# Final Design Report

## Centennial Parkway Channel West
## Durango Dive to Grand Teton Drive

**PREPARED FOR:**

City of Las Vegas
Department of Public Works
333 North Rancho Drive, 9th Floor
Las Vegas, NV 89106

**PREPARED BY:**

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Louis Berger

April 2017

# FINAL DESIGN REPORT

## CENTENNIAL PARKWAY CHANNEL WEST

### DURANGO DRIVE TO GRAND TETON DRIVE

PREPARED FOR:

CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS
333 NORTH RANCHO DRIVE
LAS VEGAS, NV 89106

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# 1.0 Introduction and Purpose

## 1.1 Project Overview

The Centennial Parkway Channel West is a proposed flood control facility located in the City of Las Vegas (City) between Grand Teton Drive and Durango Drive (See Figure 1.1). The Project consists of a storm drain within the shoulder between US-95 South and Oso Blanca Road and two lateral facilities within Gilcrease Avenue and Farm Road. The Centennial Parkway Channel West will be part of a single construction contract that includes the following projects:

- Centennial Parkway Channel West, US95/215 to Durango Drive, designed by CH2MHill;
- US-95 Phase 2B from CC-215 to Kyle Canyon Road, designed by the Nevada Department of Transportation (NDOT); and
- Kyle Canyon/US-95 Interchange, designed by GCW.

The project will be owned by the City, with regional facilities within NDOT right-of-way. Therefore, this project will be coordinated with the City, NDOT, Clark County Regional Flood Control District (CCRFCD), CH2MHill, and GCW.

Figure 1.2 shows existing and proposed storm drain facilities within the Project limits. This Project will construct a 100-year flood conveyance storm drain and collection system consisting of:

- a 15-foot x 9-foot RCB upstream of Grand Teton Drive;
- a 42-inch to a 48-inch storm drain just north of Grand Teton Drive, which replaces the Multi Use Trail (MUT) and concrete channel;
- a 27.25-foot x 7-foot to 16-foot x 7-foot transition structure downstream of Grand Teton drive;
- a 16-foot x 7-foot RCB between Grand Teton Drive and Durango Drive;
- a 48-inch RCP to 68-inch x 43-inch HERCP (Gilcrease Lateral) along Gilcrease Avenue that discharges into the main line storm drain;
- an 8-foot x 6-foot RCB (Farm Lateral) under Farm Road that will combine with the main storm drain at Durango Drive;
- a 6-foot x 3-foot RCB lateral connection at Oso Blanca Road and Satin Carnation Lane; and,
- a 12-foot x 4-foot RCB lateral connection at Oso Blanca Road and Tee Pee Lane.

Other existing facilities include RCP storm drains that discharge water from the surrounding neighborhoods. These storm drains will tie into the proposed system in their current locations.

The construction of this project will require removing channel and storm drain at the upstream end and tying into an existing 15-foot x 9-foot RCB. There is an existing 10-foot x 5-foot RCB under Grand Teton Drive that will combine with the project at the transition structure downstream of Grand Teton Drive.

At the downstream end of Louis Berger's portion of the project, the Farm Lateral and Main Storm Drain run parallel; flow from both systems discharges into a transition structure that connects to existing culverts underneath Durango Drive. These existing culverts then connect to a storm drain designed by CH2MHill.

## 1.2 Report Organization

This Final Design Report was prepared as an accompaniment to the 100% Pre-Final design plans and presents an overview of the design for the Centennial Parkway Channel West Project, the hydrologic methods, parameters, and design flow rates, hydraulic grade line and hydraulic modeling results, and drainage facility design. This Final Design Report was prepared as a comprehensive document containing all information from the previous Design Reports, as well as input from the City, CCRFCD, and NDOT.

This report is organized as follows:

Section 1 provides general project background;

Section 2 presents previous studies related to the project;

Section 3 discusses hydrologic analysis and design;

Section 4 presents results of hydrologic analysis;

Section 5 discusses hydraulic design and analysis;

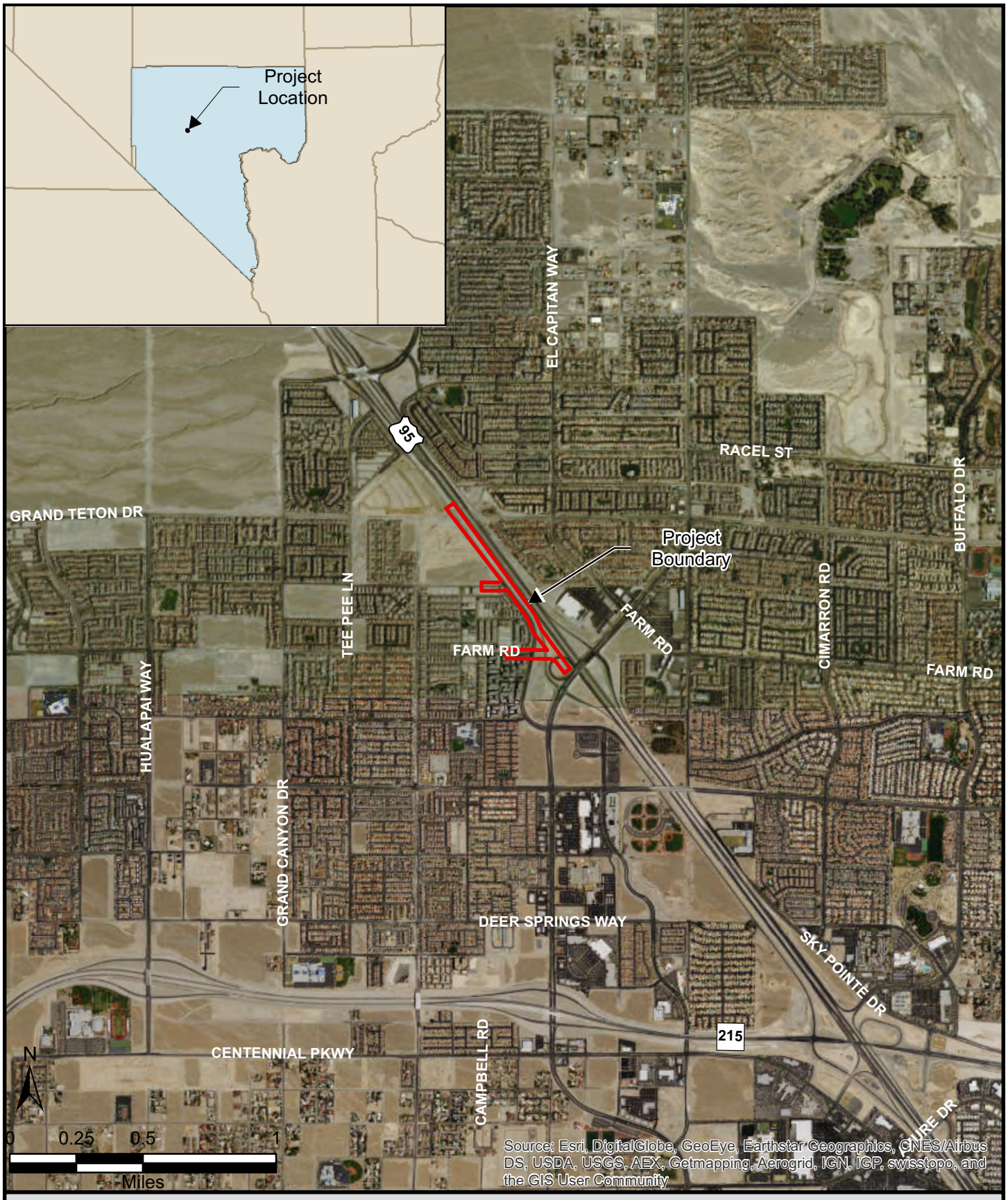
Section 6 discusses utility coordination;

Section 7 discusses right-of-way;

Section 8 provides a cost estimate;

Section 9 provides conclusions and recommendations; and

Section 10 includes references.




