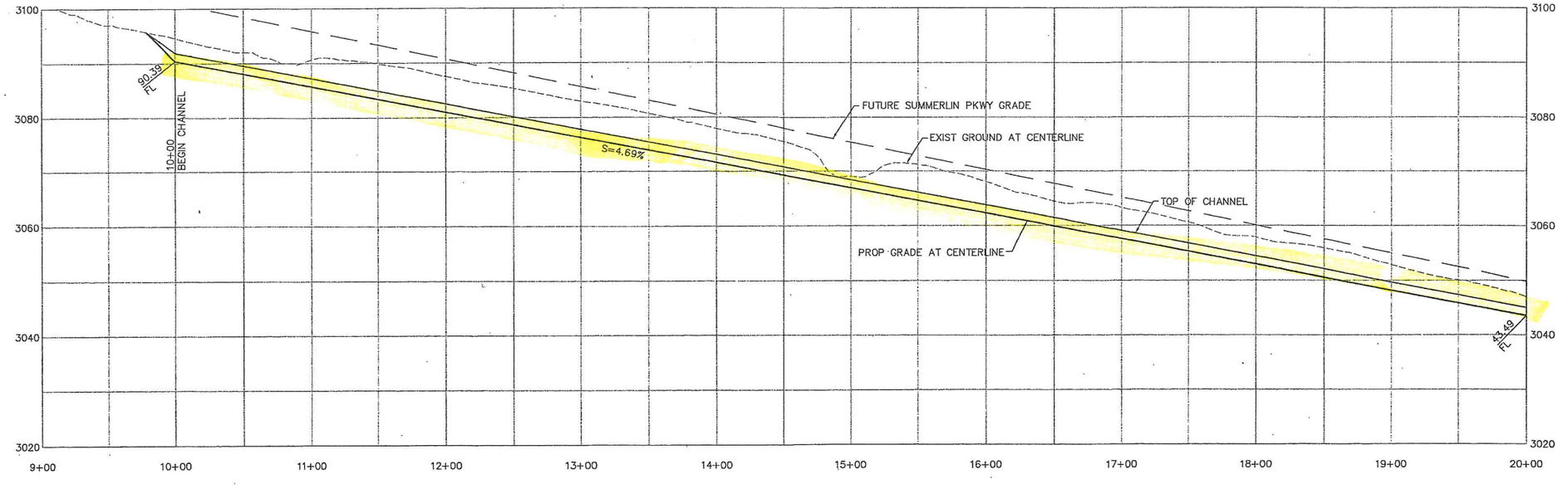
JOB NO. 62011.21B

PA 11/17/97 C-3.DWG

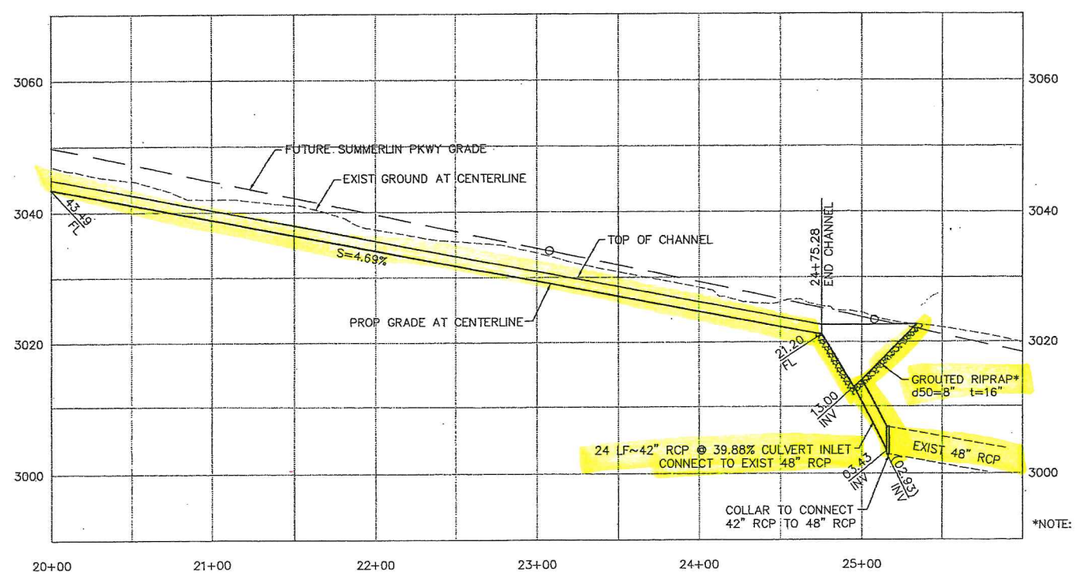
G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

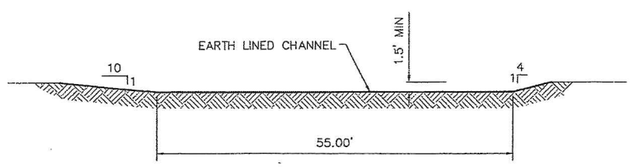
SUMMERLIN
VILLAGE 11/12 OFF-SITE CHANNEL
CONSTRUCTION PLAN
STA 17+50.44 TO 24+75.28

SHEET
C-3
SHT 3 OF 4



SCALE: HORIZ 1"=40'
VERT 1"=10'





CHANNEL SECTION
NO SCALE
A

*NOTE: SOUND CALICHE MAY BE USED FOR RIPRAP

JOB NO. 62011.21B

PA 11/17/97 C-4.DWG

SUMMERLIN
VILLAGE 11/12 OFF-SITE CHANNEL
CHANNEL PROFILE
STA 10+00 TO STA 24+75.28

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD/LAS VEGAS, NEVADA 89146

SHEET
C-4
SHT 4 OF 4

HYDRAULIC ANALYSIS
FOR
SUMMERLIN VILLAGE 11/12
OFFSITE STORM DRAIN

62011.218H

March 1997

Prepared for:

The Howard Hughes Corporation
Summerlin Division
1645 Village Center Circle, Suite 200
Las Vegas, NV 89134
Phone: (702) 791-4300
Fax: (702) 791-4453

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: April 3, 1997
TO: Barry Thompson, E.I. Land Development Services Department of Public Works APR 8 1997			FROM: Dennis W. Stransky, P.E. Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: **Smrln. V 11/12 Off-Site Storm Drain** Laurelglen Drive to Anasazi Drive FILE NO. L:\DEPOT\DS\DS2031A.DOC			COPIES TO: G. C. Wallace The Howard Hughes Corporation John McNellis, P.E.
FEMA Flood Zone	YES	No X	
Proposed Storm Drain	YES X	No	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	03/28/97	04/03/97	See Below	$250.00
			TOTAL FEES	$250.00

REMARKS:

The Drainage Study for the subject project has been reviewed and:

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

1. As required in the conditions of approval of the Villages 11/12 Master Plan, "Detention Basin #5 must be constructed prior to development of Village 11 and 12. The analysis in the conceptual study shows Detention Basin #5 constructed as part of the interim condition."
2. The WSPG calculations varies from the Grading Plans in the following areas: Element 11 at station 2836.53 shows a junction using sections 2 (3.5') and 3 (3.0'). The pipe sizes shown on the plan are 2 42 inch pipes which are section 2. Station 2588 at LAT-1 is shown as a section 3 (2.0'). The plan shows an 18 inch lateral. PHI-3 shows a 90 degree angle and the plan shows a 45 degree angle. The calculations should also show the 18 inch lateral at station 3160.36. The effect of these changes is assumed to be minor. The engineer should review the calculations and revise as needed.
3. The approximate finish grades for the roadways must be coordinated with the developers of Parcels J, K, and L.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

PLANS SENT TO LAND DEVELOPMENT yes **(initial)**

END OF REMARKS

dws

T/R/S: T20S/R59E/24

AREA K24

VI. HYDRAULICS

The storm drain was modeled using the Water Surface and Pressure Gradient Hydraulic Analysis System (WSPG) developed for the Los Angeles County. The flows were taken from the drainage studies completed for the individual parcels that contribute flow to the proposed storm drain system. The effects of off-setting peaks were not considered for this analysis.

VII. PROPOSED FLOW RATES

The proposed storm drain and points of inflow are shown in Figure 5 and summarized in Table 1. The hydraulic analysis performed for the proposed storm drain assumes that development is complete for Parcels L, J, and K of Village 11/12 in accordance with the individual drainage studies.

TABLE 1
SUMMARY OF INFLOW POINTS

Design Point*	Q_{100} Inflow (cfs)	Q_{100} Total (cfs)
Manhole #OS-9	32	271
Manhole #OS-6	68	239
Manhole #OS-4	117	171
Inlet Sta. 18+42±	35	54
Beginning Sta. 10+00±	19	19

* See Figure 5

The WSPG model is included in the Appendix. The hydraulic grade line is included on the drawings.

The proposed storm drain ties into the RCB culvert at Anasazi Drive. The master drainage study for Village 11/12 establishes an inflow at this point of 238 cfs. The proposed design flow for the storm drain is 271 cfs. An increase of flow is attributed to the addition of runoff (26 cfs) generated in the southern part of Parcel K (see Figure 5) which originally discharged south into Laurelglen Drive. Also,

Parcel L discharges 6 cfs more into the storm drain than established in the master drainage study for Village 11/12. The 26 cfs generated in the southern part of Parcel K was originally directed to the RCB culvert via the diversion channel along Anasazi Drive and, therefore, does affect the total design flow in the box. The additional 6 cfs discharged from Parcel L is negligible compared to the total anticipated 100-year flow to the RCB culvert in Anasazi Drive (1,278 cfs).

X. CONCLUSIONS AND RECOMMENDATIONS

1. The methods used to size facilities are in compliance with the Manual.

2. The proposed improvements are not located in a designated Flood Hazard Area.

3. The project is crossed by proposed CCRFCD Facility APNO 0358 described as a floodway with 3-foot banks. The preliminary 1996 CCRFCD Master Plan Update shows that the project is not located near any proposed CCRFCD facilities.

4. Flow conveyed by the proposed storm drain will discharge into the existing RCB culvert in Anasazi Drive.

5. The impacts of additional flow (6 cfs from Parcel L) to the RCB culvert in Anasazi Drive are negligible.

VILLAGE 10

FUTURE SUMMERLIN PARKWAY (NOT A PART)

50' NPC EASEMENT
OVERHEAD POWER

PROJECT

MH OS-4
117 CFS

48" RCP

42" RCP

24" RCP

MH OS-3A
35 CFS

MH OS-1
68 CFS

48" RCP

MH OS-9
32 CFS

48" RCP

A1

EXISTING RCB CULVERT

ANASAZI DRIVE/SUMMERLIN PARKWAY
DIVERSION CHANNEL

DC-3
7.0 AC

CUL-DE-SAC 'B'

ES-1
SF3
10.5 AC

NP-1
COS
6.0 AC

L
SF3
21.7 AC

EX. MH
19 CFS

K
SF3
31.5 AC

J
SF3
24.0 AC

T
SF3
3.4 AC

NORTH LOOP RD.

CH-1
NF
4.8 AC

M
SF3
24.6 AC

A2

BANBURRY CROSS DRIVE

ANASAZI DRIVE

S
SF3
25.3 AC

I
MF2
16.0 AC

COS-1
COS
4.6 AC

N
SF3
27.7 AC

H
VC
8.0 AC

HUALAPAI WAY

R
SF2
31.3 AC

HUALAPAI WAY

ROAD

O
SF3
23.6 AC

G

NORTH

SCALE: 1"=400'

GRAPHIC SCALE

400 0 200 400

(IN FEET)
1 inch = 400 ft.

SUMMERLIN VILLAGE 11/12
OFFSITE STORM DRAIN

FIGURE 5

PROPOSED STORM DRAIN

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

EQUIVALENT STATIONS

PROJECT: Summerlin Village 11/12 Offsite Storm Drain
JOB NO: 62011.218H

By: kj
Date: 6-Mar-97

WSPG FILE: summc

WSPG STATION	STREET EQUIVALENT
994.49	Stub to Existing RCB
1160.28	Manhole #OS-10
1260.28	Manhole #OS-9
1563.90	Manhole #OS-8
1948.10	Manhole #OS-7
2279.50	Manhole #OS-6
2630.71	Manhole #OS-5
2834.53	Manhole #OS-4
2854.53	Stub to Summerlin Parkway

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4			4.00														
CD	2	4			3.50														
CD	3	4			3.00														
CD	4	4			2.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

VILLAGE 11/12 OFF-SITE DRAINAGE

HEADING LINE NO 2 IS -

STA. 19+82.50 TO STA.38+22.54

HEADING LINE NO 3 IS -

FILE: SUMMC BY: KJ DATE: 3/4/97

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	994.49	2926.97	1	2929.97

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1160.28	2931.94	1	0.013	0.00	0.00	35.00	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1258.28	2934.88	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 4 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1262.28	2935.01	1	4	0	0.013	32.0	0.0	2936.44	0.00	45.00	0.00

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1563.90	2946.13	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1946.10	2962.56	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1950.10	2962.74	1	3	0	0.013	68.0	0.0	2963.65	0.00	70.00	0.00

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2279.50	2977.56	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2630.71	2993.37	1	0.013	0.00	0.00	0.00	0

ELEMENT NO 10 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2832.53	3002.04	1	0.013	0.00	0.00	0.00	1

ELEMENT NO 11 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2836.53	3002.71	2	3	0	0.013	54.0	0.0	3003.13	0.00	90.00	0.00

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2854.53	3003.70	2	0.013	0.00	0.00	0.00	0

ELEMENT NO 13 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2854.53	3003.70	2	3007.20

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

WATER SURFACE PROFILE LISTING

VILLAGE 11/12 OFF-SITE DRAINAGE
STA. 19+82.50 TO STA.38+22.54
FILE: SUMMC BY: KJ DATE: 3/4/97

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
994.49	2926.97	3.953	2930.923	271.0	21.61	7.253	2938.176	0.00	3.953		4.00	0.00	0.00	0	0.00
4.08	0.02998					.033850	0.14			4.000			0.00		
998.57	2927.09	4.000	2931.092	271.0	21.57	7.222	2938.314	0.00	3.953		4.00	0.00	0.00	0	0.00
161.71	0.02998					.035354	5.72			4.000			0.00		
1160.28	2931.94	4.908	2936.848	271.0	21.57	7.222	2944.070	0.00	3.953		4.00	0.00	0.00	0	0.00
98.00	0.03000					.035593	3.49			4.000			0.00		
1258.28	2934.88	5.456	2940.336	271.0	21.57	7.222	2947.558	0.00	3.953		4.00	0.00	0.00	0	0.00
JUNCT STR	0.03250					.031638	0.13						0.00		
1262.28	2935.01	8.298	2943.308	239.0	19.02	5.617	2948.925	0.00	3.923		4.00	0.00	0.00	0	0.00
178.82	0.03687					.027684	4.95			2.876			0.00		
1441.10	2941.60	6.658	2948.261	239.0	19.02	5.617	2953.878	0.00	3.923		4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1441.10	2941.60	2.812	2944.415	239.0	25.32	9.953	2954.368	0.00	3.923		4.00	0.00	0.00	0	0.00
122.80	0.03687					.039700	4.88			2.876			0.00		
1563.90	2946.13	2.777	2948.907	239.0	25.67	10.229	2959.136	0.00	3.923		4.00	0.00	0.00	0	0.00
53.44	0.04299					.039908	2.13			2.712			0.00		
1617.34	2948.43	2.800	2951.227	239.0	25.43	10.042	2961.269	0.00	3.923		4.00	0.00	0.00	0	0.00
139.85	0.04299					.037368	5.23			2.712			0.00		
1757.19	2954.44	2.927	2957.366	239.0	24.25	9.129	2966.495	0.00	3.923		4.00	0.00	0.00	0	0.00
72.59	0.04299					.033471	2.43			2.712			0.00		
1829.78	2957.56	3.066	2960.626	239.0	23.12	8.299	2968.925	0.00	3.923		4.00	0.00	0.00	0	0.00
46.75	0.04299					.030142	1.41			2.712			0.00		

WATER SURFACE PROFILE LISTING

VILLAGE 11/12 OFF-SITE DRAINAGE
STA. 19+82.50 TO STA.38+22.54
FILE: SUMMC BY: KJ DATE: 3/4/97

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1876.53	2959.57	3.220	2962.789	239.0	22.04	7.546	2970.335	0.00	3.923	4.00	0.00	0.00	0	0.00
32.71	0.04299					.027368	0.90		2.712			0.00		
1909.24	2960.97	3.395	2964.370	239.0	21.02	6.860	2971.230	0.00	3.923	4.00	0.00	0.00	0	0.00
23.28	0.04299					.025225	0.59		2.712			0.00		
1932.52	2961.98	3.605	2965.581	239.0	20.04	6.236	2971.817	0.00	3.923	4.00	0.00	0.00	0	0.00
13.58	0.04299					.024581	0.33		2.712			0.00		
1946.10	2962.56	3.923	2966.483	239.0	19.10	5.668	2972.151	0.00	3.923	4.00	0.00	0.00	0	0.00
JUNCT STR	0.04500					.019502	0.08					0.00		
1950.10	2962.74	8.813	2971.553	171.0	13.61	2.875	2974.428	0.00	3.732	4.00	0.00	0.00	0	0.00
49.54	0.04499					.014172	0.70		2.143			0.00		
1999.64	2964.97	7.287	2972.256	171.0	13.61	2.875	2975.131	0.00	3.732	4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
1999.64	2964.97	2.144	2967.113	171.0	24.93	9.648	2976.761	0.00	3.732	4.00	0.00	0.00	0	0.00
279.86	0.04499					.044710	12.51		2.143			0.00		
2279.50	2977.56	2.150	2979.710	171.0	24.84	9.584	2989.294	0.00	3.732	4.00	0.00	0.00	0	0.00
20.83	0.04502					.044456	0.93		2.142			0.00		
2300.33	2978.50	2.151	2980.649	171.0	24.82	9.567	2990.216	0.00	3.732	4.00	0.00	0.00	0	0.00
243.81	0.04502					.041798	10.19		2.142			0.00		
2544.14	2989.47	2.236	2991.709	171.0	23.66	8.696	3000.405	0.00	3.732	4.00	0.00	0.00	0	0.00
86.57	0.04502					.036913	3.20		2.142			0.00		
2630.71	2993.37	2.325	2995.695	171.0	22.57	7.907	3003.602	0.00	3.732	4.00	0.00	0.00	0	0.00
60.06	0.04296					.032640	1.96		2.173			0.00		

WATER SURFACE PROFILE LISTING

VILLAGE 11/12 OFF-SITE DRAINAGE
STA. 19+82.50 TO STA.38+22.54
FILE: SUMMC BY: KJ DATE: 3/4/97

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2690.77	2995.95	2.418	2998.368	171.0	21.52	7.191	3005.559	0.00	3.732		4.00	0.00	0.00	0	0.00
39.39	0.04296					.028903	1.14			2.173			0.00		
2730.16	2997.64	2.518	3000.160	171.0	20.52	6.537	3006.697	0.00	3.732		4.00	0.00	0.00	0	0.00
28.18	0.04296					.025632	0.72			2.173			0.00		
2758.34	2998.85	2.624	3001.477	171.0	19.56	5.943	3007.420	0.00	3.732		4.00	0.00	0.00	0	0.00
21.13	0.04296					.022779	0.48			2.173			0.00		
2779.47	2999.76	2.738	3002.498	171.0	18.65	5.403	3007.901	0.00	3.732		4.00	0.00	0.00	0	0.00
16.28	0.04296					.020294	0.33			2.173			0.00		
2795.75	3000.46	2.860	3003.320	171.0	17.78	4.911	3008.231	0.00	3.732		4.00	0.00	0.00	0	0.00
12.67	0.04296					.018138	0.23			2.173			0.00		
2808.42	3001.00	2.992	3003.996	171.0	16.96	4.465	3008.461	0.00	3.732		4.00	0.00	0.00	0	0.00
9.75	0.04296					.016283	0.16			2.173			0.00		
2818.17	3001.42	3.138	3004.561	171.0	16.17	4.059	3008.620	0.00	3.732		4.00	0.00	0.00	0	0.00
7.29	0.04296					.014715	0.11			2.173			0.00		
2825.46	3001.74	3.301	3005.037	171.0	15.42	3.690	3008.727	0.00	3.732		4.00	0.00	0.00	0	0.00
4.96	0.04296					.013440	0.07			2.173			0.00		
2830.42	3001.95	3.490	3005.439	171.0	14.70	3.355	3008.794	0.00	3.732		4.00	0.00	0.00	0	0.00
2.11	0.04296					.012565	0.03			2.173			0.00		
2832.53	3002.04	3.732	3005.772	171.0	14.01	3.049	3008.821	0.00	3.732		4.00	0.00	0.00	0	0.00
JUNCT STR	0.16750					.012888	0.05						0.00		
2836.53	3002.71	5.883	3008.593	117.0	12.16	2.296	3010.889	0.00	3.228		3.50	0.00	0.00	0	0.00
18.00	0.05500					.013524	0.24			1.741			0.00		

WATER SURFACE PROFILE LISTING

VILLAGE 11/12 OFF-SITE DRAINAGE
STA. 19+82.50 TO STA.38+22.54
FILE: SUMMC BY: KJ DATE: 3/4/97

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
2854.53	3003.70	5.137	3008.837	117.0	12.16	2.296	3011.133	0.00	3.228	3.50	0.00	0.00	0	0.00

SUMMERLIN

SM

VILLAGE 11/12
OFF-SITE DRAINAGE
STA 10+24.00 TO 38+22.54
1997

DEVELOPER

**HOWARD HUGHES PROPERTIES,
LIMITED PARTNERSHIP, a
Delaware limited partnership.
By its sole general partner,
The HOWARD HUGHES CORPORATION,
a Delaware Corporation.**

**1645 VILLAGE CENTER CIRCLE, SUITE 200
LAS VEGAS, NEVADA 89134
OFFICE PHONE NO. 791-4300
OFFICE FAX NO. 791-4450**

ENGINEER

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102
TELEPHONE NO. (702) 363-1200
SUMMERLIN DIVISION/TELEPHONE (702) 363-0991

BENCHMARK
CITY OF LAS VEGAS BENCHMARK
OLV0019S4 RIVET & PLATE IN TOP OF CURB NW SIDE OF TOWN CENTER DRIVE & SOUTH CIRCLE ISLAND.
2725.923 NGVD 1929 DATUM
2728.37 NAVD 1988 DATUM (831.6074 M)
*2726.19 SUMMERLIN DATUM

* THIS PROJECT BASED ON SUMMERLIN DATUM

SHEET 1 OF 7

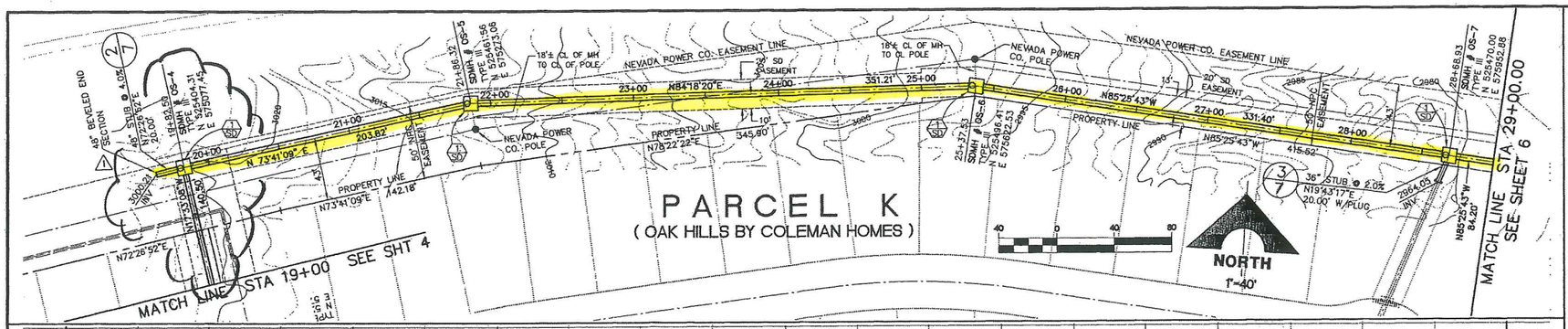
FINAL SUBMITTAL

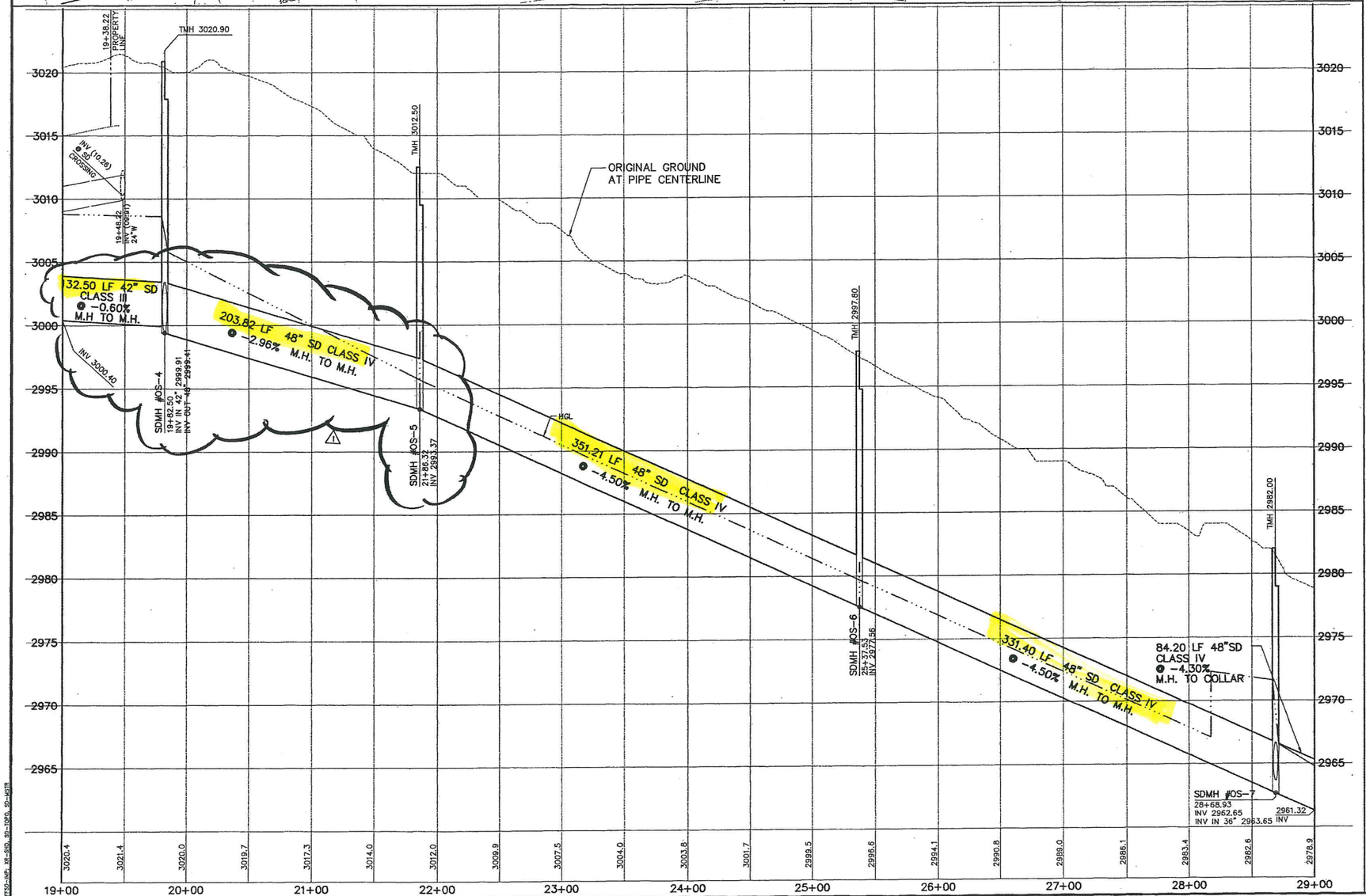
JOB NO. 62011.218

S.I.D. 707 PROJECT NO. 62 327-V246

2159

OFSD-COV





CONSTRUCTION NOTES

STORM DRAIN

INSTALL STORM DRAIN PIPES PER SUMMERLIN STD. U-19

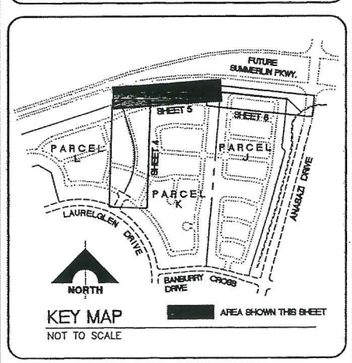
1 SD INSTALL STORM DRAIN MANHOLE D-4 / S

2 SD INSTALL STORM DRAIN MANHOLE D-3 / S

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
OLV0019S4 RIVET & PLATE IN TOP OF CURB NW SIDE OF TOWN CENTER DRIVE & SOUTH CIRCLE ISLAND.
2725.923 NGVD 1929 DATUM
2728.37 NAVD 1988 DATUM (831.6074 M)
* 2726.19 SUMMERLIN DATUM

* THIS PROJECT BASED ON SUMMERLIN DATUM



KEY MAP
NOT TO SCALE

NO.	DESCRIPTION	DATE	APP'D
1	REV. PROFILE	6/17/97	GCW

RECOMMENDED
CHRISTOPHER W. ANDERSON
P.E. NO. 5071

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA
CHRISTOPHER W. ANDERSON
CIVIL
5071

FINAL SUBMITTAL

G.C. WALLACE, INC.
Engineering/Architecture
2030 HAMPTON RD. LAS VEGAS, NEVADA 89102 (702) 363-1200
SUMMERLIN DIVISION: (702) 363-0991

SUMMERLIN
VILLAGE 11/12 OFF-SITE DRAINAGE
PLAN & PROFILE
STA 19+00.00 TO 29+00.00

SHEET 5
SHT 5 OF 7

JOB NO. 62011.218

S.I.D. 707 PROJECT NO. 62

327-V246

263

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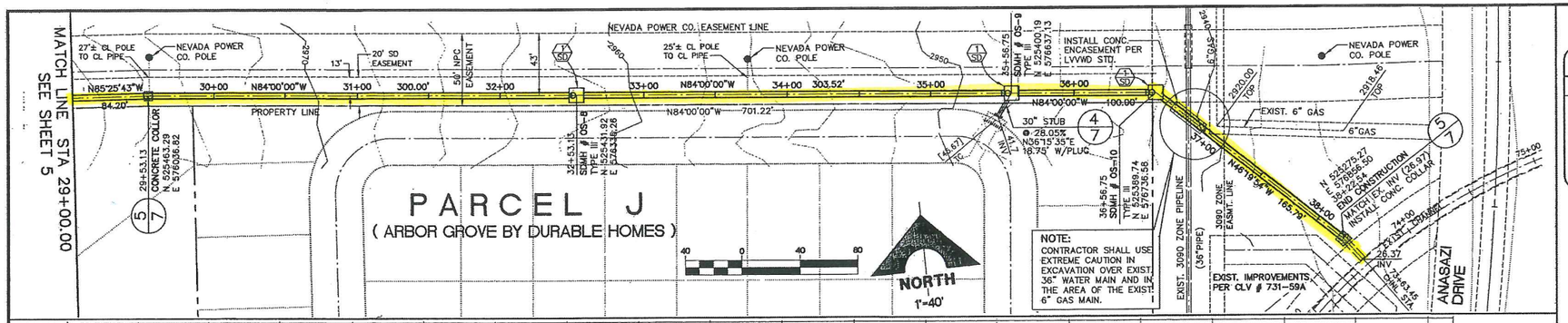
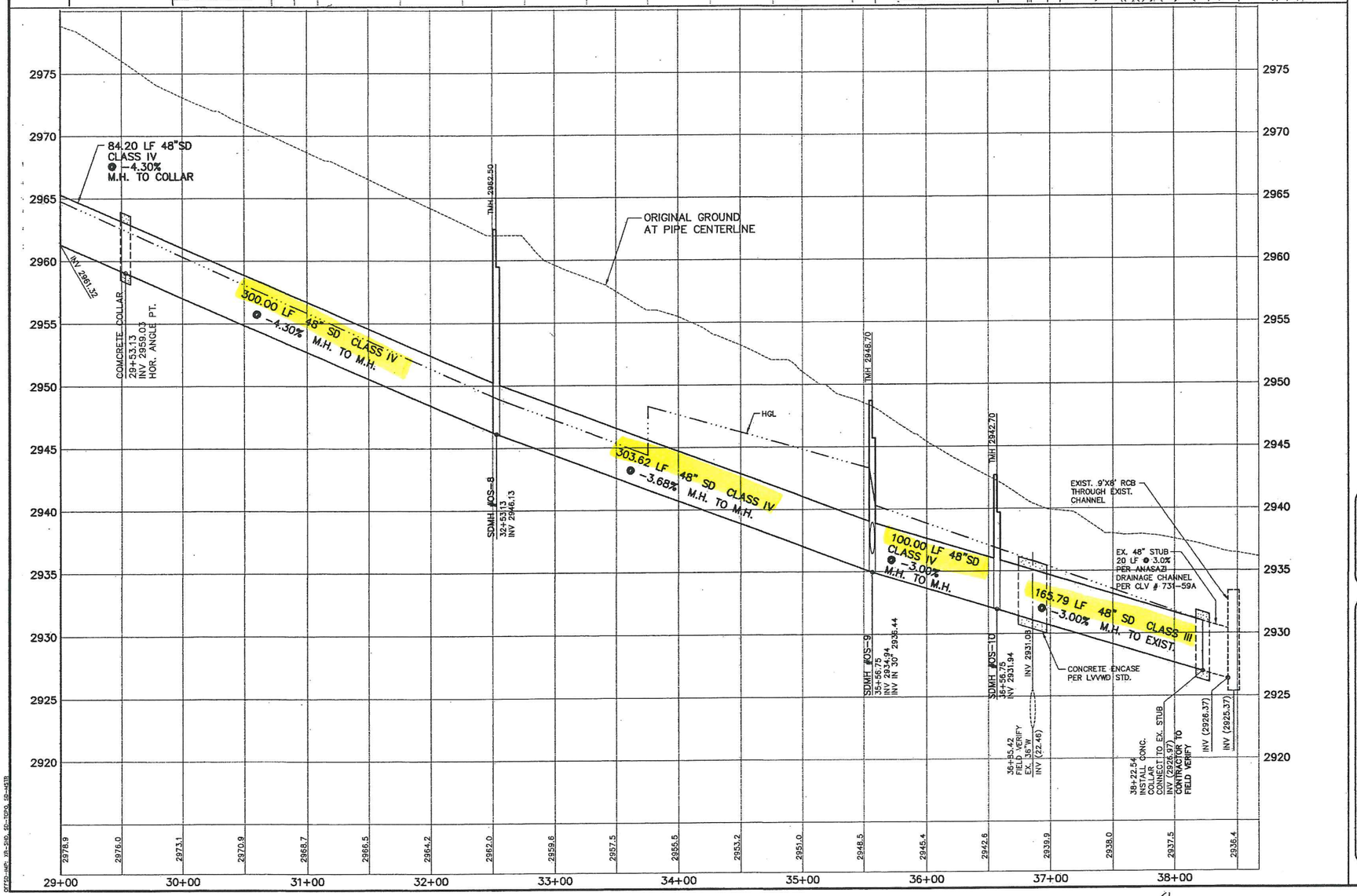
OFSD-1HP 40-0HD 80-10VD 80-1HTR





CONSTRUCTION NOTES

STORM DRAIN

INSTALL STORM DRAIN PIPES PER SUMMERLIN STD. U-19

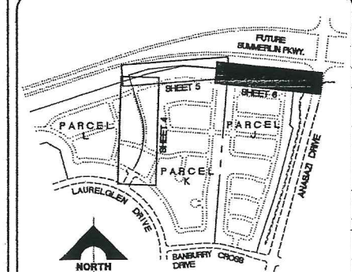
(4/SD) INSTALL STORM DRAIN MANHOLE (D-4 S)

(7/SD) INSTALL STORM DRAIN MANHOLE (D-3 S)

BENCHMARK

CITY OF LAS VEGAS BENCHMARK
OLV0019S4 RIVET & PLATE IN TOP OF CURB NW SIDE OF TOWN CENTER DRIVE & SOUTH CIRCLE ISLAND.
2725.923 NGVD 1929 DATUM
2728.37 NAVD 1988 DATUM (831.6074 M)
* 2726.19 SUMMERLIN DATUM

* THIS PROJECT BASED ON SUMMERLIN DATUM



REV.	DATE	DESCRIPTION	DATE	APPD	DATE	APP

RECOMMENDED
CHRISTOPHER W. ANDERSON
P.E. NO. 5071

PROFESSIONAL ENGINEER - STATE OF NEVADA - REGISTERED - CHRISTOPHER W. ANDERSON

FINAL SUBMITTAL

G.C. WALLACE, INC.
Engineers/Planners/Surveyors
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102 (702) 383-1200
SUMMERLIN DIVISION (702) 363-0991

SUMMERLIN

VILLAGE 11/12 OFF-SITE DRAINAGE

PLAN & PROFILE
STA 20+00.00 TO 38+22.54

SHEET 6
SHT 6 OF 7

JOB NO. 62011.218

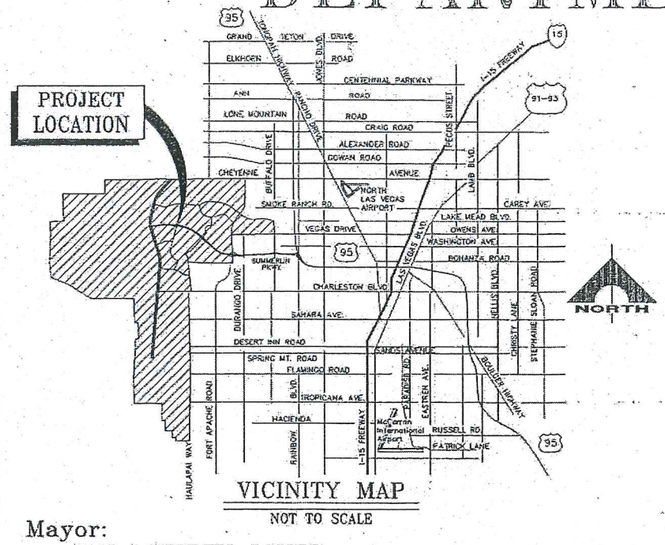
S.I.D. 707 PROJECT NO. 62

2151

327-V246

F:\82051-211\IMPROV\C-01.dwg 09-10-98 16:21:48 tcormier

DEPARTMENT OF PUBLIC WORKS



VICINITY MAP
NOT TO SCALE

CITY OF LAS VEGAS
NEVADA

Mayor:
JAN LAVERTY JONES

Councilmen:
ARNIE ADAMSEN
MICHAEL J. MCDONALD
GARY REESE
LARRY BROWN

City Manager:
LARRY K. BARTON

Director of Public Works:
RICHARD D. GOECKE

City Engineer:
DENNIS ANDERSON, P.E.

SUMMERLIN PARKWAY

WESTERN BELTWAY TO TOWN CENTER DRIVE AND INTERCHANGE WITH TOWN CENTER DRIVE

SEPTEMBER 1998

FUNDED BY: REGIONAL TRANSPORTATION COMMISSION

REVIEWED BY:

City Engineer — Date

City Traffic Engineer — Date

Regional Transportation Commission — 9/25/98 Date

Sprint — 9-11-98 Date

Las Vegas Valley Water District — 9/24/98 Date

Nevada Power Company — Date

Southwest Gas Company — 9-11-98 Date

Kimberly Granatto-Musil — 9-11-98
Community Cable — Date

REVISIONS | DATE

SCALE (H) N/A | SCALE (V) N/A | DESIGN BY AEP
FLD. BK. # N/A | DATE SEPT 1998

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

DEPARTMENT OF PUBLIC WORKS
PROJECT: SUMMERLIN PARKWAY
SHEET: COVER SHEET
BID NO. 98.1730.40

DRAWING NO. 107V-2975 | 1/177

E:\62051-211\IMPROV\C-32.dwg 09-27-98 13:04:44 RSKORPINSKI

1. CONSTRUCT CONC. SLOPE PAVING (NDOT STD. NO. B-26.1.1)
18. DROP INLET TYPE "A", L=VARIES (STD. DWG NO. 413) (USDCCA)
19. CONSTRUCT 18" RCP
20. CONSTRUCT 24" RCP
26. CONCRETE BARRIER RAIL (TYPE "A") (STD. PLAN R-8.3.1) (NDOT).
27. MODIFIED ECCENTRIC LOADING TERMINAL.
28. SPECIAL DROP INLET (SEE SHEET 12)
30. 24" RCP END SECTION
45. BANK "A" IRRIGATION SLEEVES (SUMMERLIN STD. DWG. NO. U-18) WITH DETECTION WIRE AND MARKERS (STD. PLAN R-5.1.2) (NDOT)

CURVE DATA

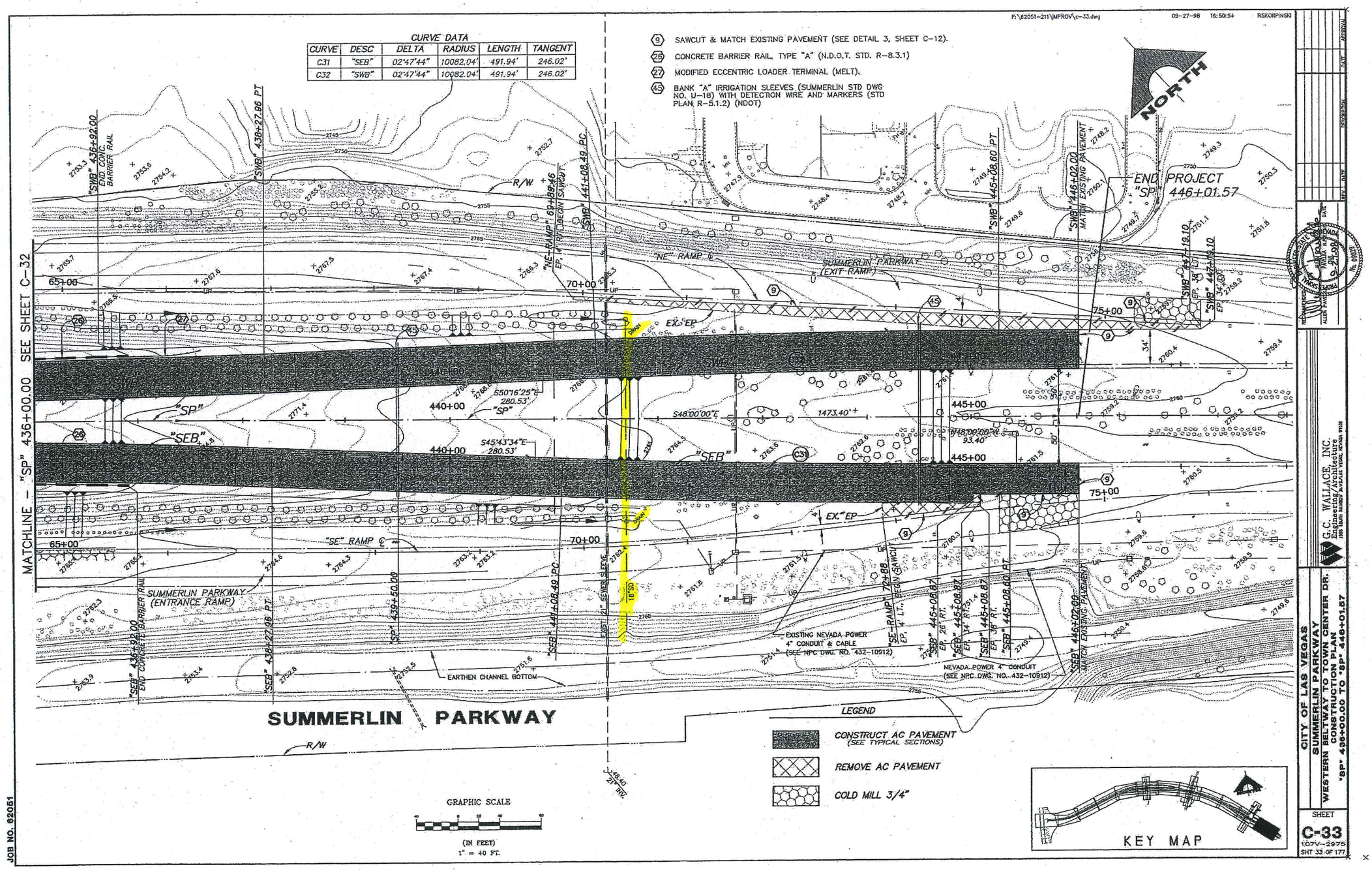
CURVE	DESC	DELTA	RADIUS	LENGTH	TANGENT
C27	"RT2"	10°40'54"	4000.00'	745.71'	373.94'
C28	"RT1"	04°57'19"	2000.00'	172.97'	86.54'
C29	"SEB"	02°16'26"	10074.04'	399.79'	199.92'
C30	"SWB"	02°16'26"	10074.04'	399.79'	199.92'
C36	EP	04°57'19"	2500.00'	216.21'	108.17'
C37	EP	10°40'54"	4500.00'	838.93'	420.68'
C38	EP	04°57'19"	2500.00'	216.21'	108.17'

"RT2" 41+50
"SP" 424+50.00
"RT2" 43+62.47 PT
"RT2" 47+16.86
"SWB" 430+19.42 END APPROACH SLAB BEGIN BRIDGE
"SWB" 432+15.92 END BRIDGE BEGIN APPROACH SLAB
"RT2" 46+62.95
"TC" 126+06.94
FOR BRIDGE DESIGN SEE B-SHEETS
NORTH
EXIST. NEVADA POWER 2" CONDUIT & CABLE (SEE NPC DWG. NO. 432-10912)
FOR IMPROVEMENTS TO TOWN CTR. DRIVE SEE SHEETS C-39 THROUGH C-41
TOWN CENTER DRIVE
"TC" 126+36.93 EXIT RAMP
NE RAMP ①
"SWB" 432+39.92 END APPROACH SLAB BEGIN CONC. BARRIER RAIL
"SWB" 434+28.17 PC
"TC" 129+12.94
"TC" 127+82.93
"TC" 127+99.93 ENTRANCE RAMP
SE RAMP ⑤
"SEB" 434+50.00
"SEB" 434+28.17 PC
"SP" 431+28.17
EARTHEN CHANNEL BOTTOM
"SEB" 431+28.17
"SWB" 425+04.42 PT, AHEAD
"SWB" 425+18.87 PT, BACK
"SP" 425+04.42 PT, 23' LT
"RT2" 43+46.98 PT, 27.97' RT
"SEB" 425+04.42 PT, AHEAD
"SEB" 424+89.96 PT, BACK
"SP" 425+04.42 PT, 23' RT
"RT1" 23+90.29 PC
"RT1" 24+00.00 BEGIN TRANS FLAT BOTTOM
"RT1" 24+17.82 END TRANS FLAT BOTTOM
"RT1" 24+65.21 103.38' RT
"RT1" 24+53.22 PT
"RT1" 26+11.92 PT
"SEB" 428+86.50 BEG. CONC. BARRIER RAIL
"RT1" 27+51.25
"SEB" 430+19.42 END APPROACH SLAB BEGIN BRIDGE
"RT1" 30+06.26
8'x4' RCB CULVERT
EX. CONC. CHANNEL
DRAINAGE ESMT.
30' LVWD ESMT.
42"W. (2975)
SUMMERLIN PARKWAY
SEE SHEET C-31 MATCHLINE — "SP" 424+50.00
"RT1" 23+00
SEE SHEET C-33 MATCHLINE — "SP" 436+00.00
425+00 430+00 435+00
"SP" "SEB"
10:1(MIN.) 10:1(TYP.) 4:1(TYP.) 3:1
S48°00'00"E 623.75' 1473.40'
N42°00'00"E 300.00'
543°02'41"E 337.18'
R=20' L=28.92'
VARIES
18"SD 24"SD 8'SW 5'SW 6'SW 8'SW
CURB/GUTTER TYP.
R/W
TRRIG
GRAPHIC SCALE
(IN FEET)
1" = 40 FT.
LEGEND
CONSTRUCT AC PAVEMENT (SEE TYPICAL SECTIONS)
CONSTRUCT BRIDGE
COLD MILL 3/4"
KEY MAP
JOB NO. 62051

G.C. WALLACE, INC.
Engineering/Architecture
2280 Corporate Circle, Suite 100, Henderson, Nevada 89074

CITY OF LAS VEGAS
SUMMERLIN PARKWAY
WESTERN BELTWAY TO TOWN CENTER DR.
CONSTRUCTION PLAN
"SP" 424+50.00 TO "SP" 436+00.00

SHEET
C-32
107V-2975
SHT 32 OF 177



CURVE DATA

CURVE	DESC	DELTA	RADIUS	LENGTH	TANGENT
C31	"SEB"	02°47'44"	10082.04'	491.94'	246.02'
C32	"SWB"	02°47'44"	10082.04'	491.94'	246.02'

(9) SAWCUT & MATCH EXISTING PAVEMENT (SEE DETAIL 3, SHEET C-12).

(26) CONCRETE BARRIER RAIL, TYPE "A" (N.D.O.T. STD. R-8.3.1)

(27) MODIFIED ECCENTRIC LOADER TERMINAL (MELT).

(45) BANK "A" IRRIGATION SLEEVES (SUMMERLIN STD DWG NO. U-18) WITH DETECTION WIRE AND MARKERS (STD PLAN R-5.1.2) (NDOT)

JOB NO. 62051

G.C. WALLACE, INC.
Engineering/Architecture

CITY OF LAS VEGAS
SUMMERLIN PARKWAY
WESTERN BELTWAY TO TOWN CENTER DR.
CONSTRUCTION PLAN
"SP" 436+00.00 TO "SP" 446+01.57

SHEET
C-33
107V-2975
SHT 33 OF 177

HUSITE PARKWAY
(CONSTRUCTION DRAWINGS)

(FROM EL CAPITAN WAY TO HUSITE PARKWAY INTERCHANGE)

Howard Hughes Properties

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

STIC FILE 9/11/89

△ 3/16/88 - ISSUE PER G.C.W. LETTER
△ 2/12/88 - ISSUE FOR CONSTRUCTION
△ 11/10/87 - ISSUED FOR GMP

CURVE DATA				
NO.	Δ	R	L	T
1	17° 11' 50"	3000.00'	900.45'	453.64'
2	17° 11' 50"	2950.00'	885.44'	446.07'
3	17° 11' 50"	3050.00'	915.45'	461.19'
4	17° 11' 50"	3046.00'	914.25'	460.59'
5	17° 11' 50"	2954.00'	886.64'	446.68'
6	17° 11' 50"	2916.00'	875.23'	440.93'

CURVE DATA				
NO.	Δ	R	L	T
7	17° 11' 50"	3084.00'	925.66'	466.33'
8	09° 39' 44"	3000.00'	505.91'	253.56'
9	09° 39' 44"	3050.00'	614.34'	257.78'
10	09° 39' 44"	2950.00'	497.48'	249.33'

CURVE DATA				
NO.	Δ	R	L	T
11	09° 39' 44"	2954.00'	498.16'	249.67'
12	09° 39' 44"	3046.00'	513.67'	257.45'
13	09° 39' 44"	3084.00'	520.08'	260.66'
14	09° 39' 44"	2916.00'	491.75'	246.40'
15	05° 10' 19"	3000.00'	270.80'	135.49'
16	04° 29' 25"	3000.00'	235.11'	117.62'

P.G. "WBHP"
P.G. "EBHP"
EP
EP
EP

(95.4±) INV. R.C.B.

APPROX. LIMITS OF FILL SLOPE

APPROX. LIMITS OF CUT SLOPE

APPROX. LIMITS OF CUT SLOPE

300 LF-48" RCP @ 0.50% (1800.0) SLEEVE FOR FUTURE LINE

5-4" CONDUITS FOR M.P.C.D. CASE NO. 482-7101

SOUTHWEST GAS TO INSPECT AND RECONDITION EXIST. 10" GAS PRIOR TO START OF CONSTRUCTION (SEE NOTE 2 ON SHEET 2)

APPROX. LIMITS OF FILL SLOPE

NORTH

SUPERELEV. TRANS. (EBHP & WBHP)

FUTURE OFF-RAMP SEE SHT. 15

BEGIN SUPERELEV. TRANS.

EXIST. 12'X14' R.C.B CULVERT (SEE PROFILE BELOW)

END SUPERELEV. TRANS.

DURANGO DR. ℄

12-5" SCH. 40 PVC SLEEVES FOR CENTEL

SUPERELEV. TRANS.

FULL SUPER ELEV.

2.726%

UTILITY CROSSING 4/14

LIGHTING SLEEVE 4

N 88°39'44" E

A.C. PAVEMENT

P.G. "WBHP"

2.497%

N 79°00'00" E. 176 F.L.

PROFILE B/17

UTILITY CROSSING 4/14

525

℄ HUSITE PARKWAY 16

EXIST. 10" HIGH PRESSURE GAS LINE

2.817%

2.415%

P.G. "EBHP"

A.C. PAVEMENT

IRRIGATION SLEEVE (TYP.) 14

FUTURE OFF-RAMP SEE SHT. 15

600' V.C.

526+00 E.V.C.

520+00 B.V.C.

RIPRAP

APPROX. LIMITS OF CUT SLOPE

FUTURE OVERPASS ℄ DURANGO DR.

APPROX. LIMITS OF FILL SLOPE

(94.53±) INV. R.C.B.

BENCHMARK

B.M. NO. H.P. 521R CHISLED "+" TOP OF HEADWALL 186' RT STA. 521+69 - ELEV. 2610.28

SUPERELEV. TRANS.

APPROX. LIMITS OF FILL SLOPE

S 00°39'22" E

525+50

528+50

529+00

524+41.64 P.C.

524+81.64 P.T.

523+00 M.V.C.

522+81.64 P.T.

520+81.64 P.T.

520+00 B.V.C.

518+00 MATCH LINE - SEE SHEET 5

530+00 MATCH LINE - SEE SHEET 7

PLAN

SCALE: 1"=40'

"WBHP" SUPERELEVATION

"EBHP" SUPERELEVATION

-4.0%
+4.0%
-4.0%
+4.0%

520+00 B.V.C. 23.36 F.G.
520+81.64 P.T. 21.34 F.G.
523+00 M.V.C. 15.76 F.G.
524+41.64 P.C. 12.00 F.G.
524+81.64 P.C. 12.00 F.G.
526+00 E.V.C. 07.69 F.G.
529+47.55 P.T. 98.05 F.G.

-2.497% (L.O.C. = 885.44')
-2.455%
-2.771%
-2.726% (L.O.C. = 514.34')
-2.415% (L.O.C. = 915.45')
-2.817% (L.O.C. = 497.48')

EXIST. GRADE ALONG "WBHP"
EXIST. GRADE ALONG "EBHP"
PROFILE GRADE ALONG "WBHP"
PROFILE GRADE ALONG "EBHP"

18" RCP 15.48 INV.
18" RCP 14.48 INV.
EXIST. R.C.B. CULVERT
(93.09±) INV.
(94.05±) INV.

600' V.C.

IDENTICAL POINT
IDENTICAL POINT

45° RCP
45° RCP

526+80.52 ℄ DURANGO DR. 05.46 F.G.
EX. 12" H.P. GAS LINE
526+72.89 ℄ DURANGO DR. 05.47 F.G.
EX. 12" H.P. GAS LINE

CAUTION

CONTRACTOR TO USE EXTREME CAUTION WHEN WORKING NEAR EXIST. HIGH PRESSURE GAS LINE. EXACT LOCATION OF GAS LINE IS UNKNOWN.

518 519 520+00 521 522 523 524 525+00 526 527 528 529 530+00

2630 2620 2600 2590

PROFILE SCALE: HORIZ. : 1" = 40' VERT. : 1" = 10'

REV	DATE	DESCRIPTION
1	10-14-86	ISSUE PER G.C.W. LETTER
2	11-17-86	ISSUE ADDENDA NO. TO GMP
3	1-7-87	ISSUE FOR CONSTRUCTION
4	3-19-87	ISSUE PER G.C.W. LETTER
5	5-20-87	REISSUE PER G.C.W. LETTER

6838 R/E NO.

DATE 4/6/87

REGISTERED PROFESSIONAL ENGINEER GREGORY C. PRIMAS CIVIL No. 6838

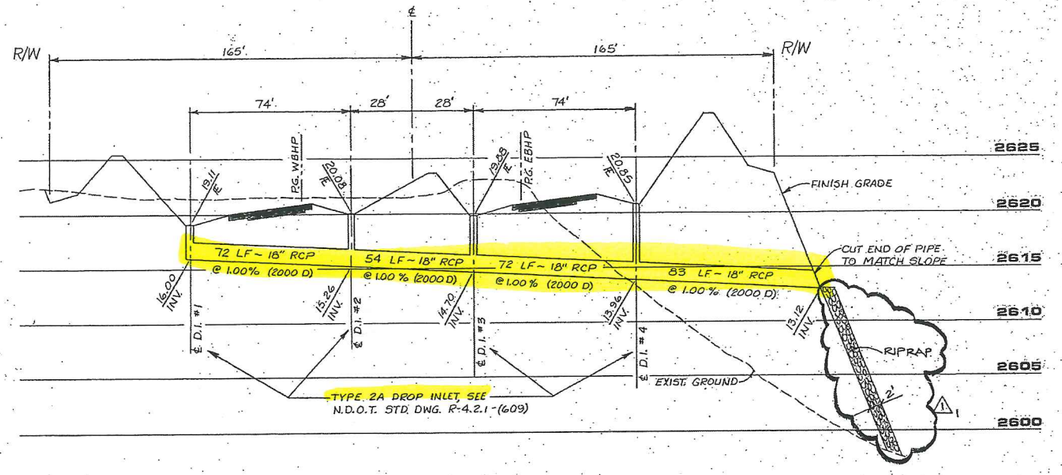
CLV CHIEF LAND DEVELOPMENT 9/14/87 DATE

G.C. WALLACE, INC. Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

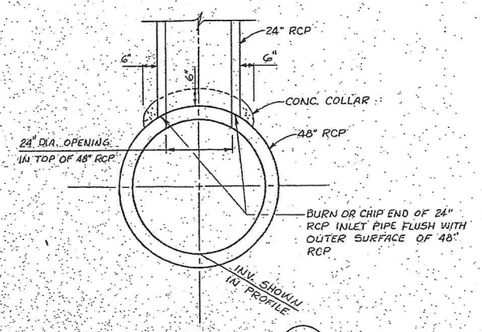
HOWARD HUGHES PROPERTIES
HUSITE PARKWAY
PLAN & PROFILE
STA. 518+00 TO STA. 530+00

SHEET 6 OF 20 SHEETS

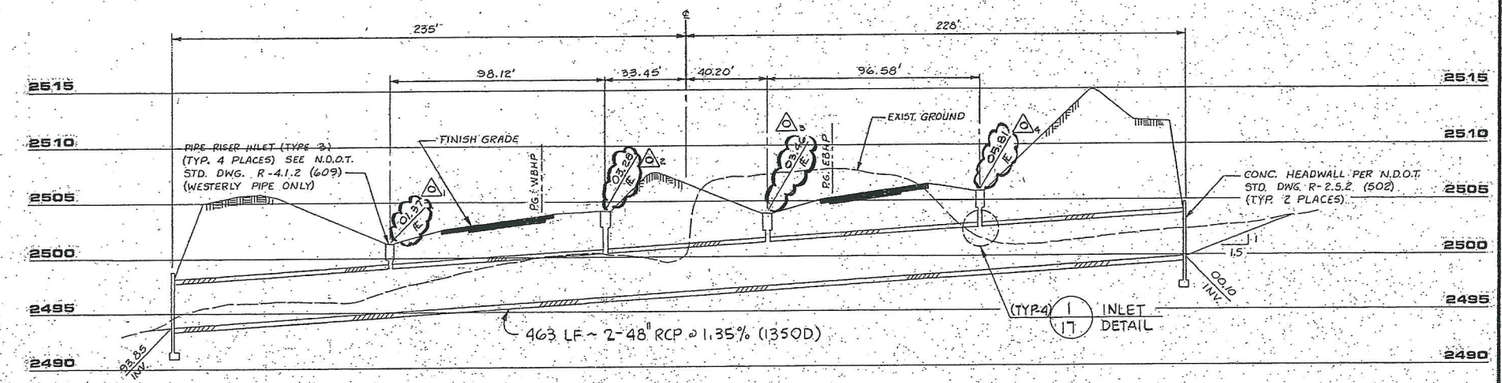
JOB NO. 620.232



PROFILE (B / 17)
SCALE: HORIZ. 1" = 30'
VERT. 1" = 6'
(REF. DRAWING NO. 6)



INLET DETAIL
(WESTERLY PIPE ONLY) (1 / 17)



PROFILE (A / 17)
SCALE: HORIZ. 1" = 30'
VERT. 1" = 6'
(REF. DRAWING NO. 9)

REC'D BY: [illegible] DATE: 6/15/95
R.E. NO. 6538 DATE
CIVIL No. 8539

REV	DATE	DESCRIPTION
1	1/18/96	ISSUED FOR BID
2	2/19/96	ISSUE FOR CONSTRUCTION
3	3/14/96	PER G.C.W. LETTER

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

HOWARD HUGHES PROPERTIES
HUGHES PARKWAY

CULVERT PROFILES AND DETAILS

SHEET 17 OF 20 SHEETS

JOB NO. 620.232

8/84 DIETERICH-POST 6532B

HUSITE PARKWAY

(CONSTRUCTION DRAWINGS)

(FROM TOWN CENTER DRIVE ENTRANCE TO EL CAPITAN WAY)

Howard Hughes Properties

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

Location: Las Vegas, Nevada

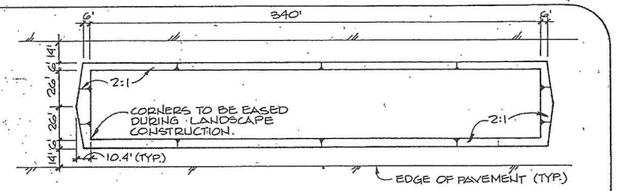
JOB NO. 620.232

△ 3-16-89 ISSUE PER G.C.W. LETTER
△ 2-12-88 ISSUE FOR CONSTRUCTION
△ 11-16-87 ISSUE FOR GMP

PROJECT 2 - ONSITE
(TOWN CENTER DRIVE TO EL CAPITAN WAY)

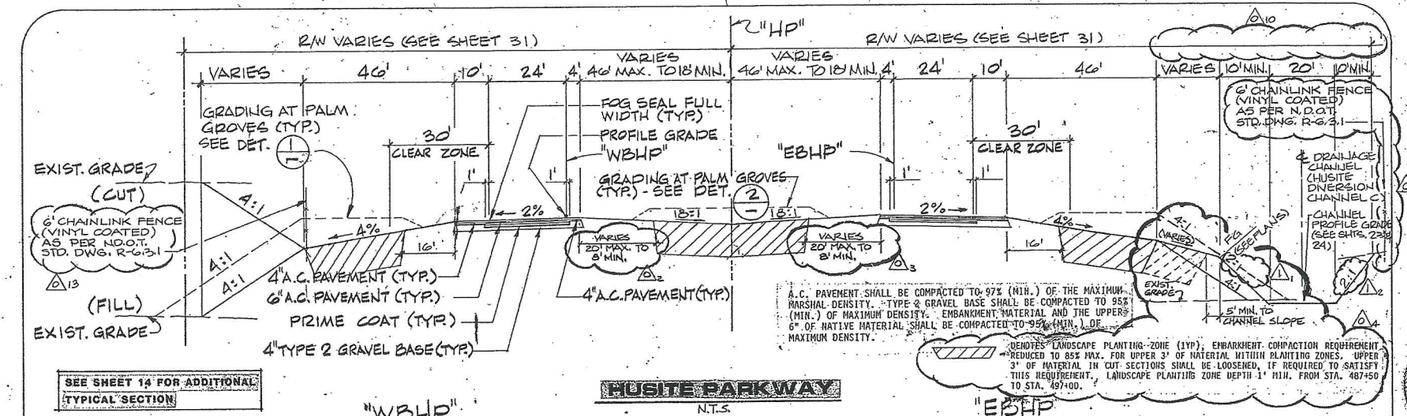
HUSITE PARKWAY (FROM TOWN CENTER DRIVE ENTRANCE TO EL CAPITAN WAY)

SHEET 1 OF 31



TYP. MEDIAN PALM GROVE GRADING DETAIL (2/—)

N.T.S.

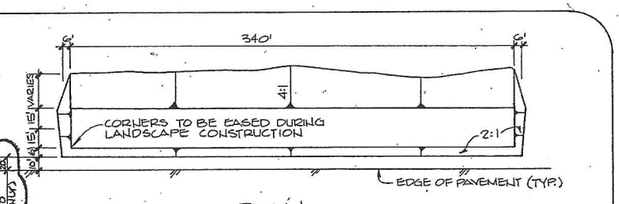


SEE SHEET 14 FOR ADDITIONAL TYPICAL SECTION

"WBHP"
STA. 437+41.67 TO STA. 466+94.00
STA. 489+09.20 TO STA. 497+00.52

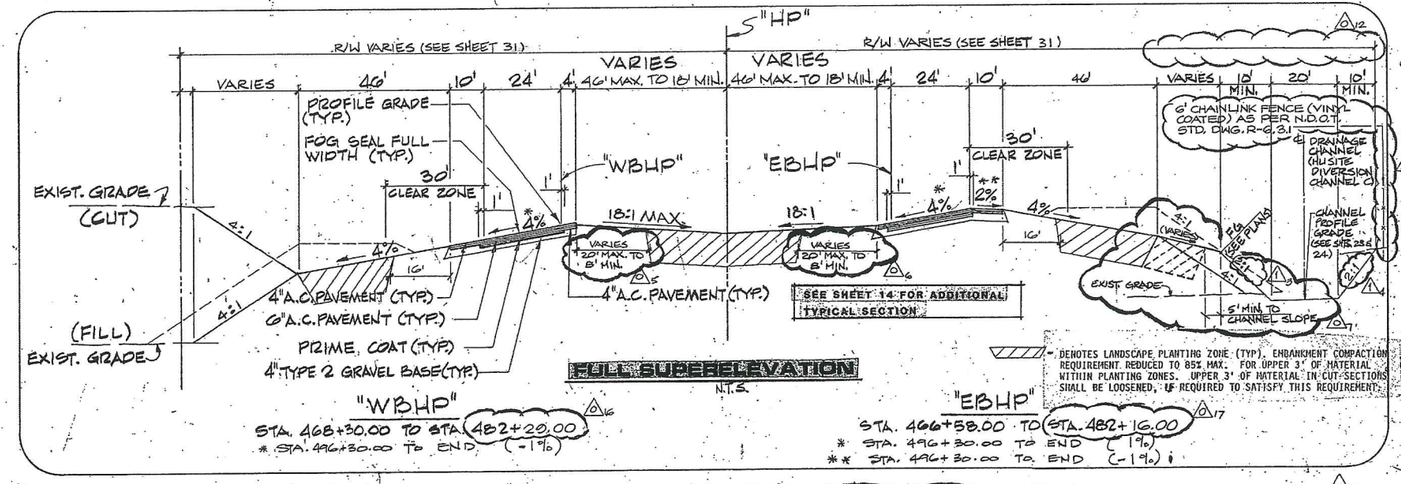
HUSITE PARKWAY
N.T.S.

"EBHP"
STA. 437+41.67 TO STA. 462+50.00
STA. 488+66.47 TO STA. 497+00.52



TYP. ROADSIDE PALM GROVE GRADING DETAIL (1/—)

N.T.S.

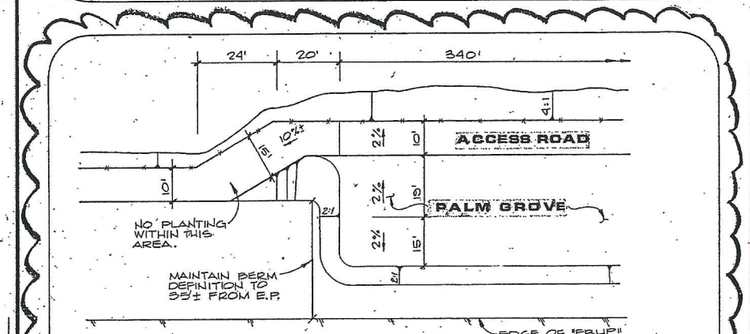


SEE SHEET 14 FOR ADDITIONAL TYPICAL SECTION

"WBHP"
STA. 468+30.00 TO STA. 482+20.00 (-1%)
* STA. 496+30.00 TO END (-1%)

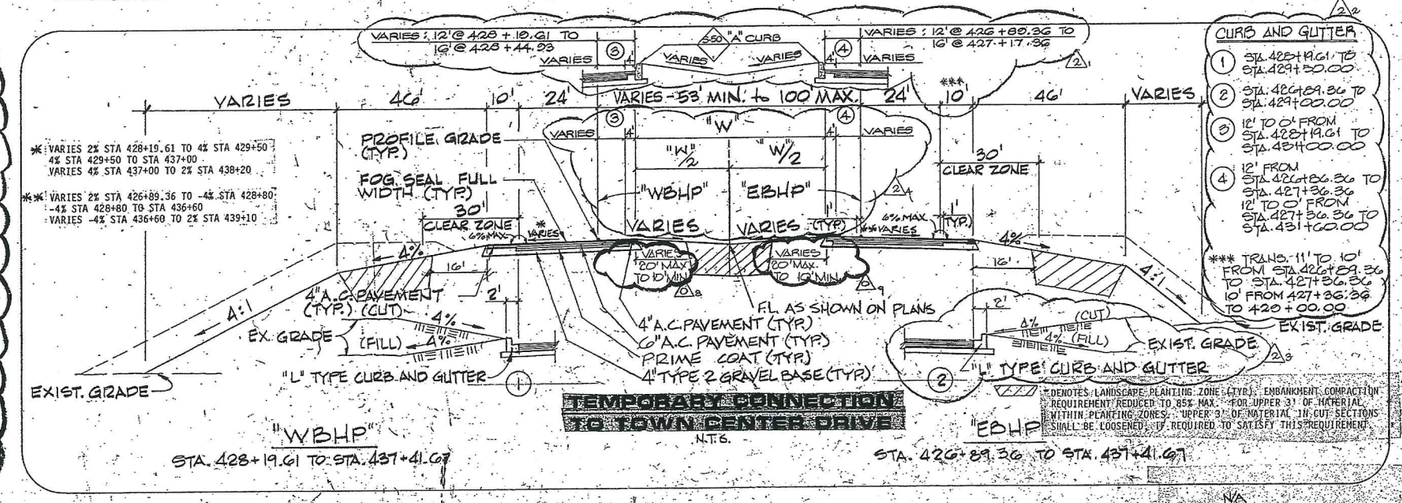
FULL SUBGRADE ELEVATION
N.T.S.

"EBHP"
STA. 466+58.00 TO STA. 482+16.00 (-1%)
* STA. 496+30.00 TO END (-1%)
** STA. 496+30.00 TO END (-1%)



ACCESS ROAD GRADING AT PALM GROVE [TYP. NORTH SIDE ONLY] (3/1)

SCALE: 1"=20'



TEMPORARY CONNECTION TO TOWN CENTER DRIVE
N.T.S.

"WBHP"
STA. 428+19.61 TO STA. 437+41.67

"EBHP"
STA. 426+89.36 TO STA. 437+41.67

N/A
CITY ENGINEER / LAND DEVELOPMENT — DATE

REV	DATE	DESCRIPTION
1	11-6-95	ISSUED FOR GMP
2	12-26-95	ISSUED PER ADDENDUM No. 1
3	2-8-96	REVISED PER NDOT LETTER
4	6-10-96	REVISED PER CCAT LETTER

R.E.C. 6838 — 10/1/96 R.E. NO. — DATE

G.C. WALLACE, INC. Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

HOWARD HUGHES PROPERTIES
HUSITE PARKWAY
TYPICAL SECTIONS

JOB NO. 6320.23

SHEET — OF 31 SHEETS

8/94 DIETERICH-POST 65328

NORTH

MATCH LINE 458+00 SEE SHEET 8

MATCH LINE 472+00 SEE SHEET 10

VILLAGE 1

VILLAGE 3

6'-0" HIGH CHAINLINK FENCE (VINYL COATED) & R/W (TYP.)

IRRIGATION SLEEVE (TYP.) 1/29

"HP" 462+35 BEGIN PALM GROVES

"HP" 467+75 END PALM GROVES

"HP" 466+74.58 P.C.

"WBHP" 466+94.00 BEGIN SUPERELEVATION TRANS.

"WBHP" 467+82.33 P.C. = "HP" 467+84.11 R.O.C. ~ 48.03 LT

"WBHP" 468+50.00 BEGIN FULL SUPERELEVATION

"WBHP" 468+96.90 P.C. = "HP" 470+00 R.O.C. ~ 40.82 LT

S. 48° 00' 00" E.

"WBHP"

"EBHP"

"HP"

460

465

1/12 MEDIAN DRAIN

42.5 TOP MATT. THK.

150 LF ~ 18" R.C.P. @ 0.50% W/ PRECAST END SECTION (1399 D)

LIGHTING SLEEVES 1/6

5-6" CONDUITS PER N.P. CO. DWG. NO. 492-7701

"WBHP" 462+50.00 BEGIN SUPERELEVATION TRANS.

"EBHP" 465+60.83 P.C. = "HP" 465+84.32 P.R.C. ~ 50.00 RT

"EBHP" 466+55.00 BEGIN FULL SUPERELEVATION

"CH" 27+25 DROP STRUCT 1/24

"CH" DROP STRUCT 1/24

"CH" 33+25 DROP STRUCT 1/24

"WBHP" 470+04.82 P.C. = "HP" 470+00 ~ 28.33 RT

HUSITE PARKWAY

PLAN

SCALE: 1" = 40'

CURVE DATA				
NO.	Δ	R	L	T
4	29° 08' 00"	3243.32'	1649.15'	842.81
5	35° 48' 10"	3,000.00'	1874.62'	969.02'
6	29° 00' 00"	2756.68'	1401.70'	716.35'

600' V.C.

1100' V.C.

458+00 53.92 F.G.

459+00 P.I. 53.50 P.I.

462+00 E.V.C. 50.50 F.G.

462+50 B.V.C. 48.00 F.G.

464+50 53.81 F.G.

FIN. GRADE "WBHP" -1.06%

EXIST. GRADE "WBHP"

FIN. GRADE "EBHP" -1.00%

EXIST. GRADE "EBHP"

PROFILE SCALE: HORIZ. 1" = 40' VERT. 1" = 10'

N/A
CIV. CHIEF LAND DEVELOPMENT DATE

REV	DATE	DESCRIPTION
1	1/16/01	ISSUED FOR CMAR
2	1/26/01	REVISED PER ADDENDUM No.1
3	2/12/01	ISSUE FOR CONSTRUCTION
4	2/10/06	REVISED PER CCD LETTER
5	6-7-07	ISSUE PER CCD LETTER

R.E. NO. 6838 DATE 1/16/01

CHRISTOPHER M. CEVARA NEVADA No. 9783 CIVIL

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

SHEET 25 OF 31 SHEETS

JOB NO. 5210-23

CURVE DATA				
NO.	Δ	R	L	T
(5)	3°-48'-10"	9000.00'	1614.62'	363.05'
(7)	06°-40'-09"	3022.00'	351.76'	176.00'
(8)	04°-40'-09"	2278.00'	546.64'	173.52'
(9)	02°-17'-30"	3000.00'	119.99'	60.00'
(10)	02°-17'-30"	3000.00'	119.99'	60.00'

SEE SHEET 13 FOR ENTRY AREA GRADING

MATCH LINE 482+00 SEE SHEET 10

MATCH LINE 498+00 SEE SHEET 12

"WBHP" 482+75 BEGIN SHOULDER TRANS.

"WBHP" 483+75 END SHOULDER TRANS.

6'-0" HIGH CHAIN LINK FENCE (VINYL COATED) ℄ R/W (TYP.)

"WBHP" 485+15 BEGIN WALL & BARRIER RAIL END SHOULDER TRANS. 46' LT.

"WBHP" 484+15 END FENCE

"WBHP" 484+85 END FULL SUPER

"WBHP" 485+49.20 P.T.

"WBHP" 485+49.20 P.T. - BACK = "WBHP" 485+49.29 P.T. - AHEAD

"WBHP" 486+63.75 END SUPER TRANS.

"WBHP" 487+63.75 BEGIN SUPER TRANS.

"WBHP" 489+09.20 P.C.

"WBHP" 489+29.20 END WALL & BARRIER RAIL

18" RCP W/END SECTION

"WBHP" 491+29 END SHOULDER TRANS.

"WBHP" 491+29 BEGIN SHOULDER TRANS. 44' LT.

"WBHP" 482+00 P.C.C. ~ 22' LT.

"EBHP" 482+00 P.C.C. ~ 22' LT.

"EBHP" 482+15.97 BEGIN BARRIER RAIL

6'-0" HIGH CHAIN LINK FENCE (VINYL COATED)

20' MIN.

RIPRAP

"EBHP" 482+77 END FULL SUPER

"EBHP" 484+77 END FULL SUPER

"EBHP" 485+49.20 P.T. - BACK = "EBHP" 485+49.29 P.T. - AHEAD

"EBHP" 487+50 END WALL & BARRIER RAIL

"EBHP" 488+66.41 END SUPER ELEV. TRANS.

"EBHP" 488+09.20 P.C.

"EBHP" 490+29.19 P.T. = "HP" 490+29.19 P.T. 24.40' RT.

"EBHP" 491+29 BEGIN SHOULDER TRANS. 24' RT.

"HP" 485+49.20 P.T.

"HP" 485+09.20 P.C.

"HP" 491+29 END SHOULDER TRANS. 24' LT.

℄ R.C.B. CULVERT, SEE SHT. 21 & 22

35° SKEW

45° SKEW

MEDIAN DRAIN

2-4" PIPES = 35' LF SEE IRRIGATION PIPE PROFILE

S. 89°48'10" E.

S. 86°05'40" E

S. 83°48'10" E.

S. 81°30'39" E.

485

490

BARRIER RAIL (TYP.) SEE DTL.

PAVEMENT (TYP.) SEE TYP. SEC. SHEET 14.

MSW SIGNS SEE DETAIL A 14

GUARD RAIL (TYP.) SEE DTL. 19 20

FUTURE ON-RAMP

FUTURE OFF-RAMP

IRRIATION SLEEVE (TYP.) 1/29

EDGE OF GRADING AND FUTURE EDGE OF PAVEMENT

6' CHAIN LINK FENCE (VINYL COATED) AND FUTURE R/W

SEE SHEET 13 FOR ACCESS ROAD DETAILS

TRANSITION FRONT 4% SLOPE TO 2:1 SLOPE

4:1 SLOPE

SLOPE VARIES

MATCH EXISTING

VILLAGE 5

VILLAGE 4

R/W

SCALE: 1" = 40'

℄ BIKE PATH

FIN. GRADE "WBHP"

EXIST. GRADE "WBHP"

FIN. GRADE "EBHP"

EXIST. GRADE "EBHP"

-0.97% 600' V.C. 1300' V.C.

IDENTICAL POINT

℄ R.C.B. CULVERT

SCALE: HORIZ.: 1" = 40'
VERT.: 1" = 10'

REV	DATE	DESCRIPTION
1	8/1/08	ISSUED PER G.C.W. LETTER
2	11/14/07	ISSUED FOR GMP
3	12/20/07	ISSUED PER ADDENDUM No. 1
4	2/27/08	ISSUED FOR CONSTRUCTION
5	5/14/08	ISSUED PER G.C.W. LETTER
6	6/10/08	REVISED TRAIL ROAD LETTERING

STATE OF NEVADA — REGISTERED ENGINEER — CIVIL — No. 9634

R.C.E. No. 9634 — 6/30/08 — EXPIRES 6/30/08

G.C. WALLACE, INC. Engineering/Architecture 1555 SOUTH RAINBOW BLVD., LAS VEGAS, NEVADA 89102

SHEET 11 OF 31 SHEETS

JOB NO. 2320.202

N/A — CLV CHIEF, LAND DEVELOPMENT — DATE

SEE SHEET 13 FOR ENTRY AREA GRADING

ON-SITE HUSITE PKWY. | OFF-SITE HUSITE PKWY.

VILLAGE 1

VILLAGE 3

MATCH LINE 294+00.00 SEE SHEET 3.1

"WBHP" 494+95 BEGIN SUPER TRANS.

"WBHP" 496+09.42 P.C. = 496+08.92 ~ "HP" 47.60' LT.

"WBHP" 496+30 BEGIN FULL SUPER

"EBHP" 494+95 BEGIN SUPER TRANS.

"EBHP" 496+09.42 P.C. = 496+08.92 ~ "HP" 47.60' RT.

"EBHP" 496+30 BEGIN FULL SUPER

END PROJECT "WBHP" 497+00.52 = "WBHP" 497+00.00 ~ 0.52' LT. EQUATION: "WBHP" 497+25.41 PT. BACK = "WBHP" 497+26.89 PT. AHEAD

END PROJECT "EBHP" 497+00.52 = "EBHP" 497+00.00 ~ 0.52' RT. EQUATION: "EBHP" 497+25.41 PT. BACK = "EBHP" 497+26.89 PT. AHEAD

S. 86° 05' 40" E.

S. 83° 48' 10" E.

S. 81° 30' 40" E.

"WBHP" "HP" "EBHP"

495 496 497 498 499 500

100+00.00

493+78.86

EL CAPITAN WAY

ANGEL PARK

ANGEL PARK

HUSITE PARKWAY

NORTH

CURVE DATA				
NO.	Δ	R.	L.	T
(11)	02° 17' 30"	3,000.00'	119.99'	60.00'
(12)	02° 17' 30"	3,000.00'	119.99'	60.00'

PLAN
SCALE: 1" = 40'

TURTLE-BACK GRATE & FRAME "NEENAH" R-4360-B OR APPROVED EQUAL (BOLTED DOWN)

℄ GRATE

CONCRETE COLLAR

(2) #4 REBARS ALL AROUND LAP 12" (MIN.)

18" RCP

PLAN - MEDIAN DRAIN (2)
N.T.S.

3" CLR. (TYP.)

TOP OF KERB CONCRETE OR PAVING

(2) #4 REBARS ALL AROUND LAP 12" (MIN.)

CONCRETE COLLAR

90° RCP ELBOW

℄ FLOW LINE OF PAVING

18" RCP

18" RCP

* RCP 'T' SECTION TYP. AT STATION 496+60 (ONLY)

DETAIL - MEDIAN DRAIN (1)
N.T.S.

ON-SITE HUSITE PKWY. | OFF-SITE HUSITE PKWY.

FIN. GRADE "WBHP"

EXIST. GRADE "WBHP"

1300' V.C.

FIN. GRADE "EBHP"

EXIST. GRADE "EBHP"

1300' V.C.

2690 2680 2690 2680

494+00 84.18 P.G.

494+00 84.18 P.G.

497+00.52 80.95 P.G.

EQUATION: "WBHP" 497+25.41 PT. BACK = "WBHP" 497+26.89 PT. AHEAD

EQUATION: "EBHP" 497+25.41 PT. BACK = "EBHP" 497+26.89 PT. AHEAD

497+00 80.00 P.G.

497+00 P.I. 80.50 P.G.

497+00 P.I. 80.50 P.G.

-3.41%

-3.41%

495 496 497 498 499 500+00 501

PROFILE
SCALE: HORIZ. 1" = 40'
VERT. 1" = 10'

REV	DATE	DESCRIPTION
1	11/16/01	ISSUED FOR GLOW INFO.
2	12/6/01	ISSUED FOR CONSTRUCTION
3	8/5/02	ISSUE PER G.C.W. LETTER

8358 R.E. NO. 9/4/02 DATE

P.E. CERTIFICATE NO. 7969 STATE OF NEVADA CHRISTOPHER G. WALLACE CIVIL

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

HOWARD HUGHES PROPERTIES
HUSITE PARKWAY
PLAN & PROFILE
STA. 493+78.86 TO STA. 500+00
DETAILS

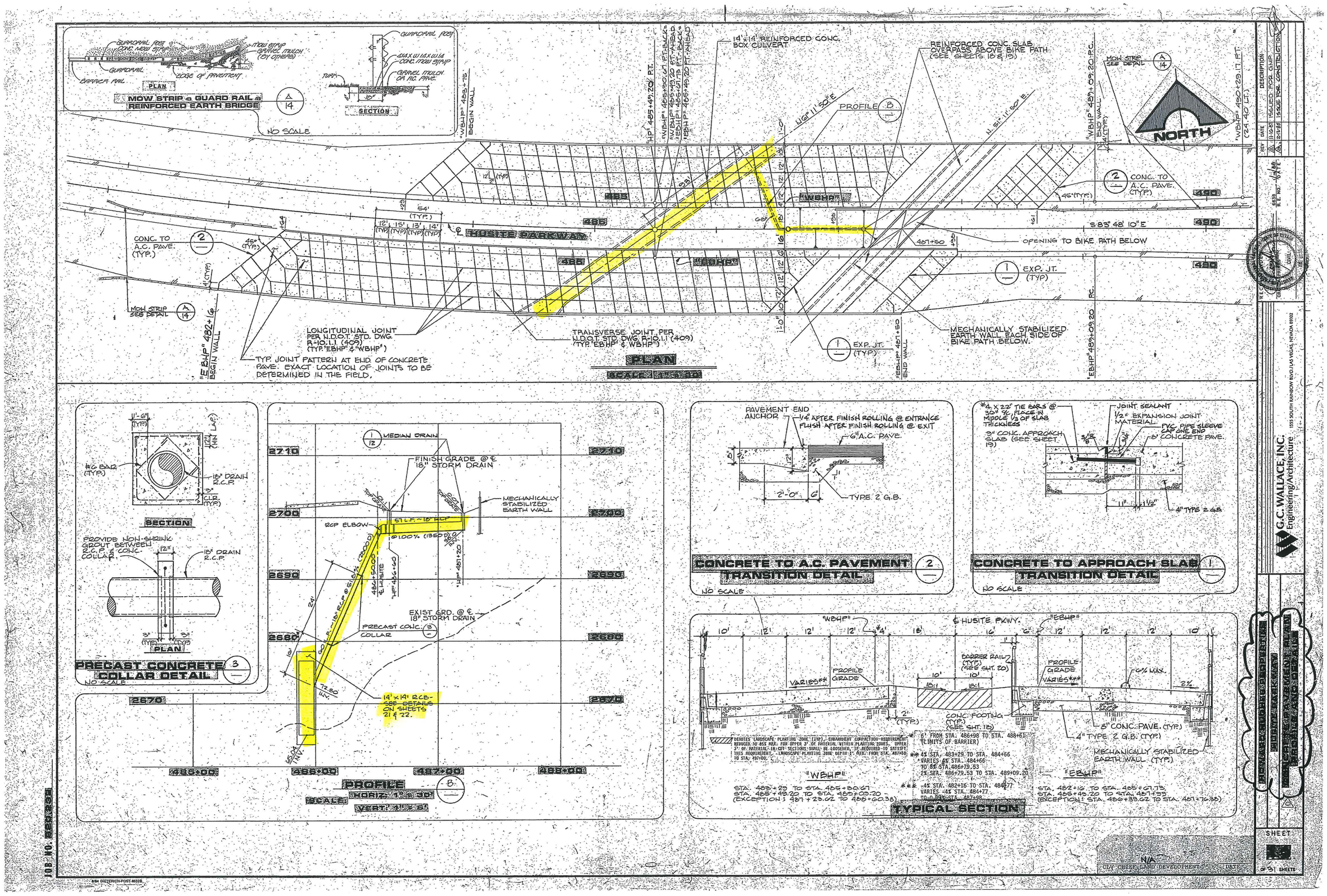
SHEET 12 OF 23 SHEETS

JOB NO. 8221232

N/A
CLV. CHIEF, LAND DEVELOPMENT

DATE

8/94 DIETERICH-POST 6032B

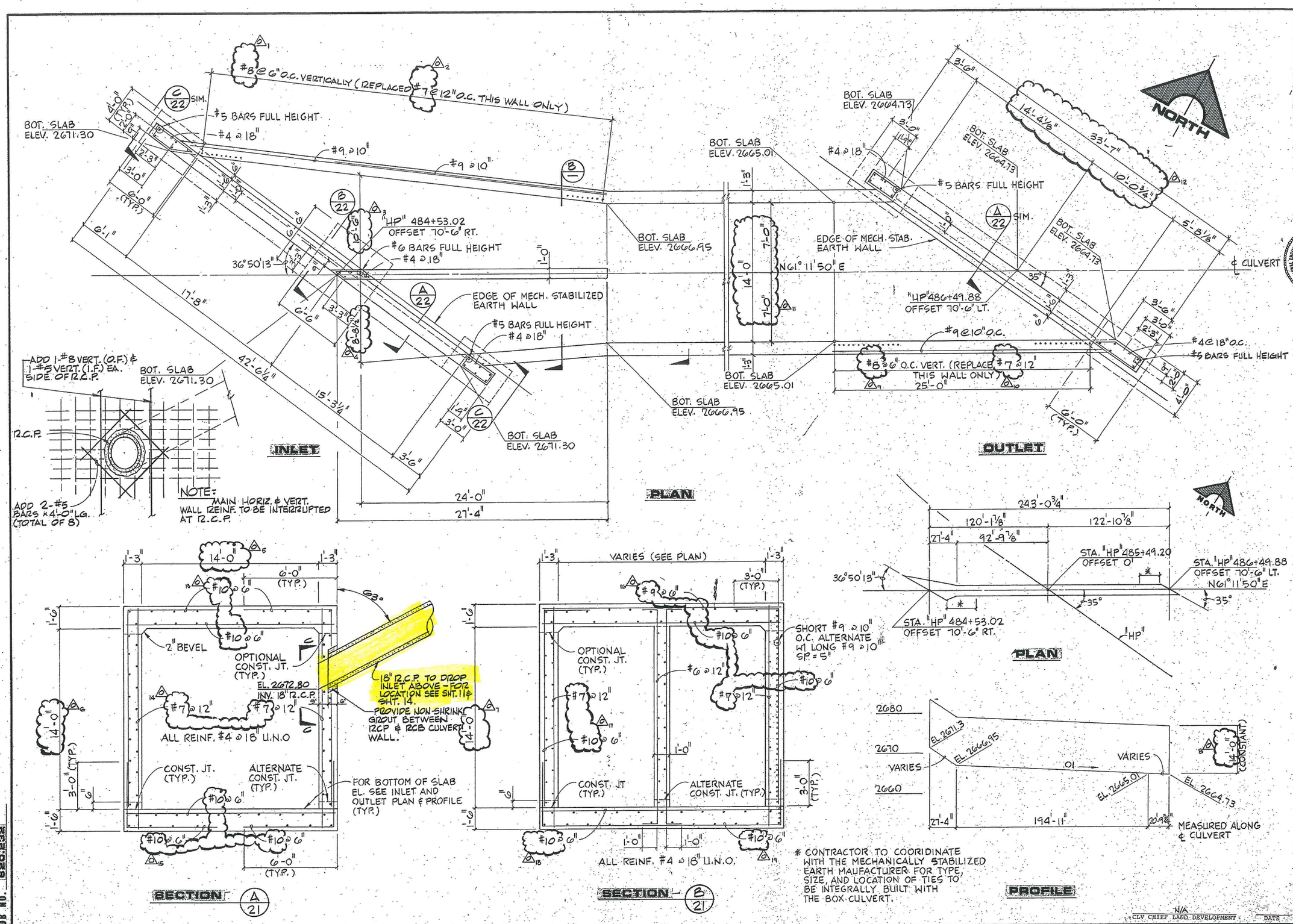


G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

SHEET
OF 31 SHEETS

N/A
CLV CHIEF LAND DEVELOPMENT DATE

JOB NO. 820.232



* CONTRACTOR TO COORIDINATE WITH THE MECHANICALLY STABILIZED EARTH MAUFACTURER FOR TYPE, SIZE, AND LOCATION OF TIES TO BE INTEGRALLY BUILT WITH THE BOX CULVERT.