**Centennial Parkway**
**Channel West**
**Vicinity Map**
**Figure 1.1**

Louis Berger

RACEL ST

EL CAPITAN WAY

DURANGO DR

10'x10' RCB

Horse
Storm Drain
(15'x9' RCB)

15'x9' RCB

16'x7' RCB

24" RCP

42" RCP

Transition
Structure

95

(2) 12'x10' RCBs

48" RCP

OSO BLANCA RD

42" RCP

Transition
Structure

(2) 42" RCP/CMP

36" RCP

Farm Lateral
8'x6' RCB

20'x7' RCB

5'x3' RCB

Grand Teton
Storm Drain
(10'x5' RCB)

Gilcrease Lateral
54" RCP

6'x3' RCB

GRAND TETON DR

GILCREASE AVE

OSO BLANCA RD

95

6'x3" RCB

OSO BLANCA RD

12'x4' RCB

N

BRILLIANT POMPON

0 100 200 400

Feet

FARM RD

FORT APACHE RD

SEVERENCE LN

CITY OF LAS VEGAS NEVADA

**Centennial Parkway**
**Channel West**

## Legend

- Existing Facility
- Proposed Facility
- Proposed by others

N

0 200 400 800

Feet

Louis Berger

**Existing and Proposed Facilities**
**Figure 1.2**

# 2.0 Previous Studies

## 2.1 Las Vegas Valley Flood Control Facilities Master Plan Update

In 1985, the Nevada Legislature passed legislation allowing local entities the opportunity to create the CCRFCD. The CCRFCD is responsible for developing and implementing a comprehensive flood control master plan to alleviate flooding. In 1986, the original flood control master plan was developed in accordance with Nevada state law that covered the entire CCRFCD service area, Clark County. The Master Plan has been updated several times since, with the most recent update occurring in 2013. The 2013 Las Vegas Valley Flood Control Facilities Master Plan Update (CCRFCD, 2013) includes information on existing and planned flood control facilities within the entire valley.

This Project will construct a portion of the Centennial Parkway Channel West/U.S. 95 Branch identified in the MPU (ID MILE) as CN95 0167 and CN95 0102 and will tie into CH2MHill's design of MPU facility CN95 0068. The project will also connect the Centennial Parkway Channel West/Kyle Canyon Branch to the U.S. 95 Branch identified in the MPU as CNKC 0000 and CN95 0257 respectively. Table 2.1 lists the proposed MPU facilities along with the description and 100-year flow rate. The MPU facilities map and associated inventory sheet are provided as Figures 2.1 and 2.2.

Since the time that the MPU hydrology was prepared, the National Resource Conservation Service (NRCS) has updated the soils information for Clark County. The soils data used in the MPU for the Centennial Parkway Channel West watershed were based on the Soil Survey of Las Vegas Valley (NRCS, 1985) and State Soil Geographic (STATSGO) Data Base (NRCS, 1995).

New soils data subsequently published by the NRCS (2014d) were used for this Project. Using lag times and curve numbers based on the new soils data, Louis Berger prepared a revised MPU HEC-1 model for comparison. The results presented in Table 2.1 show an increase in the peak flow rate using the new soils data. The revised lag time calculations, curve numbers, and HEC-1 model are provided on the CD included as an attachment to this study.

**TABLE 2.1 MPU FACILITIES AND FLOWS**

| ID MILE | FACILITY DESCRIPTION | MPU FLOW (CFS) 1985/1995 SOILS DATA | REVISED MPU FLOW (CFS) 2014 SOILS DATA | INCREASE |
|---|---|---|---|---|
| CN95 0167 | 2: 10' x 6' RCB | 2,160 | 2,324 | 7.6% |
| CN95 0102 | 3: 8' x 6' RCB | 2,888 | 3,209 | 11.1% |

## 2.2 City of Las Vegas Northwest Neighborhood Study Phase 2

The City developed the Northwest Neighborhood Study Phase 2 that shows existing and future drainage conditions for the northwest area of Las Vegas. Figures were created that show flows at concentration points, flow areas, and proposed and existing systems. This Project is located on maps E-12 (existing conditions) and F-12 (future conditions). The prior existing conditions map is omitted from this report since the map no longer reflects current existing conditions. The future conditions map is included in this report as Figure 2.3.

The Study shows a 10-foot x 10-foot RCB at the upstream end of the project, and a 12-foot x 10-foot RCB at the downstream end of the project. The flows in the system range from 2,408 cfs at the upstream end to 2,850 cfs at the downstream end.

Since the time that the Northwest Neighborhood Study was performed, several developments within the area have been designed and built. Louis Berger reviewed the development plans and studies to determine the amount of runoff entering the system from the neighborhood discharge points. Figure 2.4 shows the neighborhood locations and titles associated with their respective drainage reports and plan sets. Existing facilities built with the neighborhoods will be tied into the proposed lateral collection facilities along Farm Road, Gilcrease Avenue, Grand Teton Drive and the Main SD. Appendix C includes plans and figures referenced from the various developments listed in Table 2.2.

### TABLE 2.2 REFERENCE STUDIES AND PLANS

| DEVELOPMENT NAME | ENGINEER | DATE | TYPE |
|---|---|---|---|
| Centennial Point | VTN | May 2001 | Drainage Study |
| Centennial Heights | Tetra Tech, Inc. | June 2002 | Drainage Study |
| Terra Bella | Tetra Tech, Inc. | July 2002 | Drainage Study |
| Cascade | VTN | September 2002 | Drainage Study |
| Aventine/Barada | Tetra Tech, Inc. | December 2002 | Drainage Study |
| Cascade II | VTN | January 2003 | Drainage Study |
| Terrasano | Tetra Tech, Inc. | April 2003 | Drainage Study |
| Cascade III | VTN | May 2003 | Drainage Study |
| Sky Ridge | Southwest Engineering | December 2003 | Drainage Study |
| Fort Apache Ranch | Alpha Engineering Company | February 2004 | Drainage Study |
| Astoria at Town Center North – Unit 1 | VTN | May 2004 | Plans |
| Astoria at Town Center North – Unit 2 | VTN | June 2004 | Plans |
| Terrasano III | TCE | December 2004 | Drainage Study |
| Brookhaven | Slater Hanifan Group, Inc. | August 2005 | Drainage Study |
| Astoria at Town Center North – Unit 2A | VTN | August 2005 | Plans |
| Fairfield at Farm/US-95 | VTN | January 2007 | Drainage Study |
| Astoria at Town Center North | VTN | February 2008 | Drainage Study |
| Astoria at Town Center South | VTN | February 2008 | Drainage Study |
| Horse Drive Improvements | VTN | June 2008 | Plans |
| Grand Teton Drive Storm Drain | Poggemeyer | November 2008 | Plans |
| Grand Teton & Tee Pee | Slater Hanifan Group, Inc. | December 2012 | Drainage Study |
| Oso Blanca & Grand Teton | Slater Hanifan Group, Inc. | July 2013 | Drainage Study |

## 2.3 Flood Insurance Rate Maps

The Federal Emergency Management Agency (FEMA) publishes Flood Insurance Rate Maps (FIRM) which delineate special flood hazard areas (SFHAs) subject to flooding by the 1% annual chance (100-year) flood and Other Flood Areas Zone X (shaded) defined by FEMA as an area of 0.2% annual chance (500-year) flood; areas of 1% annual change flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual change flood. According to FIRM Number 32003C1745E, Panel 1745 of 4090, effective date September 27, 2002, the Centennial Parkway Channel West site lies within a Zone X (unshaded) area. This project will not affect the FEMA FIRM (Figure 2.5).