REV	DATE	DESCRIPTION
A	11-16-87	ISSUED FOR GMP
B	2-12-88	ISSUE FOR CONSTRUCTION

6838 R.E. NO. 11/16/88 DATE

RECOMMENDED CRAIG A. SIMMONS CIVIL NO. 6838 REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA

G.C. WALLACE, INC. Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

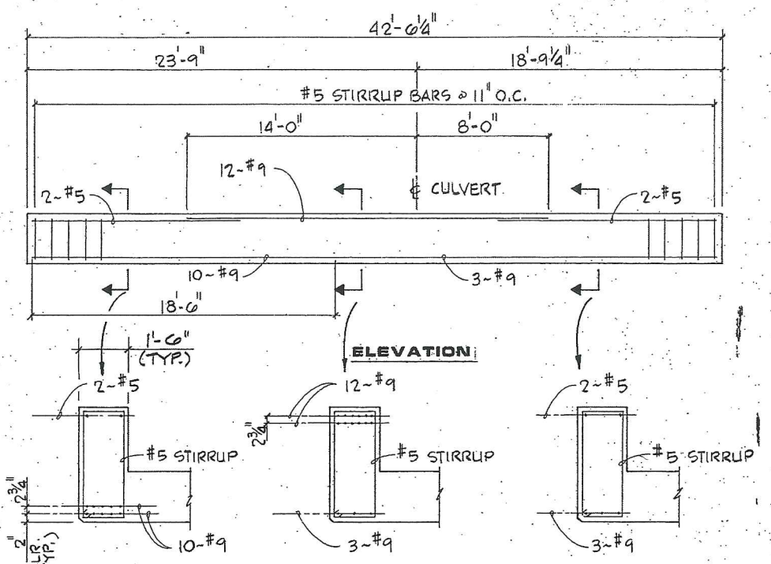
HOWARD HUGHES PROPERTIES
HUSITE PARKWAY
REINFORCED CONCRETE BOX CULVERT AT "HP" STA. 485+49.20

SHEET 21 OF 31 SHEETS

N/A CLV CHIEF LAND DEVELOPMENT DATE

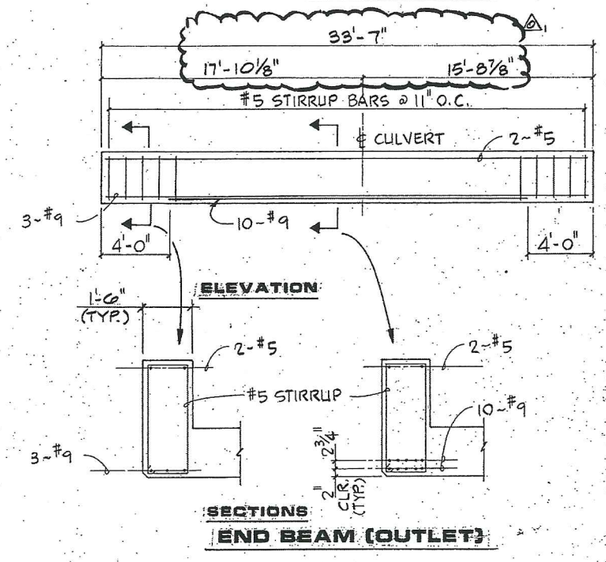
JOB NO. 620.232

8/84 DIETERICH-POST 6532B



SECTIONS

END BEAM (INLET)



SECTIONS

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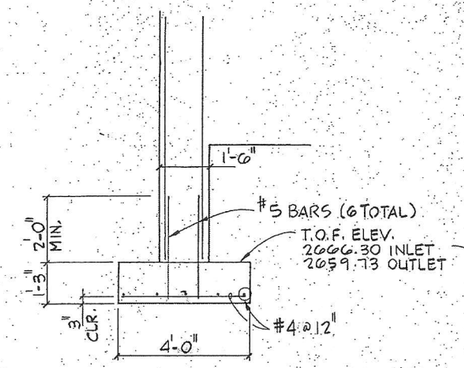
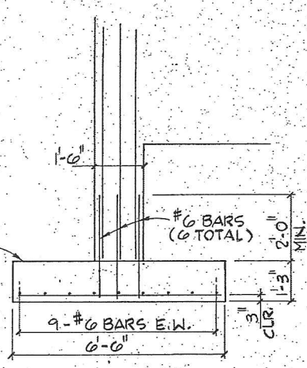


SECTION C 22 21



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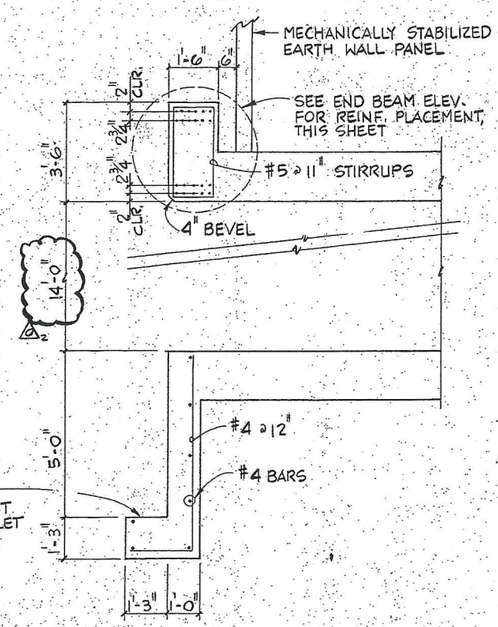


SECTION A 22 21

REV	DATE	DESCRIPTION
1	11-16-01	ISSUED FOR GMP
2	12-12-01	ISSUED FOR CONSTRUCTION

R.E. CURRAN, STATE OF NEVADA, No. 6538, DONALD A. THOMAS, CIVIL, CERTIFICATE OF AUTHORITY NO. 1328

REG. NO. 6538 DATE 11/16/01

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89102

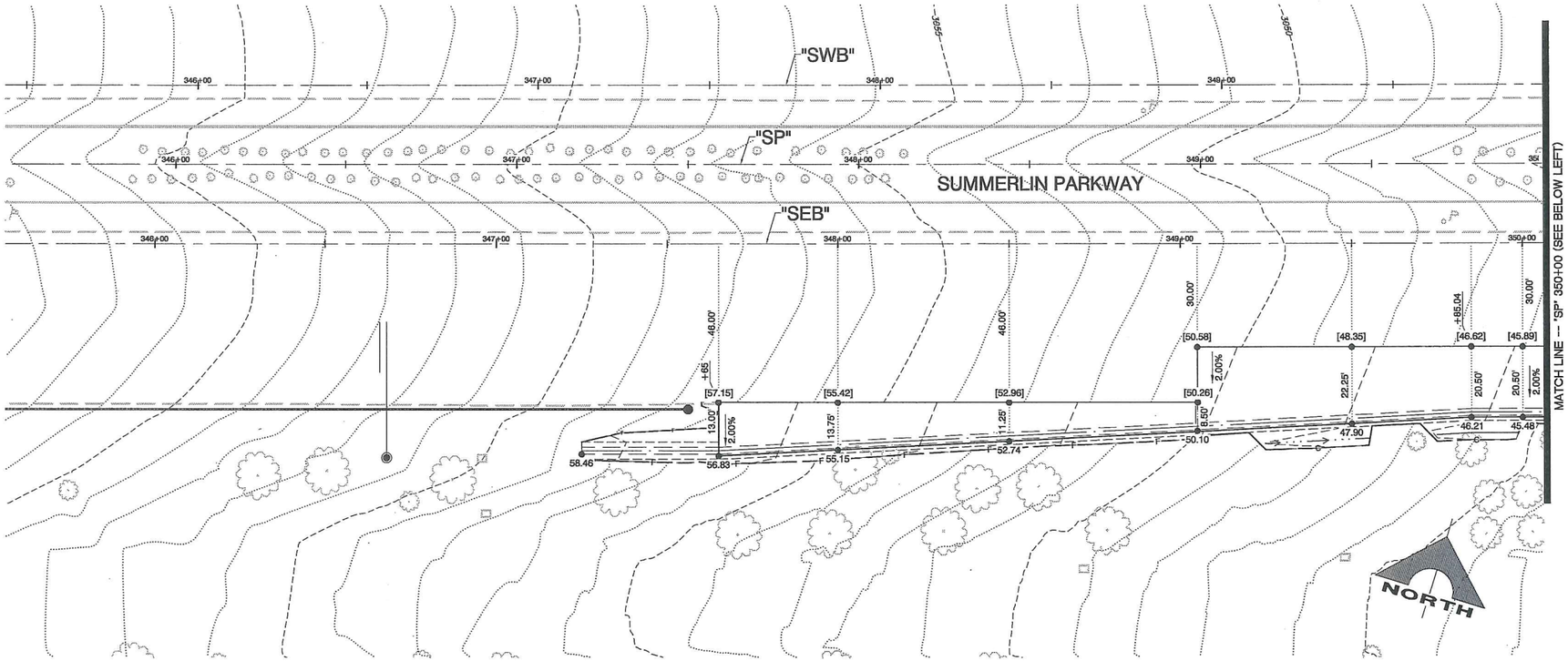
HOWARD HUGHES PROPERTIES
HUSITE PARKWAY
REINFORCED CONCRETE BOX CULVERT
SECTIONS & DETAILS

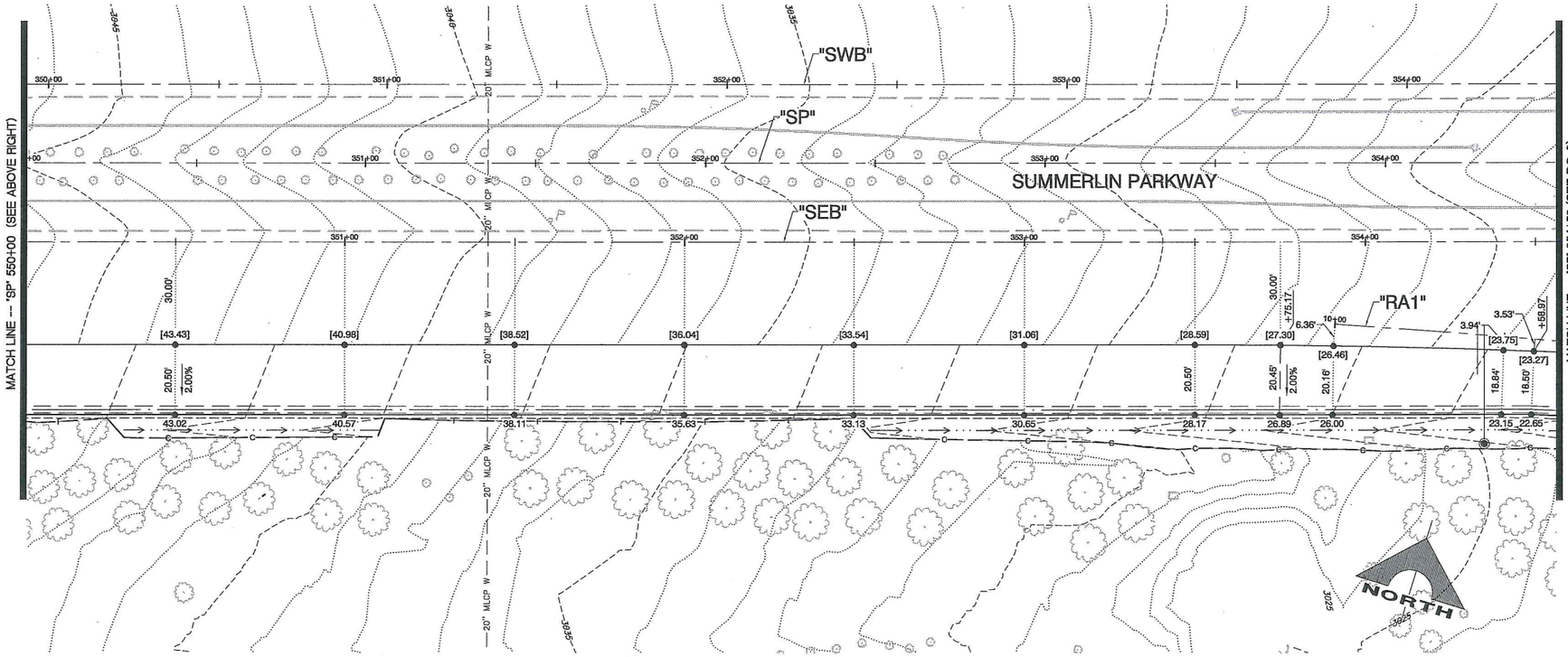
SHEET 22 OF 31 SHEETS

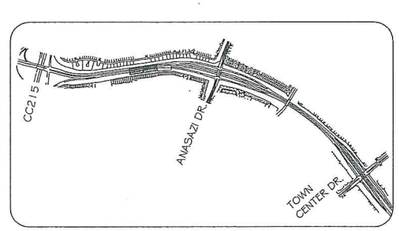
N/A
CLV. CHIEF, LAND DEVELOPMENT DATE

JOB NO. 520.232

8/84 DIETERICH-POST 6532B







20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.

NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEER'S SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG
DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

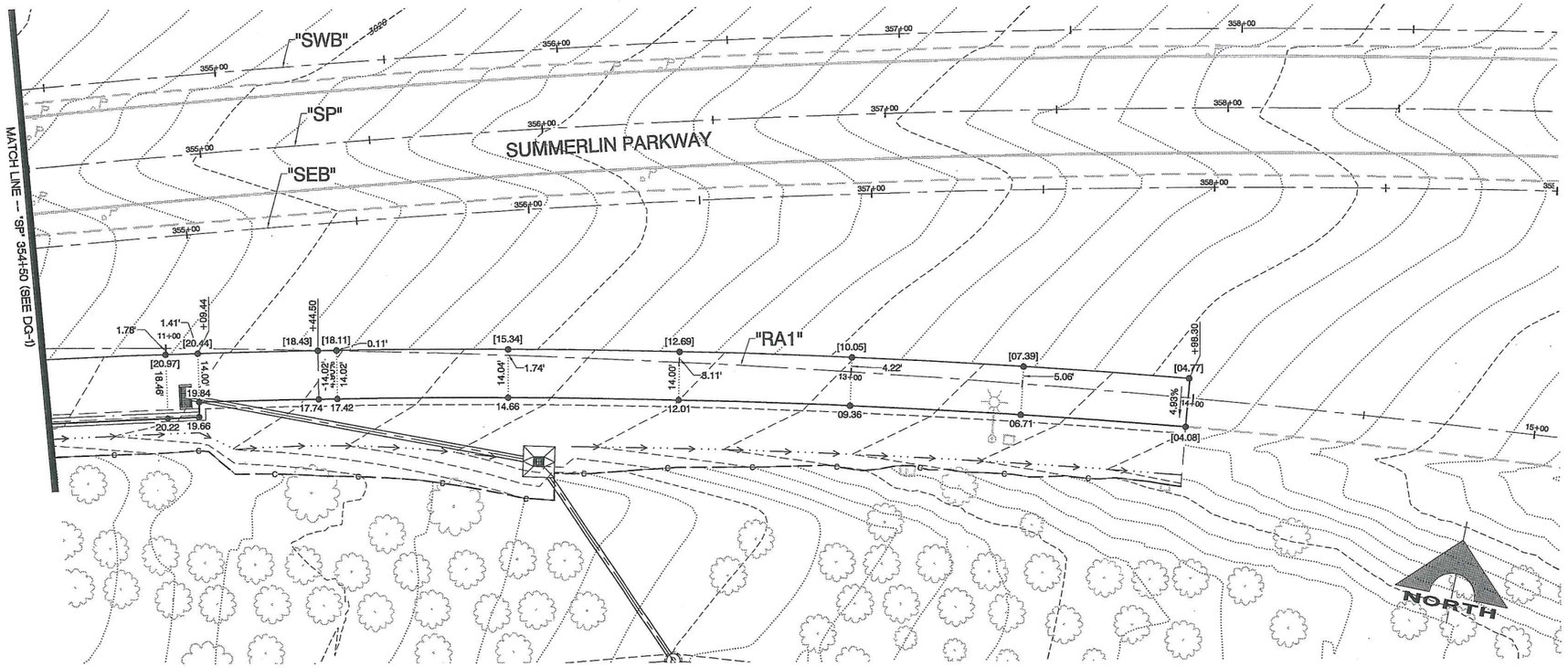
TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAIL GRADING PLANS
"SP" 345+50 TO "SP" 354+50

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-1
26 OF 85
DRAWING NO.
XXXX

12/1/2016 8:47 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54648-C-06-DG.DWG TRAVIS DE GROOT



SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

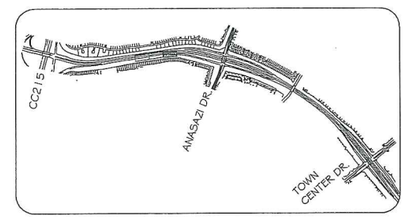
RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: F.J.G
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: T.J.C | CHECKED BY: J.R.T

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 554+50 TO "SP" 359+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-2
27 OF 85
DRAWING NO.
XXXX

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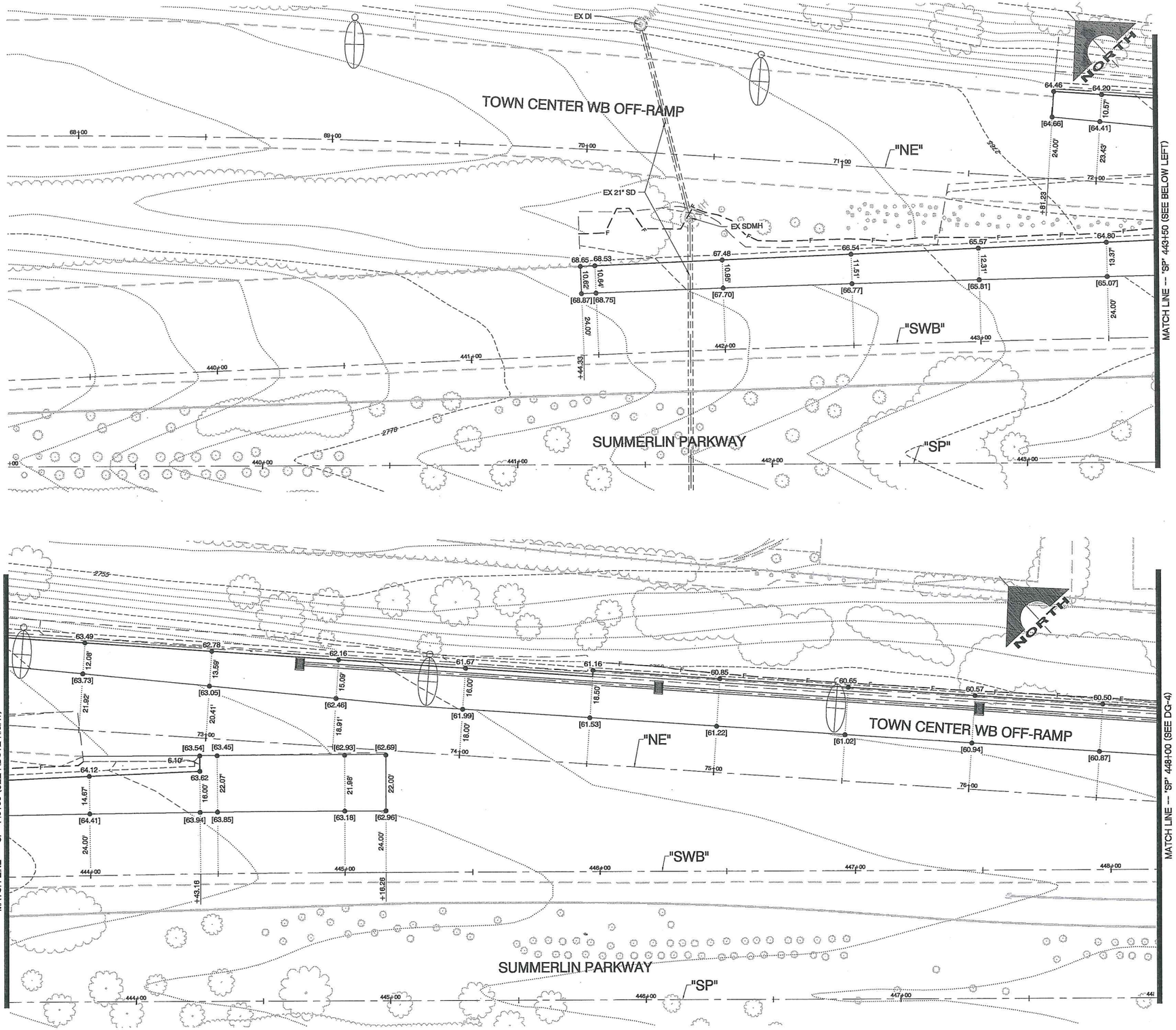


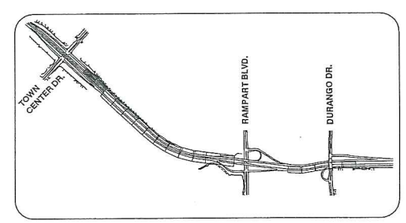
CALL BEFORE CONSTRUCTION ⚠		
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2029

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEER'S SURVEYORS

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: **90% SUBMITTAL** | DRAWN BY: TJC | CHECKED BY: JRT

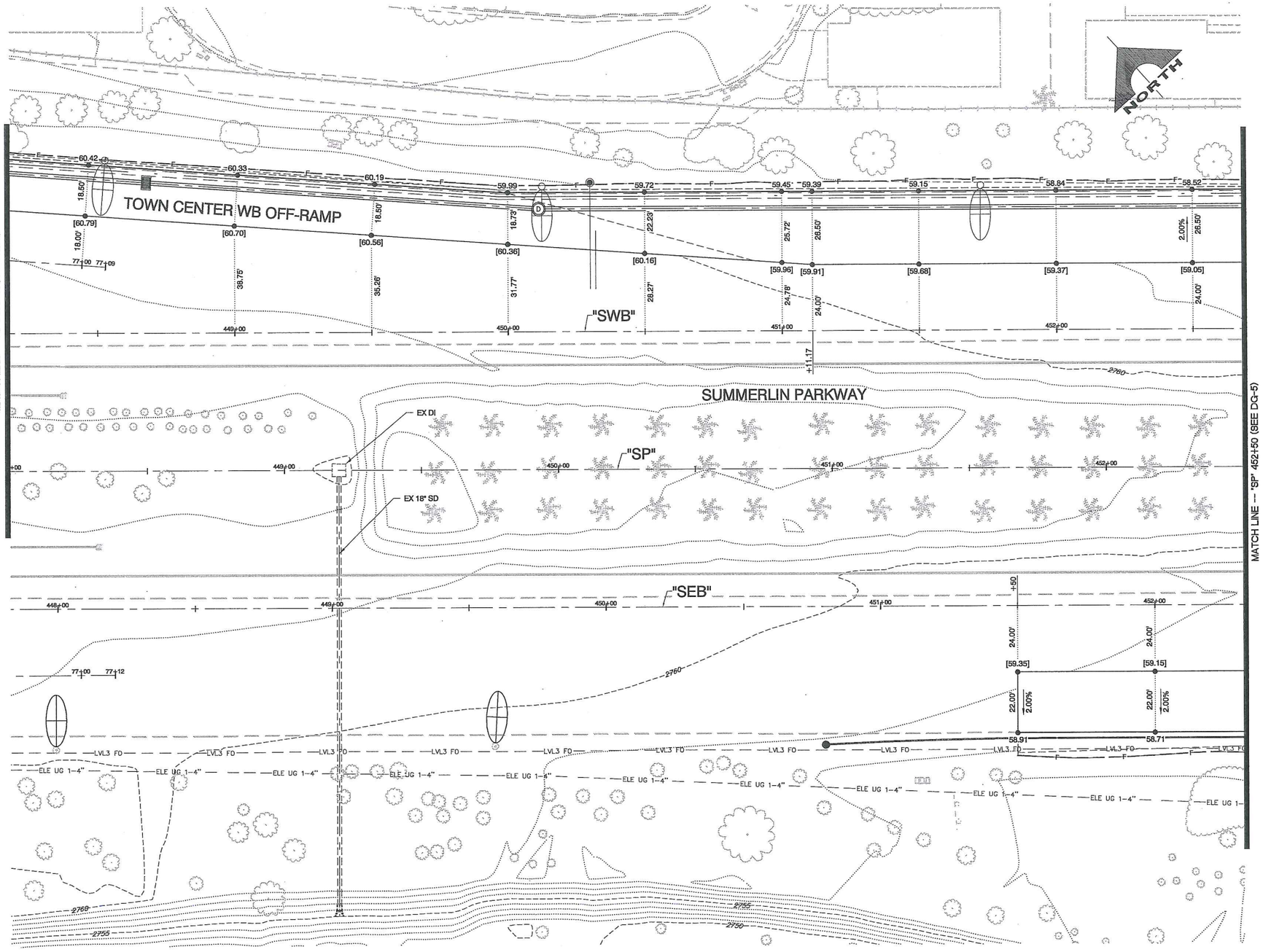
TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 439+00 TO "SP" 448+00

PROFESSIONAL ENGINEER — STATE OF NEVADA — JOHN R. TOBIN — No. 8150 — CIVIL — EXP. 05/30/2018
12/1/16

SHEET
DG-3
28 OF 85
DRAWING NO.
XXXX

12/1/2016 1:33 PM F:\PROJECTS\400\412-65B\DWG\PRODUCTION\H54648-C-06-DG.DWG TIM CLARK



20	0	20	40
SCALE			FEET

CALL BEFORE CONSTRUCTION ⚠

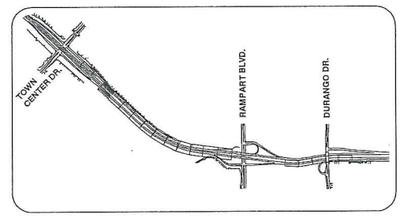
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056	BID# 16.67056	DESIGNED BY:	FJG
DATE: 12/1/2016		DRAWN BY:	TJC
SUBMITTAL STAGE: 90% SUBMITTAL		CHECKED BY:	JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 448+00 TO "SP" 452+50

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. JOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-4
29 OF 85

DRAWING NO.
XXXX

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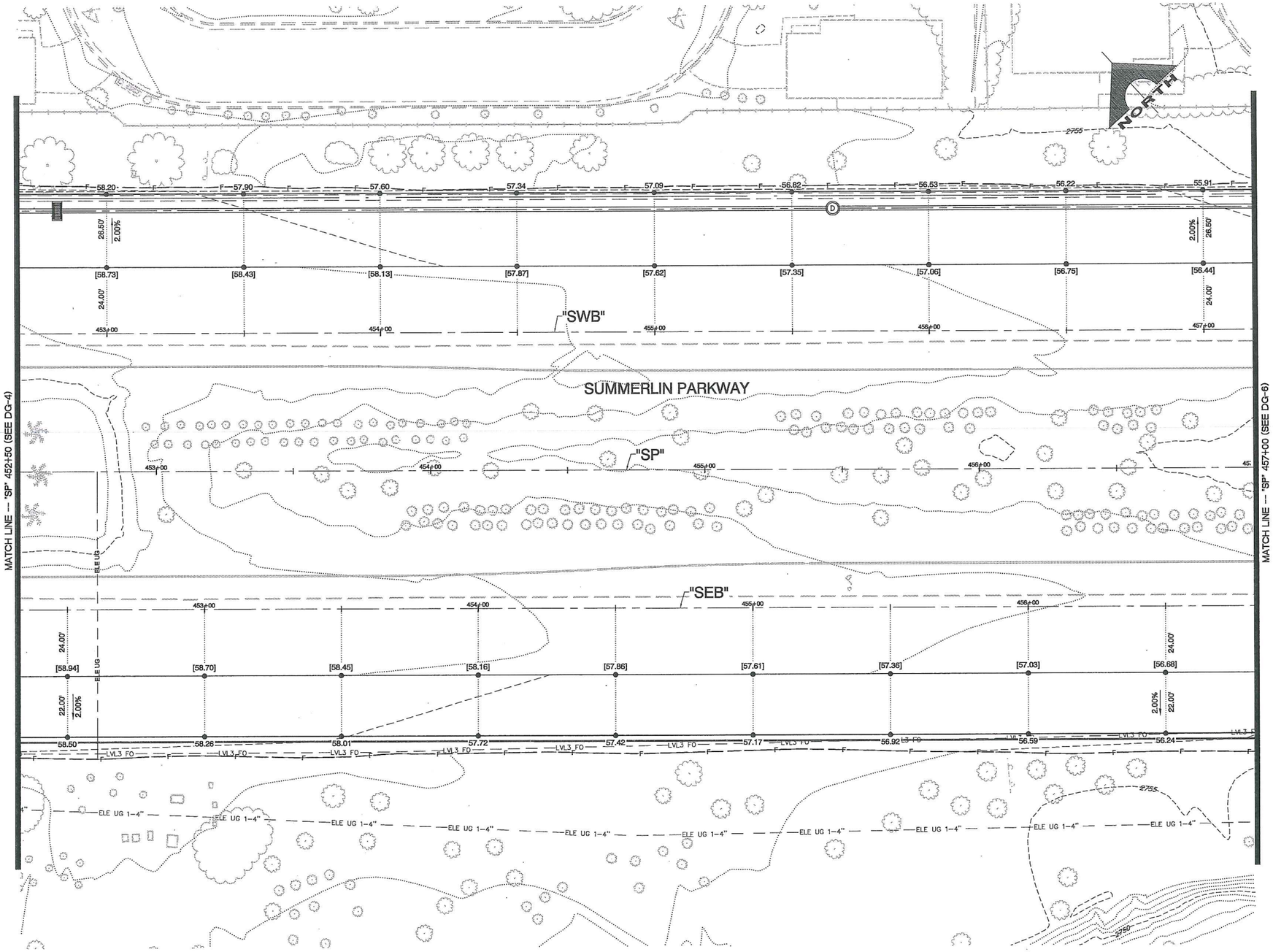


SCALE 20 0 20 40 FEET

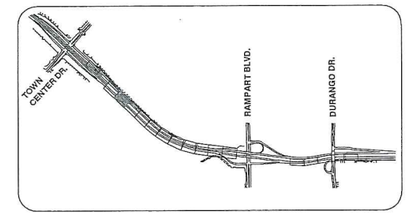
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: F-G | DRAWN BY: T-C | CHECKED BY: JRT
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 452+50 TO "SP" 457+00

PROFESSIONAL ENGINEER
STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-5
30 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

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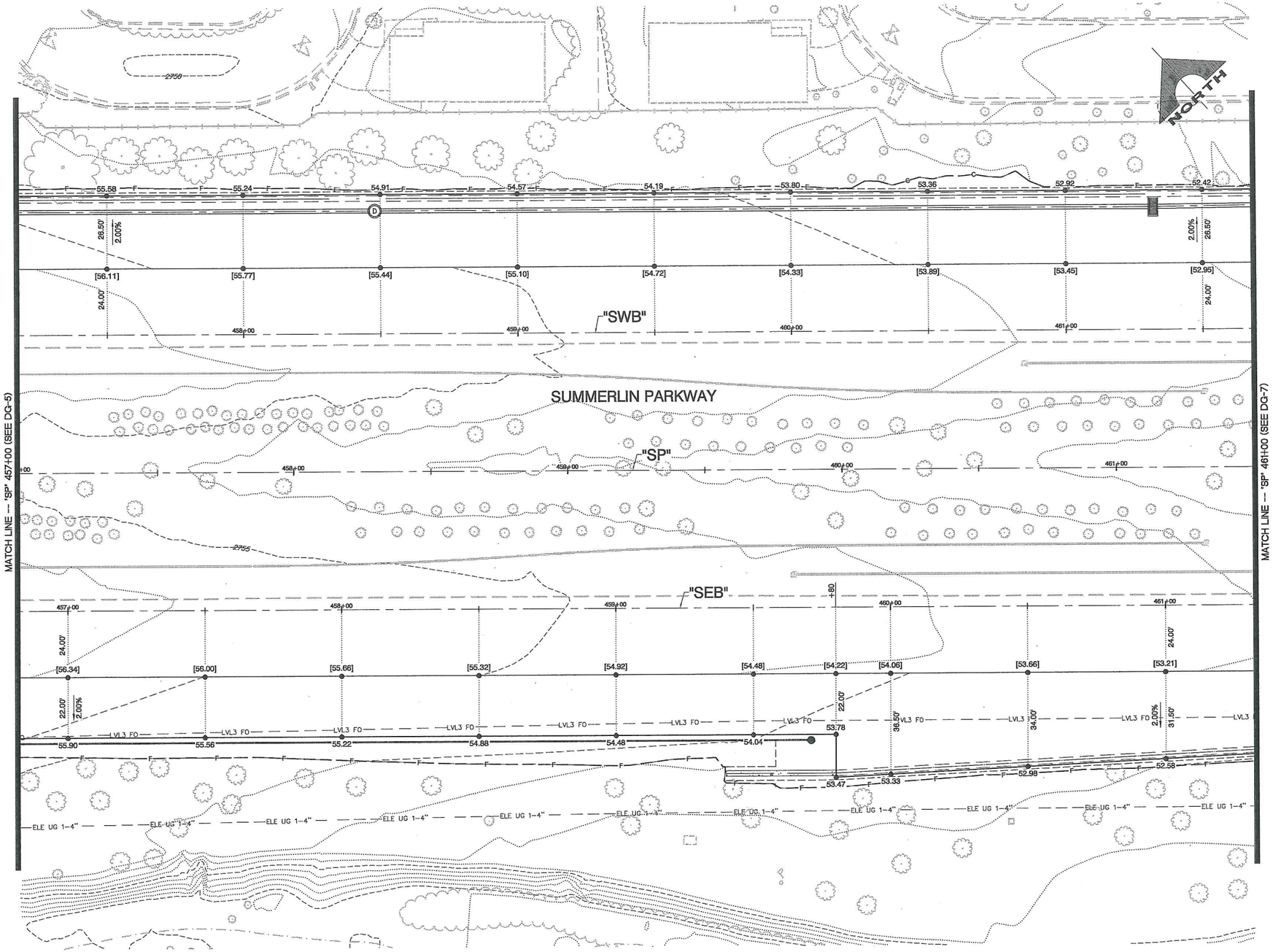


SCALE 20 0 20 40 FEET

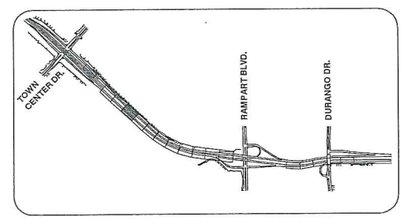
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
----	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG | DRAWN BY: TJC | CHECKED BY: JRT
SUBMITTAL STAGE: **90% SUBMITTAL**

TITLE: **SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3**

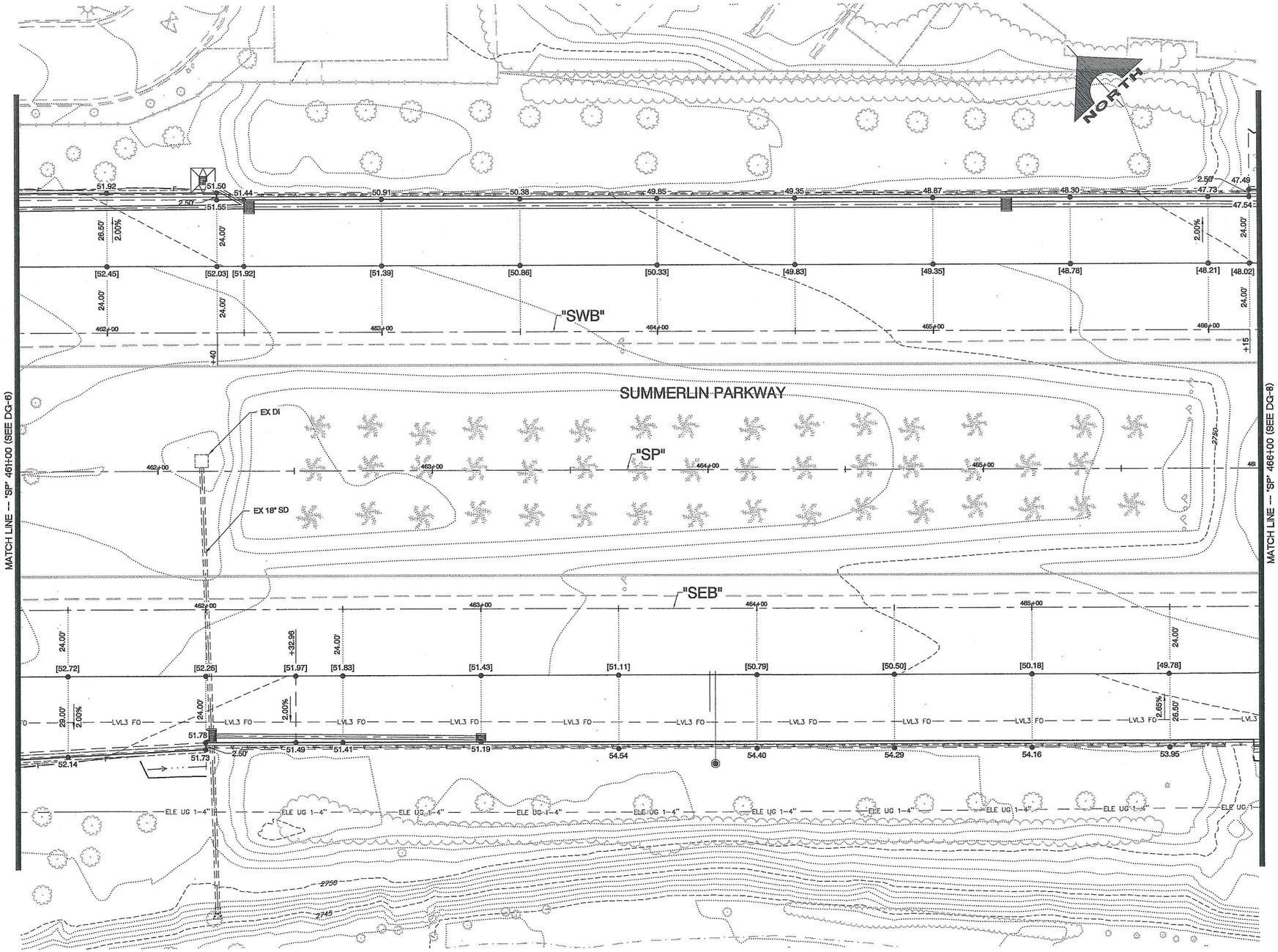
SHEET: **DETAILED GRADING PLANS 'SP" 457+00 TO "SP" 461+00**

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 05/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-6
31 OF 85
DRAWING NO.
XXXX

12/1/2016 8:49 AM P:\PROJECTS\400\412.658\DWG\PRODUCTION\H54648-C-06-DG.DWG TRAVIS DE GROOT



20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION

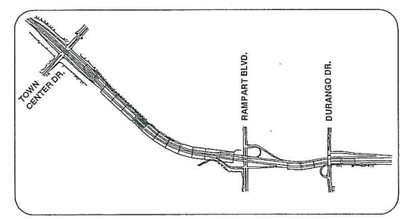
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
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F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

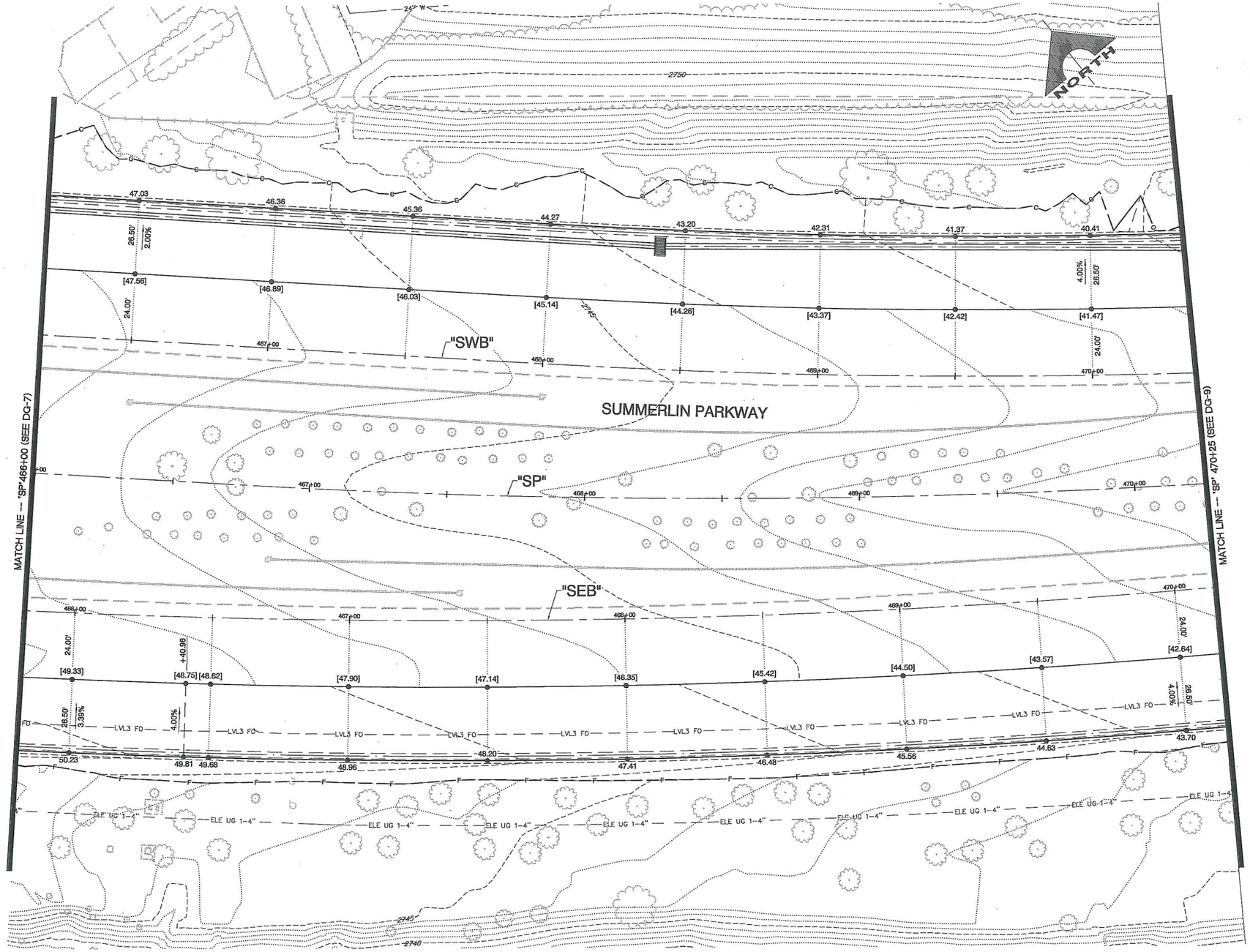
SHEET
DETAILED GRADING PLANS
"SP" 461+00 TO "SP" 466+00

PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
STATE OF NEVADA
12/1/16

SHEET
DG-7
32 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:49 AM F:\PROJECTS\400\412-65B\DWG\PRODUCTION\H54648-C-08-DG.DWG TRAVIS DE GROOT



20 0 20 40
SCALE FEET

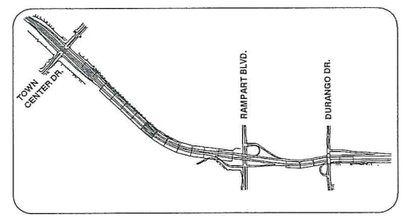
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
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F: 702.804.2299
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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: F.JG | DRAWN BY: T.JC | CHECKED BY: JRT

DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

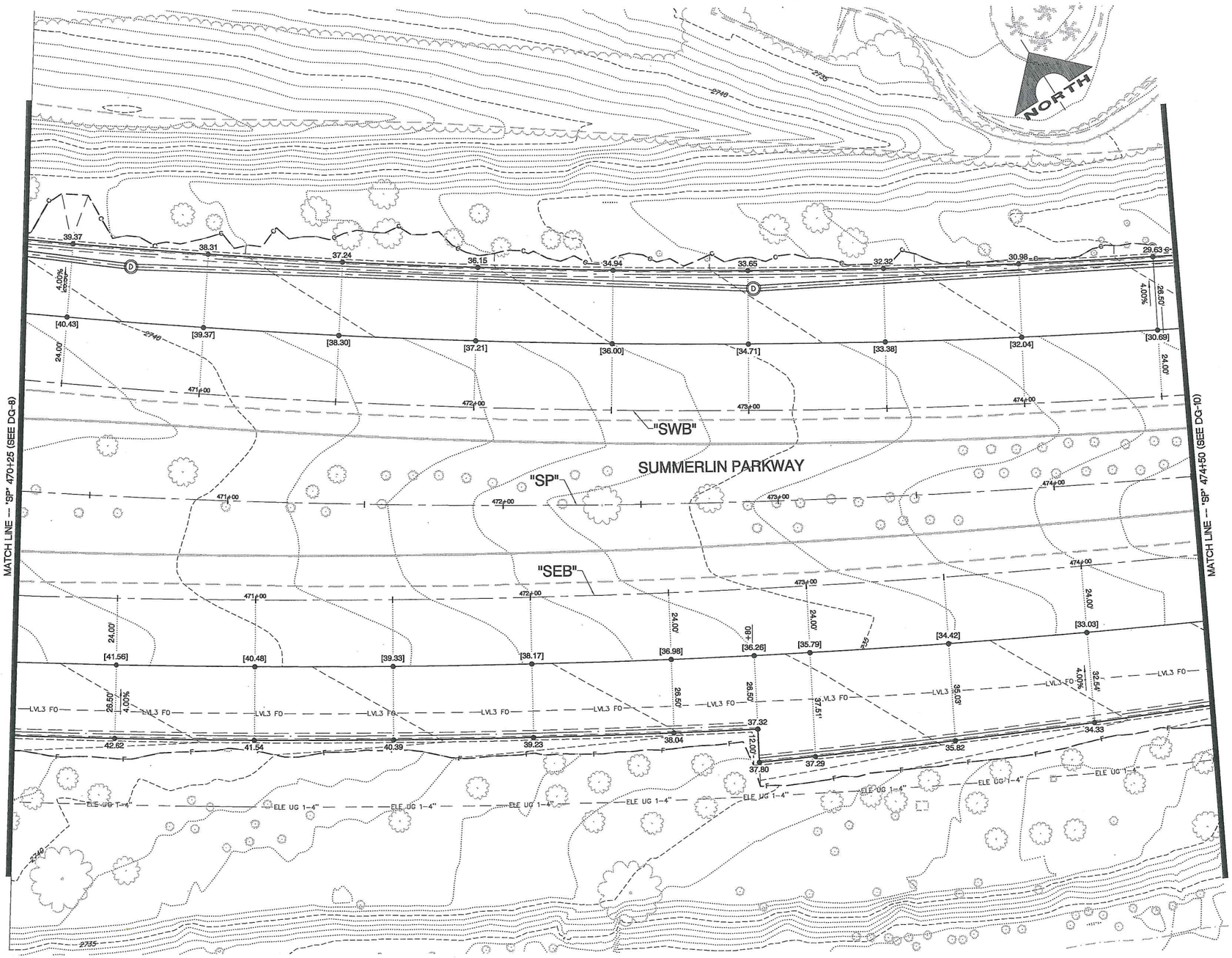
SHEET
DETAILED GRADING PLANS
"SP" 466+00 TO "SP" 470+25

PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
STATE OF NEVADA
12/1/16

SHEET
DG-8
33 OF 85

DRAWING NO.
XXXX

12/1/2016 8:49 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H546498-C-06-DG.DWG TRAVIS DE GROOT



20 0 20 40
SCALE FEET

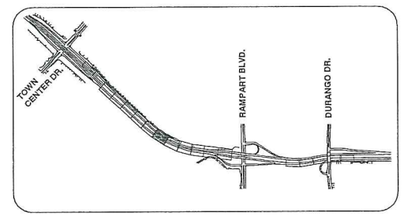
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
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F: 702.804.2299
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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 470+25 TO "SP" 474+50

PROFESSIONAL ENGINEER — STATE OF NEVADA
JOHN R. ROBIN
Exp. 05/31/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-9
34 OF 85
DRAWING NO.
XXXX