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

**FIGURE F- 13**
**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 |

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)

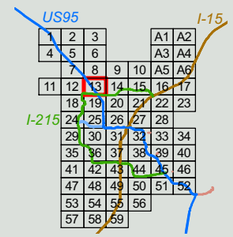



**Figure 2.1**

| ID / River Mile | Status | Facility Description | Length (ft.) | Flow (cfs) | HEC-1 Node | HEC-1 Model | Tributary Area (sq.mi.) | Channel Slope (%) ** |
|---|---|---|---|---|---|---|---|---|
| **BCHU** | | **BELTWAY CHANNEL - HUALAPAI** | | | | | | |
| 0000 | E | 12' X 5' RCAP | 853 | 501 | CBA3-C | WEST3 | 0.84 | 1.11 |
| 0017 | E | 8' X 5' RCAP | 1216 | 501 | CBA3-C | WEST3 | 0.84 | 1.33 |
| 0040 | E | 66" RCP | 60 | 222 | DNW26-C | WEST3 | 0.51 | 1.04 |
| 0042 | E | 60" RCP | 615 | 222 | DNW26-C | WEST3 | 0.51 | 1.42 |
| 0054 | E | 54" RCP | 770 | 222 | DNW26-C | WEST3 | 0.51 | 1.23 |
| **BRDB** | | **BRENT DRAINAGE SYSTEM** | | | | | | |
| 0000 | E | 36" RCP with 18" Orifice Plate | 2170 | 37 | BRDB | WEST3 | 2.48 | 0.40 |
| 0031 | E | 45,080 cfs PMF Spillway | | 45080 | CBRDB | WEST3 | 2.48 | |
| 0032 | E | 450 ac-ft South Environmental Enhancement Area | | 1902 | CBRDB | WEST3 | 2.48 | |
| 0033 | E | Energy Dissipator | 100 | 957 | CNW113-C | WEST3 | 1.58 | |
| 0043 | P1 | 8' X 6' RCB | 2920 | 957 | CNW113-C | WEST3 | 1.58 | 2.10 |
| 0107 | P1 | 8' X 6' RCB | 2660 | 957 | CNW113-C | WEST3 | 1.58 | 2.40 |
| 0157 | P1 | 12' X 6' RCB | 1260 | 741 | CNW96-C | WEST3 | 0.95 | 0.25 |
| **CN95** | | **CENTENNIAL PKWY CHANNEL WEST / U.S 95 BRANCH** | | | | | | |
| 0000 | P1 | Conc Chnl 22'W 10'D 0:1 SS | 2690 | 3340 | CNWBB3-C | WEST3 | 3.36 | 2.17 |
| 0068 | P1 | 3: 8' X 7' RCB | 3380 | 3216 | CNW103-C | WEST3 | 3.05 | 2.12 |
| 0102 | P1 | 3: 8' X 6' RCB | 1710 | 2888 | 2CNW89-C | WEST3 | 2.66 | 2.09 |
| 0167 | P1 | 2: 10' X 6' RCB | 1580 | 2160 | 2CNW71-E | WEST3 | 1.64 | 1.50 |
| 0199 | E | 2: 10' X 6' RCB | 320 | 1423 | 2CNW72-C | WEST3 | 1.14 | 0.82 |
| 0218 | E | 15' X 9' RCB | 1127 | 1423 | 2CNW72-C | WEST3 | 1.14 | 0.82 |
| 0257 | E | Transition Structure | 59 | 1423 | 2CNW72-C | WEST3 | 1.14 | 0.77 |
| 0259 | E | 15' X 9' RCB | 290 | 653 | CNW74-C | WEST3 | 0.44 | 0.77 |
| 0313 | E | 10' X 6' RCB | 2680 | 653 | CNW74-C | WEST3 | 0.44 | 2.50 |
| 0318 | E | Transition Structure | 60 | 653 | CNW74-C | WEST3 | 0.44 | 1.50 |
| 0333 | E | 5' X 5' RCB | 670 | 339 | NW62-S | WEST3 | 0.22 | 1.50 |
| **CNGT** | | **CENTENNIAL PKWY CHANNEL WEST / GRAND TETON BRANCH** | | | | | | |
| 0000 | E | 10' X 5' RCB | 2376 | 600 | CNW71-E | WEST3 | 0.47 | 2.58 |
| 0043 | P0 | 6' X 6' RCB | 3980 | 600 | CNW71-E | WEST3 | 0.47 | 3.00 |
| 0118 | E | 6' X 5' RCAP | 5472 | 363 | KYLEDET* | KYLEDB | 57.73 | 3.72 |
| **CNKC** | | **CENTENNIAL PKWY CHANNEL WEST / KYLE CANYON BRANCH** | | | | | | |
| 0000 | E | 12' X 4' RCB | 377 | 999 | CNW72-C | WEST3 | 0.71 | 4.58 |
| 0007 | E | 10' X 5' RCB | 874 | 999 | CNW72-C | WEST3 | 0.71 | 3.28 |
| 0024 | E | 8' X 5' RCB | 1385 | 999 | CNW72-C | WEST3 | 0.71 | 2.40 |
| 0050 | P0 | 84" RCP | 2610 | 854 | CNW72-C | WEST3 | 0.71 | 3.60 |
| **CNWE** | | **CENTENNIAL PKWY CHANNEL WEST** | | | | | | |
| 0150 | E | Conc Chnl 40'W 9.5'D 0:1 SS | 2279 | 4233 | CNW3B3-C | WEST3 | 5.64 | 0.42 |
| 0173 | E | 3: 18' X 8' RCBC @ Torrey Pines | 200 | 4233 | CNW3B3-C | WEST3 | 5.64 | 0.42 |
| 0176 | E | Conc Chnl 40'W 9'D 0:1 SS | 150 | 4233 | CNW3B3-C | WEST3 | 5.64 | 0.41 |
| 0189 | E | Conc Chnl 36'W 10'D 0:1 SS | 1200 | 4067 | CNW2D4-C | WEST3 | 5.15 | 0.42 |
| 0200 | E | Conc Chnl 36'W 9'D 0:1 SS | 2470 | 4067 | CNW2D4-C | WEST3 | 5.15 | 1.00 |
| 0226 | E | 2: 18' X 8.5' RCBC @ Rio Vista | 100 | 4067 | CNW2D4-C | WEST3 | 5.15 | 0.51 |
| 0241 | E | Conc Chnl 36'W 9.5'D 0:1 SS | 405 | 3951 | CNW2D3-C | WEST3 | 4.65 | 0.51 |
| 0251 | E | Conc Chnl 36'W 9'D 0:1 SS | 575 | 3951 | CNW2D3-C | WEST3 | 4.65 | 0.51 |
| 0271 | E | Conc Chnl 32'W 10'D 0:1 SS | 229 | 3951 | CNW2D3-C | WEST3 | 4.65 | 0.51 |
| 0274 | E | 32' X 10' RCBC @ Tenaya | 142 | 3951 | CNW2D3-C | WEST3 | 4.65 | 0.51 |
| 0277 | E | Conc Chnl 32'W 9'D 0:1 SS | 579 | 3951 | CNW2D3-C | WEST3 | 4.65 | 0.64 |
| 0287 | E | Conc Chnl 13'W 10'D 2:1 SS | 605 | 3593 | CNW2B2-C | WEST3 | 3.84 | 1.19 |
| 0301 | P2 | Conc Chnl 32'W 10'D 0:1 SS | 235 | 3593 | CNW2B2-C | WEST3 | 3.84 | 1.19 |
| 0304 | P2 | 32' X 10' RCB | 3259 | 3593 | CNW2B2-C | WEST3 | 3.84 | 1.79 |
| 0314 | E | 22' X 7' RCB | 785 | 3593 | CNW2B2-C | WEST3 | 3.84 | 1.79 |
| 0325 | P1 | 32' X 10' RCB | 2200 | 3593 | CNW2B2-C | WEST3 | 3.84 | 1.75 |
| **EKBU** | | **ELKHORN SPRINGS AND BUFFALO** | | | | | | |
| 0000 | E | 60" RCP | 1046 | 375 | NW134-C | WEST3 | 0.46 | 1.00 |
| **EKDB** | | **ELKHORN SPRINGS DETENTION BASIN** | | | | | | |
| 0000 | E | Grass Chnl 15'W 5.8'D 3.5:1 SS | 2575 | 238 | CNW150-C | WEST3 | 1.41 | 0.39 |
| 0025 | E | 4' X 3' RCB | 160 | 120 | ELKBASIN | WEST3 | 0.84 | 0.50 |
| 0026 | E | 48" RCP | 1270 | 120 | ELKBASIN | WEST3 | 0.84 | 1.23 |
| 0049 | E | 60" RCP | 1095 | 120 | ELKBASIN | WEST3 | 0.84 | 0.13 |
| 0070 | E | 48 ac-ft Elkhorn Springs Detention Basin | | 629 | CNW133-C | WEST3 | 0.84 | |