12/1/2016 8:50 AM P:\PROJECTS\4000\412-558\DWG\PRODUCTION\#56648-C-06-DG.DWG TRAVIS DE GROOT

SCALE 20 0 20 40 FEET

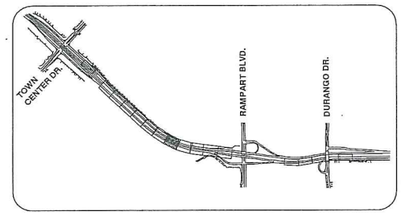
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
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1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: F.JG
DATE: 12/1/2016 | DRAWN BY: T.JC
SUBMITTAL STAGE: 90% SUBMITTAL | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 474+50 TO "SP" 479+00

PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
STATE OF NEVADA
12/1/16

SHEET
DG-10
35 OF 85

DRAWING NO.
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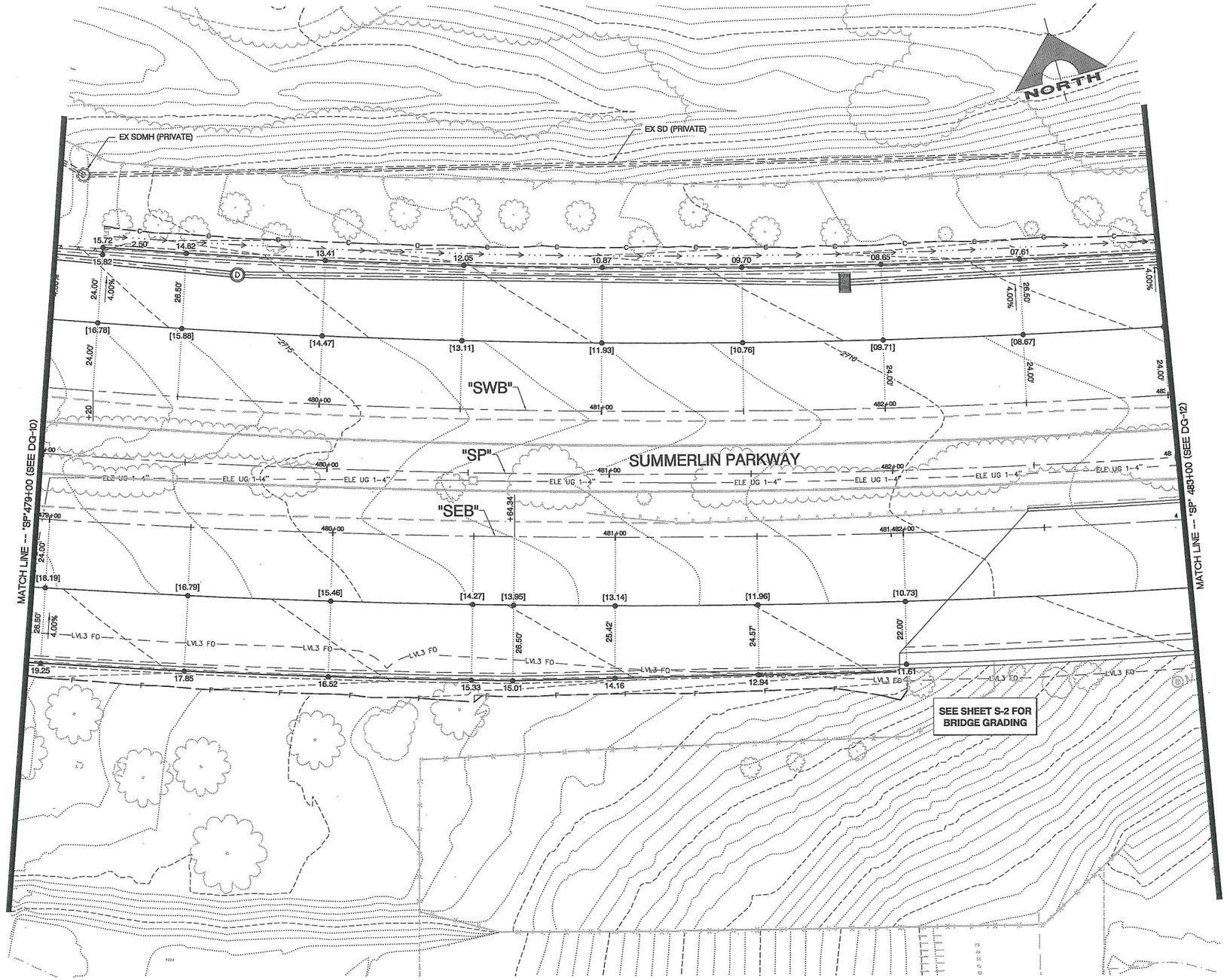


SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

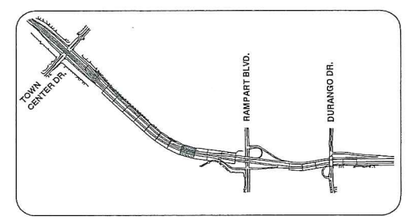
RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
ENGINEERS \ SURVEYORS
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LAS VEGAS, NV 89146
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F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 479+00 TO "SP" 483+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-11
36 OF 85

DRAWING NO.
XXXX

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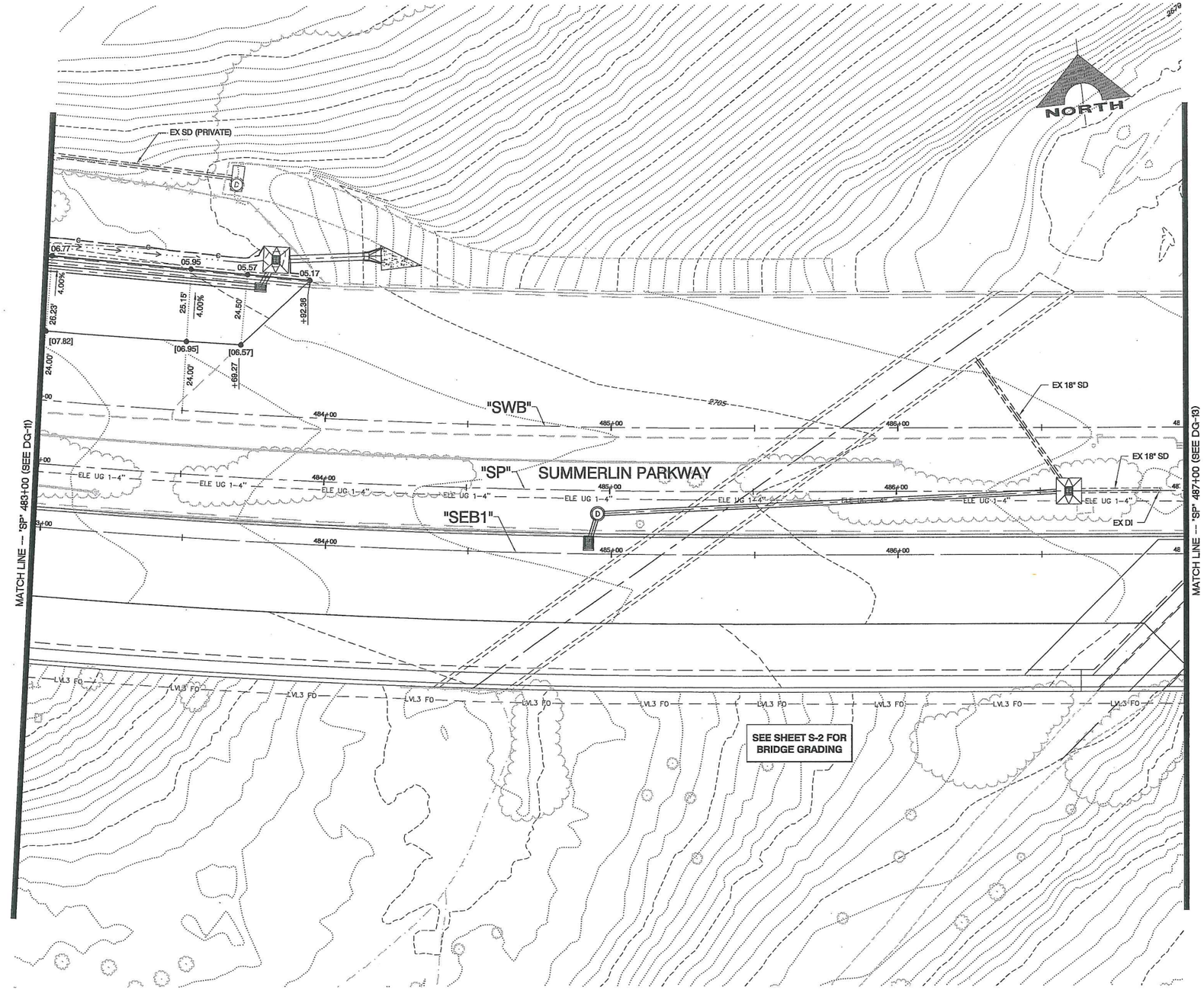


20 0 20 40
SCALE FEET

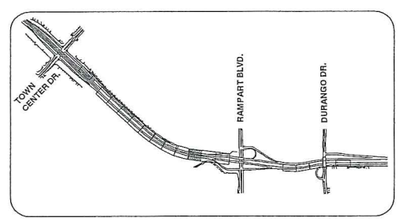
CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2288
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

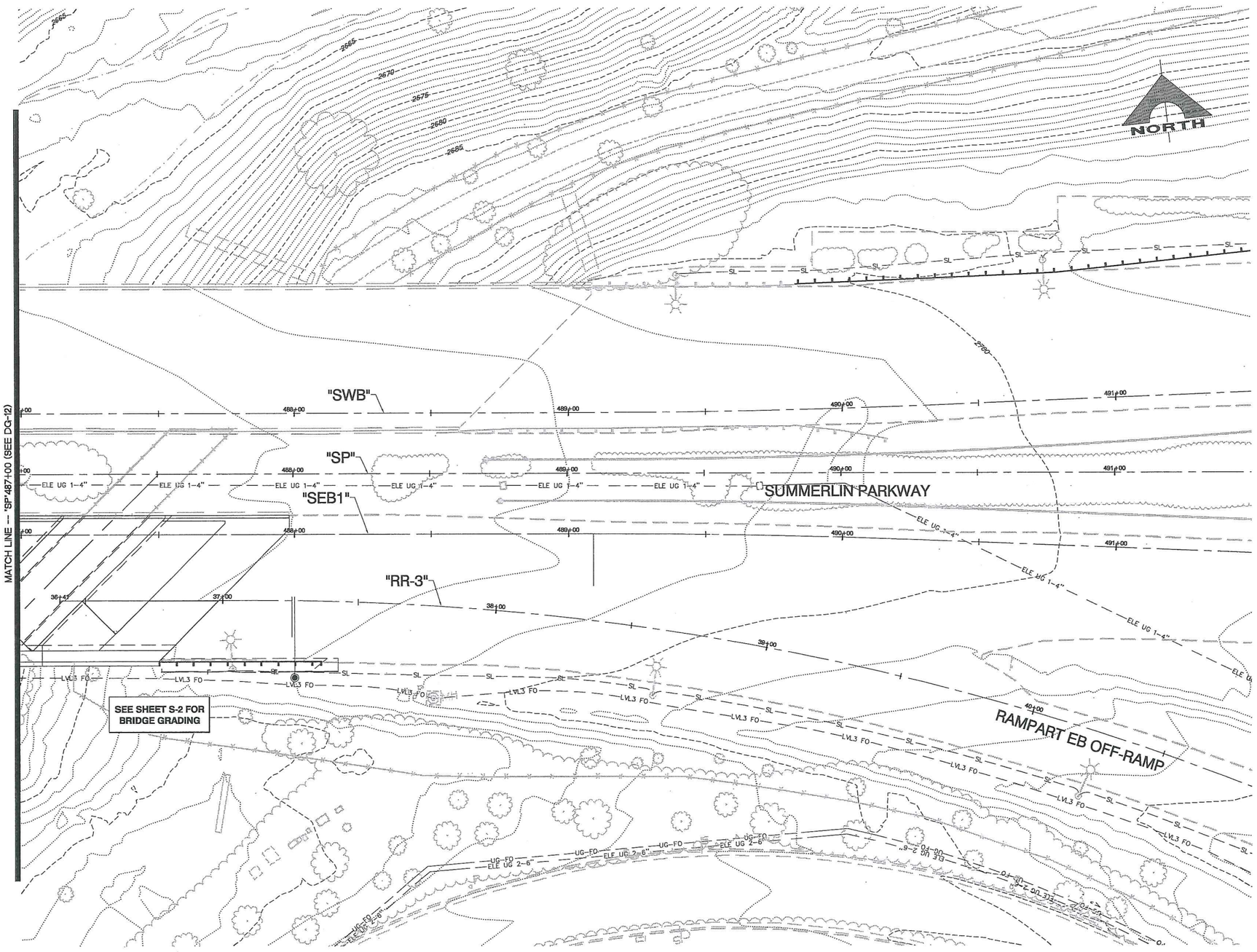
SHEET
DETAILED GRADING PLANS
"SP" 483+00 TO "SP" 487+00

PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
STATE OF NEVADA
12/1/16

SHEET
DG-12
37 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:50 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54648-C-08-DG.DWG TRAVIS DE GROOT



SCALE: 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION ⚠

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
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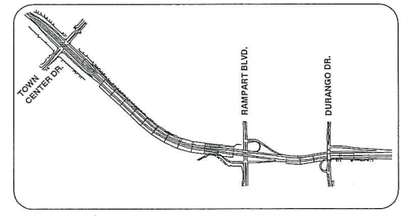


NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 E. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: F.JG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

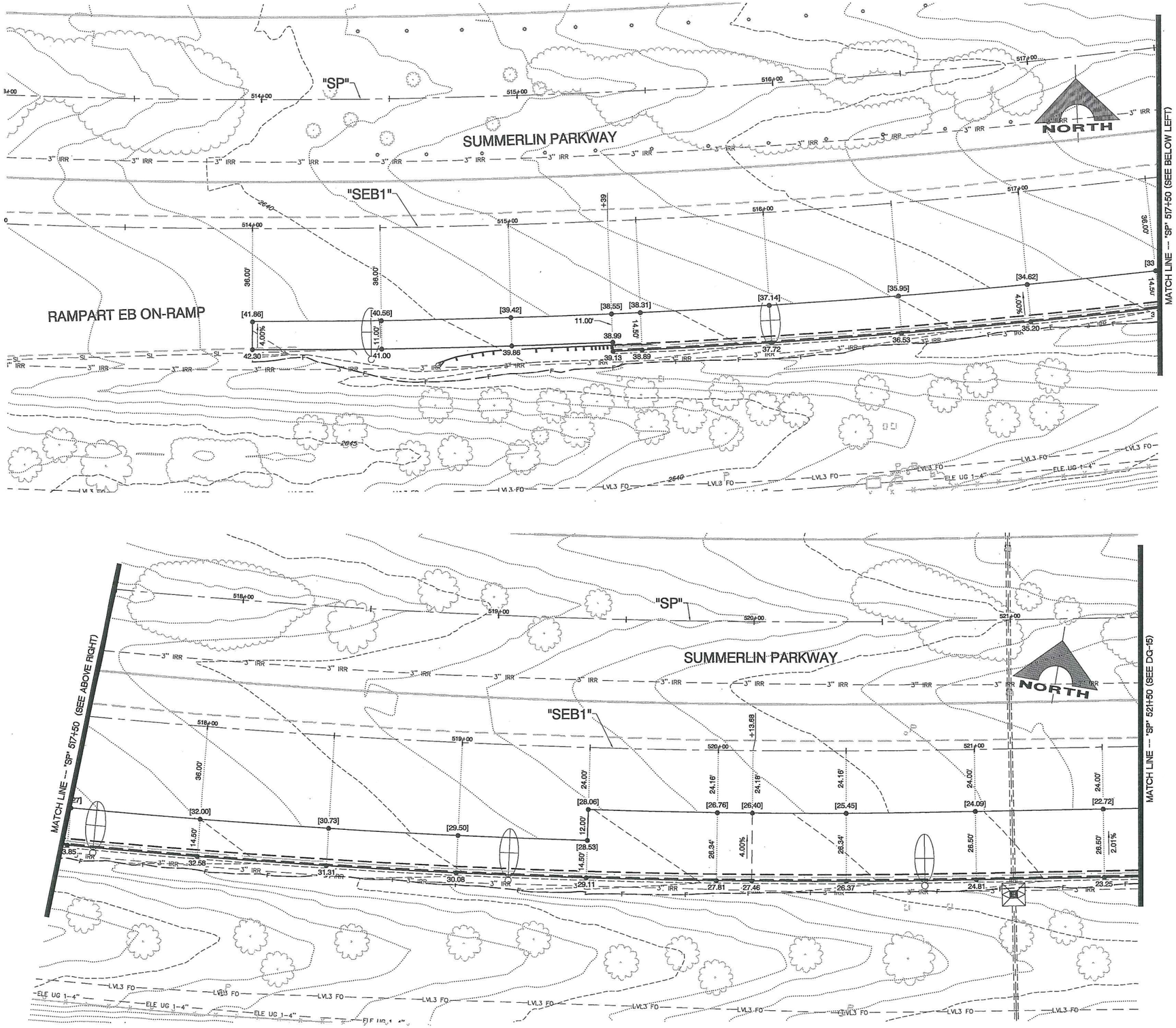
SHEET
DETAILED GRADING PLANS
"SP" 487+00 TO "SP" 491+50

PROFESSIONAL ENGINEER — STATE OF NEVADA — JOHN R. TOBIN — Exp. 05/30/2018 — CIVIL — No. 8150 — 12/1/16

SHEET
DG-13
38 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:51 AM F:\PROJECTS\400\412-858\DWG\PRODUCTION\H54848-C-06-DG.DWG TRAVIS DE GROOT



SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

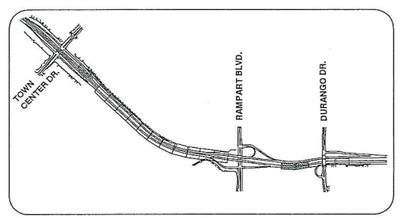
RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: F.JG | DRAWN BY: T.JC | CHECKED BY: JRT
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 513+00 TO "SP" 521+50

PROFESSIONAL ENGINEER — STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-14
39 OF 85
DRAWING NO.
XXXX

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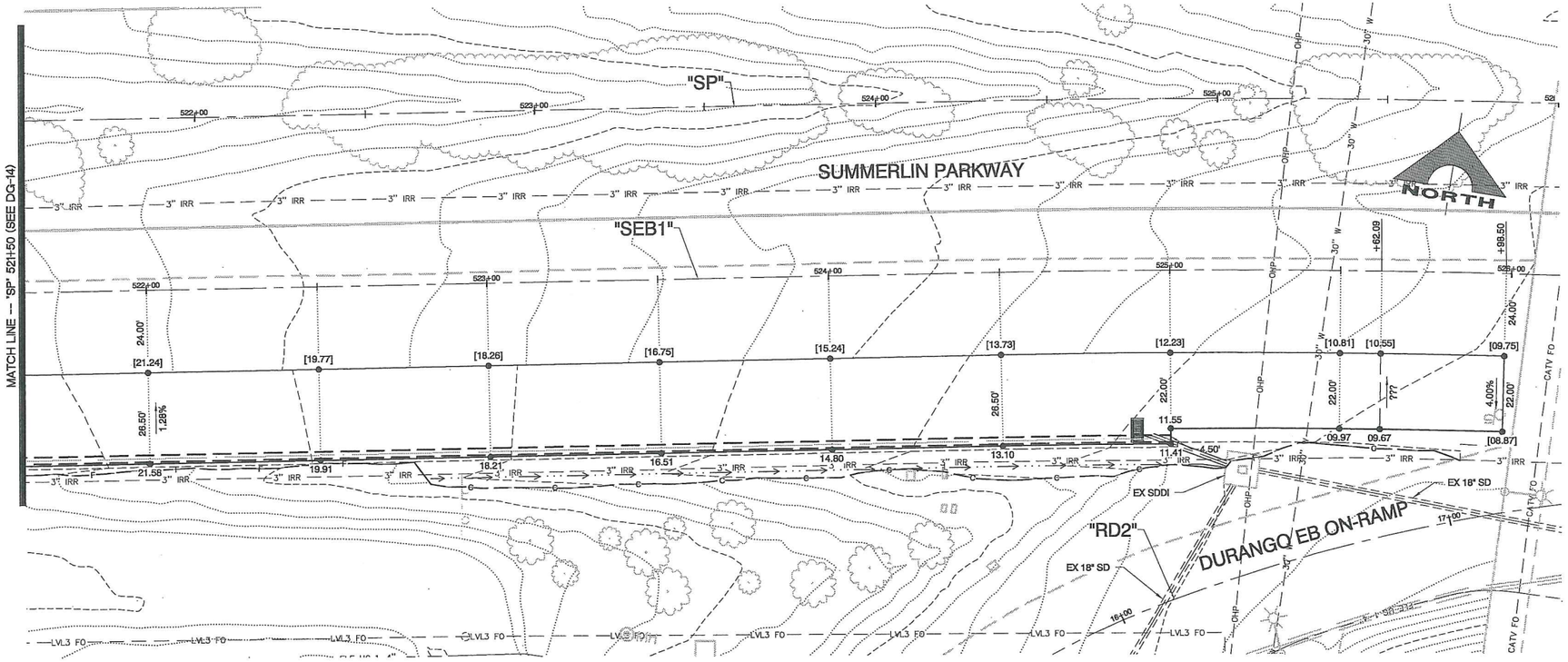


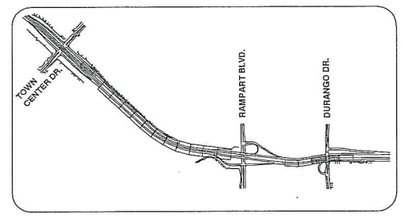
20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION ⚠		
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



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HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG
DATE: 12/1/2016 | DRAWN BY: TJC
SUBMITTAL STAGE: 90% SUBMITTAL | CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 521+50 TO "SP" 526+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-15
40 OF 85
DRAWING NO.
XXXX

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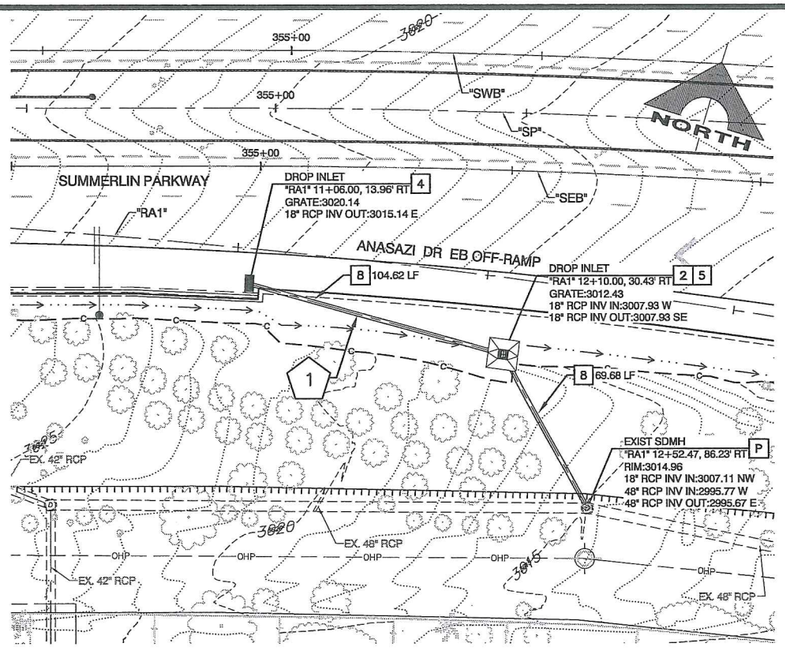

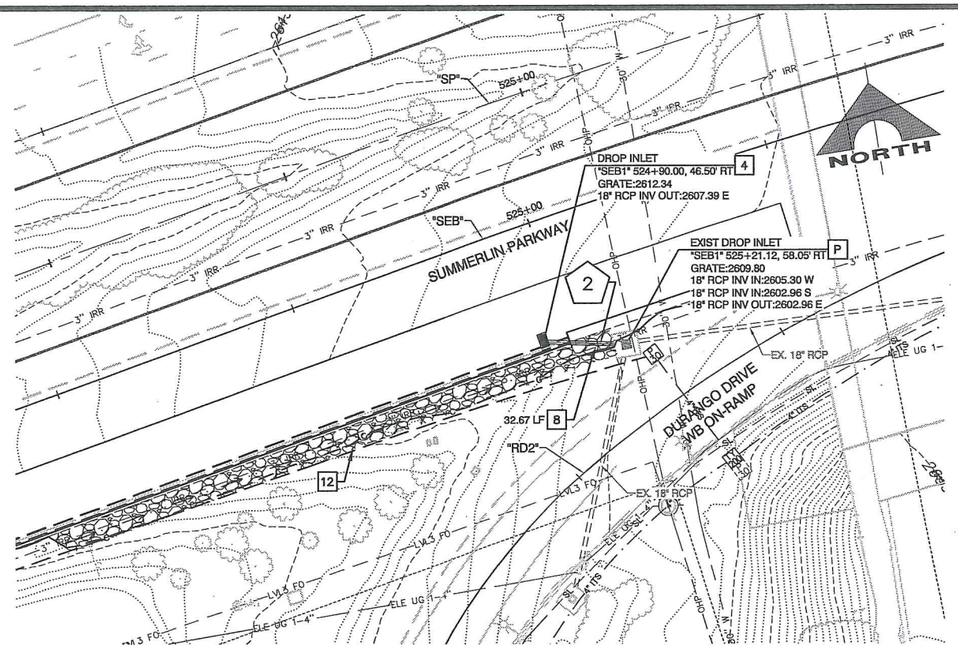

SCALE 30 0 30 60 FEET

CALL BEFORE CONSTRUCTION

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

1. CONSTRUCT TYPE 2 DI (NDOT STD. PLAN R-4.2.1)
2. CONSTRUCT TYPE 2A DI (NDOT STD. PLAN R-4.2.1.1)
3. CONSTRUCT TYPE 2 DI W/ DOUBLE GRATES (NDOT STD. PLAN R-4.2.1)
4. CONSTRUCT TYPE 2 DI W/ TRIPLE GRATES (NDOT STD. PLAN R-4.2.1)
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6. CONSTRUCT TYPE I MANHOLE W/ CONCRETE COLLAR (NDOT STD. PLAN R-4.3.1)
7. CONSTRUCT CONCRETE APRON AT END SECTION (NDOT STD. PLAN R-4.2.7) (NO DIRECT PAYMENT)
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10. INSTALL 30-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
11. INSTALL 30-INCH RCP END SECTION (NDOT STD. PLAN R-2.3.1)
12. INSTALL RIPRAP (D50 = 8-INCH, TH = 16-INCHES)

P. PROTECT IN PLACE

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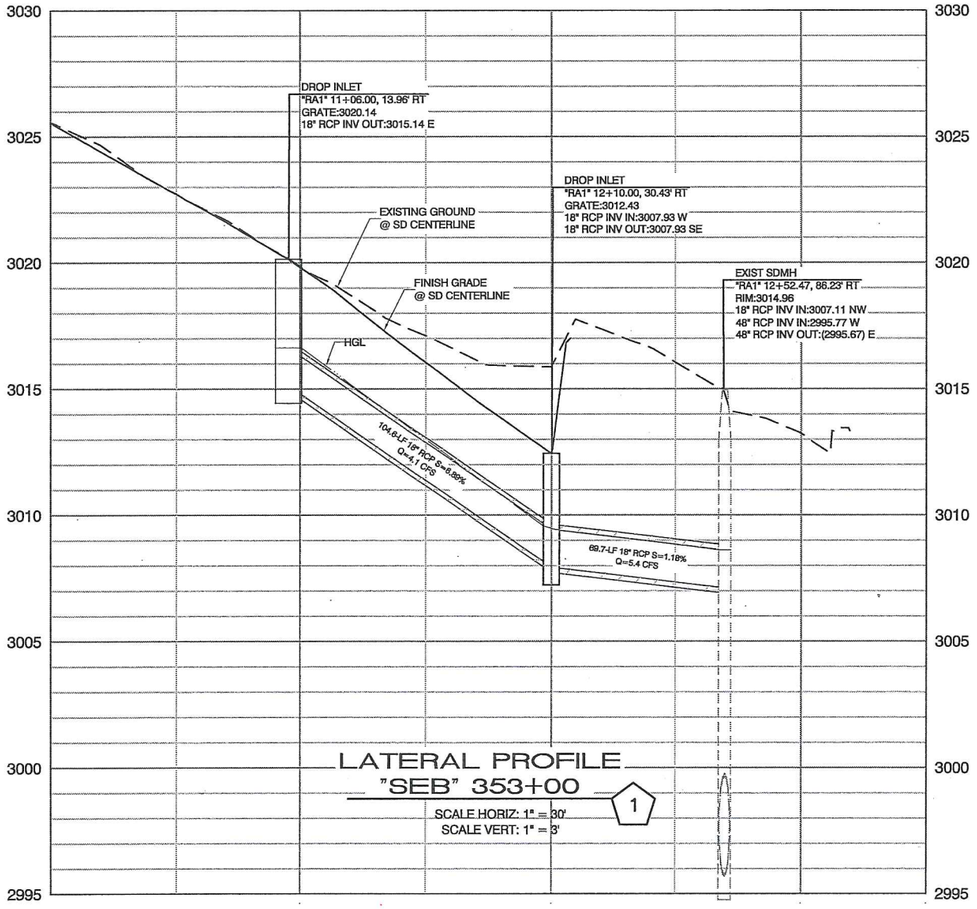
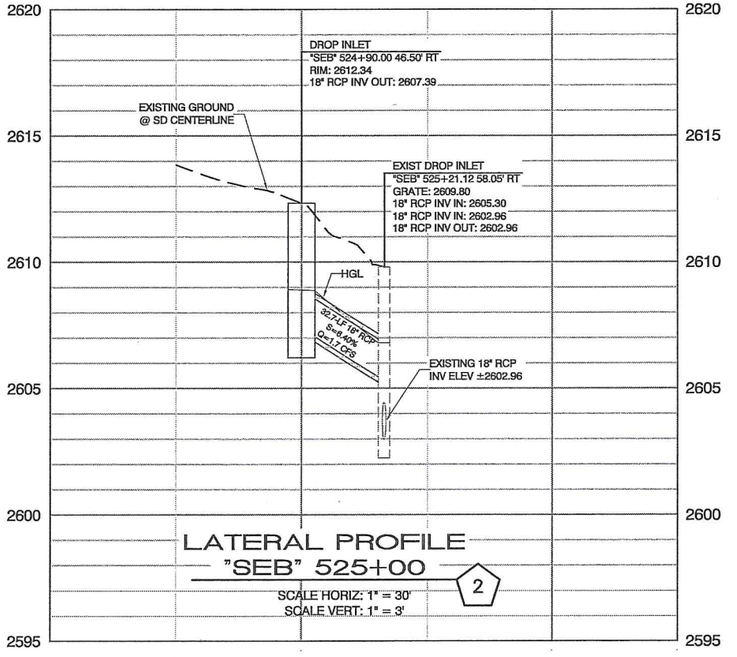
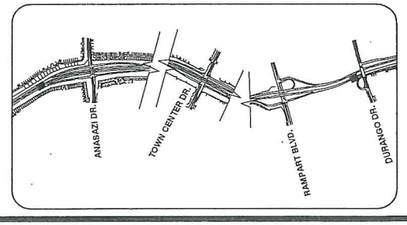


LATERAL PROFILE
"SEB" 353+00
(1)
SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'



LATERAL PROFILE
"SEB" 525+00
(2)
SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'



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ENGINEERS \ SURVEYORS

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

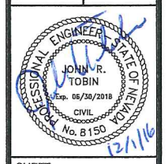
PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056	BID# 16.67056
DATE: 12/1/2016	DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL	DRAWN BY: TJC
	CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

STORM DRAIN
PLAN AND PROFILE

SHEET



SHEET
SD-1
41 OF 85
DRAWING NO.
XXXX

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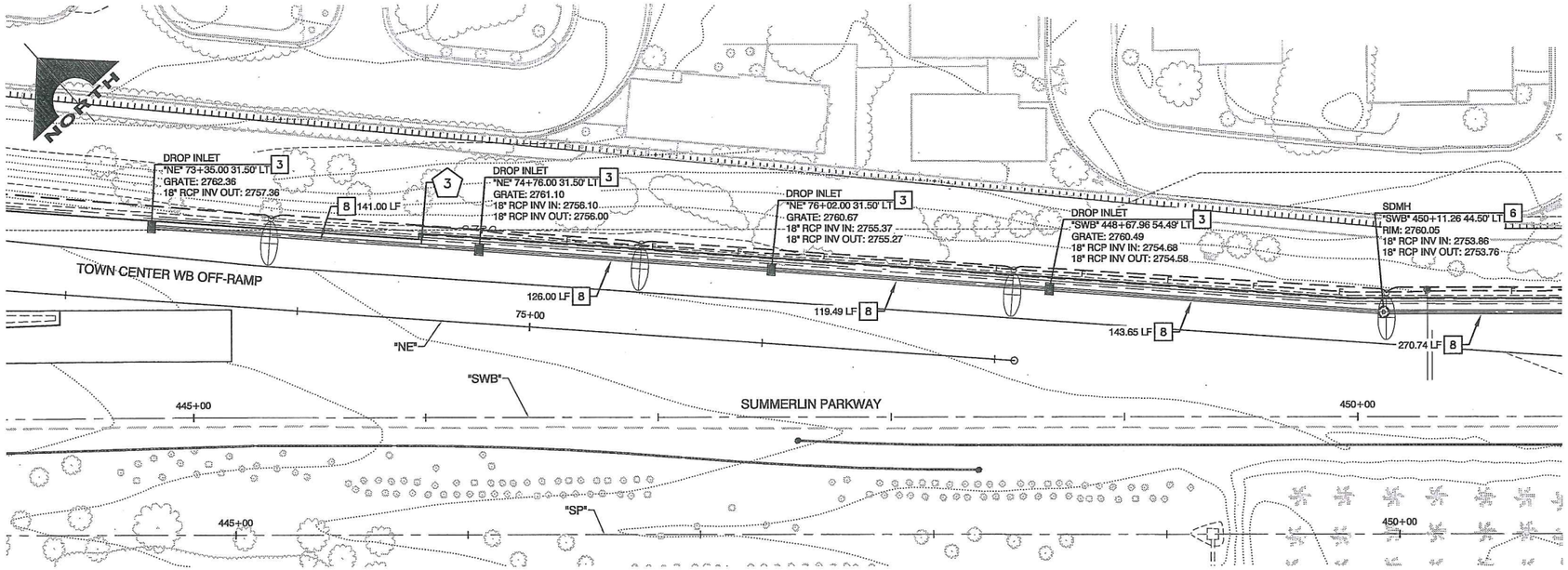

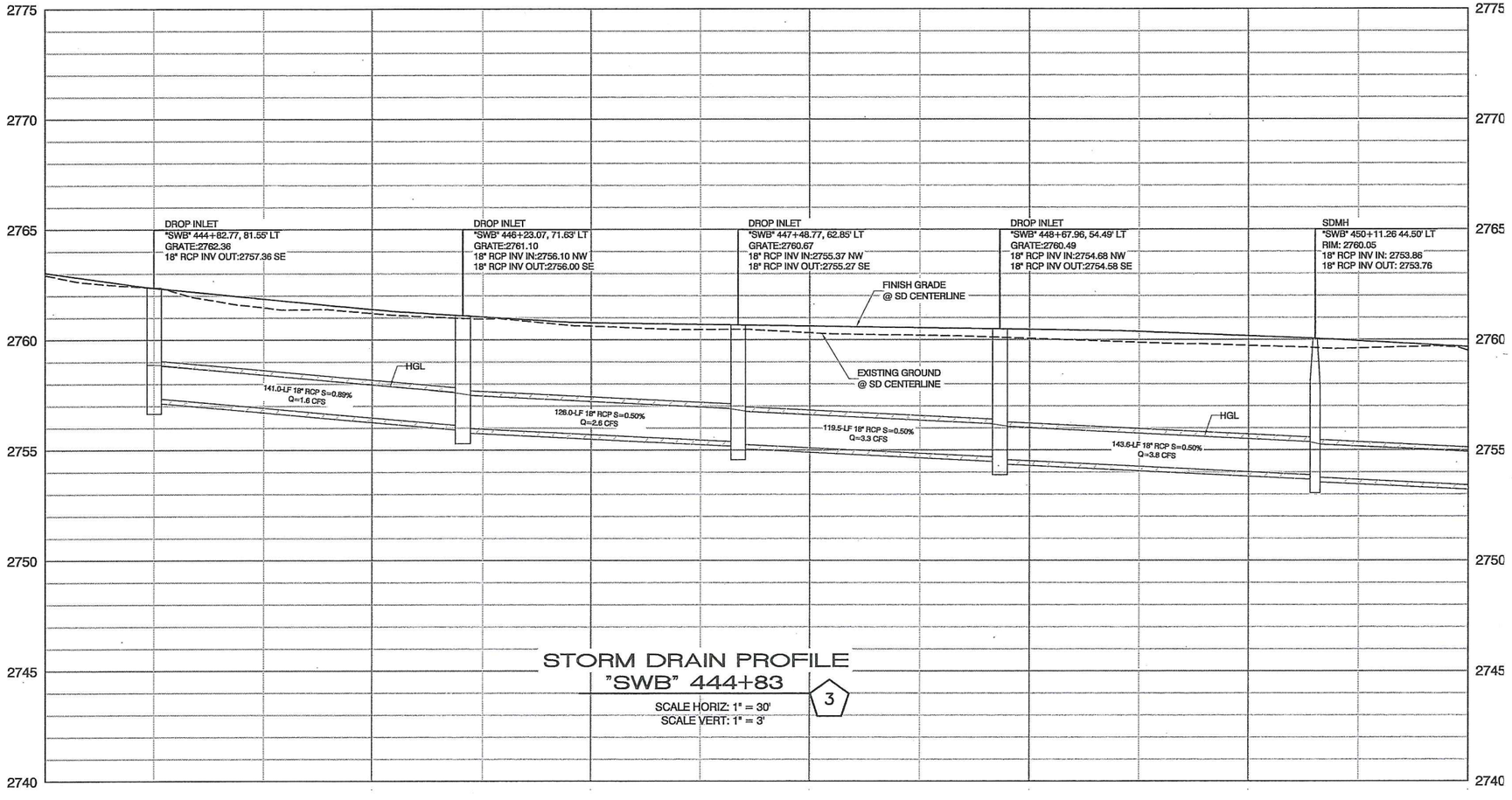

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

SCALE: 30 0 30 60 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

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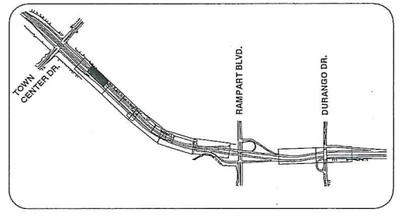

NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

BID# 16.67056 | DESIGNED BY: F.J/G
HANSEN NO. 67056 | DRAWN BY: T.J/C
DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL | CHECKED BY: J.R.T

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-2
42 OF 85
DRAWING NO.
XXXX

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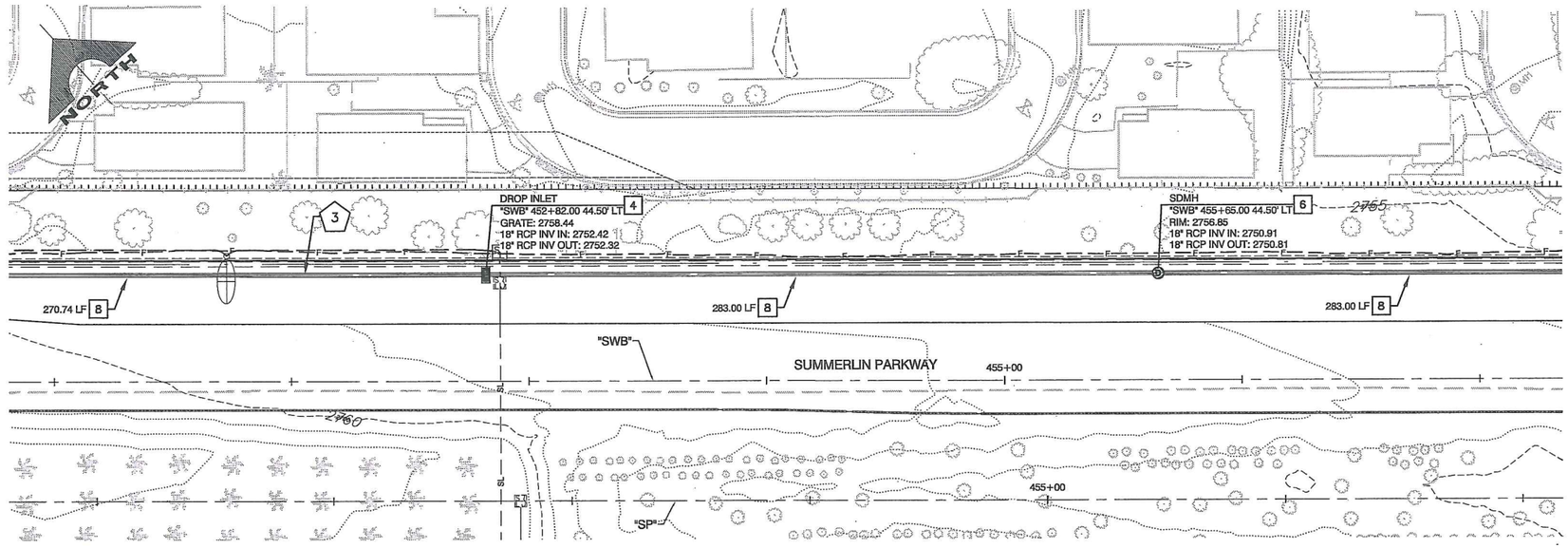

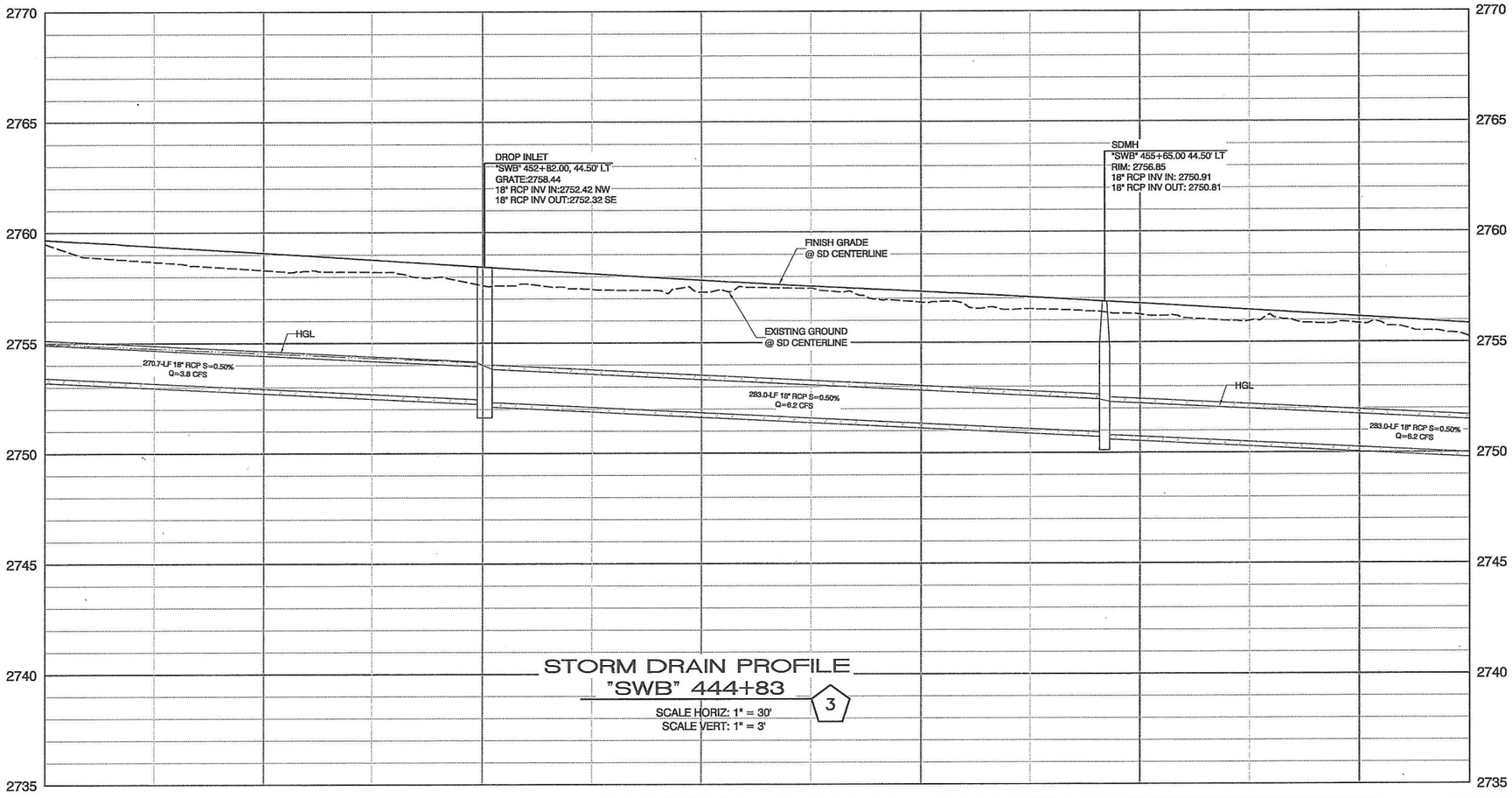

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

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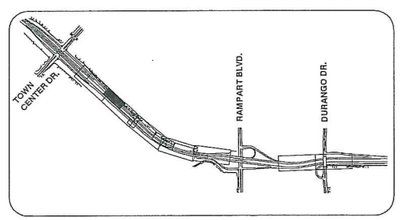

NO.	DATE	REVISIONS

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PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG
DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
STORM DRAIN PLAN AND PROFILE

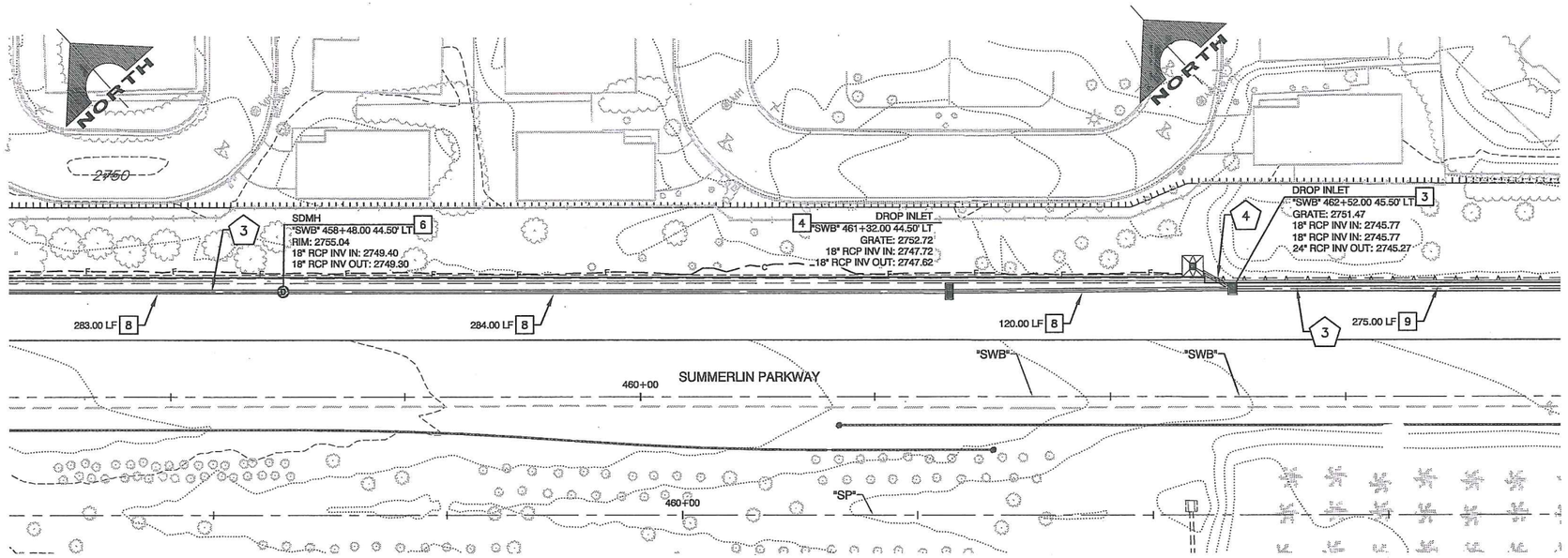
PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

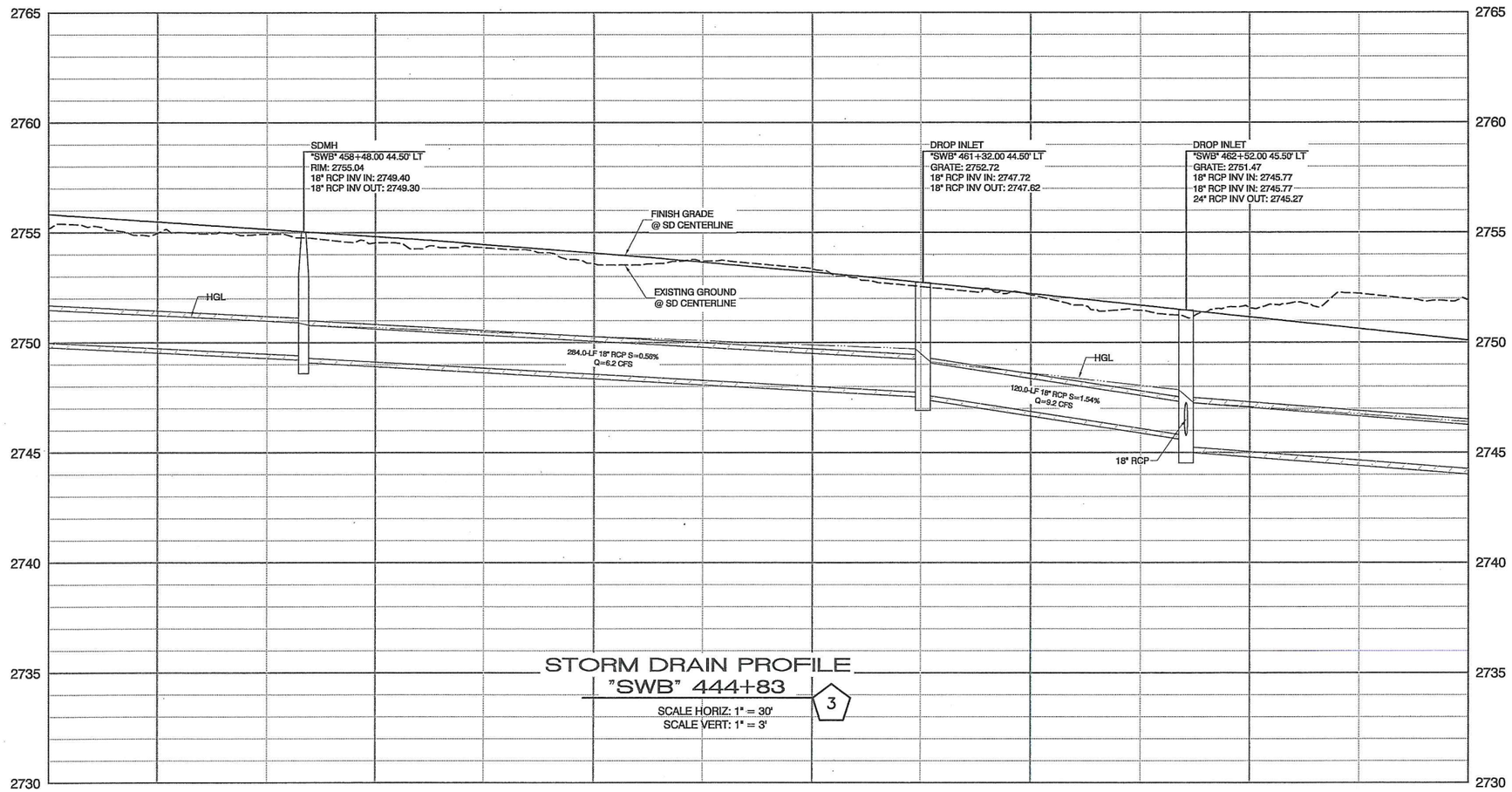
SHEET
SD-3
43 OF 85

DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 7:36 PM P:\PROJECTS\SUMMERLIN PKWY\PHASE 3\DRAWINGS\SHEETS\SD-3.DWG HIM CLARK





STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

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P PROTECT IN PLACE

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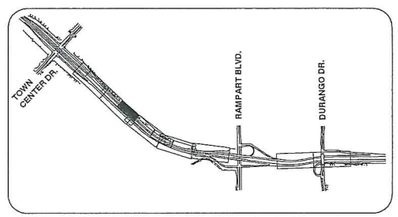

NO.	DATE	REVISIONS

PREPARED BY
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LAS VEGAS, NV 89146
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F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

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CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG
DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-4
44 OF 85

DRAWING NO.
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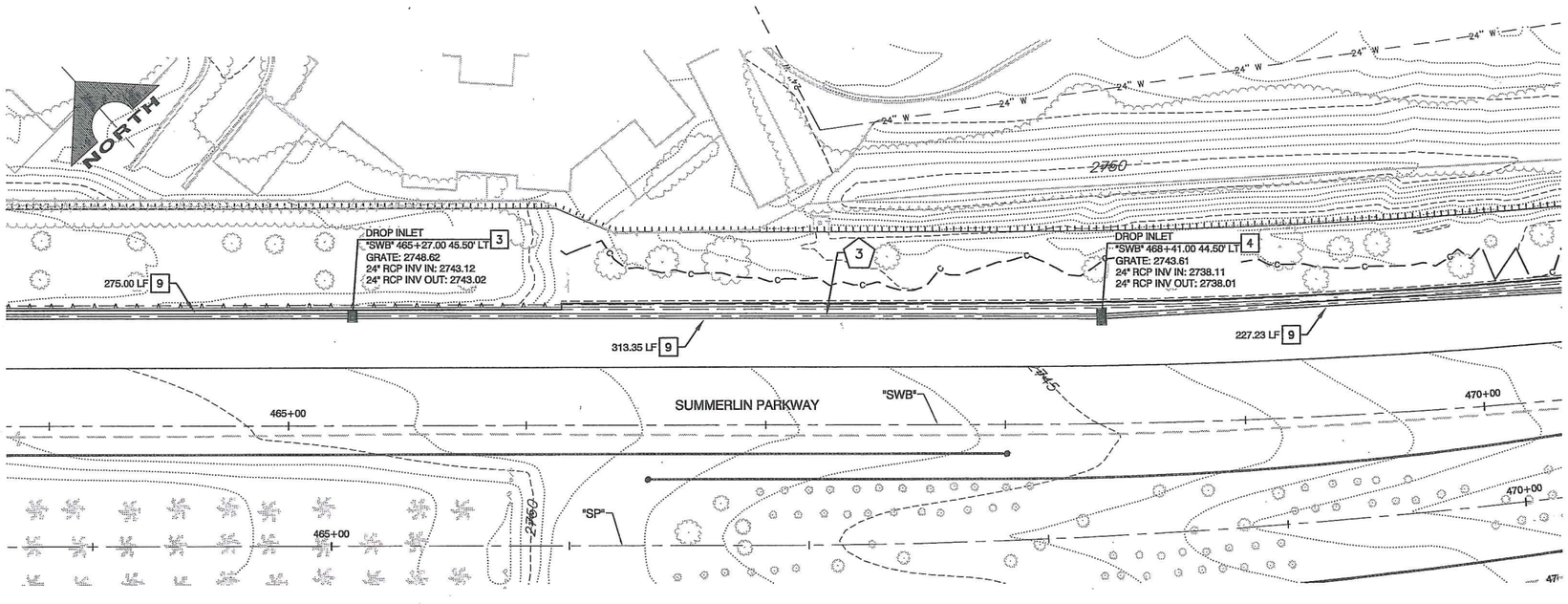

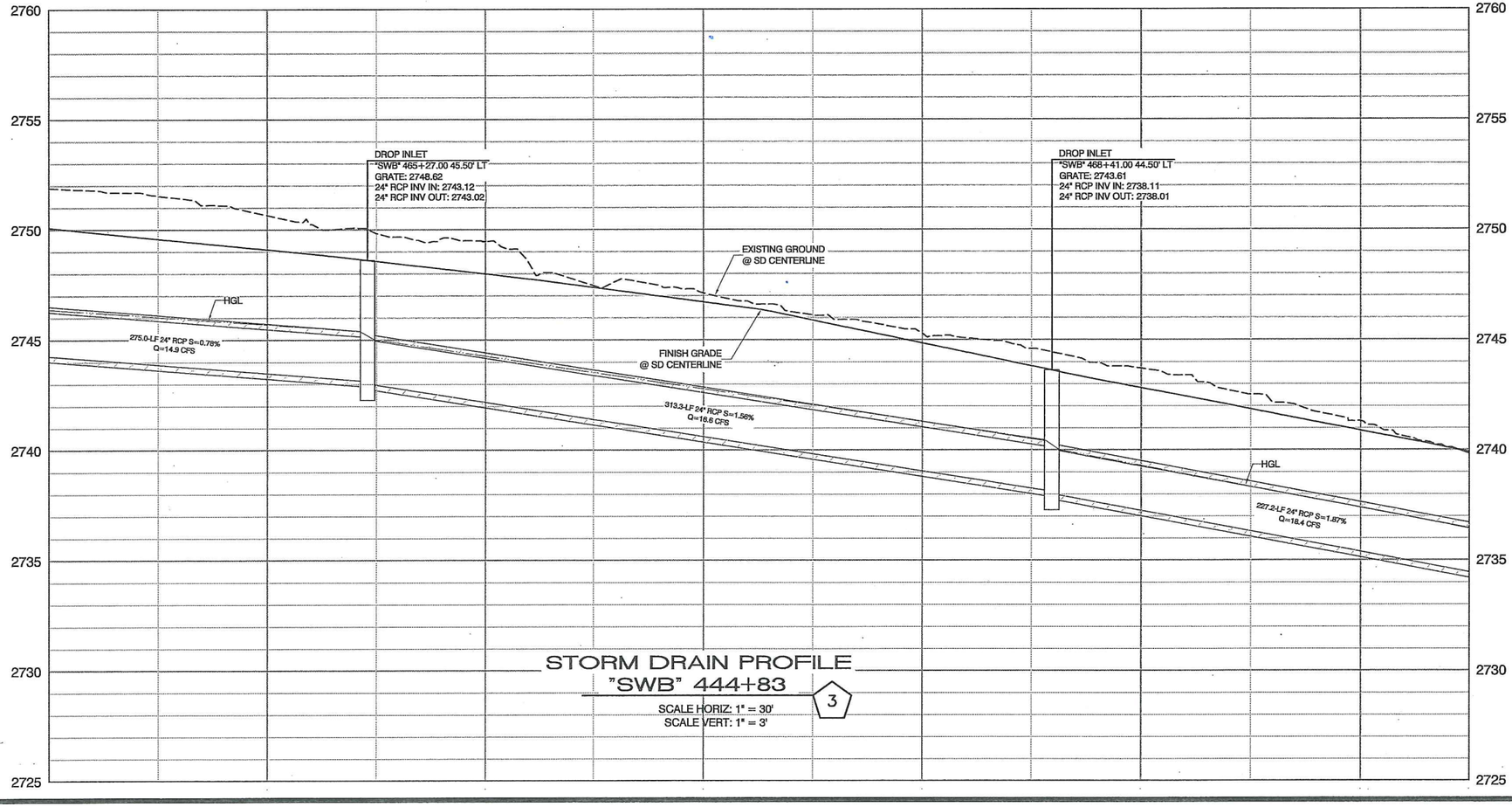

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

CALL BEFORE CONSTRUCTION ⚠

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

1. CONSTRUCT TYPE 2 DI (NDOT STD. PLAN R-4.2.1)
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P PROTECT IN PLACE

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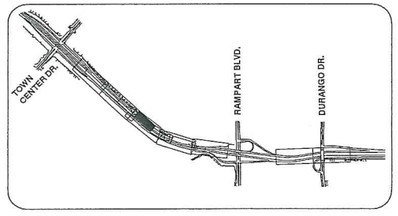

NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: F/G
DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: T/C
CHECKED BY: JRT

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PROFESSIONAL ENGINEER STATE OF NEVADA
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SHEET
SD-5
45 OF 85
DRAWING NO.
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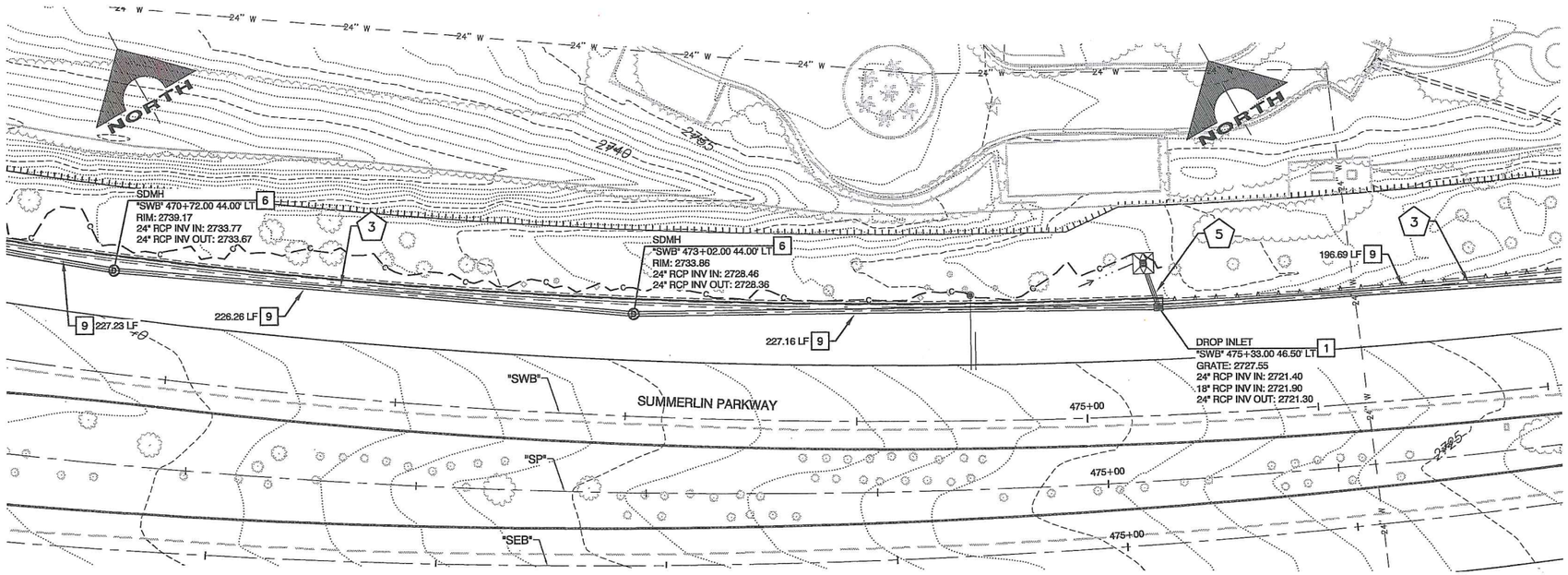

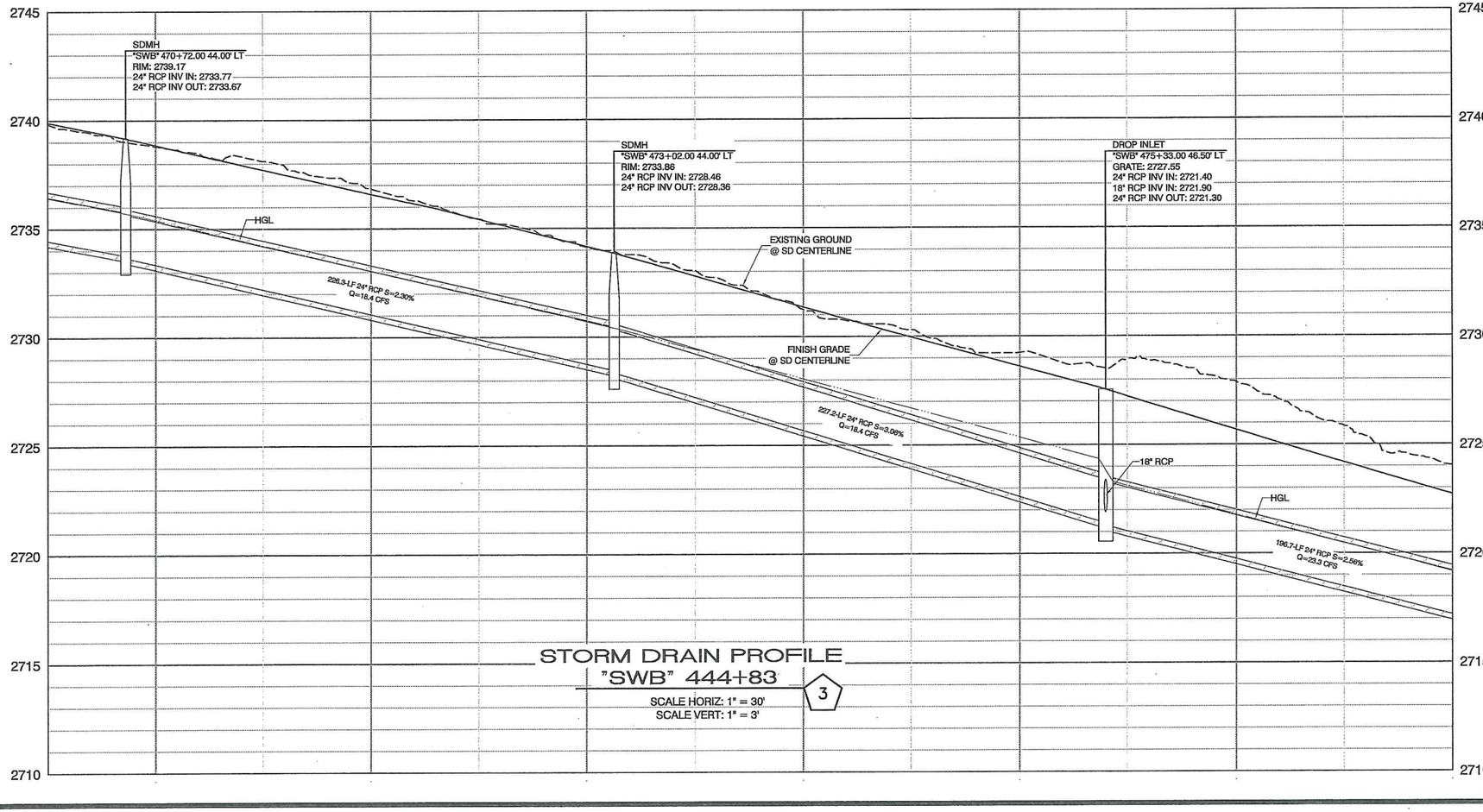

STORM DRAIN PROFILE
"SWB" 444+83

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SCALE: 30 0 30 60 FEET

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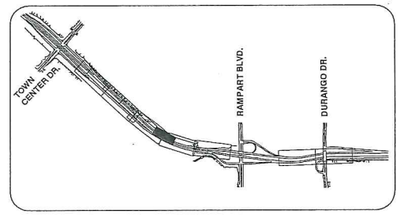

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ENGINEERS & SURVEYORS

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: F-JG | DRAWN BY: TJC | CHECKED BY: JRT
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
STORM DRAIN PLAN AND PROFILE

SHEET
SD-6
46 OF 85

DRAWING NO.
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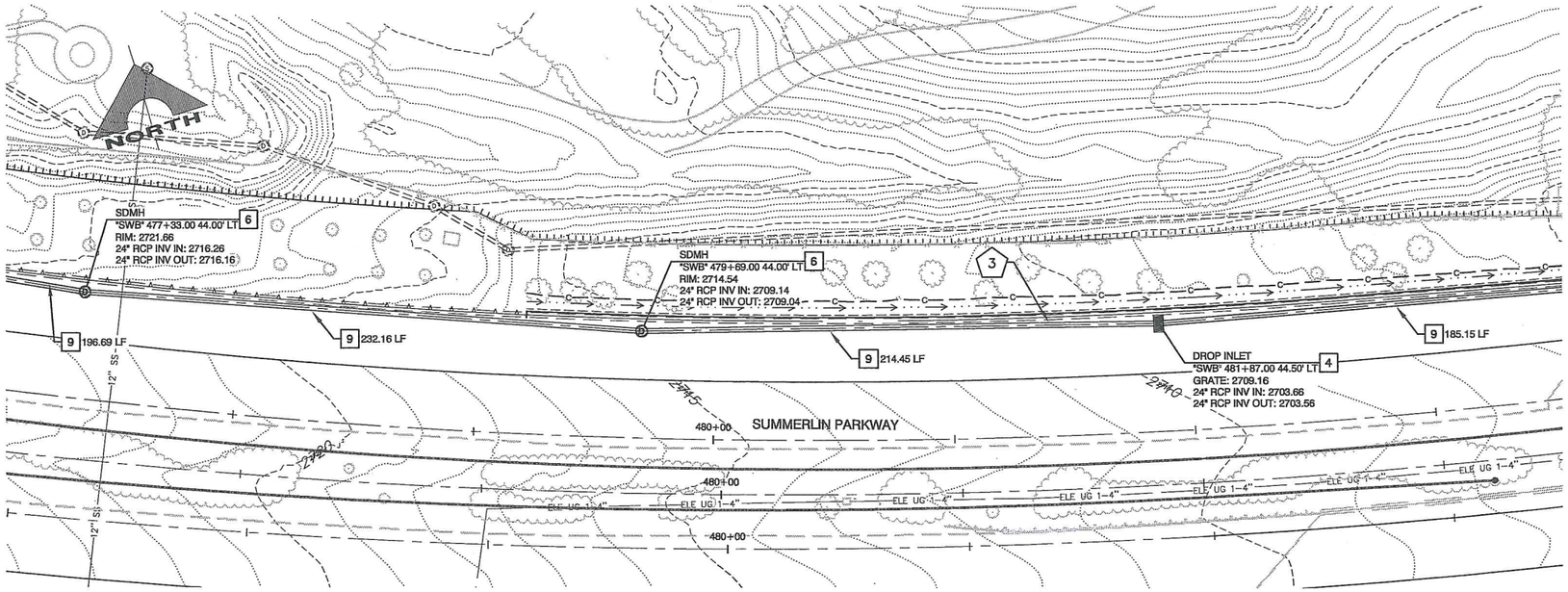

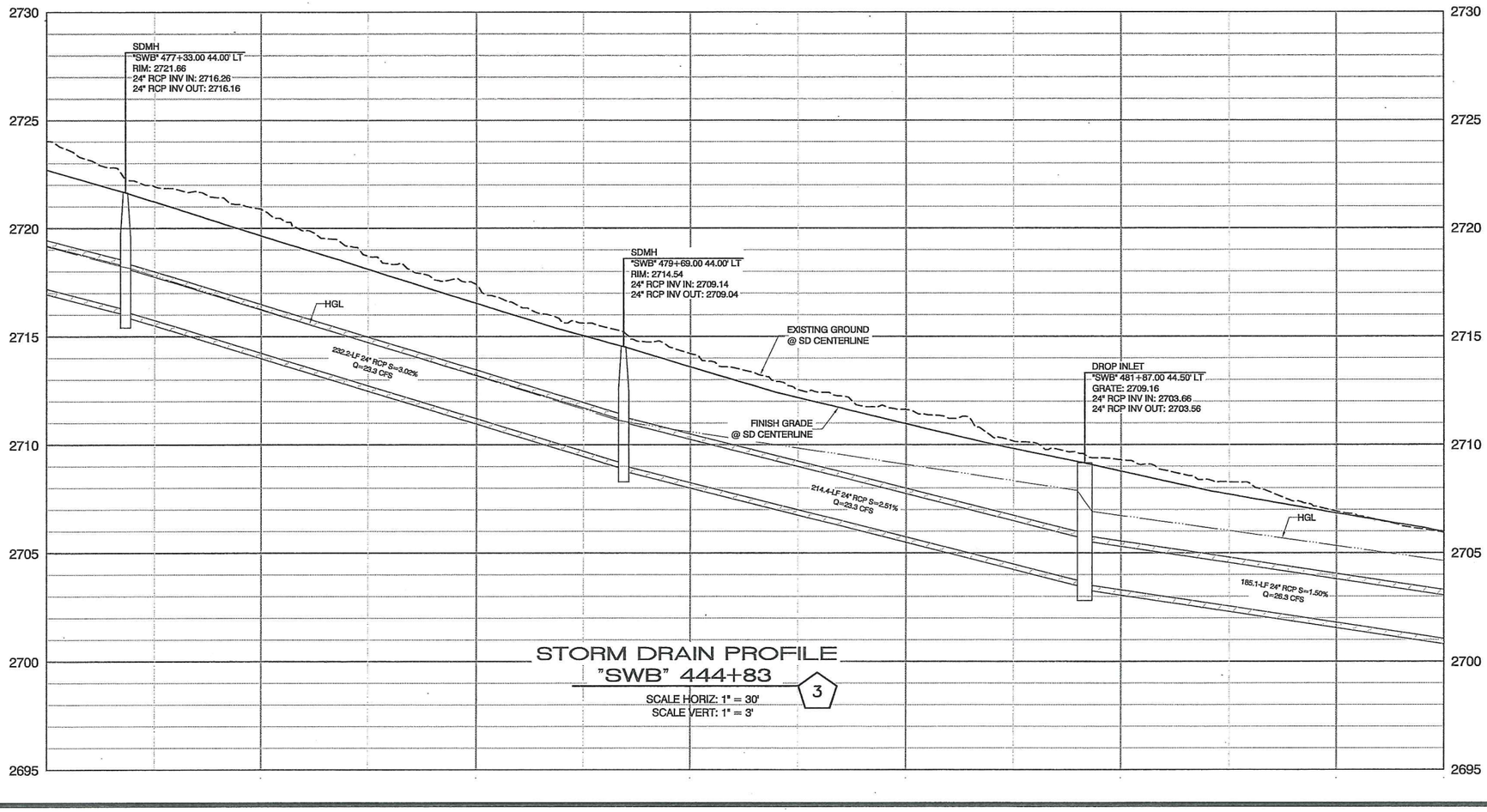

STORM DRAIN PROFILE
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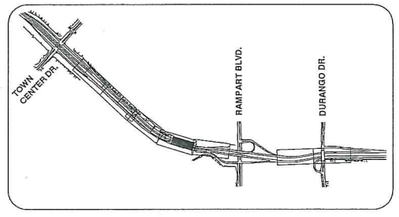

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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

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SHEET
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
EXP. 05/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-7
47 OF 85

DRAWING NO.
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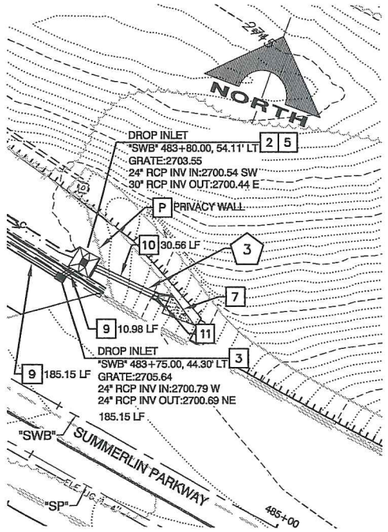

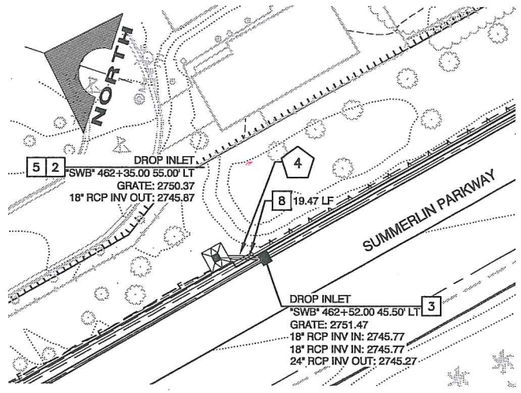

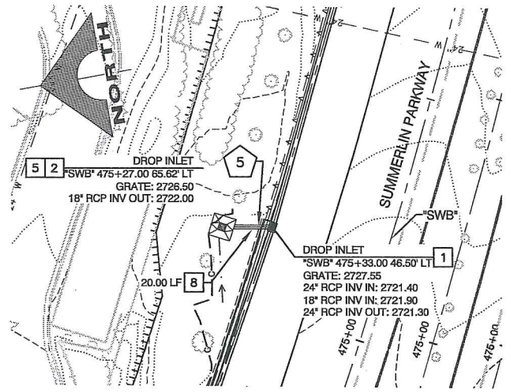

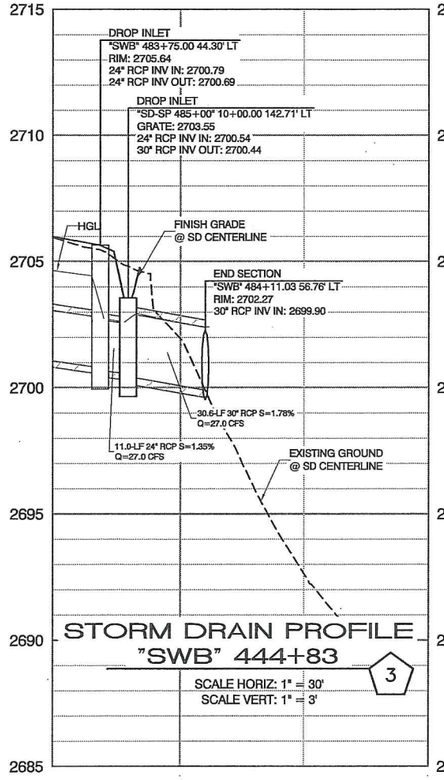

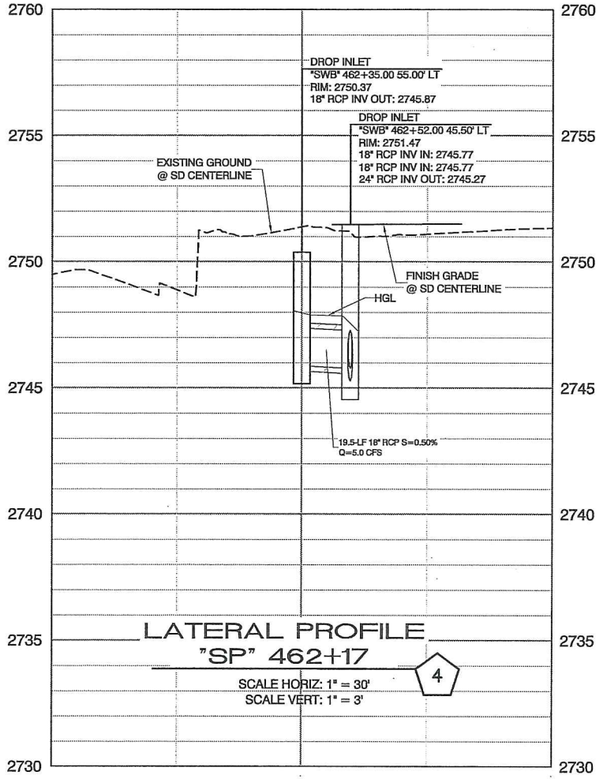

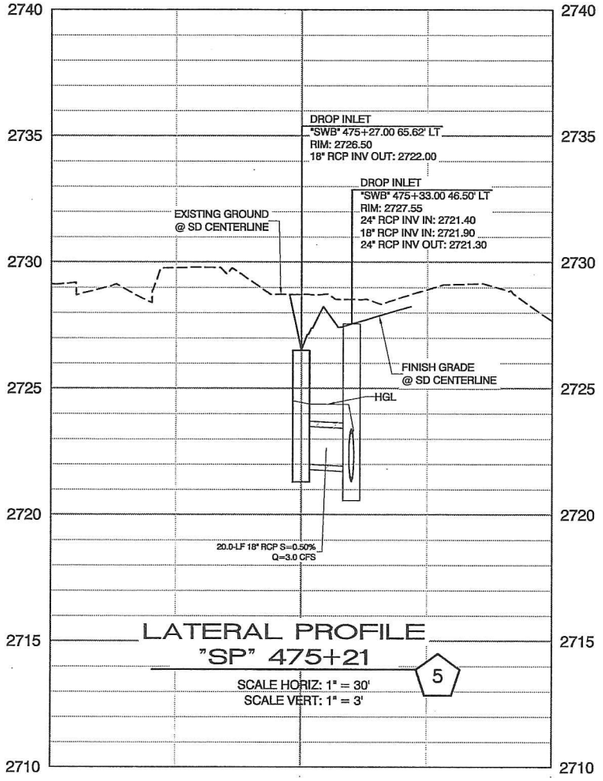

30 0 30 60
SCALE FEET

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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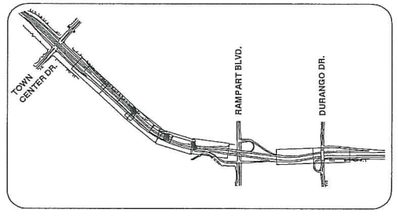

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JOHN R. LITOBIN
Exp. 06/30/2018
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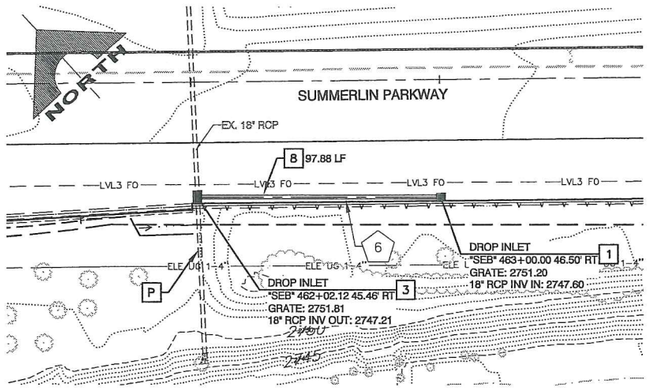
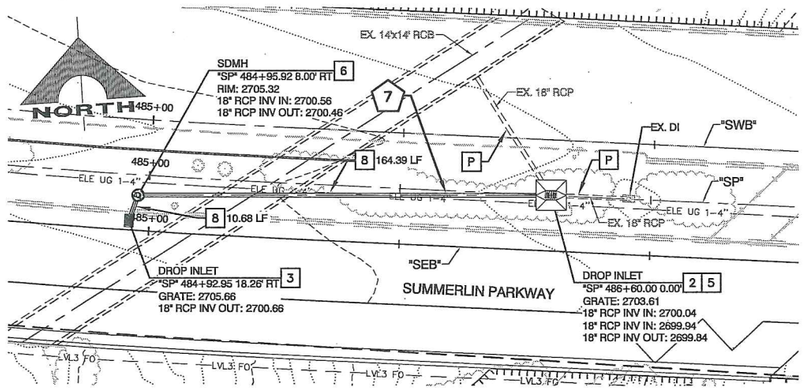
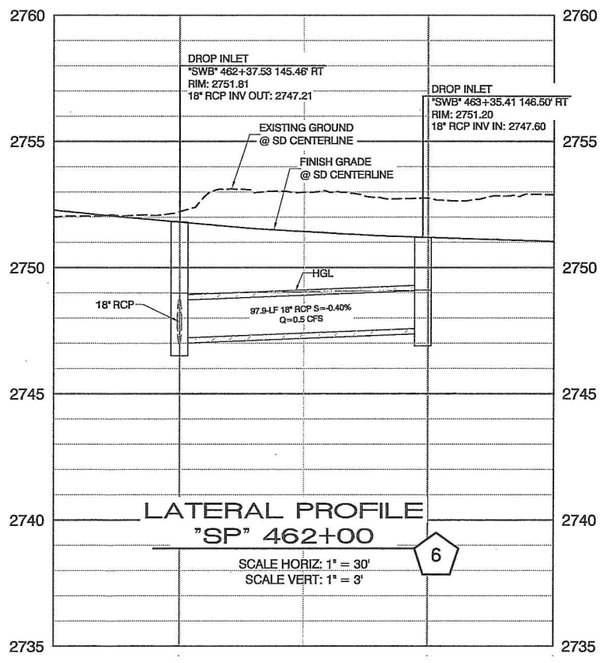
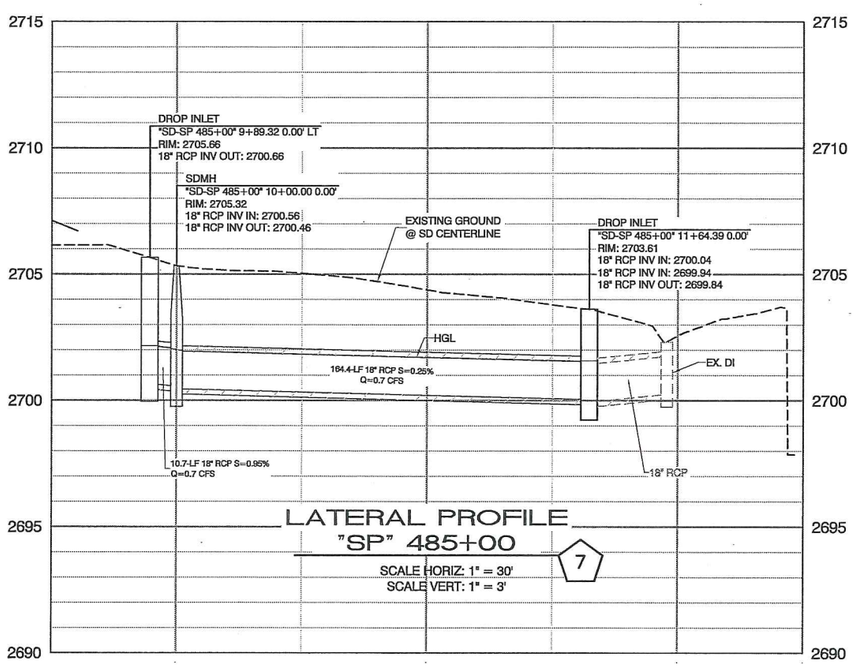
SHEET
SD-8
48 OF 85
DRAWING NO.
XXXX

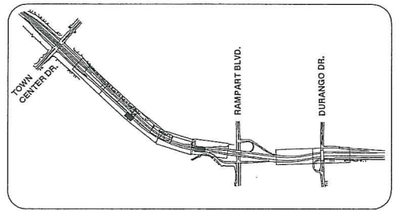
12/7/2016 1:08 PM P:\PROJECTS\16\67056\PLOTS\67056-SD-STORM DRAIN PLAN AND PROFILE.DWG TIM CLARK











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10. INSTALL 30-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
11. INSTALL 30-INCH RCP END SECTION (NDOT STD. PLAN R-2.3.1)
12. INSTALL RIPRAP (D50 = 8-INCH, TH = 16-INCHES)

P PROTECT IN PLACE

UTILITY DISCLAIMER:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION. ANY UTILITIES DAMAGED DURING CONSTRUCTION MUST BE REPAIRED IMMEDIATELY AND TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.

NO.	DATE	REVISIONS

PREPARED BY
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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC
CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-9
49 OF 85
DRAWING NO.
XXXX

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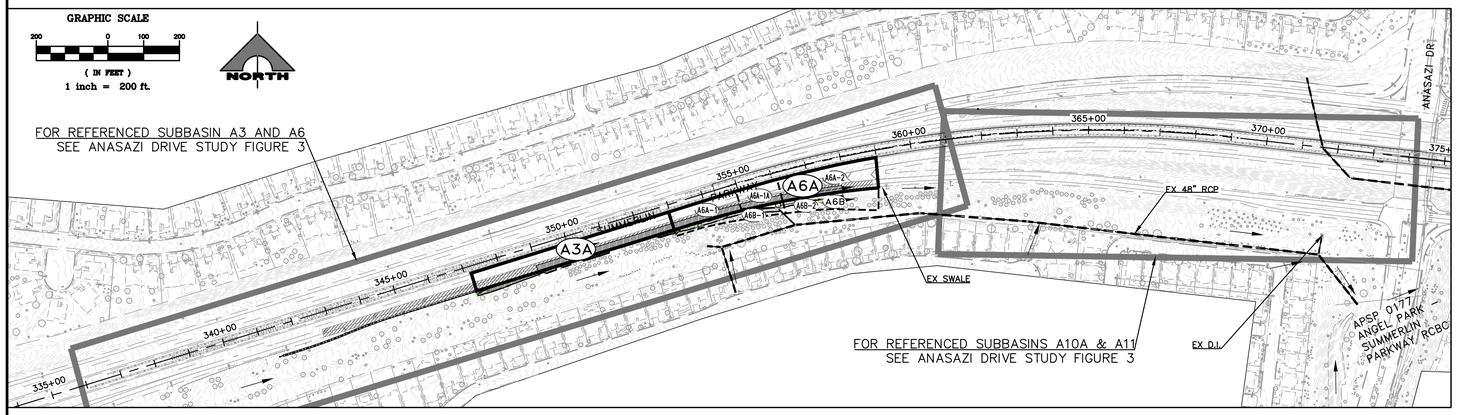

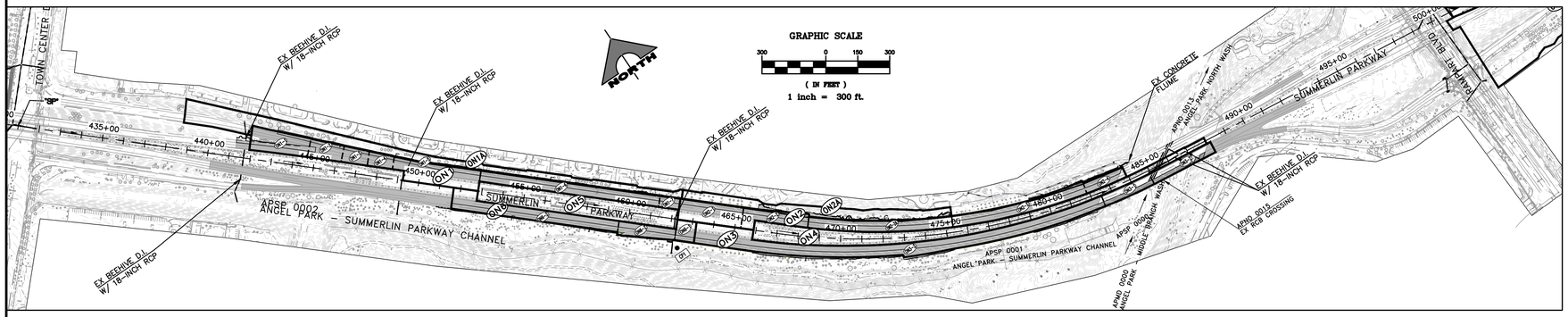

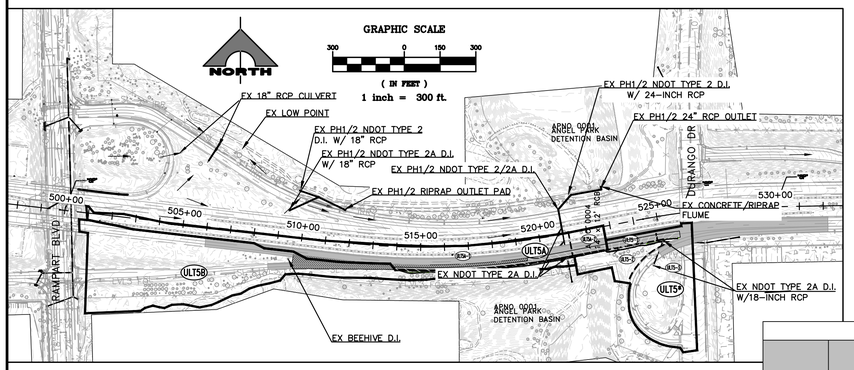

LEGEND

- BASN1 — SUBBASIN NAME
- BASN1A — PRORATED SUBBASIN NAME
- SUBBASIN BOUNDARY
- PRORATED SUBBASIN BOUNDARY
- FLOW DIRECTION
- LOCATION OF REFERENCED SUBBASINS
- CP1 — CONCENTRATION POINT

SUMMARY OF ULTIMATE CONDITIONS HEC-1 MODEL

SB OR CP	AREA (AC)	100 YR (CFS)	10 YR (CFS)
A3A	0.69	3	2
A6A**	0.88	4	2
ON1	3.38	10	5
ON2	3.03	9	5
ON3	3.43	10	6
ON4	2.53	6	2
ON5	1.99	5	2
ON6	1.66	5	3
CP1	-	10	5
ON1A	2.46	5	2
ON2A	1.30	3	1
ULT5A	3.84	11	5
ULT5B	6.69	17	8
ULT5*	3.50	12	6

* Referenced from the Durango Study.