| ID / River Mile | Status | Facility Description | Length (ft.) | Flow (cfs) | HEC-1 Node | HEC-1 Model | Tributary Area (sq.mi.) | Channel Slope (%) ** |
|---|---|---|---|---|---|---|---|---|
| **EKHU** | | **ELKHORN AND HUALAPAI** | | | | | | |
| 0000 | E | 6' X 5' RCB Overflow Structure | 48 | 638 | CNW26-C | WEST3 | 0.51 | 0.91 |
| 0001 | E | 6' X 5' RCAP | 72 | 638 | CNW26-C | WEST3 | 0.51 | 0.91 |
| 0003 | E | 6' X 4' RCAP | 980 | 638 | CNW26-C | WEST3 | 0.51 | 3.61 |
| 0020 | E | 6' X 5' RCAP | 150 | 638 | CNW26-C | WEST3 | 0.51 | 3.61 |
| 0023 | E | 8' X 5' RCAP | 1200 | 638 | CNW26-C | WEST3 | 0.51 | 0.90 |
| **GOEC** | | **GOWAN NORTH - EL CAPITAN BRANCH** | | | | | | |
| 0176 | P1 | 78" RCP | 1320 | 363 | CCPFR-C | ALLGOW3 | 0.46 | 1.15 |
| **GONO** | | **GOWAN NORTH SYSTEM** | | | | | | |
| 0511 | P1 | 7' X 6' RCB | 1320 | 546 | CCPHW-C | ALLGOW3 | 0.60 | 1.14 |
| **LVMD** | | **LAS VEGAS WASH - MIDDLE** | | | | | | |
| 2490 | E | 2: 13' X 7' RCB | 2555 | 2278 | CNW168-C | CWEST3 | 4.69 | 0.40 |
| 2507 | E | 2: 13' X 9' RCB | 2831 | 2278 | CNW168-C | CWEST3 | 4.69 | 0.36 |
| 2525 | E | 24' X 8' RCB | 1140 | 1913 | CNW159-C | CWEST3 | 3.91 | 0.40 |
| 2550 | E | 24' X 8' RCB | 1445 | 1664 | CD161-C | CWEST3 | 3.41 | 0.40 |
| 2574 | E | 24' X 8' RCB | 1430 | 1664 | CD161-C | CWEST3 | 3.41 | 0.40 |
| 2599 | E | Conc Chnl 24'W 7'D 2:1 SS | 1577 | 1585 | CNW162-C | CWEST3 | 3.08 | 0.50 |
| 2632 | E | 18' X 5' RCB | 1580 | 968 | CNW138-C | WEST3 | 1.16 | 0.46 |
| 2661 | E | 18' X 5' RCB | 2640 | 968 | CNW138-C | WEST3 | 1.16 | 0.46 |
| 2711 | E | 10' X 5' RCB | 1320 | 968 | CNW138-C | WEST3 | 1.16 | 1.54 |
| 2737 | E | 10' X 5' RCB | 1320 | 818 | CNW139-C | WEST3 | 0.93 | 2.22 |
| 2763 | E | 6' X 5' RCB | 1320 | 818 | CNW139-C | WEST3 | 0.93 | 1.79 |
| 2789 | E | 6' X 5' RCB | 1470 | 818 | CNW139-C | WEST3 | 0.93 | 2.17 |
| **MOHU** | | **MOCCASIN - HUALAPAI BRANCH** | | | | | | |
| 0000 | P0 | 14' X 8' RCB | 1920 | 761 | 2CNW45-N | LOWER3 | 2.10 | 0.50 |
| 0036 | P0 | 10' X 8' RCB | 2590 | 368 | CNW45-N | LOWER3 | 1.15 | 0.50 |
| 0085 | P0 | 72" RCP | 790 | 368 | CNW45-N | LOWER3 | 1.15 | 3.00 |
| 0100 | P0 | Natural Wash | 850 | 65 | DMODB1 | LOWER3 | 0.81 | 3.00 |
| 0116 | P0 | 60" RCPC | 12 | 65 | DMODB1 | LOWER3 | 0.81 | 3.00 |
| 0118 | P0 | Natural Wash | 3485 | 65 | DMODB1 | LOWER3 | 0.81 | 3.00 |
| **MOIR** | | **MOCCASIN - IRON MOUNTAIN BRANCH** | | | | | | |
| 0000 | P0 | 66" RCP | 2770 | 446 | 2CNW33-C | LOWER3 | 1.76 | 3.60 |
| **MOKC** | | **MOCCASIN AND KYLE CANYON** | | | | | | |
| 0000 | P1 | 11' X 8' RCB | 5450 | 2662 | CNW35-C | LOWER3 | 2.69 | 3.40 |
| **MOSM** | | **MOCCASIN AND SHEEP MOUNTAIN PARKWAY** | | | | | | |
| 0000 | P0 | 14' X 9' RCB | 3370 | 3778 | CNW64-C | LOWER3 | 5.32 | 2.40 |
| 0064 | P0 | 14' X 8' RCB | 880 | 3505 | CNW50-C | LOWER3 | 4.99 | 3.00 |
| 0080 | P0 | 14' X 8' RCB | 710 | 3325 | 2CNW35-C | LOWER3 | 4.80 | 3.00 |
| **MSNV** | | **MOUNTAIN SPA/VISTA RANCH** | | | | | | |
| 0000 | E | 6: 12' X 5' RCBC @ Grand Teton | 273 | 679 | CNW163-C | CWEST3 | 1.67 | 0.40 |
| 0005 | E | Grass Chnl 100'W 4.5'D 10:1 SS | 6325 | 679 | CNW163-C | CWEST3 | 1.67 | 0.40 |
| 0125 | E | Grass Chnl 100'W 4.5'D 10:1 SS | 1300 | 116 | CNW147E | WEST3 | 1.54 | 0.40 |
| **RACO** | | **RACEL STREET COLLECTOR** | | | | | | |
| 0000 | E | 96" RCP Baffled Energy Dissipator | 54 | 497 | CNW111S | WEST3 | 0.55 | 4.20 |
| 0001 | E | 78" RCP | 3245 | 497 | CNW111S | WEST3 | 0.55 | 2.46 |
| 0064 | E | 78" RCP | 2650 | 423 | DNW111S | WEST3 | 0.44 | 2.09 |
| **RCBC** | | **RANCHO ROAD SYSTEM - BELTWAY CHANNEL** | | | | | | |
| 0000 | E | 6' X 5' RCB | 1062 | 222 | FADB | WEST3 | 1.60 | 1.04 |
| 0002 | E | 54" RCP Outlet with 41" Orifice | 503 | 222 | FADB | WEST3 | 1.60 | 2.38 |
| 0003 | E | 2,341 cfs PMF Spillway | | 2341 | FADBIN | WEST3 | 1.60 | |
| 0004 | E | 76 ac-ft Fort Apache Detention Basin | | 1255 | FADBIN | WEST3 | 1.60 | |
| 0007 | E | Energy Dissipator | 100 | 1255 | FADBIN | WEST3 | 1.60 | |
| 0009 | E | 12' X 6' RCBC @ Fort Apache Detention Basin | 133 | 1255 | FADBIN | WEST3 | 1.60 | 1.79 |
| 0012 | E | Conc Chnl 12'W 6'-7'D 0:1 SS | 1937 | 1255 | FADBIN | WEST3 | 1.60 | 3.15 |
| 0048 | E | 12' X 6' RCBC @ Grand Canyon | 140 | 1040 | CMNA1 | WEST3 | 1.32 | 3.15 |
| 0051 | E | Conc Chnl 12'W 6'-8'D 0:1 SS | 2660 | 1040 | CMNA1 | WEST3 | 1.32 | 3.44 |
| 0096 | E | 1: 10' X 6' and 1: 6' X 6' RCBC @ Hualapai Way | 190 | 1040 | CMNA1 | WEST3 | 1.32 | 1.93 |
| 0100 | E | Conc Chnl 12'W 5.5'D 0:1 SS | 2085 | 598 | CDMNA1 | WEST3 | 0.48 | 2.88 |
| 0140 | E | Conc Chnl 10'W 5'D 0:1 SS | 2155 | 598 | CDMNA1 | WEST3 | 0.48 | 1.65 |

| ID / River Mile | Status | Facility Description | Length (ft.) | Flow (cfs) | HEC-1 Node | HEC-1 Model | Tributary Area (sq.mi.) | Channel Slope (%) ** |
|---|---|---|---|---|---|---|---|---|
| **RCHB** | | **RANCHO ROAD SYSTEM - BELTWAY** | | | | | | |
| 0034 | E | Conc Chnl 21'W 8'D 0:1 SS | 1000 | 2631 | CNW1C-W | WEST3 | 4.68 | 1.19 |
| 0053 | E | 2: 12' X 8' RCBC @ South Ramp Connector | 85 | 2304 | CDW1C1 | WEST3 | 4.31 | 1.40 |
| 0054 | E | Conc Chnl 21'W 8'D 0:1 SS | 432 | 2304 | CDW1C1 | WEST3 | 4.31 | 1.51 |
| 0062 | E | Transition Structure | 130 | 2304 | CDW1C1 | WEST3 | 4.31 | 1.51 |
| 0065 | E | 24' X 7' RCB | 480 | 2304 | CDW1C1 | WEST3 | 4.31 | 0.30 |
| 0074 | E | 24' X 6' RCB | 50 | 2226 | CNWBC6-C | WEST3 | 4.17 | 0.30 |
| 0075 | E | 20' X 6' RCBC @ Beltway | 428 | 2226 | CNWBC6-C | WEST3 | 4.17 | 2.81 |
| 0083 | P1 | 20' X 6' RCB | 950 | 2226 | CNWBC6-C | WEST3 | 4.17 | 2.49 |
| 0101 | P1 | Conc Chnl 20'W 7'D 0:1 SS | 980 | 2226 | CNWBC6-C | WEST3 | 4.17 | 2.38 |
| 0120 | E | 20' X 6' RCBC @ Grand Montecito | 120 | 2226 | CNWBC6-C | WEST3 | 4.17 | 1.00 |
| 0122 | P1 | Conc Chnl 16'-20'W 6'D 0:1 SS | 350 | 2226 | CNWBC6-C | WEST3 | 4.17 | 1.84 |
| 0130 | P1 | Conc Chnl 16'W 6'D 0:1 SS | 1012 | 2226 | CNWBC6-C | WEST3 | 4.17 | 2.67 |
| 0149 | P1 | Conc Chnl 16'W 6'-7'D 0:1 SS | 87 | 1888 | CNWBC3 | WEST3 | 3.75 | 2.27 |
| 0151 | P1 | Conc Chnl 16'W 7'D 0:1 SS | 1255 | 1888 | CNWBC3 | WEST3 | 3.75 | 2.65 |
| 0171 | E | 16' X 6' RCBC @ El Capitan Way | 234 | 1888 | CNWBC3 | WEST3 | 3.75 | 1.75 |
| 0175 | E | Conc Chnl 14'W 7'D 0:1 SS | 1220 | 1888 | CNWBC3 | WEST3 | 3.75 | 2.93 |
| 0198 | E | Conc Chnl 14'W 7'D 0:1 SS | 225 | 1402 | CNWBA6-C | WEST3 | 3.61 | 2.93 |
| 0227 | E | 12' X 6' RCB | 1885 | 1402 | CNWBA6-C | WEST3 | 3.61 | 1.02 |
| 0250 | E | 12' X 6' RCB | 3200 | 1402 | CNWBA6-C | WEST3 | 3.61 | 1.00 |
| 0275 | P1 | 7' X 6' RCB | 2650 | 973 | CNW66-C | WEST3 | 1.75 | 3.30 |
| 0295 | P1 | 7' X 6' RCB | 2875 | 973 | CNW66-C | WEST3 | 1.75 | 3.30 |
| **TSDB** | | **TULE SPRINGS DRAINAGE SYSTEM** | | | | | | |
| 0000 | E | 2: 10' X 4' RCBC @ Echo Grande | 100 | 26 | TULEDB | WEST3 | 1.35 | 1.04 |
| 0002 | E | 36" RCP with 22" Orifice Plate | 320 | 26 | TULEDB | WEST3 | 1.35 | 0.33 |
| 0010 | E | 14,013 cfs PMF Spillway | | 14013 | CTULEDB | WEST3 | 1.35 | |
| 0011 | E | 117 ac-ft North Environmental Enhancement Area | | 804 | CTULEDB | WEST3 | 1.35 | |
| 0012 | E | Energy Dissipator | 260 | 376 | CNW148-C | WEST3 | 0.52 | |
| 0023 | P1 | 84" RCP | 1320 | 376 | CNW148-C | WEST3 | 0.52 | 0.80 |
| 0059 | P1 | 78" RCP | 2640 | 376 | CNW148-C | WEST3 | 0.52 | 1.03 |

** 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 - 13**

**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

**Figure 2.2**

CERC 2204

0156

0123

LVMD 2763

EKDB 0070

GRAND TETON DR

EL CAPITAN WY

DURANGO DR

JO MARCY DR

AL CARRISON DR

CIMARRON RD

WHISPERING SANDS DRIVE

DONALD NELSON AVE

FARM RD

PALM GROVE LN

BUFFALO DR

TULE SPRINGS RD

SUNNY SPRINGS LANE

SEVERENCE LN

FORT APACHE RD

CAMPBELL RD

ELKHORN RD

78" 2.9%

10' X 10' RCB 1.50%

90" 2.4%

8' X 7' RCB 1.81%

9' X 7' RCB 1.8%

48" 0.3%

24" 2.91%

12' X 10' RCB 1.26%

36" 1.39%

36" 0.3%

30" 0.3%

60" 0.45%

12' X 12' RCB 2.09%

36" 2.58%

36" 2.31%

42" 2.29%

60" 0.44%

42" 2.55%

12' X 12' RCB 2.12%

36" 0.62%

36" 2.57%

36" 2.5%

36" 1.8%

PMD 200

GND 150

GND 160

RAN 778

RAN 738

RAN 736

RAN 748

RAN 734

RAN 730

RAN 720

RAN 715

RAN 710

RAN 700

RAN 680

RAN 630

ELK 150

ELK 155

ELK 280

ELK 270

ELK 160

ELK 410

ELK 240

ELK 200

ELK 190

CMR 100

(1098) (2408)

0 145 (36) (36)

(1110) (2614)

0 153

0 90

(1148) (2850)

0 124

(101) (101)

0 43

(1201) (3033)

0 106 (92) (92)

(1313) (3290)

0 0 (43) (43)

(503) (1038)

0 55

(42) (42)

0 43

0 29

(17) (17)

0 29

(49) (49)

0 72 (69) (69)

0 20

0 29

0 0

0 28

(544) (1188)

17 45

21 143

0 26

0 149 (90) (90)

54 152

0 28

(620) (1406)

0 76 (54) (76)

(65) (65)

(32) (32)

(101) (267)

(291) (736)

0 11 (91) (147)

0 33 (56) (56)

9 77 (56) (56)

0 11

0 11

2737

2711

N

W E

S

800 600 400 200 0 400 800

(IN FEET)

SCALE: 1 INCH = 800 FEET

FLOW ARROW

250 10-YEAR STREET FLOW
500 100-YEAR STREET FLOW
(300) 10-YEAR FACILITY FLOW
(800) 100-YEAR FACILITY FLOW

(FLOWS IN CFS)

NOTE:

Ultimate drainage conditions are based on future CN values with all flood control facilities in place.
Regional facility identifiers were established based on the methodology used in the "1996 Clark County Regional Flood Control Master Plan Update for the Las Vegas Valley."