** Referenced from the Anasazi Overpass Study.

ULTIMATE CONDITION PRORATED FLOW SUMMARY

Ultimate Onsites			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
A6A**	4	0.88	4.55
ULT5*	12	3.50	3.43
ULT5A	11	3.84	2.86
ON1	10	3.38	2.96
ON2	9	3.03	2.97
ON6	5	1.66	3.01
ON3	10	3.43	2.92
A6B	1.4	0.45	3.13
Ultimate Onsite Prorated Basins			
Subbasin*	Q_{100} (cfs)	Area (acres)	cfs/acre
A6A-1	1.1	0.24	4.55
A6A-1A	0.8	0.17	4.55
A6A-2	2.1	0.47	4.55
TOTAL	**4.0**	**0.88**	**-**
A6B-1	0.5	0.17	3.13
A6B-2	0.9	0.28	3.13
TOTAL	**1.4**	**0.45**	**-**
ULT5-1	0.7	0.20	3.43
ULT5-2	2.4	0.70	3.43
ULT5-3	8.9	2.60	3.43
TOTAL	**12.0**	**3.50**	**-**
ULT5A-1	10.0	3.49	2.86
ULT5A-2	1.0	0.35	2.86
TOTAL	**11.0**	**3.84**	**-**
ON1-1	1.9	0.64	2.96
ON1-2	0.9	0.30	2.96
ON1-3	0.6	0.21	2.96
ON1-4	0.5	0.18	2.96
ON1-5	2.6	0.89	2.96
ON1-6	3.1	1.04	2.96
ON1-7	0.4	0.12	2.96
TOTAL	**10.0**	**3.38**	**-**
ON2-1	2.0	0.68	2.97
ON2-2	1.4	0.48	2.97
ON2-2A	2.4	0.82	2.97
ON2-3	2.5	0.81	2.97
ON2-4	0.7	0.24	2.97
TOTAL	**9.0**	**3.03**	**-**
ON6-1	0.6	0.21	3.01
ON6-2	1.1	0.37	3.01
ON6-3	3.3	1.08	3.01
TOTAL	**5.0**	**1.66**	**-**
ON3-1	0.9	0.30	2.92
ON3-2	1.2	0.40	2.92
ON3-3	7.9	2.73	2.92
TOTAL	**10.0**	**3.43**	**-**

*Referenced from the Durango Drive Study.

** Referenced from the Anasazi Overpass Study.

100-YEAR DITCH CHARACTERISTICS ADJACENT TO PROPOSED PAVEMENT

Location	Station	Slope (%)	Side Slopes	Q_{100} (cfs)	Flow Depth (ft)	Total Depth (ft)	Velocity (ft/s)	Lining d50 (in)
A6B-1	"SP" 352+97 to 354+93	5.50	3:1/2:1	0.5	0.32	1.00	3.91	N/A
A6A-1A	"SP" 354+93 to 355+97	5.50	10:1/2:1	1.3	0.23	1.00	3.24	N/A
A6B-2	"SP" 355+97 to 358+90	5.50	10:1/ 2:1	3	0.34	1.00	4.26	N/A
ULT5B	"SP" 515+33 to 521+04	2.54	8:1/0:1	17	1.03	2.00	4.02	8
ULT5-2	"SP" 521+29 to 525+12	3.43	10:1/2:1	2.4	0.32	1.00	3.23	N/A

SUMMARY - DROP INLET CALCULATIONS

Alignment	Station	Tributary	Q_{100} (cfs)	$Q_{intercept}$ (cfs)	Q_{bypass} (cfs)	Longitudinal Slope (%)	Cross Slope (%)	Flow Depth (ft)	Velocity (ft/s)	D*V	Shoulder (SH) Width (ft)	Spread (ft)	Drop Inlet Size	Inlet Type*
SEB	354+95	A3A + A6A-1	4.1	4.1	0.0	5.72	4.26	0.25	5.71	1.4	9.8	5.8	NDOT Type 2 (Triple)	EOB
SEB	355+98	A6A-1A	1.3	1.3	0.0	-	-	0.23	-	-	-	-	NDOT Type 2A	SUMP
SWB	444+83	ON1-1	1.9	1.6	0.3	1.35	2.00	0.18	2.30	0.4	10	9.1	NDOT Type 2 (Double)	Capacity
SWB	446+23	ON1-1_{BYP} + ON1-2	1.2	1.0	0.2	0.62	2.00	0.18	1.53	0.3	10	8.9	NDOT Type 2 (Double)	Capacity
SWB	447+49	ON1-2_{BYP} + ON1-3	0.8	0.7	0.1	0.15	2.00	0.20	0.81	0.2	10	9.9	NDOT Type 2 (Double)	Capacity
SWB	448+68	ON1-3_{BYP} + ON1-4	0.6	0.5	0.1	0.15	2.00	0.18	0.76	0.1	10	8.9	NDOT Type 2 (Double)	Capacity
SWB	452+82	ON1-4_{BYP} + ON1-5	2.7	2.4	0.3	0.65	2.00	0.24	1.91	0.5	12	11.9	NDOT Type 2 (Triple)	Capacity
SWB	461+32	ON1-5_{BYP} + ON1-6	3.4	3.0	0.4	1.01	2.00	0.24	2.38	0.6	12	12.0	NDOT Type 2 (Triple)	Capacity
SWB	462+35	ON1A	5.0	5.0	0.0	-	-	0.33	-	-	-	-	NDOT Type 2A	SUMP
SWB	462+52	ON1-6_{BYP} + ON1-7	0.8	0.7	0.1	1.06	2.00	0.14	1.69	0.2	12	6.9	NDOT Type 2 (Double)	Capacity
SWB	465+27	ON1-7_{BYP} + ON2-1	2.1	1.7	0.4	1.15	2.00	0.20	2.22	0.4	12	9.7	NDOT Type 2 (Double)	Capacity
SWB	468+41	ON2-1_{BYP} + ON2-2	1.8	1.8	0.0	1.79	4.00	0.22	2.97	0.7	24	5.5	NDOT Type 2 (Triple)	EOB
SWB	475+27	ON2A	3.0	3.0	0.0	-	-	0.24	-	-	-	-	NDOT Type 2A	SUMP
SWB	475+33	ON2-2A	2.4	1.9	0.5	3.02	4.00	0.22	3.88	0.9	12	5.6	NDOT Type 2 (Single)	Capacity
SWB	481+87	ON2-2A$_{BYP}$ + ON2-3	3.0	3.0	0.0	2.13	4.00	0.26	3.60	0.9	24	6.5	NDOT Type 2 (Triple)	EOB
SWB	483+75	ON2-4	0.7	0.7	0.0	2.01	4.00	0.15	2.45	0.4	9	3.8	NDOT Type 2 (Double)	BRIDGE
SEB	462+02	ON6-2	1.1	1	0.1	0.86	2.00	0.16	1.69	0.3	12	8.1	NDOT Type 2 (Double)	Capacity
SEB	463+00	ON6-2_{BYP} + ON6-1	0.7	0.5	0.2	0.55	1.00	0.11	1.08	0.1	12	11.4	NDOT Type 2 (Double)	SER
SP	484+92	ON3-1	0.9	0.7	0.2	1.24	4.00	0.18	2.17	0.4	6.3	4.6	NDOT Type 2 (Double)	SER
SP	486+60	ON4	6.0	6.0	0.0	-	-	0.38	-	-	-	-	NDOT Type 2A	SUMP
SEB1	521+14	ULT5B	17.0	17.0	0.0	-	-	1.03	-	-	-	-	EX. NDOT Type 2A	SUMP
SEB1	524+90	ULT5-1 + ULT5A-2	1.7	1.7	0.0	3.02	3.08	0.18	3.35	0.6	12	5.8	NDOT Type 2 (Triple)	EOB
SEB1	525+21	ULT5-2	2.4	2.4	0.0	-	-	0.20	-	-	-	-	EX. NDOT Type 2A	SUMP

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PROJECT NO. 412-658-3
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 12-01-16
PLOT TIME: 11:03:17

REV	DATE	DESCRIPTION	DATE	AGEN APP	DATE	GCW APP	DATE:

% COMPLETE

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Nelson Boggs

CITY OF LAS VEGAS

SUMMERLIN PARKWAY TRAFFIC CAPCACITY AND SAFETY IMPROVEMENTS PHASE 3

EXHIBIT 1

ULTIMATE CONDITIONS DRAINAGE MAP

DRAWING
EXH-1
OF SHTS

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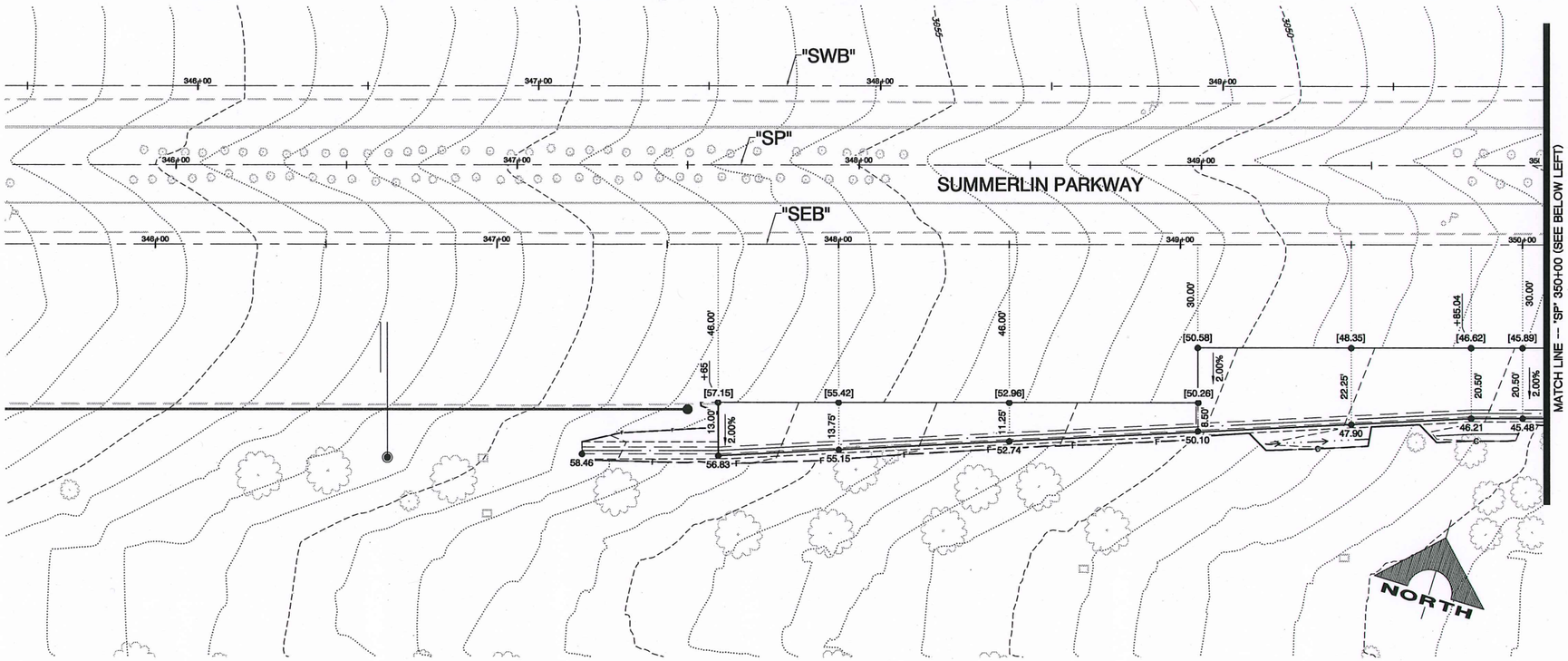

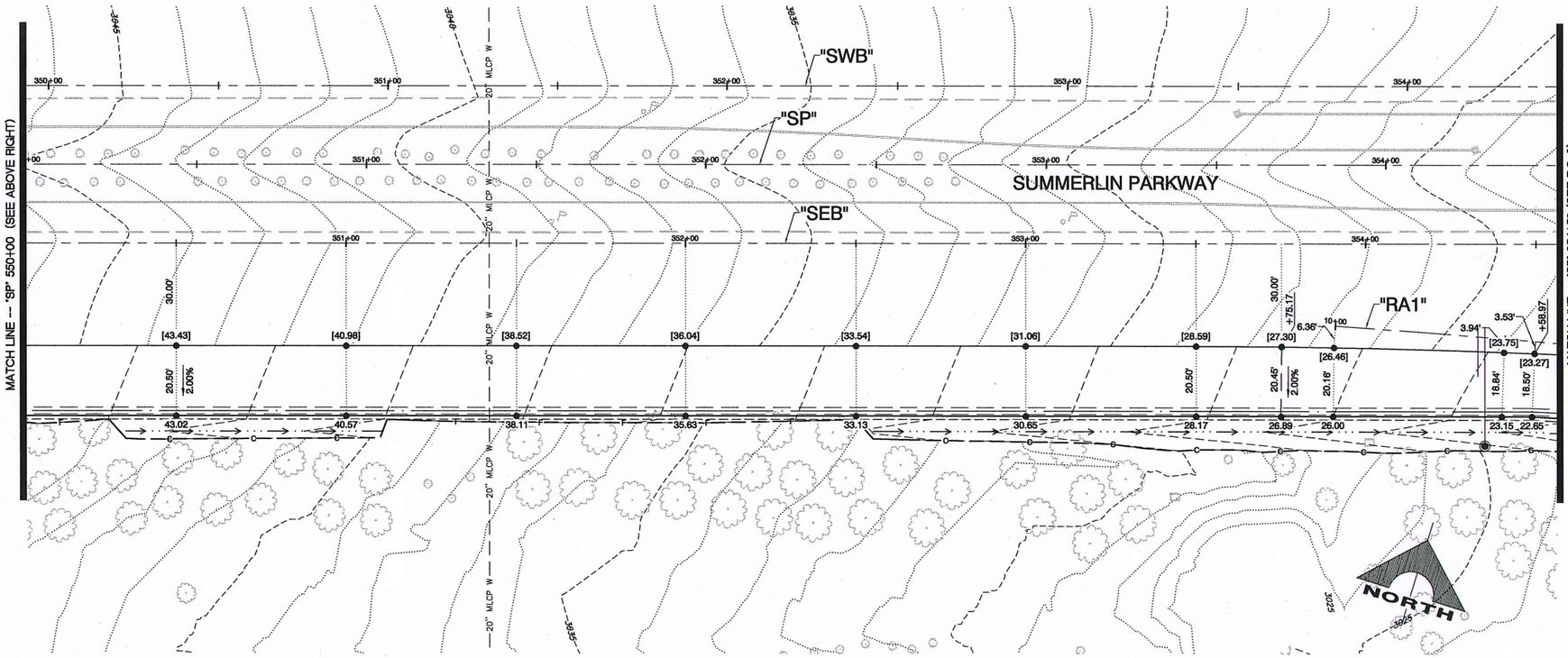

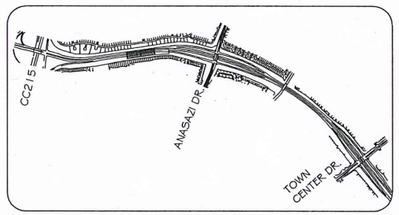

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SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.

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DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAIL GRADING PLANS
"SP" 345+50 TO "SP" 354+50

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-1
26 OF 85
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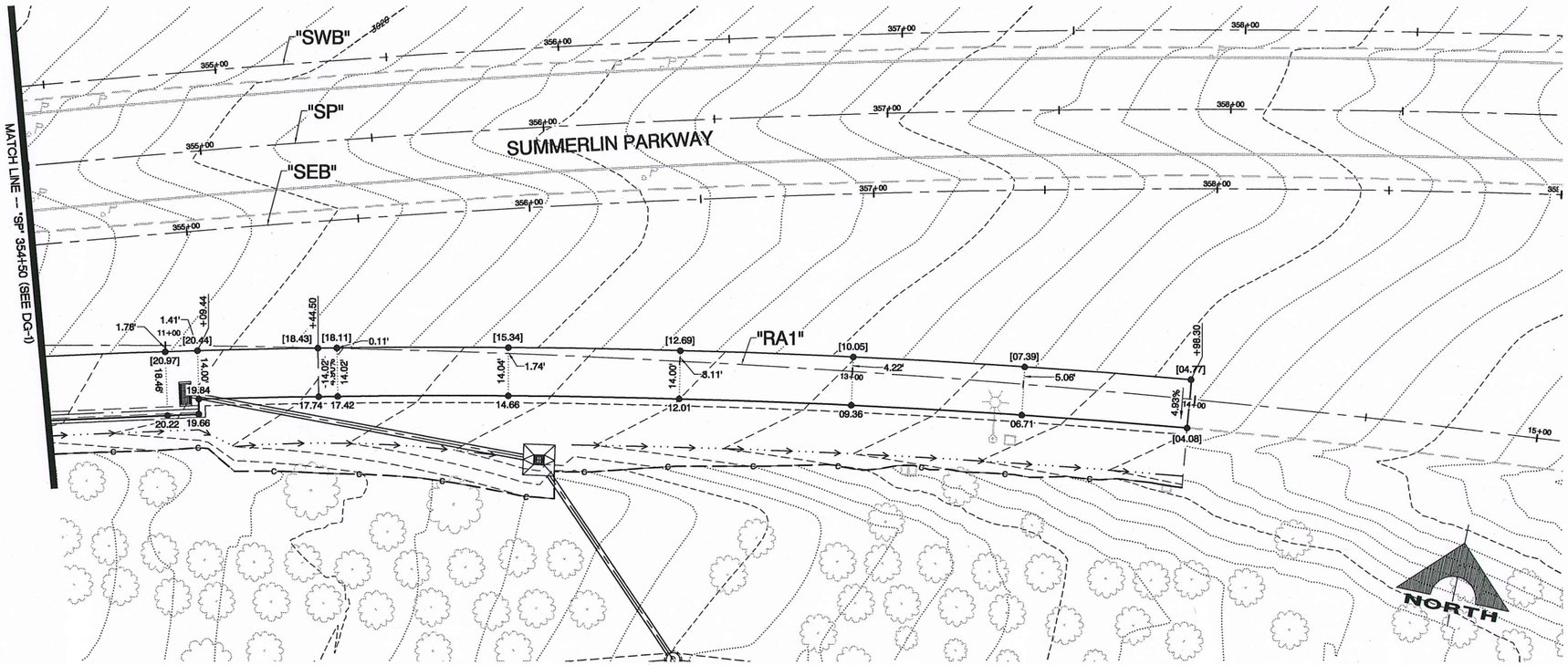

SCALE 20 0 20 40 FEET

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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CONCRETE SWALE

HINGE LINE

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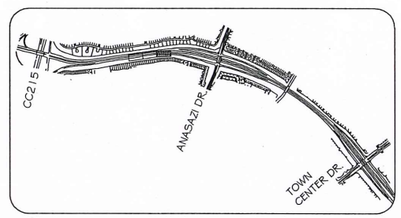

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SHEET
DG-2
27 OF 85
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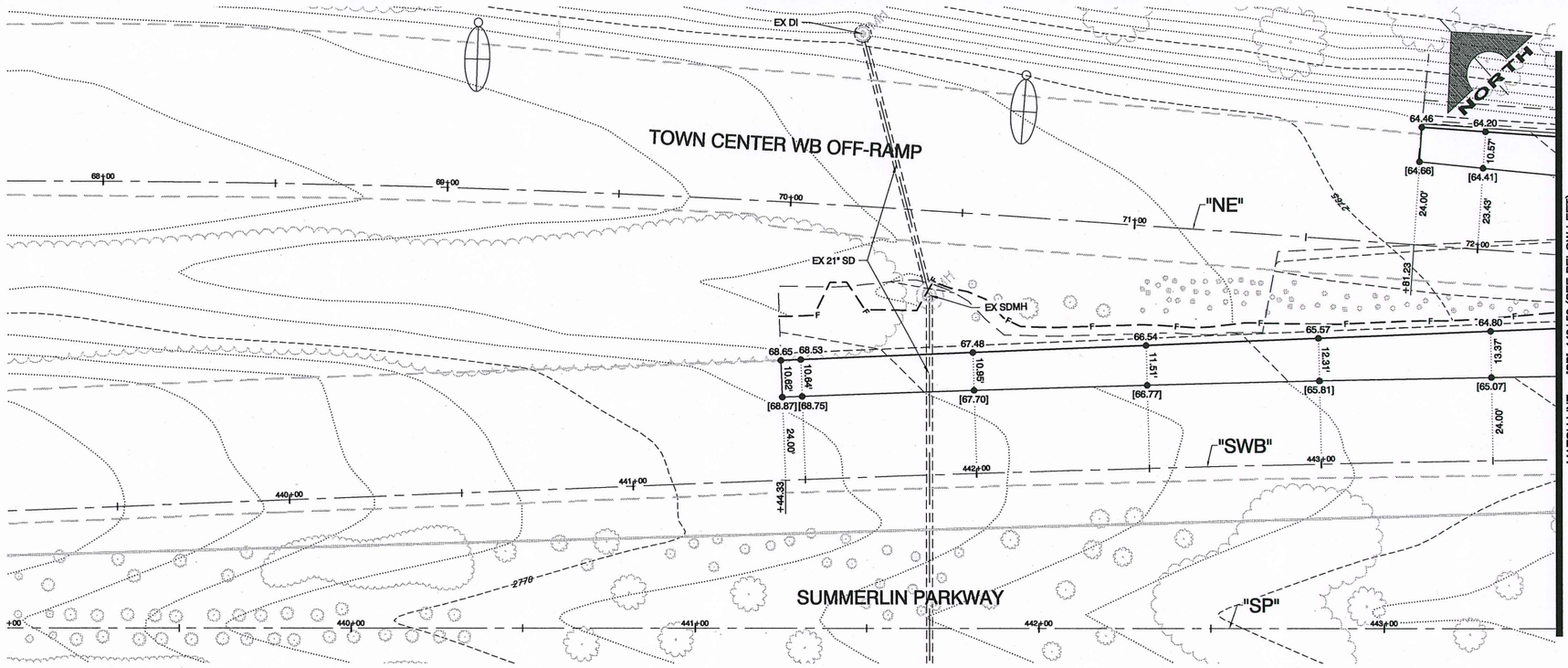

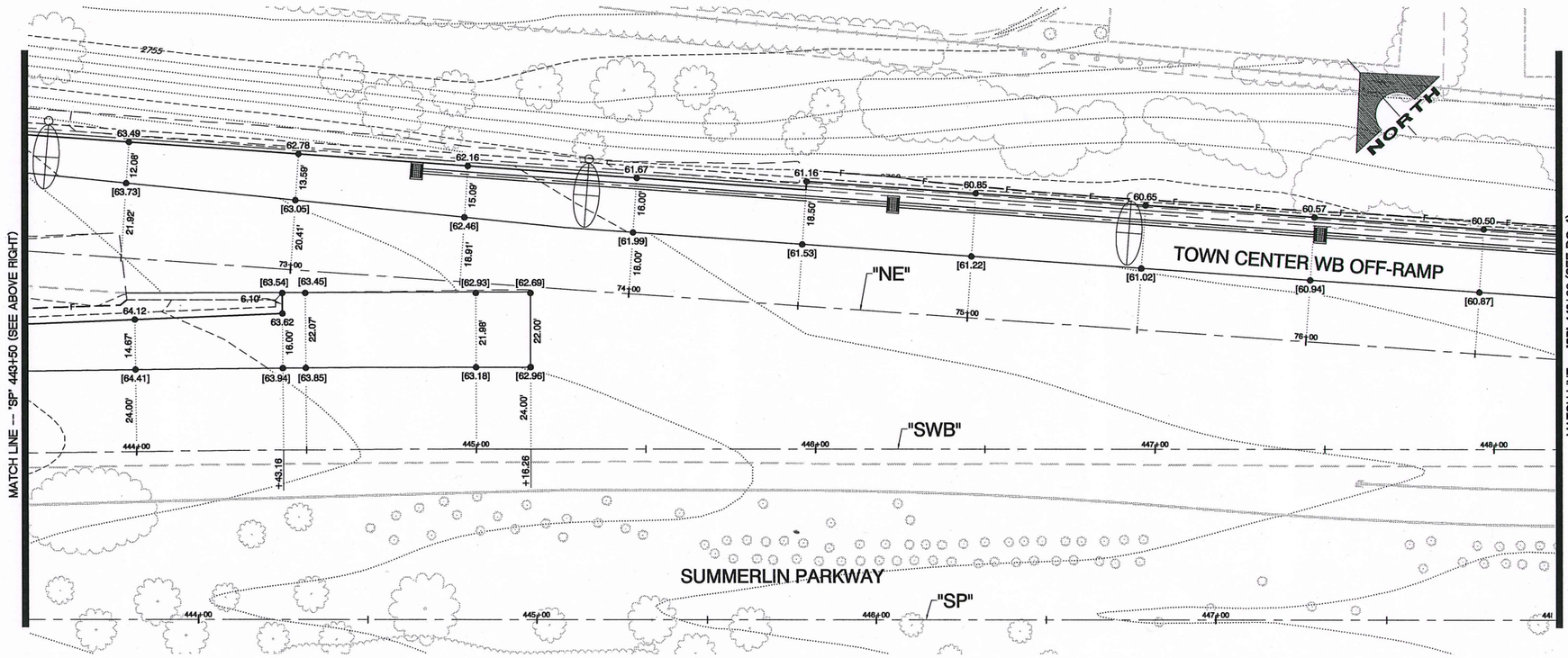

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SCALE FEET

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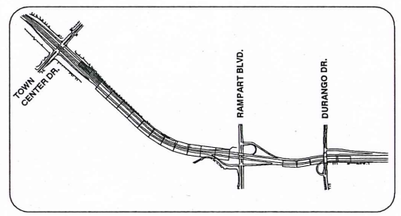

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SHEET
DG-3
28 OF 85
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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

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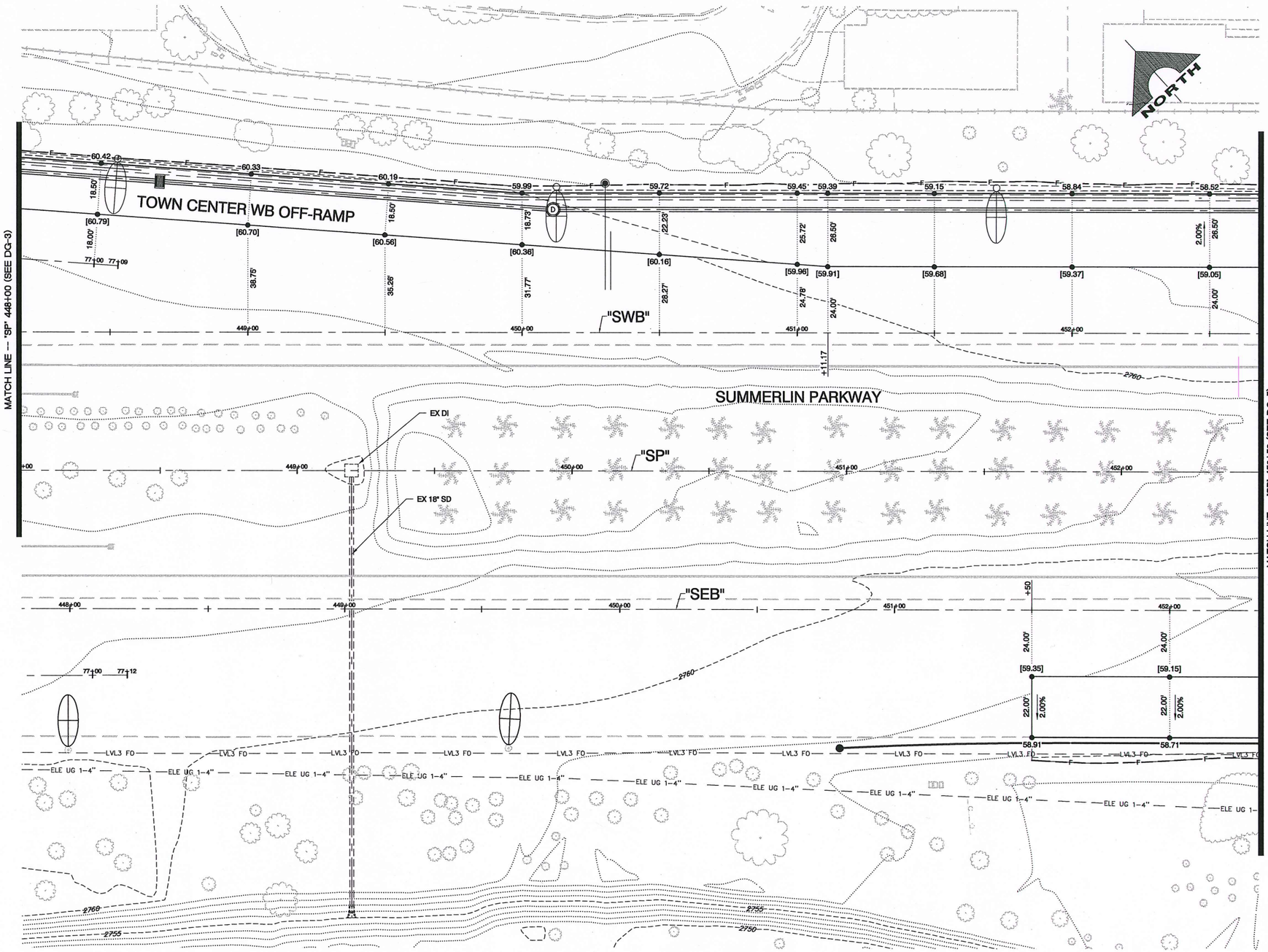

SCALE: 20 0 20 40 FEET

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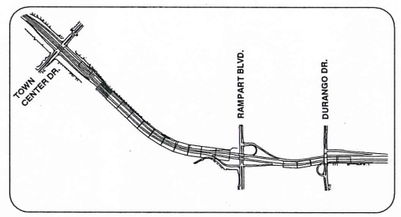

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CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 448+00 TO "SP" 452+50

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-4
29 OF 85
DRAWING NO.
XXX

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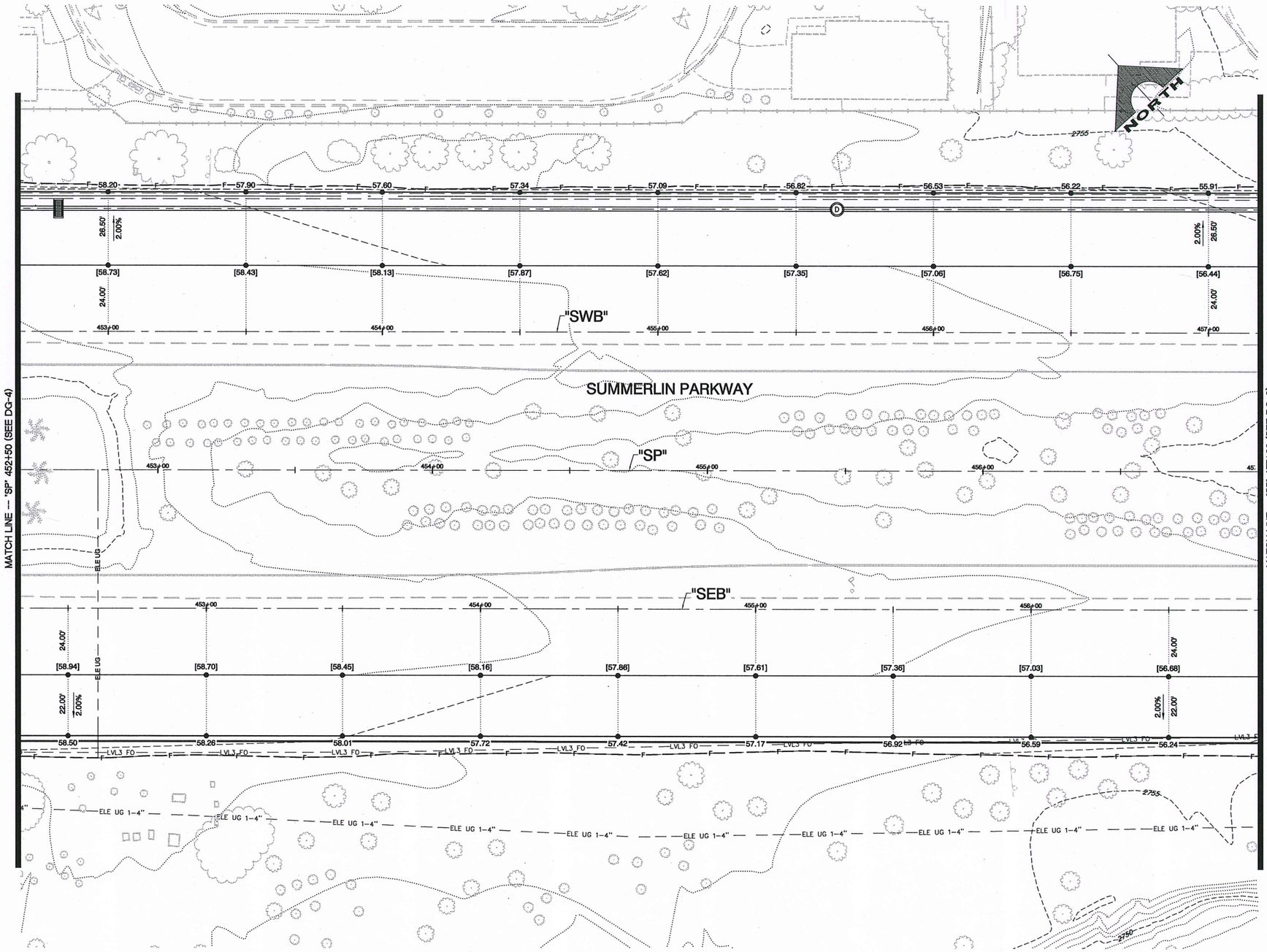

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SCALE FEET

CALL BEFORE CONSTRUCTION

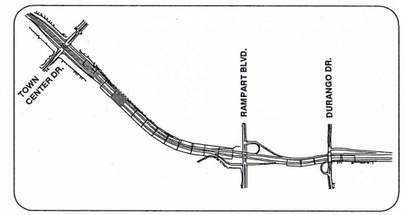
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 452+50 TO "SP" 457+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. LTOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-5
30 OF 85

DRAWING NO.
XXXX

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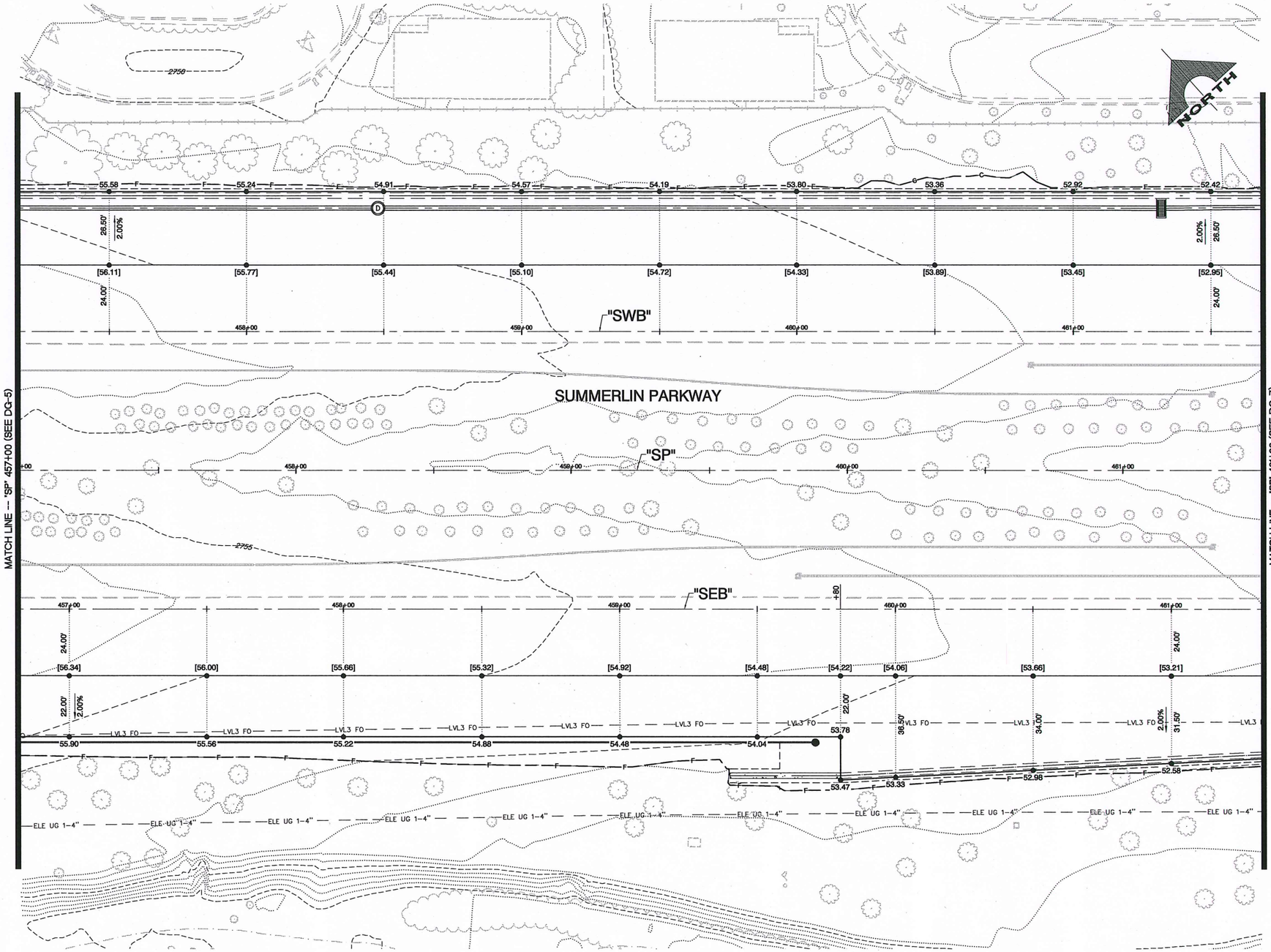


20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

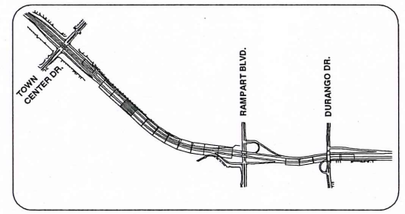
RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



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CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG
DATE: 12/1/2016 | DRAWN BY: TJC
SUBMITTAL STAGE: **90% SUBMITTAL** | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS 'SP" 457+00 TO "SP" 461+00

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-6
31 OF 85
DRAWING NO.
XXXX

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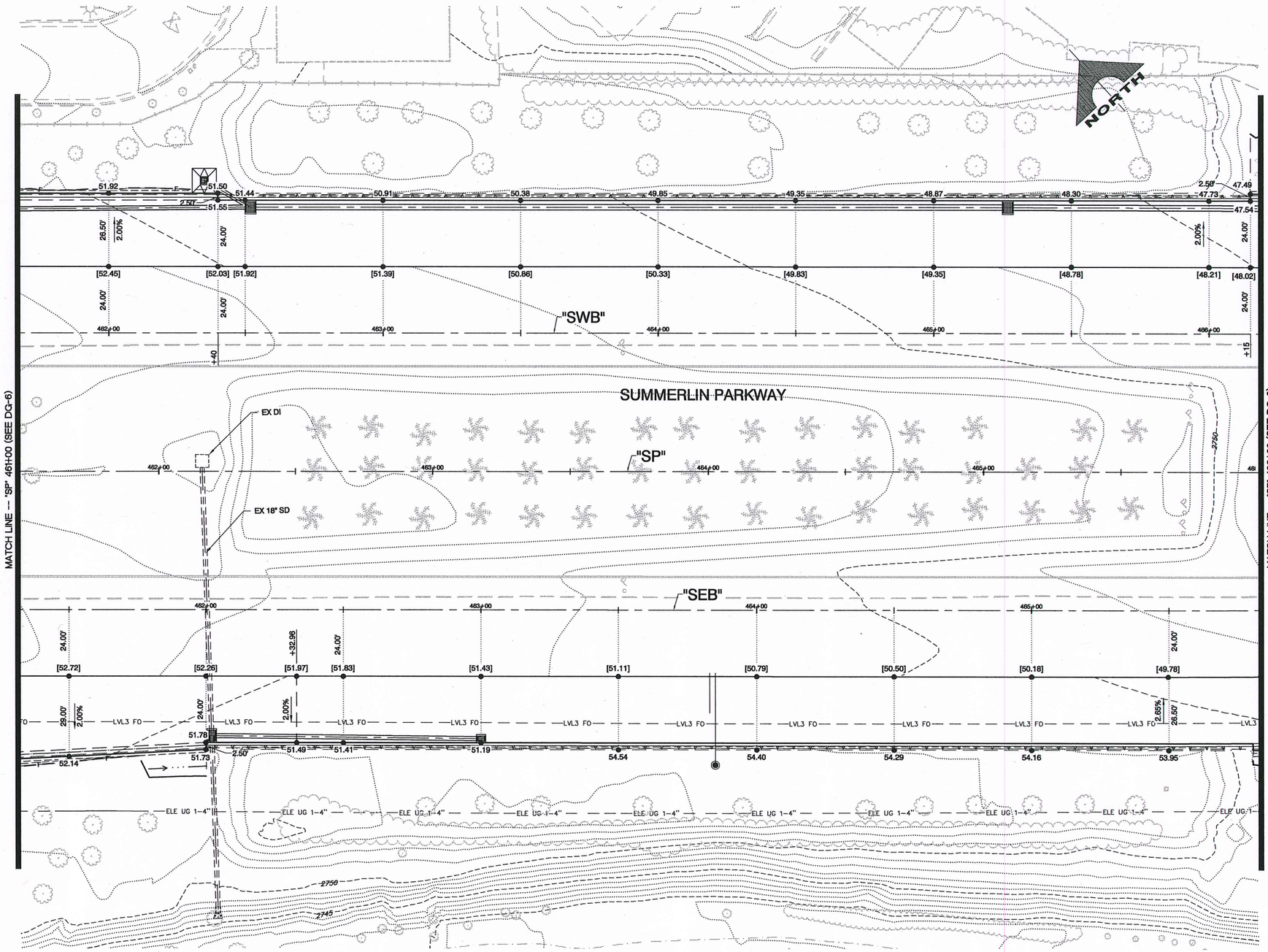

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SCALE FEET

CALL BEFORE CONSTRUCTION

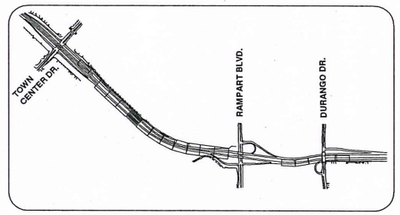
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:

ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



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CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
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SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

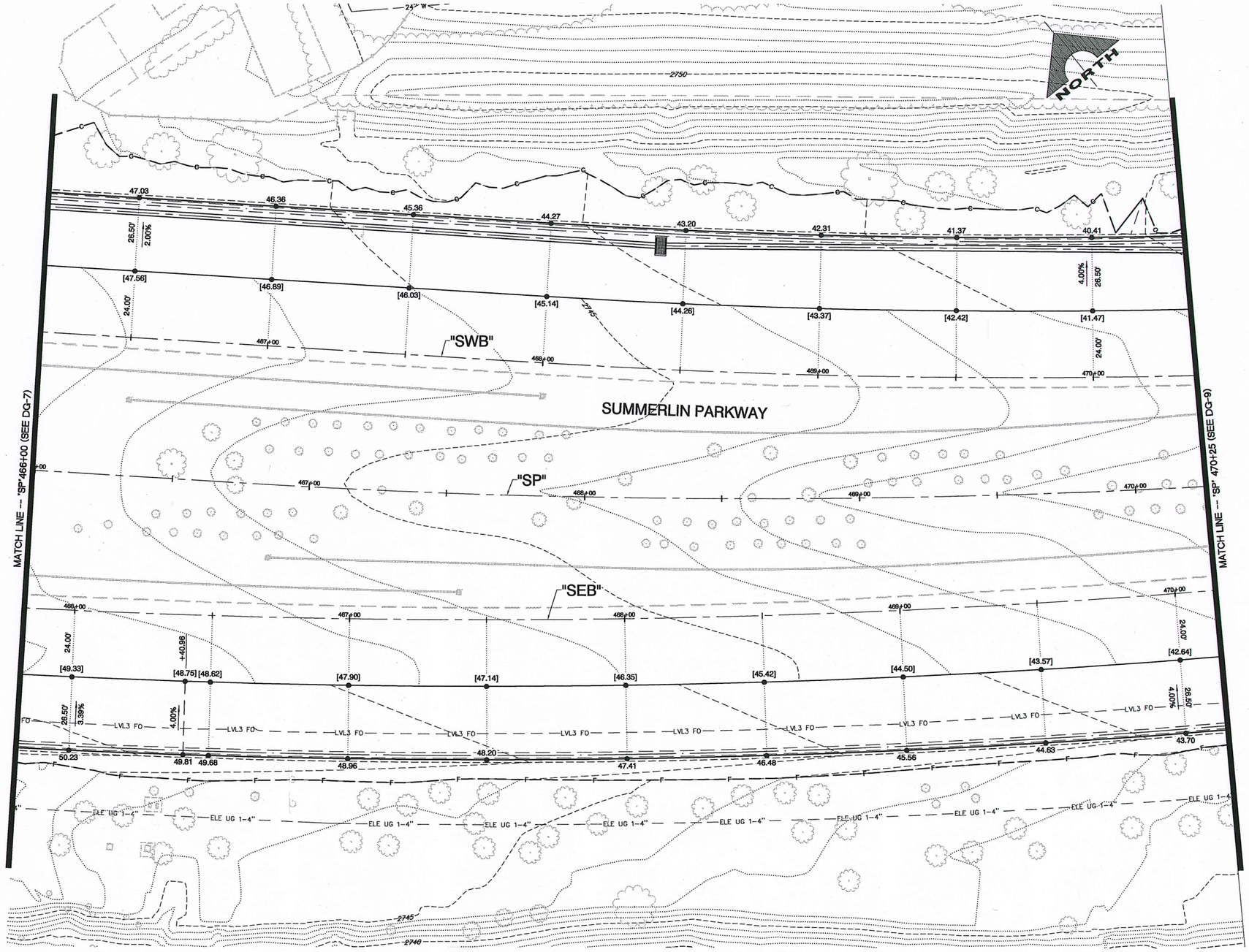
SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 461+00 TO "SP" 466+00

SHEET
DG-7
32 OF 85
DRAWING NO.
XXXX

12/1/2016 8:49 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54648-C-06-DG.DWG TRAVIS DE GROOT



CALL BEFORE CONSTRUCTION ⚠		
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

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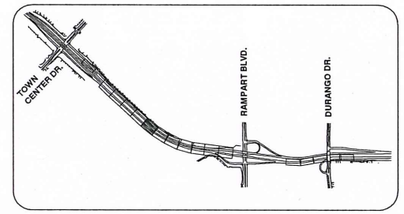

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CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
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SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 466+00 TO "SP" 470+25

SHEET
DG-8
33 OF 85

DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

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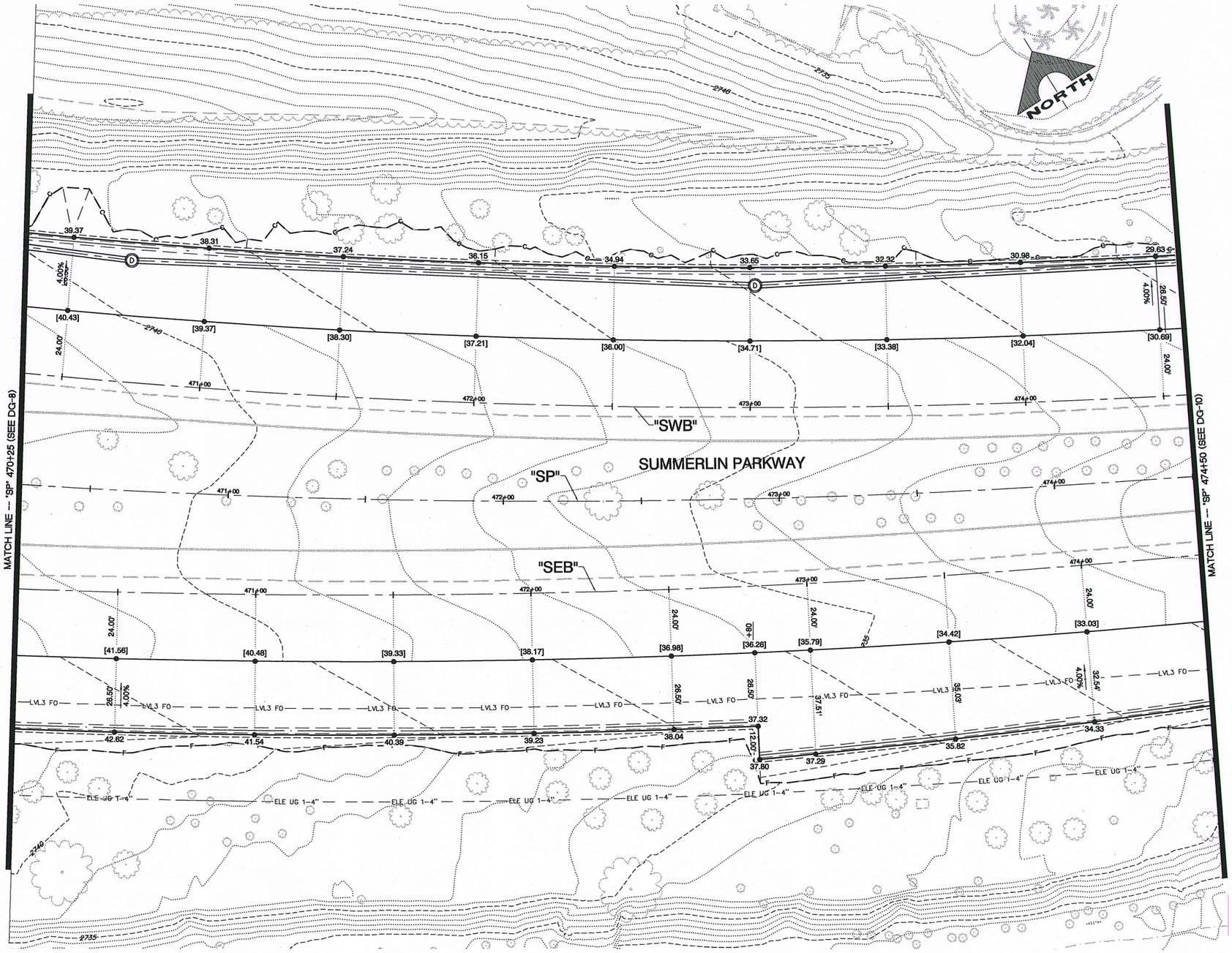

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
	HINGE LINE

NOTE:

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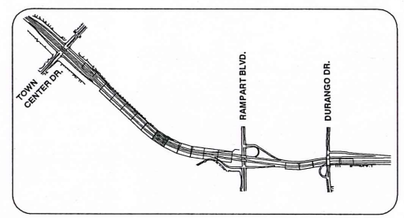

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HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: **90% SUBMITTAL** | DRAWN BY: TJC | CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 470+25 TO "SP" 474+50

PROFESSIONAL ENGINEER — STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-9
34 OF 85

DRAWING NO.
XXXX

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20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

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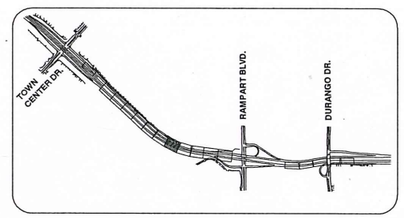

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F: 702.804.2299
ENGINEERS \ SURVEYORS
gcwengineering.com

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056
DATE: 12/1/2016
SUBMITTAL STAGE: 90% SUBMITTAL

BID# 16.67056
DESIGNED BY: FJG
DRAWN BY: TJC
CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS "SP" 474+50 TO "SP" 479+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-10
35 OF 85
DRAWING NO.
XXXX

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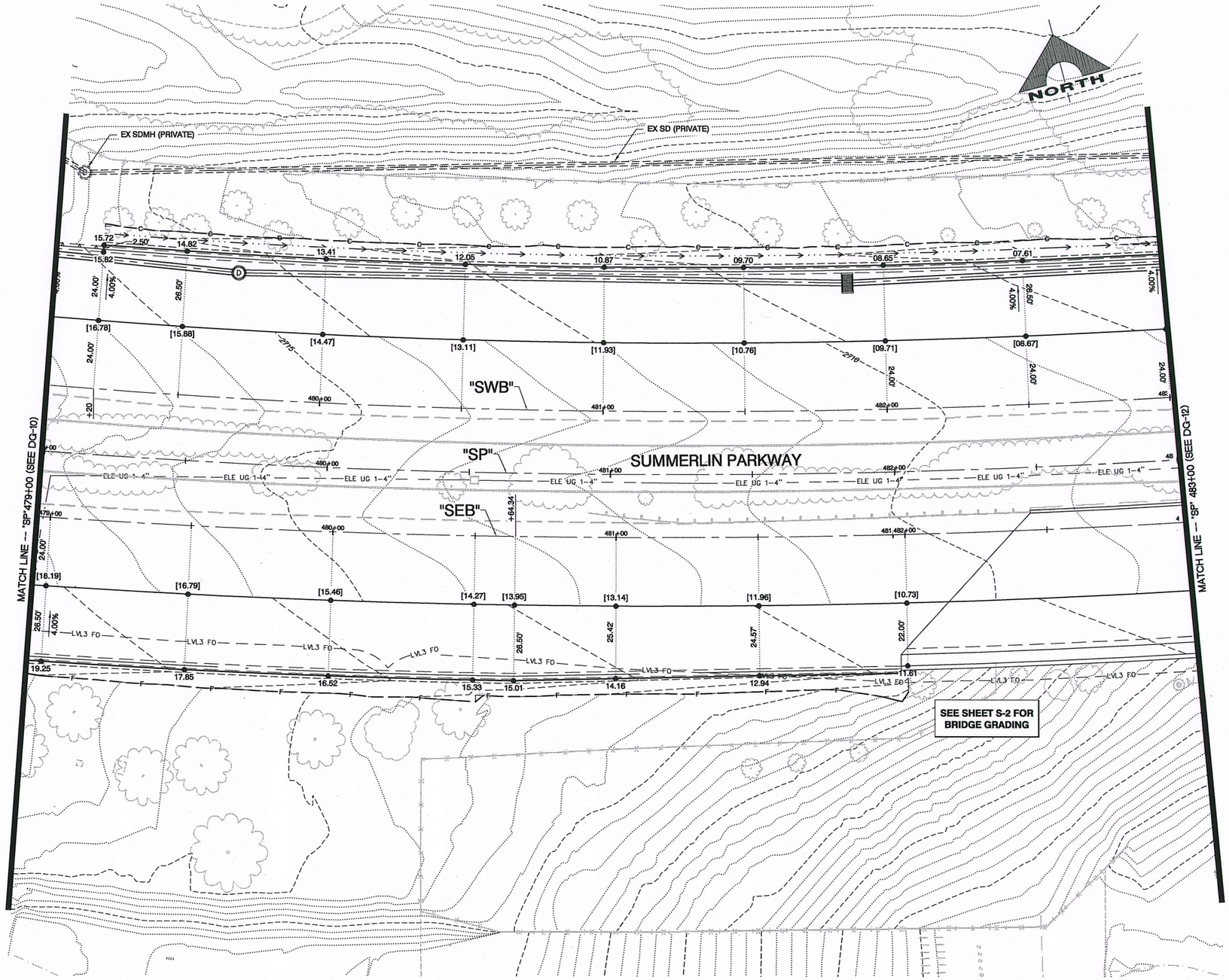

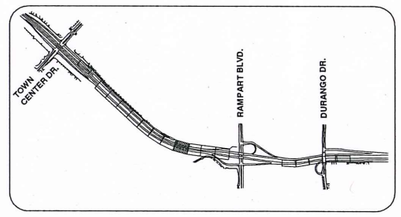

SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.

NO.	DATE	REVISIONS

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HANSEN NO. 67056
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SUBMITTAL STAGE: 90% SUBMITTAL
BID# 16.67056
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PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

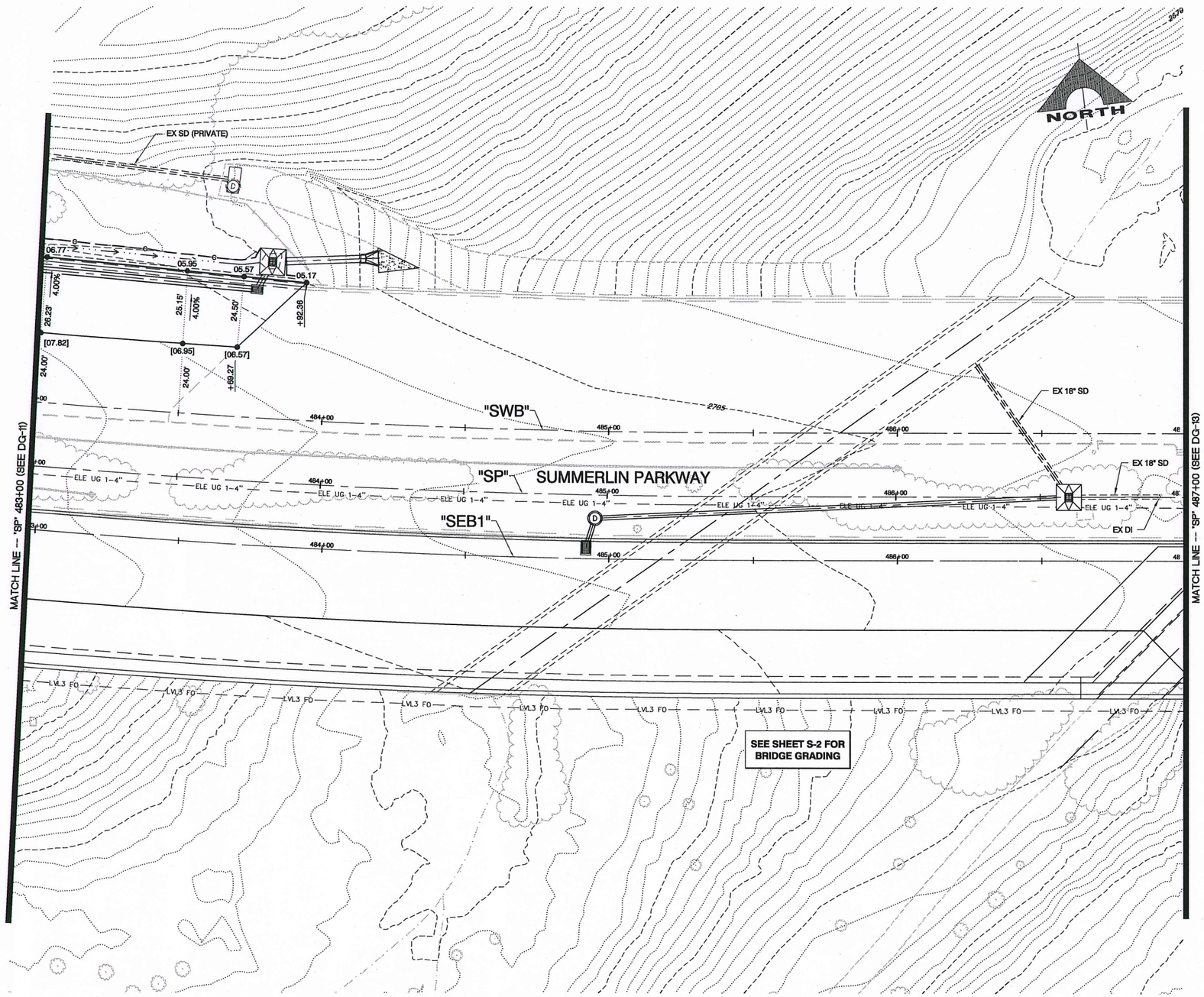
TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 479+00 TO "SP" 483+00

SHEET
DG-11
36 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:50 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54648-C-06-DG.DWG TRAVIS DE GROOT



20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION ⚠		
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0)	EXISTING ELEVATION
00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
	RIP RAP (D50=8", TH=16")
	CONCRETE SWALE
- - - -	HINGE LINE

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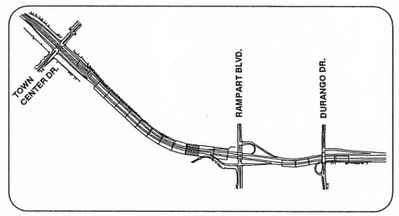

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ENGINEERS \ SURVEYORS

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
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SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC
CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

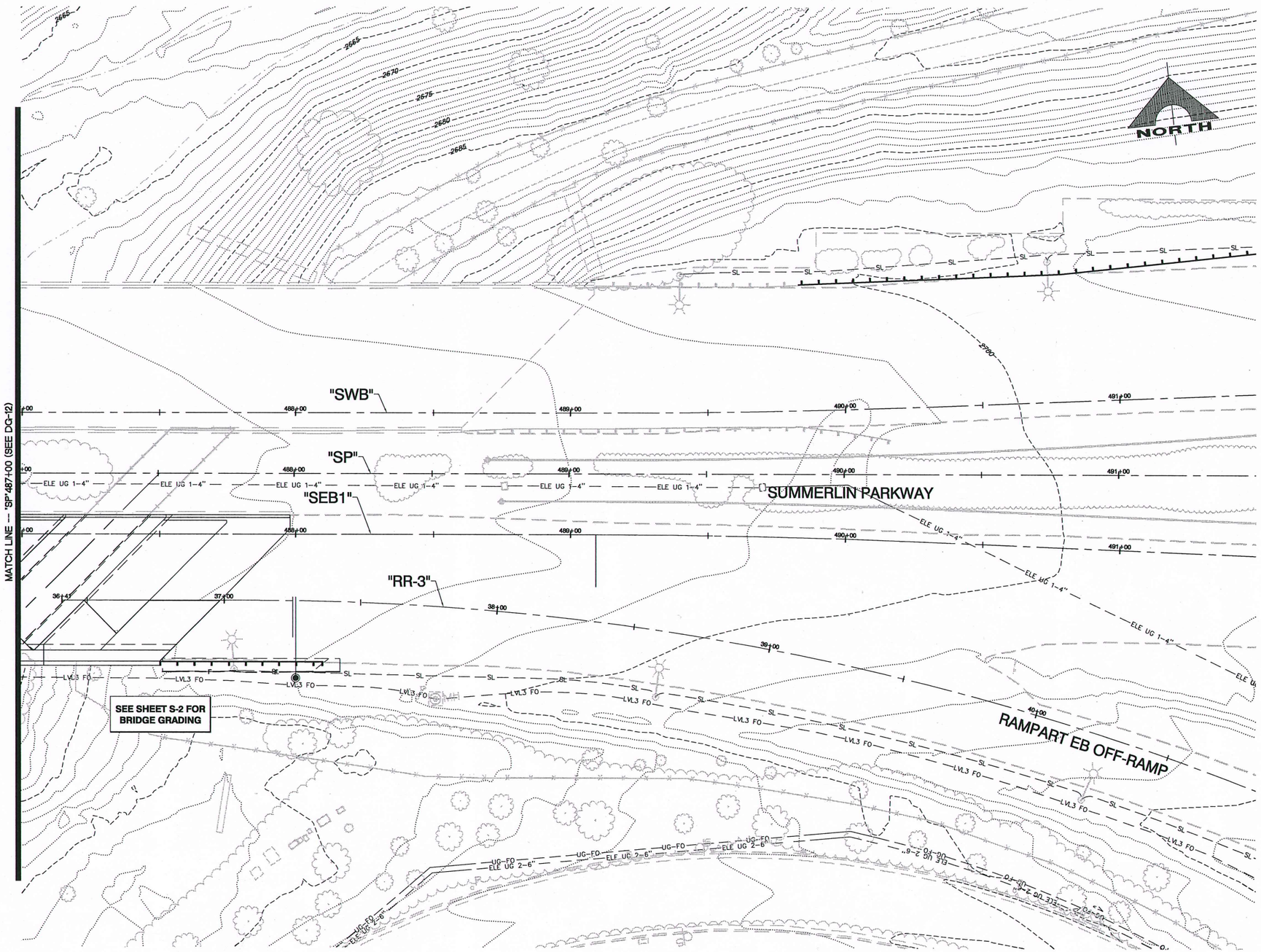
TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 483+00 TO "SP" 487+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-12
37 OF 85
DRAWING NO.
XXXX

12/1/2016 8:50 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54848-C-06-DG.DWG TRAVIS DE GROOT



SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

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BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

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00.00	FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED
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	CONCRETE SWALE
- - - -	HINGE LINE

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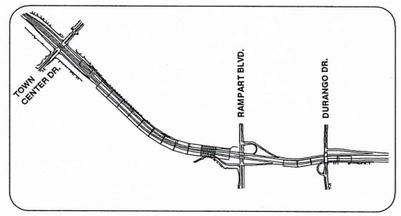

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PREPARED FOR
CITY OF LAS VEGAS

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SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC
CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 487+00 TO "SP" 491+50

PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
STATE OF NEVADA
12/1/16

SHEET
DG-13
38 OF 85
DRAWING NO.
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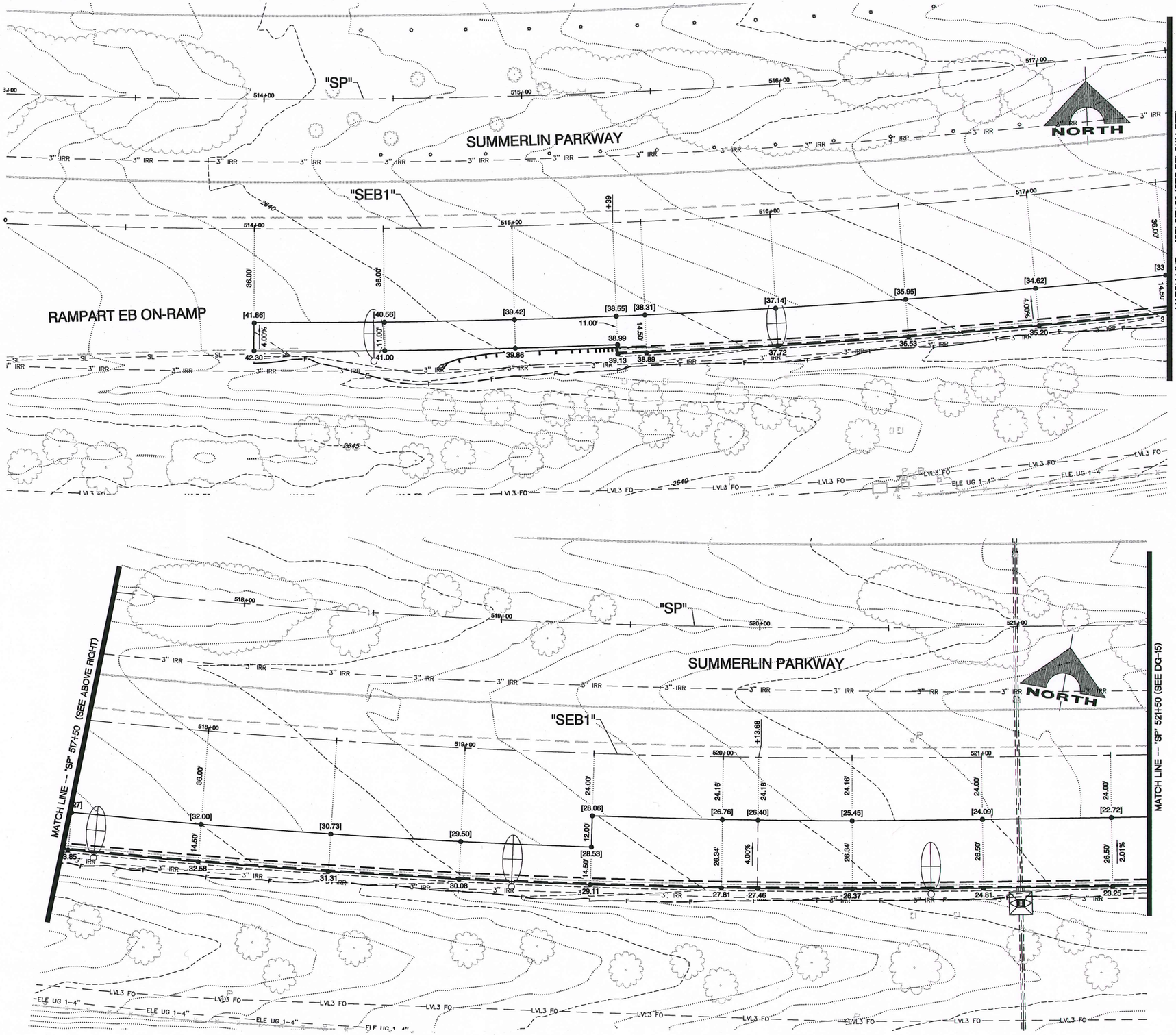
SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:51 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H5464B-C-06-DG.DWG TRAVIS DE GROOT



20 0 20 40
SCALE FEET

CALL BEFORE CONSTRUCTION ⚠		
BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

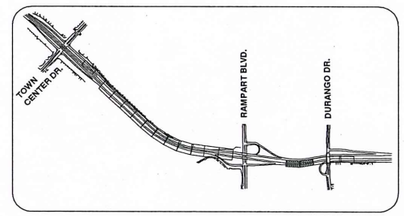
00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:
ALL DIMENSIONS ARE BETWEEN SPOT ELEVATIONS AND/OR CONTROL LINES.



NO.	DATE	REVISIONS

PREPARED BY
GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

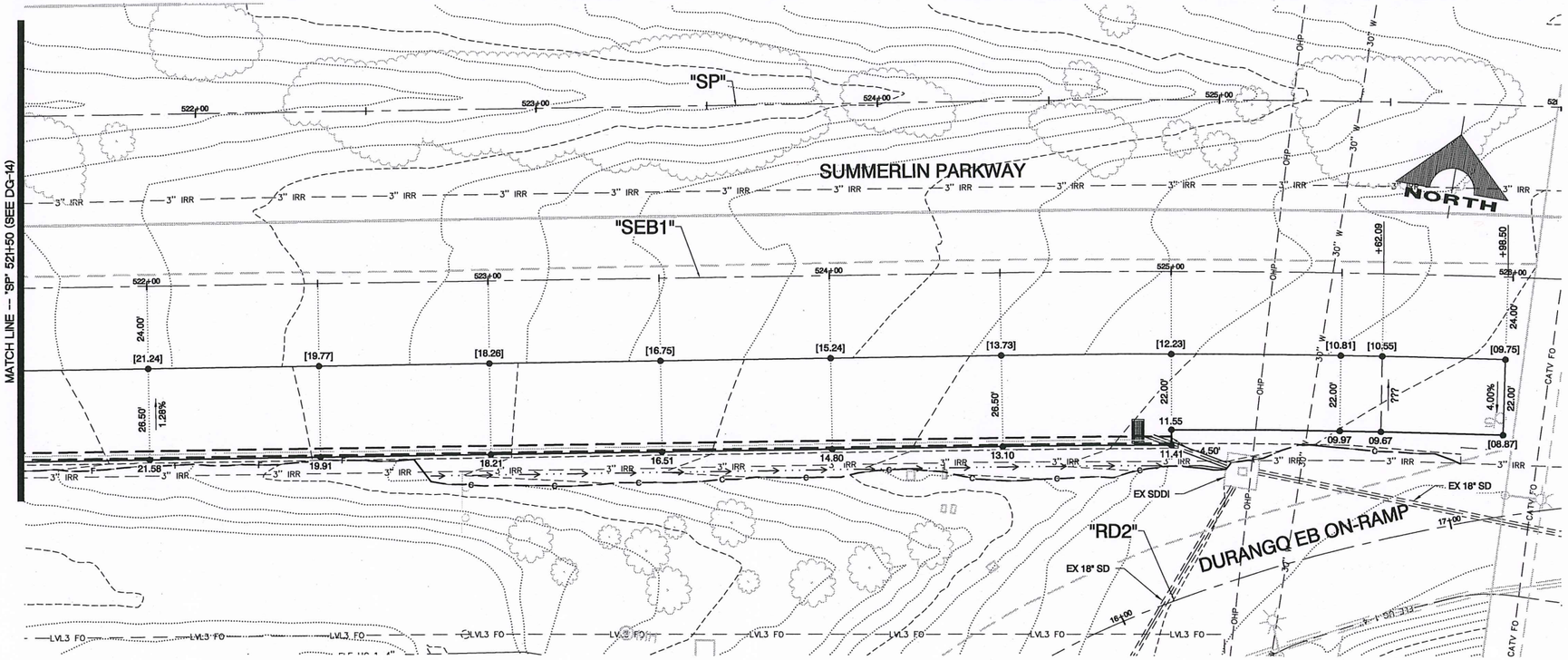
SHEET
DETAILED GRADING PLANS
"SP" 513+00 TO "SP" 521+50

STATE OF NEVADA
PROFESSIONAL ENGINEER
JOHN R. TOBIN
Exp. 05/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-14
39 OF 85
DRAWING NO.
XXXX

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

12/1/2016 8:51 AM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H15648-C-06-DG.DWG TRAVIS DE GROOT



SCALE 20 0 20 40 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

LEGEND

(00.0) EXISTING ELEVATION

00.00 FINISH GRADE ELEVATION AT EDGE OF PAVEMENT UNLESS OTHERWISE NOTED

RIP RAP (D50=8", TH=16")

CONCRETE SWALE

HINGE LINE

NOTE:

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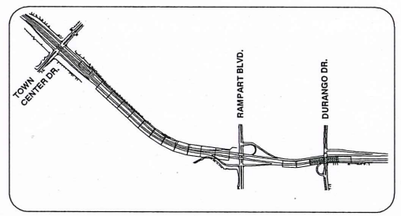

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SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG | DRAWN BY: TJC | CHECKED BY: JRT
SUBMITTAL STAGE: 90% SUBMITTAL

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
DETAILED GRADING PLANS
"SP" 521+50 TO "SP" 526+00

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
DG-15
40 OF 85

DRAWING NO.
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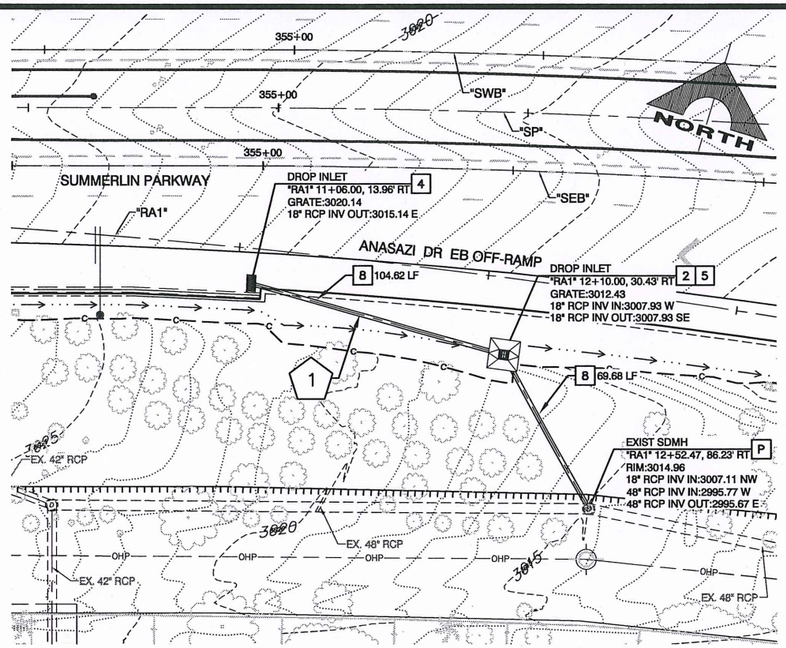
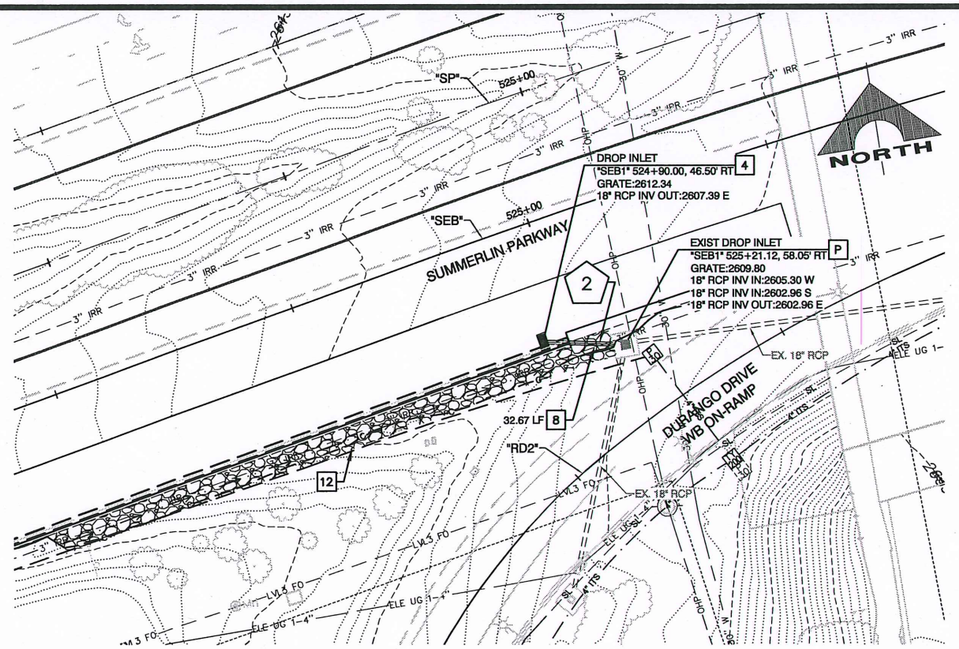
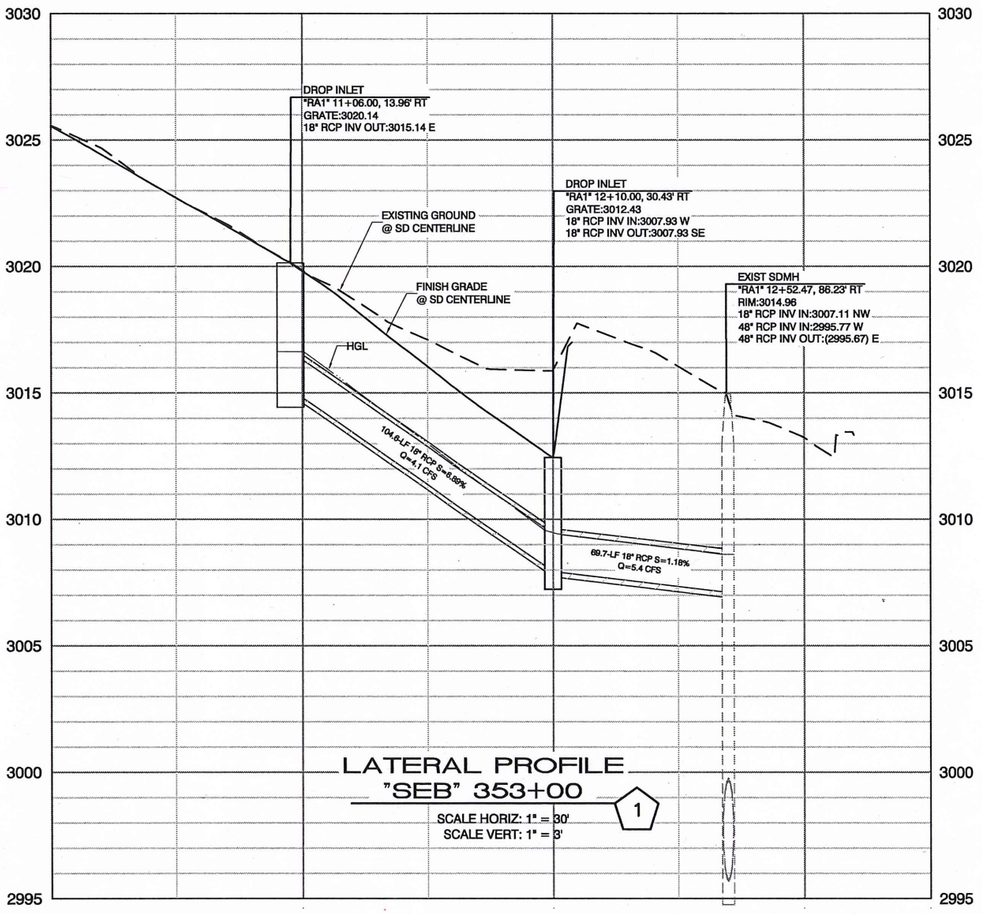
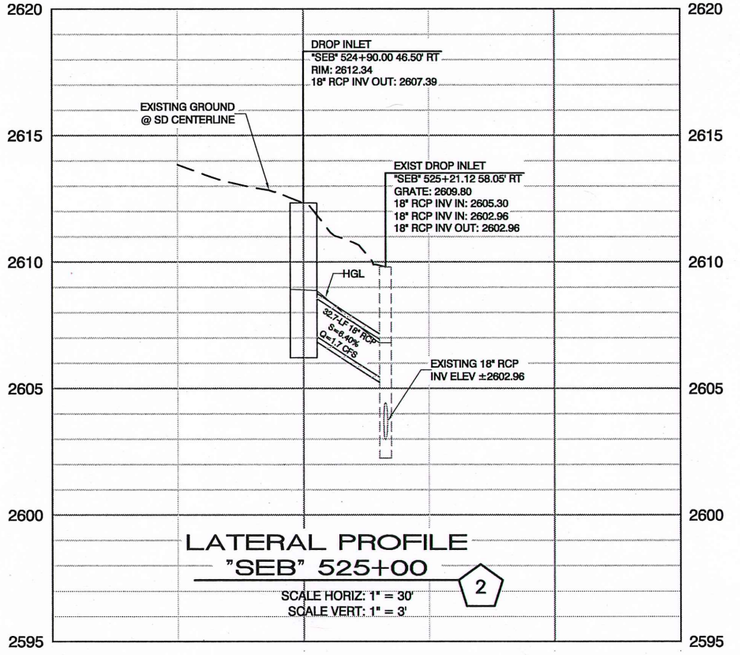






LATERAL PROFILE "SEB" 353+00 (1)

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'



LATERAL PROFILE "SEB" 525+00 (2)

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

SCALE: 20 0 20 60 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

1. CONSTRUCT TYPE 2 DI (NDOT STD. PLAN R-4.2.1)
2. CONSTRUCT TYPE 2A DI (NDOT STD. PLAN R-4.2.1.1)
3. CONSTRUCT TYPE 2 DI W/ DOUBLE GRATES (NDOT STD. PLAN R-4.2.1)
4. CONSTRUCT TYPE 2 DI W/ TRIPLE GRATES (NDOT STD. PLAN R-4.2.1)
5. CONSTRUCT DROP INLET CONCRETE APRON (NDOT STD. PLAN R-4.2.7) (NO DIRECT PAYMENT)
6. CONSTRUCT TYPE I MANHOLE W/ CONCRETE COLLAR (NDOT STD. PLAN R-4.3.1)
7. CONSTRUCT CONCRETE APRON AT END SECTION (NDOT STD. PLAN R-4.2.7) (NO DIRECT PAYMENT)
8. INSTALL 18-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
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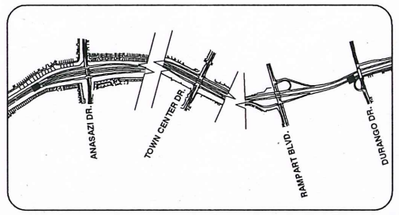
11. INSTALL 30-INCH RCP END SECTION (NDOT STD. PLAN R-2.3.1)
12. INSTALL RIPRAP (D50 = 8-INCH, TH = 16-INCHES)
- P PROTECT IN PLACE

UTILITY DISCLAIMER:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION. ANY UTILITIES DAMAGED DURING CONSTRUCTION MUST BE REPAIRED IMMEDIATELY AND TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.



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T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PREPARED FOR: CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG | DRAWN BY: TJC | CHECKED BY: JRT

DATE: 12/1/2016

SUBMITTAL STAGE: 90% SUBMITTAL

TITLE: SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET: STORM DRAIN PLAN AND PROFILE

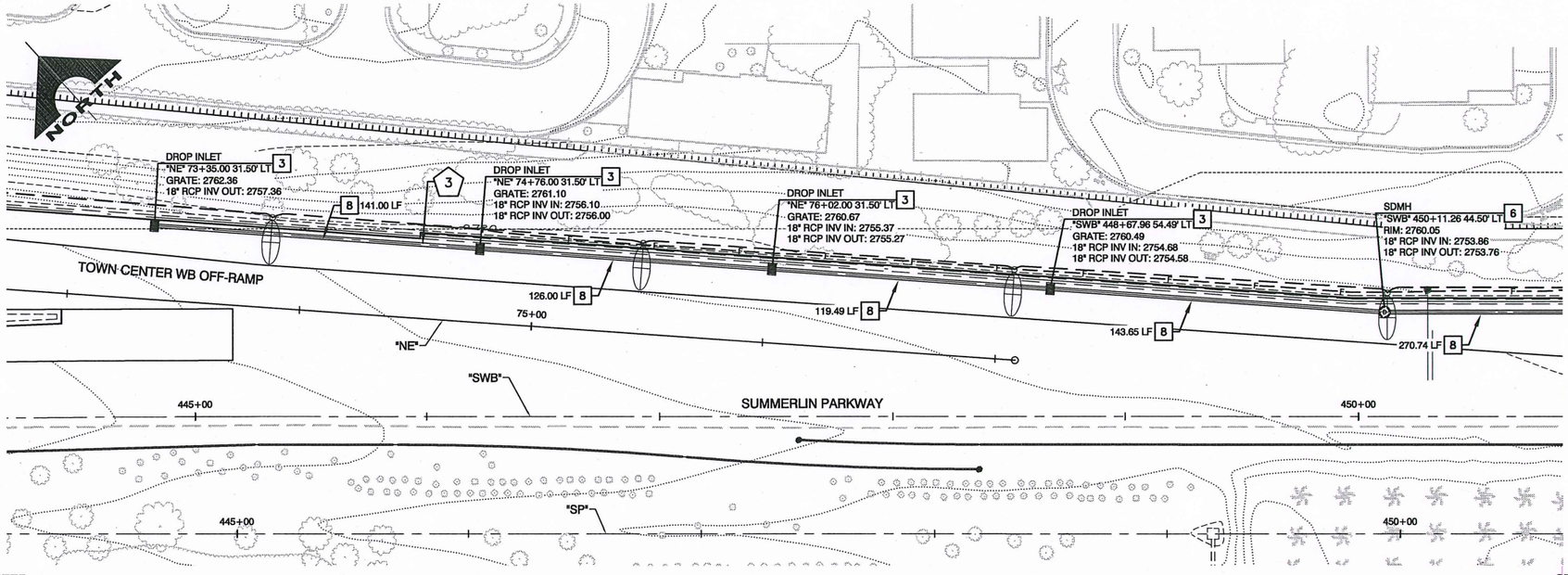
SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

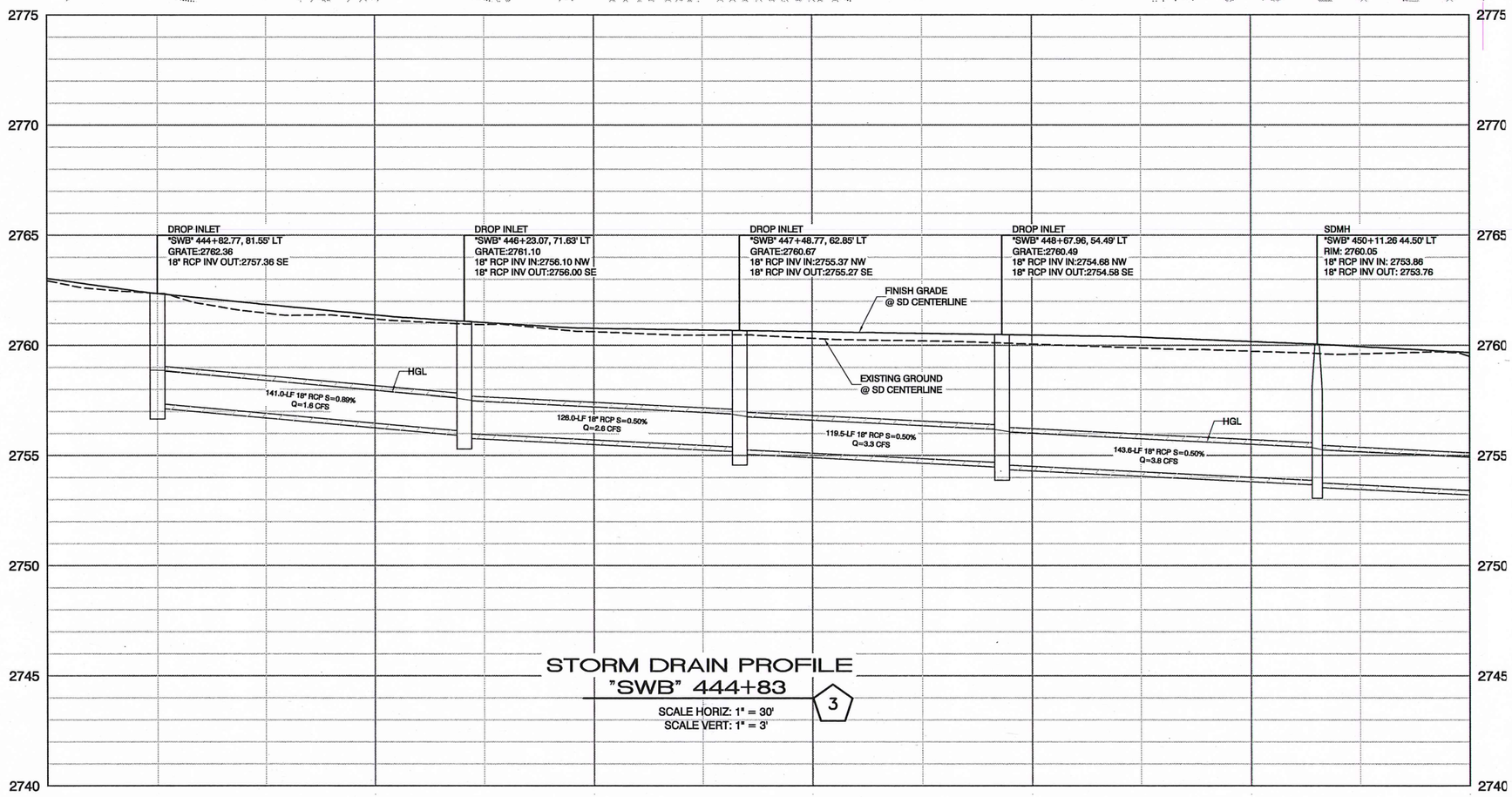
PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET SD-1
41 OF 85

DRAWING NO. XXXX

12/1/2016 1:06 PM F:\PROJECTS\400\412-658\DWG\PRODUCTION\H54648-C-07-SD01.DWG TIM CLARK





STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

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P PROTECT IN PLACE

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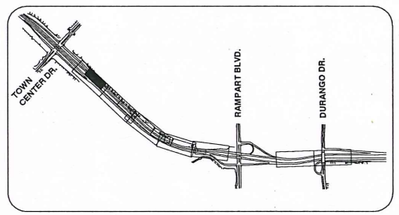

NO.	DATE	REVISIONS

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GCW
ENGINEERS \ SURVEYORS
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LAS VEGAS, NV 89146
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F: 702.804.2299
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PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056 | DESIGNED BY: FJG | DRAWN BY: TJC | CHECKED BY: JRT

DATE: 12/1/2016 | SUBMITTAL STAGE: 90% SUBMITTAL

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-2
42 OF 85

DRAWING NO.
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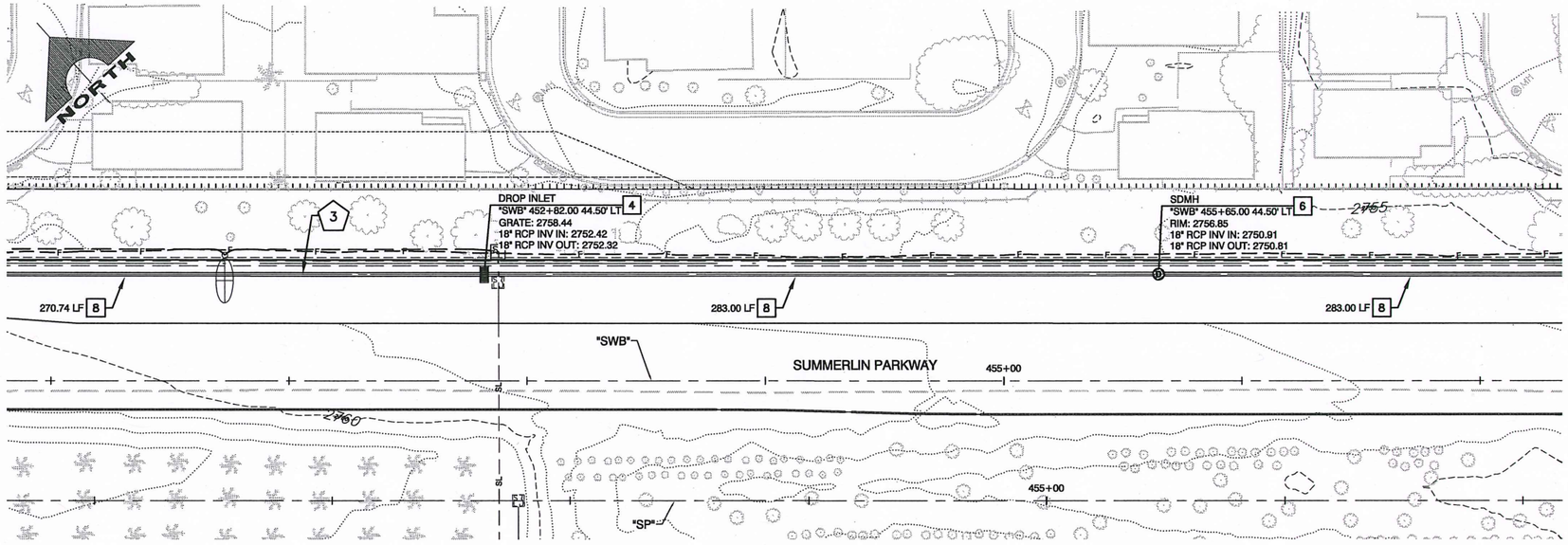