NOTE:

All regional facilities proposed in the "1996 Clark County Regional Flood Control Master Plan Update for the Las Vegas Valley" have been resized based on the flows developed in this study. In addition, many of these facilities have been changed from channels to reinforced concrete box culverts.

CITY OF LAS VEGAS NEVADA

# NORTHWEST NEIGHBORHOOD STUDY PHASE 2

LEGEND

- EXISTING REGIONAL DETENTION BASINS
- PROPOSED REGIONAL DETENTION BASINS (Not Included In 1996 MPU)
- EXISTING REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES
- PROPOSED REGIONAL BRIDGES (Not Included In 1996 MPU)
- EXISTING LOCAL BRIDGES
- PROPOSED REGIONAL CULVERT
- EXISTING REGIONAL CULVERT
- EXISTING LOCAL CULVERT
- EXISTING REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE
- PROPOSED REGIONAL PIPELINE (Not Included In 1996 MPU)
- EXISTING LOCAL PIPELINE
- PROPOSED LOCAL PIPELINE
- EXISTING REGIONAL CHANNEL
- PROPOSED REGIONAL CHANNEL
- EXISTING LOCAL CHANNEL
- PROPOSED LOCAL CHANNEL
- PROPOSED REGIONAL CHANNEL (Not Included In 1996 MPU)
- EXISTING REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE
- PROPOSED REGIONAL DIKE/LEVEE (Not Included In 1996 MPU)
- PROPOSED LOCAL DIKE/LEVEE

FIGURE F-12

## FUTURE DRAINAGE CONDITIONS

PBS&J
ENGINEERING PLANNING GIS SURVEYING CONSTRUCTION SERVICES
901 North Green Valley Parkway, Suite 100
Henderson, Nevada 89014-6139
Phone: 702/263-7275
Fax: 702/263-7200

**Figure 2.3**

/F7/NW/F12.MAP

CITY OF LAS VEGAS NEVADA

**Centennial Parkway Channel West**

N

0 250 500 1,000

Feet

Louis Berger

**Neighborhood Map**
**Figure 2.4**

# NOTES TO USERS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

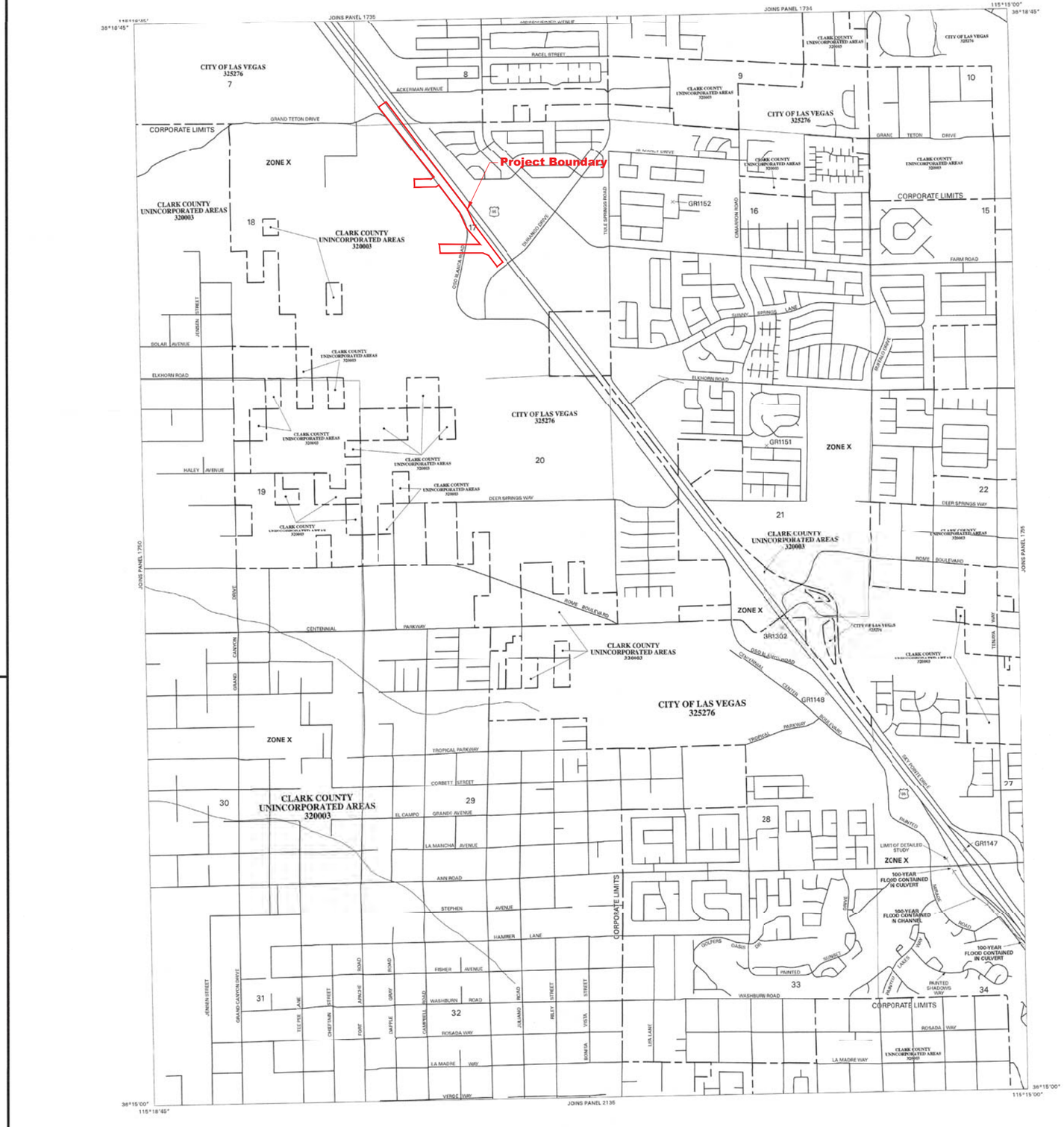
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at www.fema.gov.

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

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

This DFIRM reflects several innovative features. These include:
- Southern Nevada GIS – Cooperation among local governmental agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS Metadata.
- The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the base map for this DFIRM.

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




# LEGEND

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

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

**ZONE A** No base flood elevations determined.

**ZONE AE** Base flood elevations determined.

**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.

**ZONE A99** Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

*Referenced to the North American Vertical Datum of 1988

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

MAP REPOSITORY
Refer to Repository Listing on Index Map

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

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to delete special flood hazard areas, to change zone designations, to add roads and road names, to incorporate previously issued letters of map revision, to incorporate previously issued letters of map amendment, and to change floodway.

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

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

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1745 E

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

**PANEL 1745 OF 4090**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| LAS VEGAS, CITY OF | 325276 | 1745 | E |
| CLARK COUNTY UNINCORPORATED AREAS | 320003 | 1745 | E |

Please refer to the Map Repository when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C1745 E

MAP REVISED:
SEPTEMBER 27, 2002

Federal Emergency Management Agency

**Figure 2.5**

# 3.0 Hydrologic Design and Analysis

This section addresses hydrologic and hydraulic design criteria implemented for the design of the Centennial Parkway Channel West. The design satisfies both the HCDDM and the guidelines in the NDOT Drainage Manual (NDOT, 2006).

## 3.1 Hydrologic Criteria

### 3.1.1 CCRFCD Hydrologic Criteria and Drainage Design Manual

The Project adheres to the HCDDM design guidelines as outlined in Table 3.1.