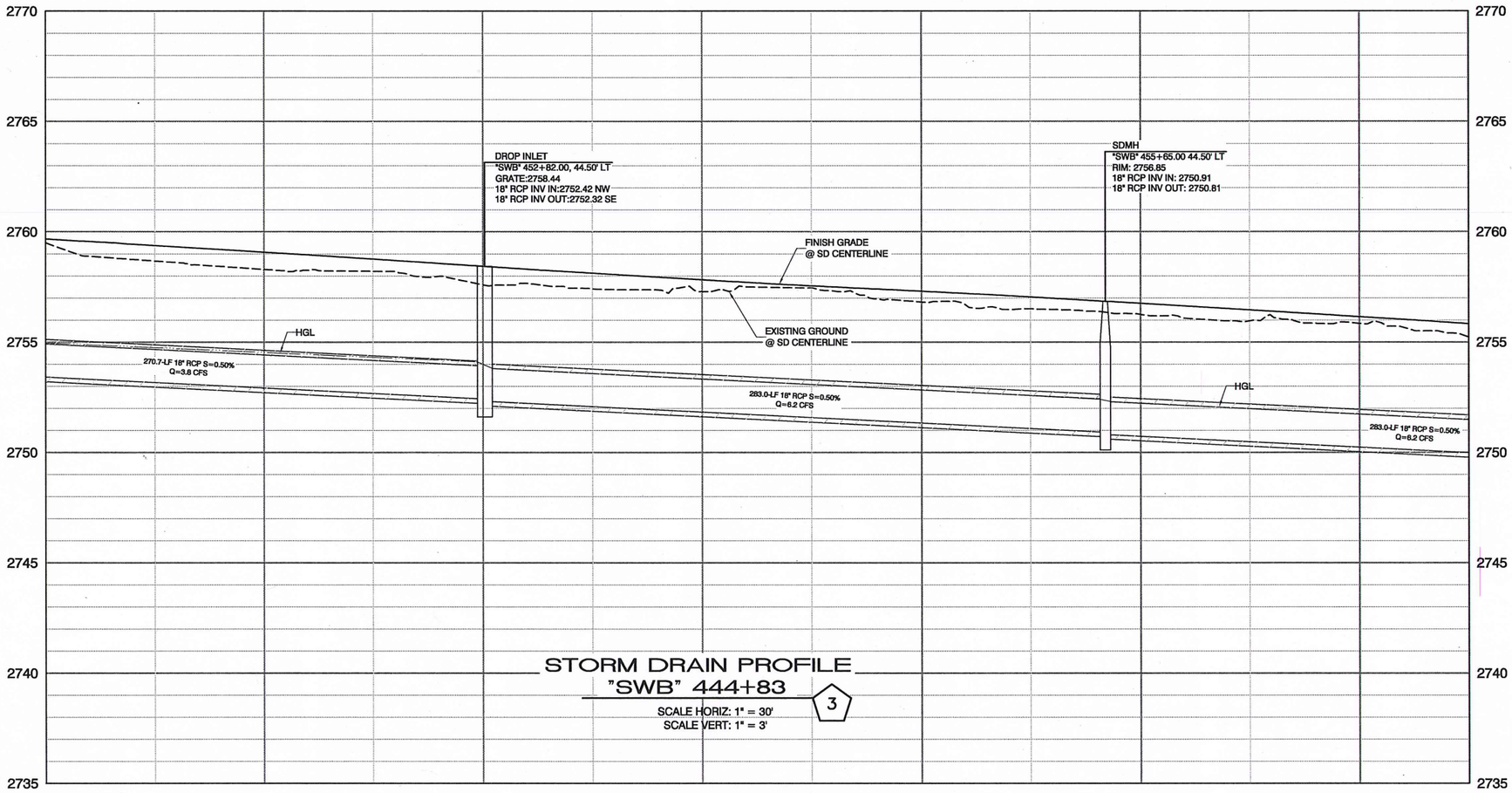

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

SCALE 30 0 30 60 FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
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STORM DRAIN NOTES

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P. PROTECT IN PLACE

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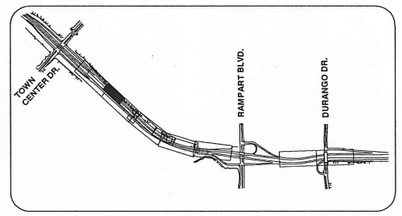

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STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-3
43 OF 85

DRAWING NO.
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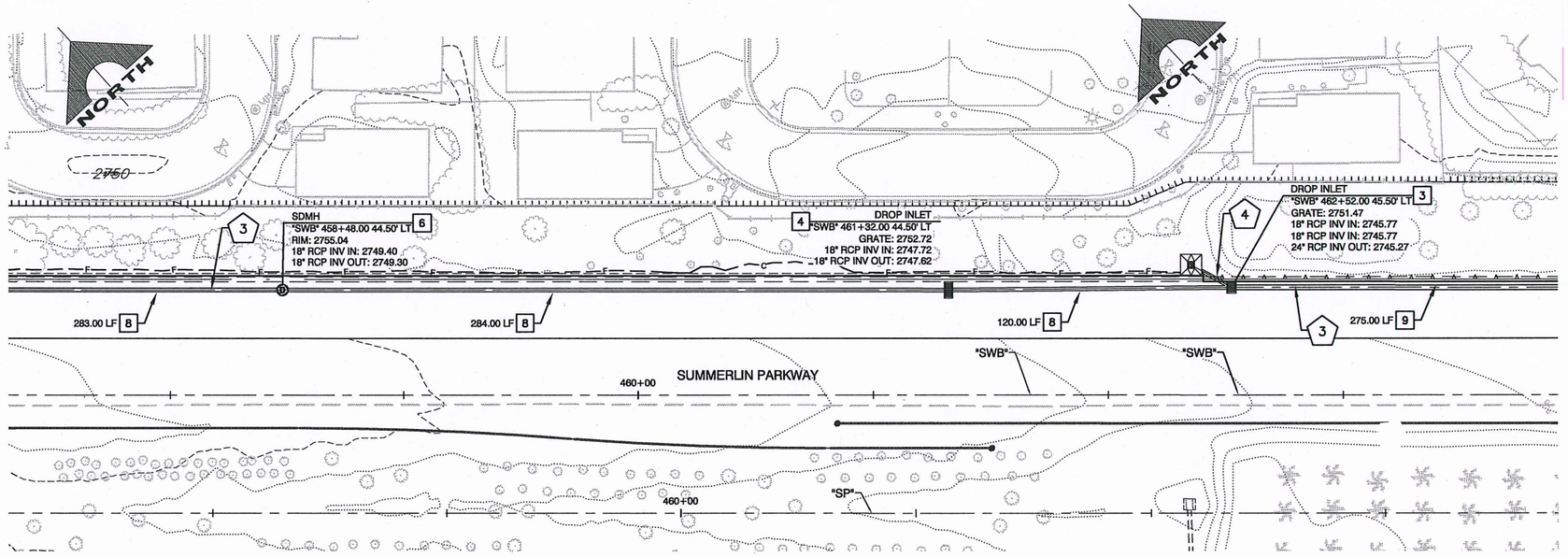

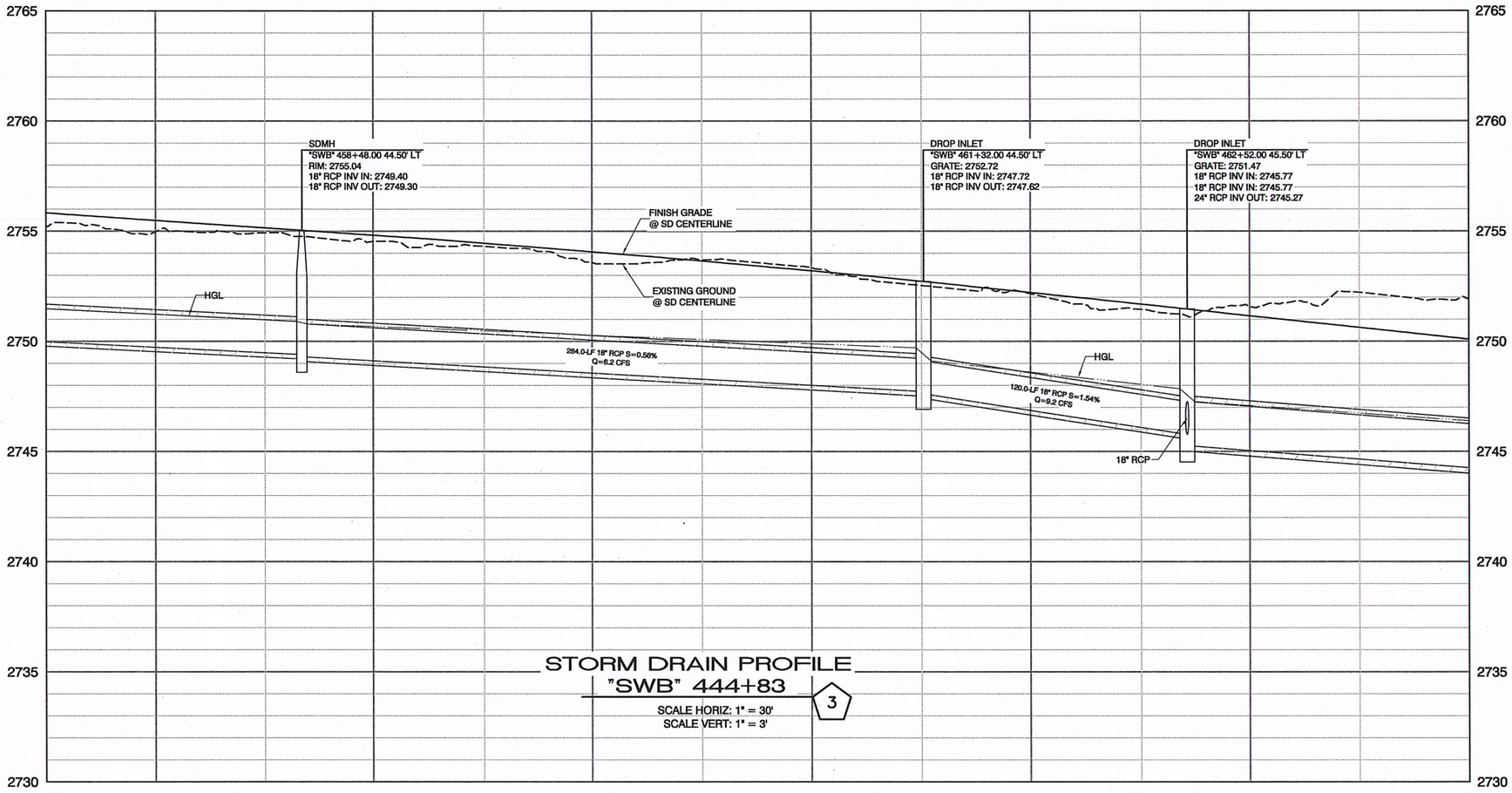

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

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	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

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11. INSTALL 30-INCH RCP END SECTION (NDOT STD. PLAN R-2.3.1)
12. INSTALL RIPRAP (D50 = 8-INCH, TH = 16-INCHES)

P PROTECT IN PLACE

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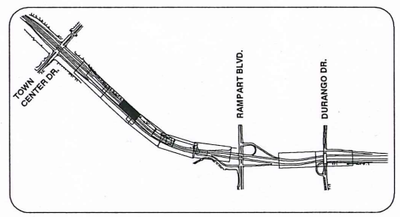

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gcwengineering.com

PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC | CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3

SHEET
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-4
44 OF 85

DRAWING NO.
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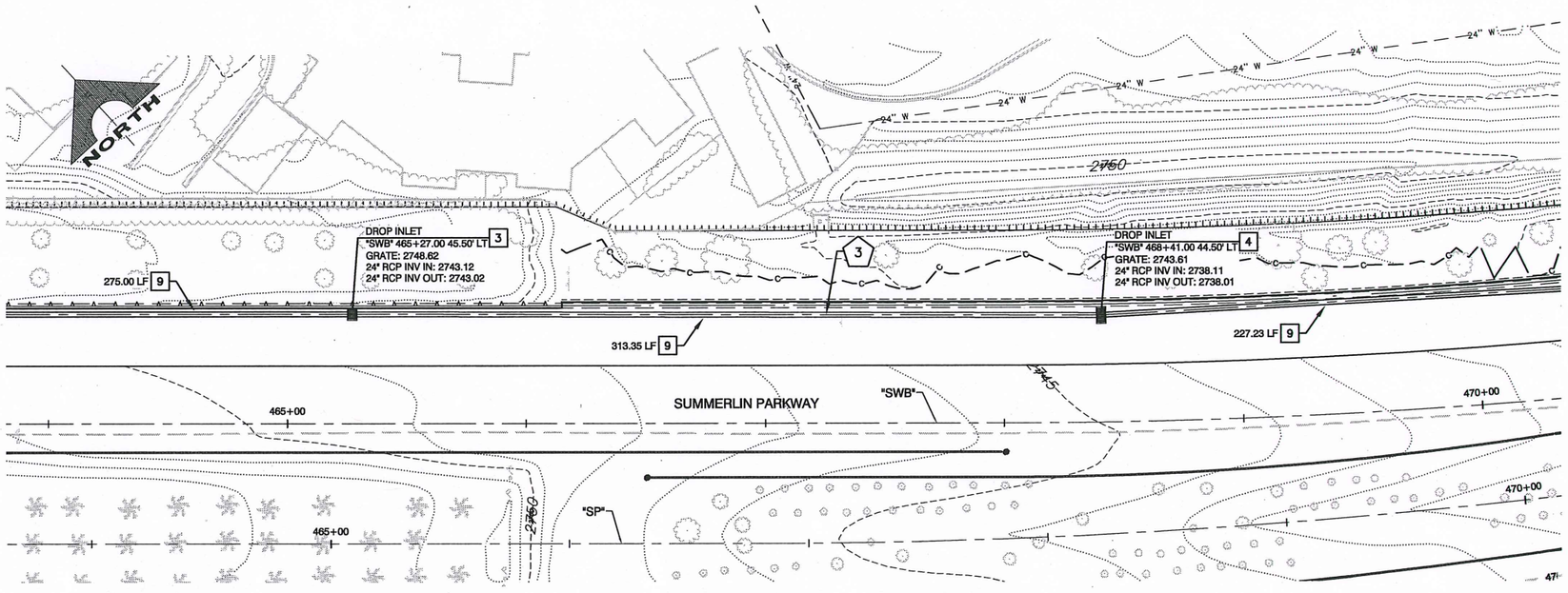

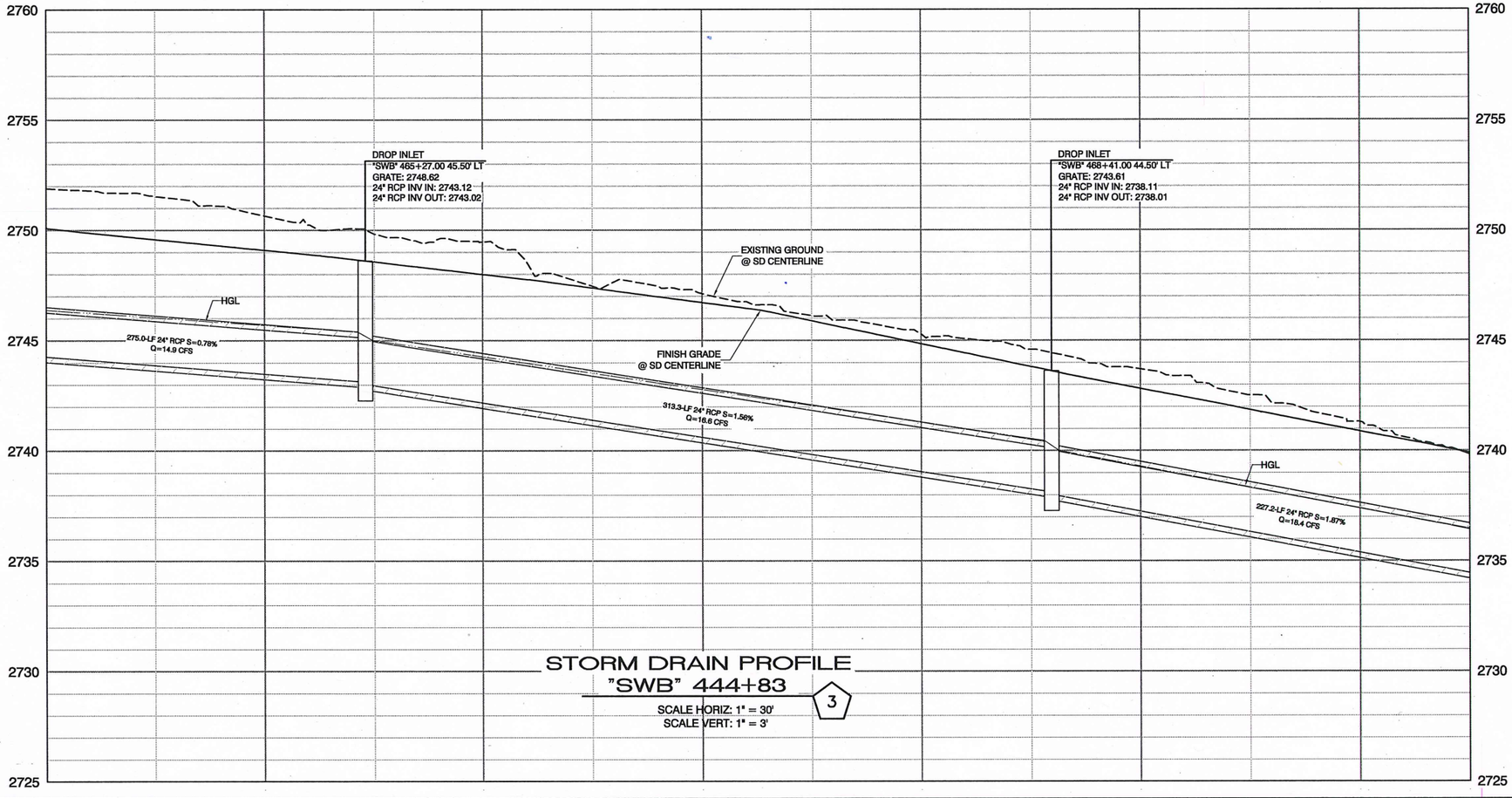

STORM DRAIN PROFILE
"SWB" 444+83

3

SCALE HORIZ: 1" = 30'
SCALE VERT: 1" = 3'

30 0 30 60
SCALE FEET

CALL BEFORE CONSTRUCTION

BEFORE YOU DIG	USA NORTH	811 OR 800-227-2600
BEFORE YOU UNDERGROUND	F.A.S.T.	702-432-5300
	CLARK COUNTY TRAFFIC OPERATIONS	702-455-7511
	CITY OF LAS VEGAS T.E.F.O.	702-229-6611
BEFORE YOU OVERHEAD	NV ENERGY	702-227-2929

STORM DRAIN NOTES

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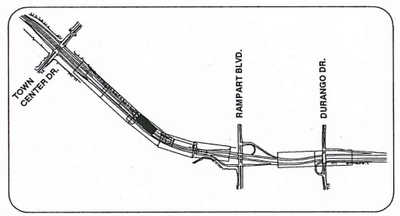

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GCW
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STORM DRAIN PLAN AND PROFILE

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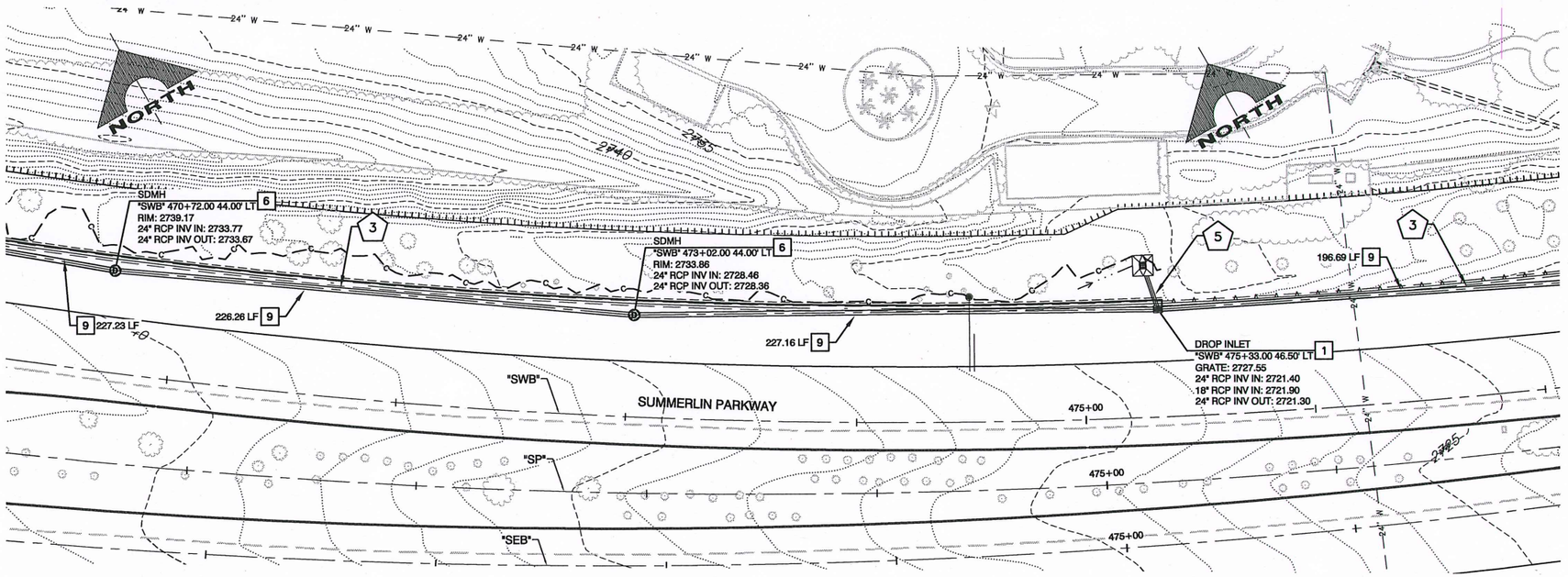

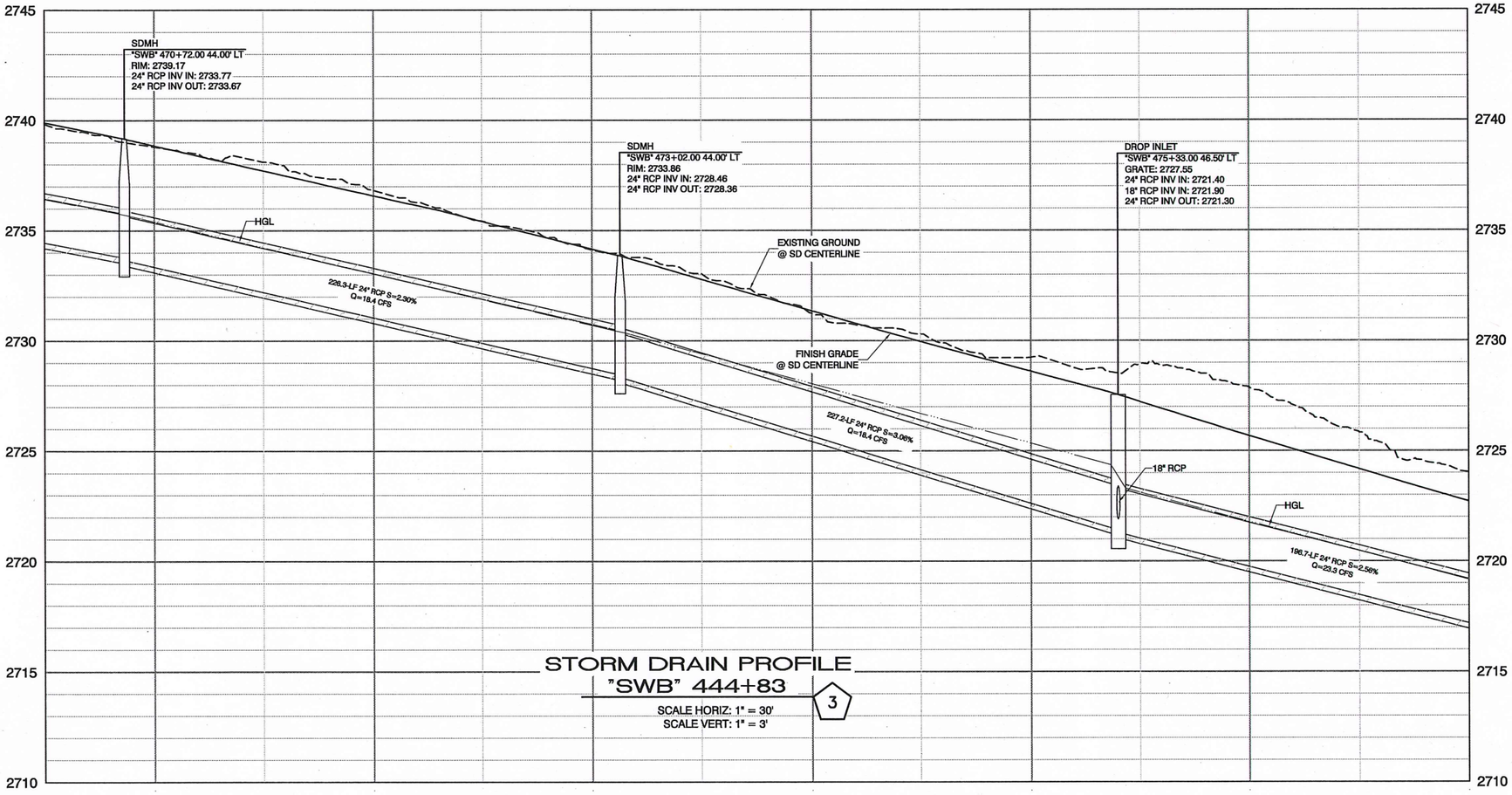

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"SWB" 444+83 (3)

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SCALE: 30 0 30 60 FEET

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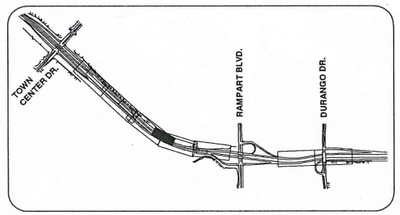

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STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
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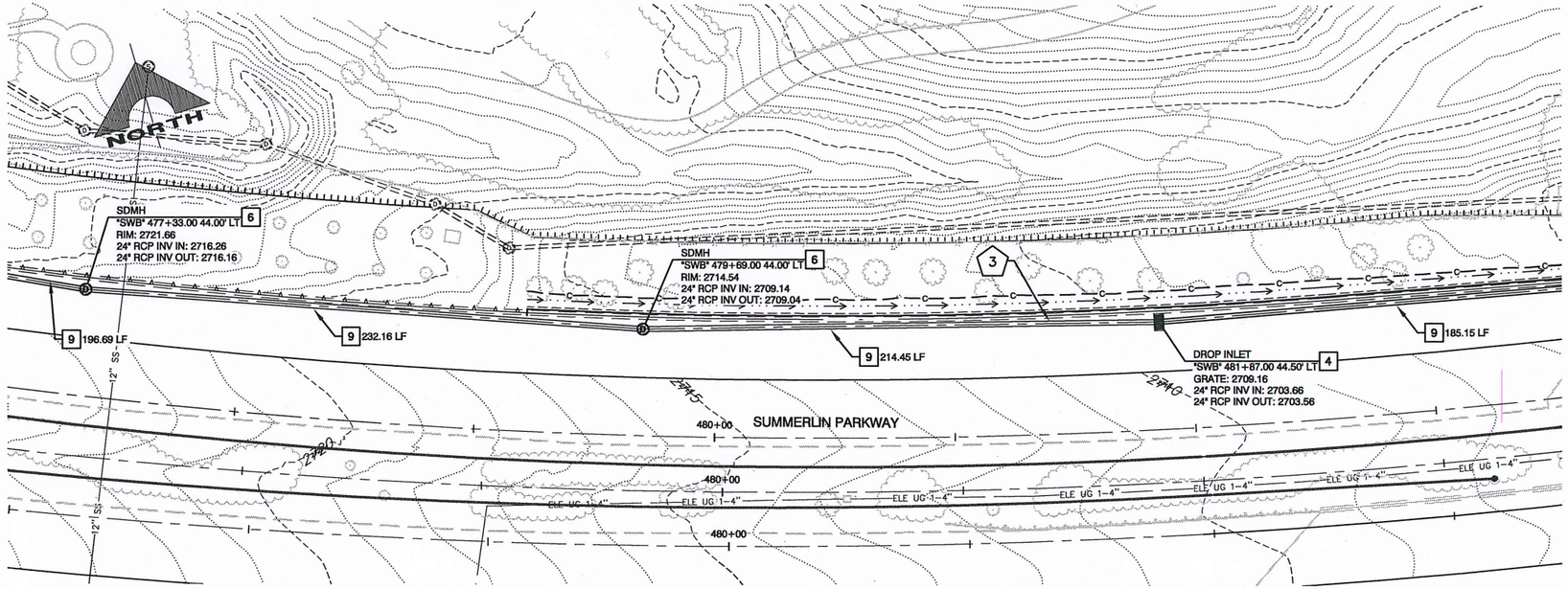

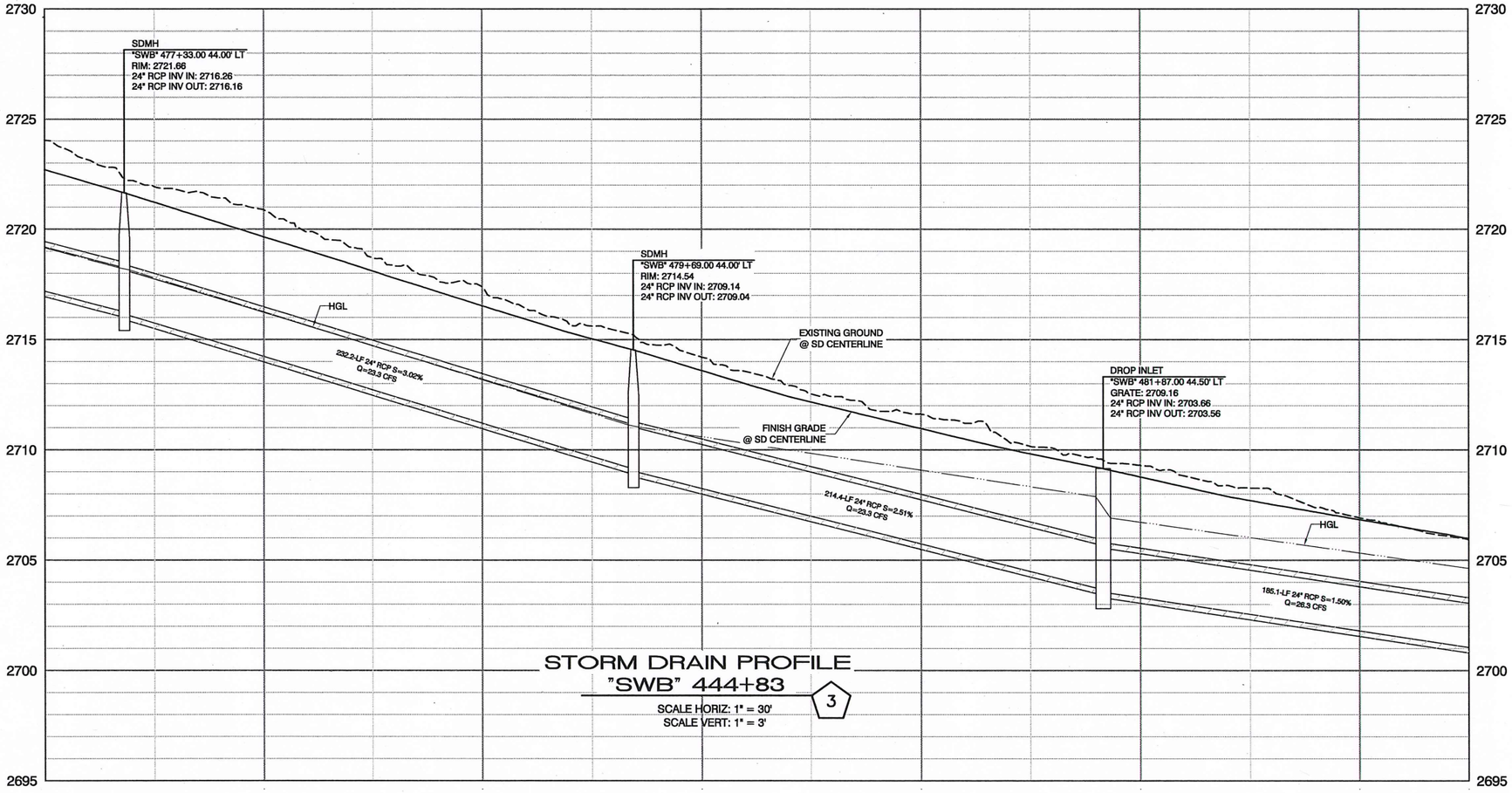

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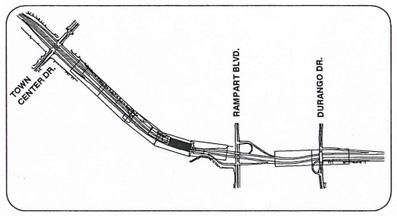

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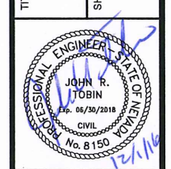

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47 OF 85
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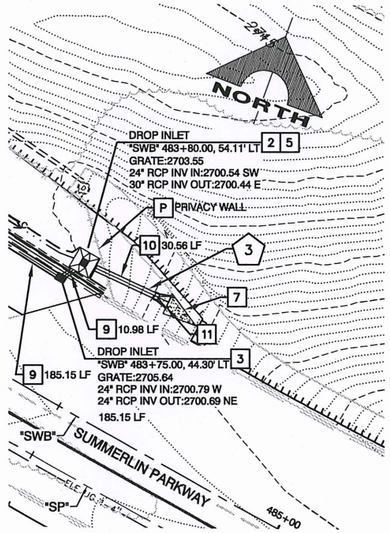

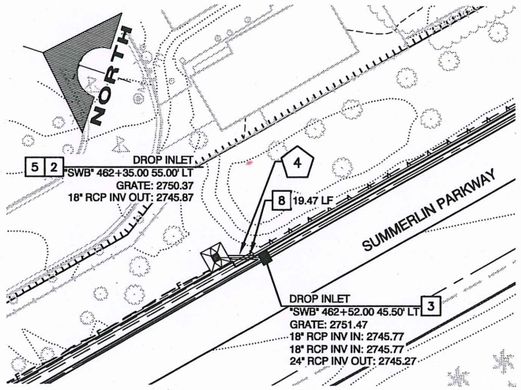

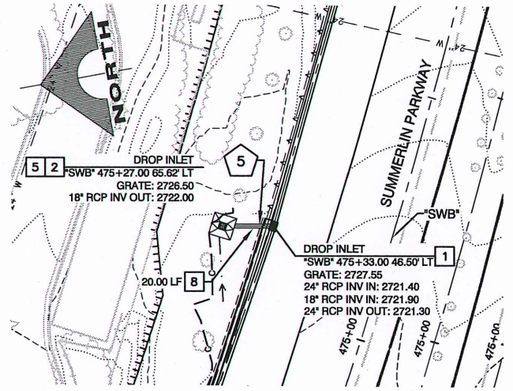

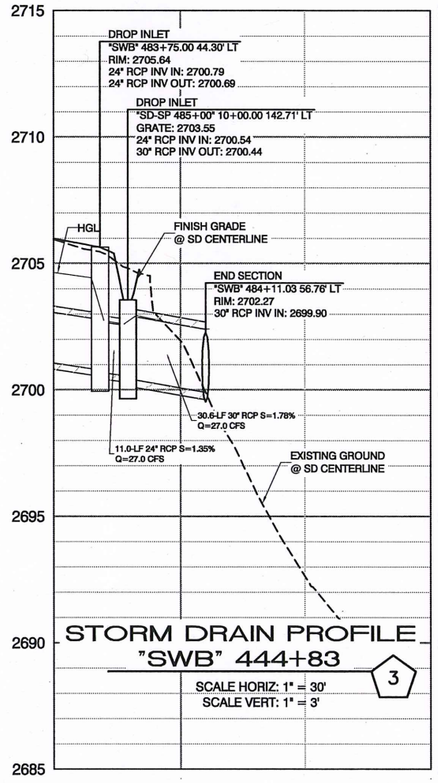

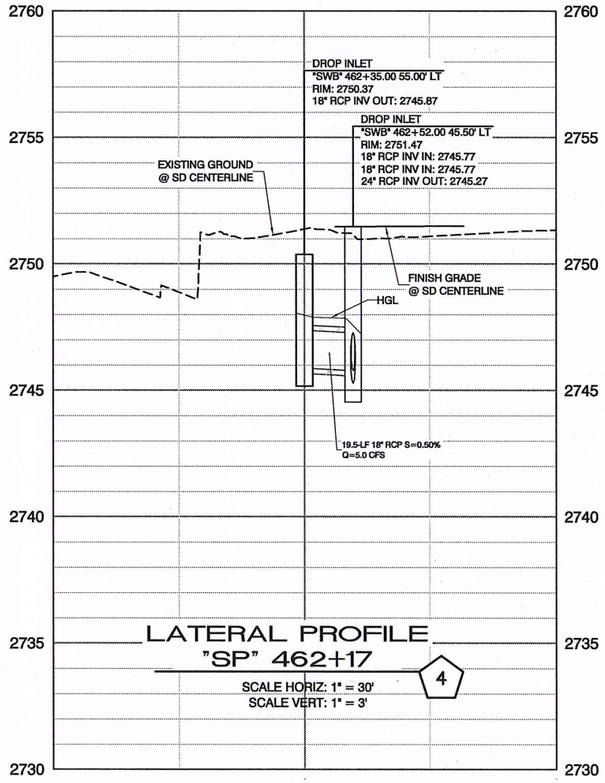

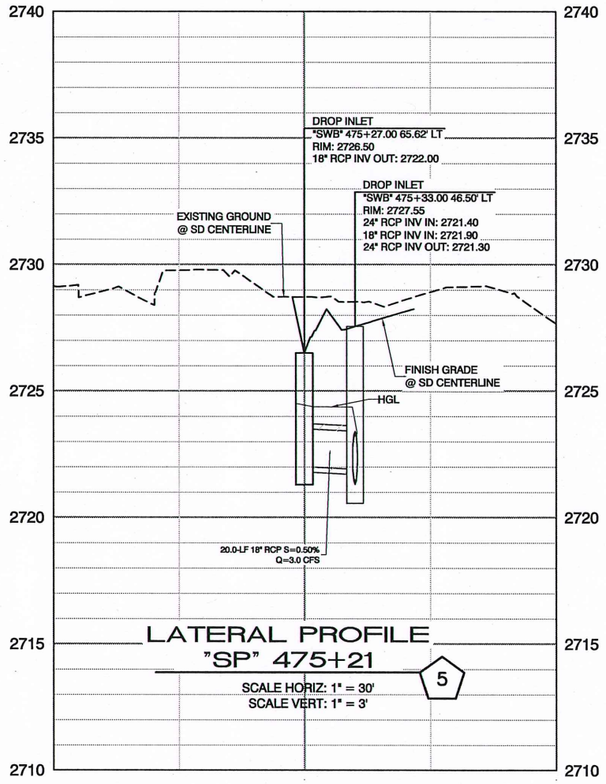

30 0 30 60
SCALE FEET

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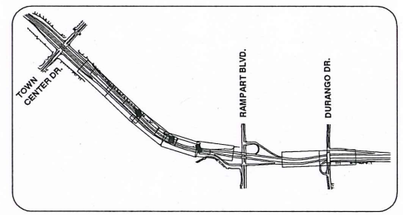

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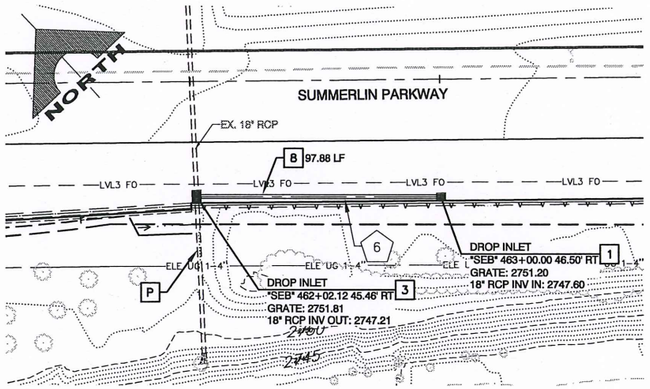

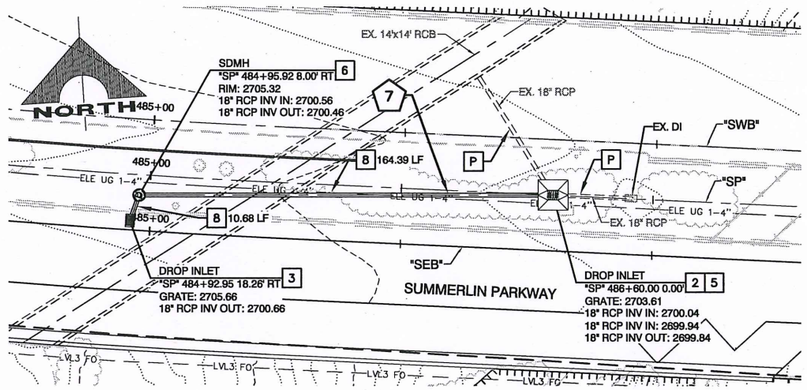

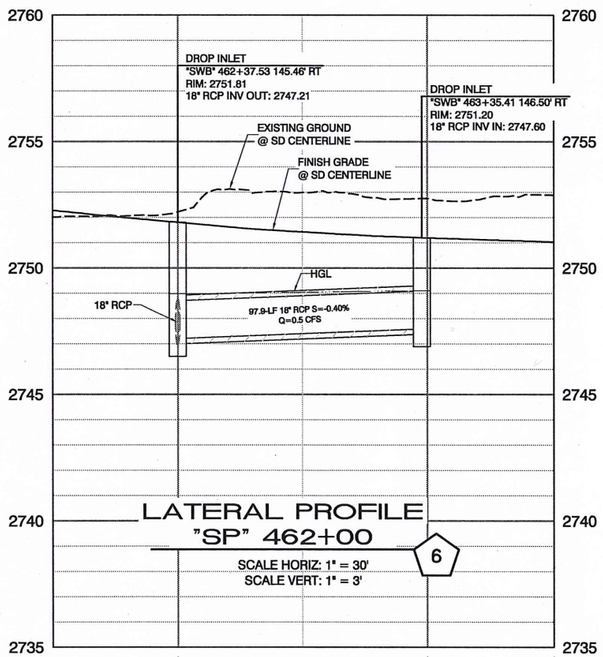

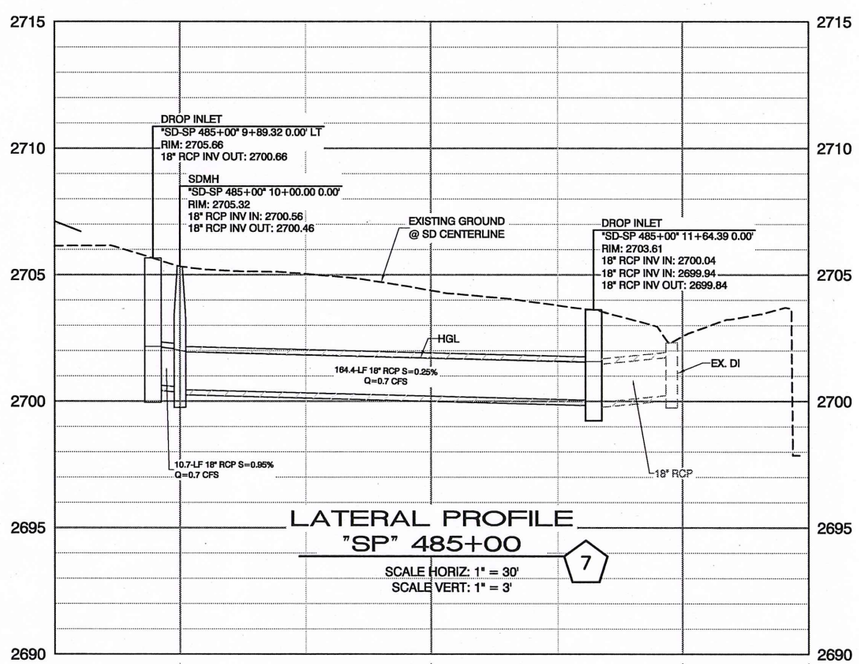

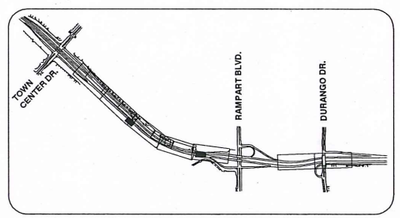

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3. CONSTRUCT TYPE 2 DI W/ DOUBLE GRATES (NDOT STD. PLAN R-4.2.1)
4. CONSTRUCT TYPE 2 DI W/ TRIPLE GRATES (NDOT STD. PLAN R-4.2.1)
5. CONSTRUCT DROP INLET CONCRETE APRON (NDOT STD. PLAN R-4.2.7) (NO DIRECT PAYMENT)
6. CONSTRUCT TYPE I MANHOLE W/ CONCRETE COLLAR (NDOT STD. PLAN R-4.3.1)
7. CONSTRUCT CONCRETE APRON AT END SECTION (NDOT STD. PLAN R-4.2.7) (NO DIRECT PAYMENT)
8. INSTALL 18-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
9. INSTALL 24-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
10. INSTALL 30-INCH RCP (CLASS III UNLESS OTHERWISE NOTED)
11. INSTALL 30-INCH RCP END SECTION (NDOT STD. PLAN R-2.3.1)
12. INSTALL RIPRAP (D50 = 8-INCH, TH = 16-INCHES)

P PROTECT IN PLACE

UTILITY DISCLAIMER:

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION. ANY UTILITIES DAMAGED DURING CONSTRUCTION MUST BE REPAIRED IMMEDIATELY AND TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.

NO.	DATE	REVISIONS

PREPARED BY
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PREPARED FOR
CITY OF LAS VEGAS

HANSEN NO. 67056 | BID# 16.67056
DATE: 12/1/2016 | DESIGNED BY: FJG
SUBMITTAL STAGE: 90% SUBMITTAL | DRAWN BY: TJC
CHECKED BY: JRT

SUMMERLIN PARKWAY TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS / PHASE 3

TITLE
SUMMERLIN PARKWAY - TRAFFIC CAPACITY AND SAFETY IMPROVEMENTS PHASE 3
STORM DRAIN PLAN AND PROFILE

PROFESSIONAL ENGINEER STATE OF NEVADA
JOHN R. TOBIN
Exp. 06/30/2018
CIVIL
No. 8150
12/1/16

SHEET
SD-9
49 OF 85
DRAWING NO.
XXX

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