**TABLE 3.1 APPLICABLE HCDDM METHODS AND PROCEDURES**

| TOPIC | DESIGN MANUAL SECTION OR SUBSECTIONS | MANUAL PAGE(S) | COMMENTS |
|---|---|---|---|
| Design Storm | 304.2 | 315 | Storm drains were designed to collect and convey the major (100-year frequency) storm event. |
| Rainfall | 500 | 501 thru 506 | Rainfall depth, duration and distribution were applied as outlined for use in the Soil Conservation Service (SCS) Unit Hydrograph Method. |
| Time of Concentration | 602 | 603 thru 606 | Time of concentration was calculated using procedures outlined in these sections as applicable to urban and non-urban drainage areas. |
| Precipitation Losses | 603 | 607 thru 610 | SCS Curve Number method was employed as described. |
| SCS Unit Hydrograph Method | 606 | 617 thru 619 | Rainfall-runoff modeling was performed using HEC-1 Flood Hydrograph Package SCS Unit Hydrograph procedure and procedures for calculating lag time as presented in Section 606. |
| Channel Routing of Hydrographs | 608.3 | 624 | Muskingum-Cunge Method was utilized for hydrograph routing. |
| Open Channel Hydraulics | 702.3 – 702.5 | 709 thru 711 | Fundamentals for gradually and rapidly varied flow analyses as presented in these subsections were applied to the future RCB |
| Storm Sewer Systems | 800 | 803 thru 819 | Parameters, standards, hydraulics, and design criteria in this section were applied to the Main SD and laterals. |

### 3.1.2 NDOT Drainage Design Manual

Applicable design guidelines from the NDOT Drainage Design Manual are summarized in Table 3.2

**TABLE 3.2 APPLICABLE NDOT DESIGN GUIDELINES**

| TOPIC | DESIGN MANUAL SECTION OR SUBSECTIONS | MANUAL PAGE(S) | COMMENTS |
|---|---|---|---|
| Storm Drains | 3.3.2.2.3 | 3-8 | Field inlets in the shoulder area between US-95 and Oso Blanca Road were designed per this section. |

## 3.2 Hydrologic and Hydraulic Methods

This report addresses 100-year flood flows during ultimate hydrologic conditions related to the Centennial Parkway Channel West/U.S. 95 Branch. Ultimate conditions are those that would be present after full development and implementation of the MPU.

This study utilized the US Army Corps of Engineers' Hydrologic Engineering Center, Flood Hydrograph Package, HEC-1 (USACE, 1998), SCS Unit Hydrograph Method. This section discusses the development of the ultimate conditions hydrologic model.

The model results are provided in Appendix A.3 and electronic files of the input and output are contained on the enclosed CD in this report. A discussion of the results is provided in Section 4.0 of this report.

### 3.2.1 Design Storm

The Centennial Parkway Channel West system was designed to convey the future conditions 100-year, 6-hour storm.

### 3.2.2 Watershed Area

The watersheds are delineated on Figure 3.1. The 2013 MPU model drainage areas were used as a base for the ultimate conditions model prepared by Louis Berger for the Centennial Parkway Channel West project. The future conditions model includes the following revisions to the 2013 MPU model:

- Subdivided drainage basin NW72-C into subbasins NW72-C1 and NW72-C2
- Subdivided drainage basin NW89-C into subbasins NW89-C1 through NW89-C4
- Subdivided drainage basin NW66-C into subbasins NW66-C1 and NW66-C2
- Subdivided drainage basin NW103-C into subbasins NW103-C1 and NW103-C3

### 3.2.3 Rainfall

One model was run for this system. The 2.7 square mile watershed was modeled using Storm Distribution Number (SDN) 3 for basins less than 8 square miles in accordance with the HCDDM Table 503.

Rainfall depths in the HEC-1 (PB line) were obtained from the MPU Geographic Information System (GIS) coverage. Depth-area reduction factors (HCDDM Table 502) were applied in the HEC-1 model (JR line) based on the size of the upstream area draining to a specific point of interest.

### 3.2.4 Curve Numbers and Land Use

Runoff curve numbers were developed based on new soils data prepared by the Natural Resources Conservation Service (NRCS, 2014). Appendix A.1 contains pertinent data from the new soils database including the GIS metafile descriptions.

Figures A.1.1 and A.1.2 in Appendix A.1 depict the drainage basin and soil unit boundaries and future land use, respectively. The NRCS soils database includes mapped soil unit and hydrologic soil group (A, B, C, or D). Table A.1.1 in Appendix A.1 lists the map soil units, land use codes, and weighted curve numbers for the basins. These values were inserted in the curve number matrix developed for the MPU to determine curve numbers for the various land uses defined by the MPU (2013). The curve numbers are input into the HEC-1 model as the LS card.

### 3.2.5 Time of Concentration and Lag Times

Times of concentration ($T_C$) and lag time ($T_{LAG}$) were calculated using the Clark County's Standard Form 4 for ultimate conditions and are provided in Appendix A.2, Table A.2.1.

### 3.2.6 Kyle Canyon Detention Basin Outflow

In order to evaluate the effect of outfall from the Kyle Canyon Detention Basin and coordinate the hydrology with CH2MHill's downstream storm drain design, outflow from Kyle Canyon Detention Basin was evaluated for this project. The base flow of 363 cfs was added in basin NW29-C using the BF line. The HEC-1 analysis is included on the Data CD; however, flows reflected in the design of the storm drain system excludes the outflow.

### 3.2.7 Flow Splits

The MPU HEC-1 model includes a flow split at the intersection of Fort Apache Road and Farm Road that diverts flow into a storm drain along Fort Apache Road. A future facility along Farm Road was recommended by Louis Berger (Louis Berger, 2013) to collect flows in Farm Road and eliminate the flow split. Therefore, the flow split was removed for this analysis. Section 5.3 of this report includes a discussion on the Future MPU facility along Farm Road.

### 3.2.8 WSPG Analysis

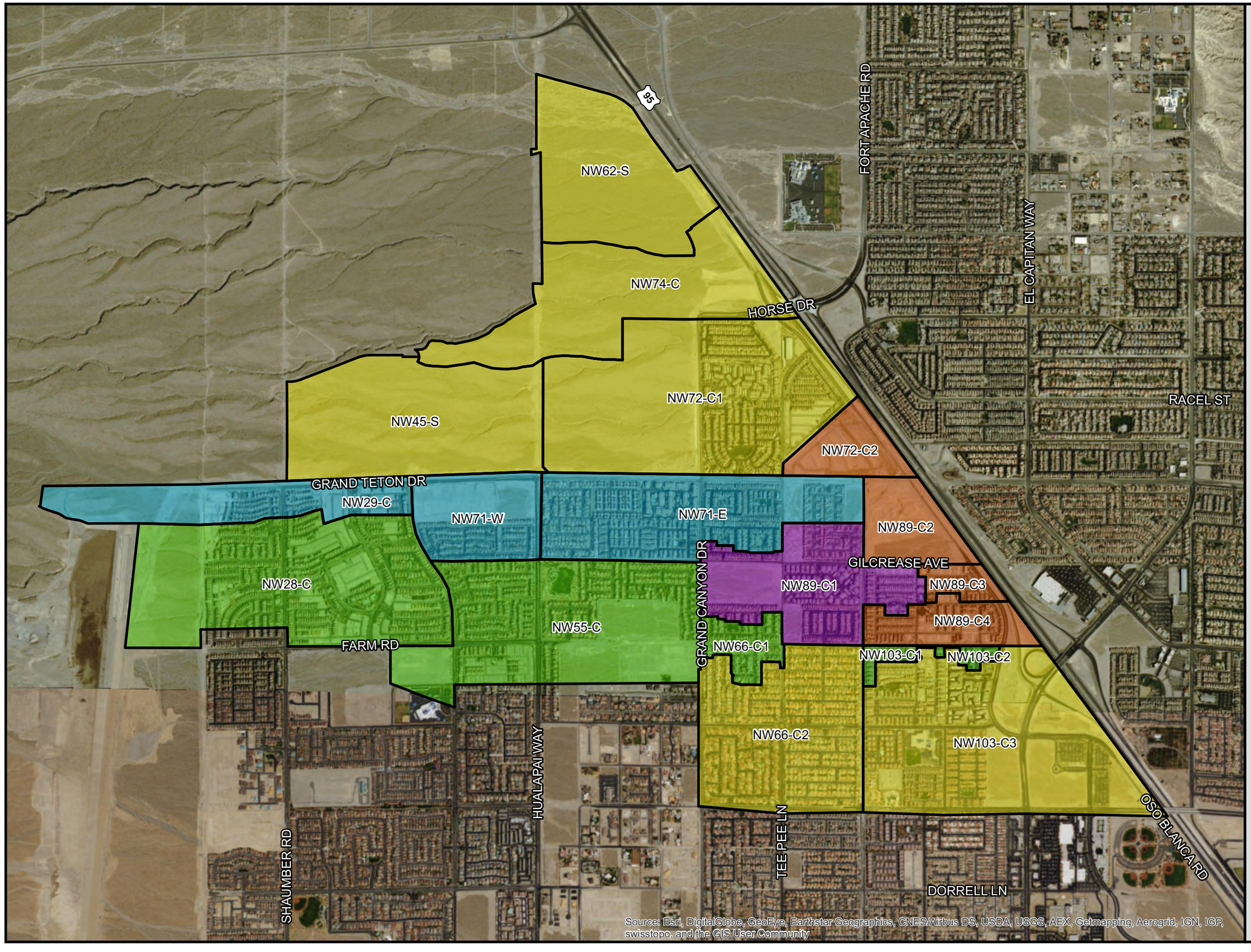
Hydraulic analyses for the Centennial Parkway Channel West system were performed using the Water Surface Pressure Gradient Computer Program (WSPG, 2002), distributed by Civil Design Software Corporation, that was prepared originally by the Los Angeles Flood Control District.

The following WSPG models were prepared (see Appendix B.1):

1) Main Line – Upstream of Grand Teton (Manning's N = 0.013 and 0.015)
2) Main Line – Downstream of Grand Teton (Manning's N = 0.013 and 0.015)
3) Gilcrease Lateral
4) Farm Lateral (Manning's N=0.013 and 0.015)
5) Grand Teton Lateral

The boundary conditions for the Main Line Storm Drain WSPG models were set at normal depth. The down steam boundary conditions for the Gilcrease Lateral, Farm and Grand Teton Laterals were set at the Main Storm Drain water surface elevation. The upstream boundary condition for the Gilcrease, Farm and Grand Teton Laterals were set at normal depth. The WSPG input, output and normal depth calculations are included in Appendix B.1.

WSPG models using a Manning's N of 0.013 and 0.015 were run for the Main SD and the Farm Lateral. The resulting Hydraulic Grade Lines (HGLs) are depicted on the improvement plans in Appendix D. WSPG input and output electronic files are provided on the enclosed CD.




CITY OF LAS VEGAS NEVADA

**Centennial Parkway**
**Channel West**

**Legend**

- HEC1 Basins

**Collector**

- Farm
- Gilcrease
- Grand Teton
- Main Line
- Offsite

N

0 750 1,500 3,000

Feet

Louis Berger

**Ultimate Condition**
**Watershed Map**
**Figure 3.1**

# 4.0 Results of Hydrologic Analysis

This section presents the results of the ultimate conditions 100-year hydrologic models. All permanent facilities to be constructed with the Project were designed based on the ultimate condition 100-year flow rates.

## 4.1 Ultimate Conditions Hydrologic Analysis

Figure 4.1 shows the ultimate condition drainage basins and 100-year flow rates ($Q_{100}$) that drain to the Centennial Parkway Channel West system between Grand Teton Drive and Durango Drive. The ultimate conditions flow rates were used for design of the Centennial Parkway Channel West System.

Note that the concentration point flows on Figure 4.1 represent future peak flow rates (all hydrographs combined) at the point of concentration. For individual drainage basin 100-year peak flow rates refer to Table 4.1.

**TABLE 4.1 ULTIMATE CONDITIONS DRAINAGE BASIN 100-YEAR FLOW RATES**

| BASIN ID | AREA (SQ MI) | $Q_{100}$ (CFS) |
|---|---|---|
| NW103-C1 | 0.01 | 18 |
| NW103-C2 | 0.01 | 16 |
| NW28-C | 0.36 | 503 |
| NW29-C | 0.13 | 198/561* |
| NW45-S | 0.27 | 452 |
| NW55-C | 0.32 | 320 |
| NW62-S | 0.21 | 327 |
| NW66-C1 | 0.04 | 49 |
| NW71-E | 0.23 | 274 |
| NW71-W | 0.10 | 154 |
| NW72-C1 | 0.38 | 553 |
| NW72-C2 | 0.06 | 98 |
| NW74-C | 0.25 | 357 |
| NW89-C1 | 0.17 | 221 |
| NW89-C2 | 0.07 | 118 |
| NW89-C3 | 0.02 | 34 |
| NW89-C4 | 0.07 | 88 |

*includes Kyle Canyon Detention Basin Base Flow (363 cfs)

The drainage basins on Figure 4.1 have been grouped into five color-coded sub-watersheds that drain to select points of concentration (C1 through C11) along the main line and lateral alignments. Table 4.5 lists the concentration point, the HEC-1 Node, drainage area, and total flow rate.

### TABLE 4.2 ULTIMATE CONDITIONS CONCENTRATION POINT 100-YEAR FLOW RATES

| CONCENTRATION POINT | HEC-1 NODE | AREA (SQ MI) | FLOW (CFS) | FLOW* (CFS) | CH2MHILL FLOW (CFS) | CH2MHILL FLOW* (CFS) | MPU FLOW (CFS) |
|---|---|---|---|---|---|---|---|
| C1 | 2CNW72C2 | 1.17 | 1,657 | 1,657 | 1,634 | 1,634 | 1,423 |
| C2 | CNW71-E | 0.46 | 622 | 984 | 595 | 956 | 600 |
| C3 | COB1 | 1.63 | 2,246 | 2,608 | 2,144 | 2,507 | 2,160 |
| C4 | NW89-C1 | 0.17 | 221 | 221 | --- | --- | --- |
| C5 | COB2 | 1.88 | 2,516 | 2,883 | --- | --- | 2,888 |
| C6 | COB3 | 1.90 | 2,533 | 2,900 | --- | --- | 2,888 |
| C7 | CNW55-C | 0.68 | 788 | 788 | 788 | 788 | 786 |
| C8 | CFR1 | 0.72 | 812 | 812 | --- | --- | --- |
| C9 | CFR2 | 0.73 | 816 | 816 | 803 | 803 | --- |
| C10 | CFR3 | 0.74 | 820 | 820 | --- | --- | --- |
| C11 | COB4 | 2.71 | 3,224 | 3,593 | 3,054 | 3,417 | 2,888 |

*includes Kyle Canyon Detention Basin Base Flow (363 cfs) – See model on Data CD

Regarding the future 100-year flow patterns and rates depicted on Figure 4.1, the following should be noted:

- The HEC-1 model from the MPU uses outdated soils information. New soils information was used in Louis Berger's and CH2MHill's model which increased runoff.
- The drainage basins that were subdivided (see Section 3.2.2) in Louis Berger's model changed the routing within the HEC-1 model and added several concentration points along Oso Blanca Road. The differences in HEC-1 routing and basin shapes changes peak flow rates throughout the project corridor.
- CH2MHill's model does not include the same subdivided drainage basins, resulting in a negligible difference in peak flows.
- Drainage basins NW62-S, NW74-C, NW45-S, and NW72-C1 have flows that are relevant to the system, but are considered offsite flow that enter the upstream system. These values combined with basin NW72-C2 at concentration point C1 make up the base flow that enters the system just upstream of Grand Teton Drive.
- The concentration point C2 shows a flow of 622 cfs that enters the Grand Teton Storm Drain and will be combined with main line system just downstream of Grand Teton Drive.
- Flow from NW89-C2 enters the main line system through a storm drain built with the Oso Blanca & Grand Teton subdivision.
- The flow of 221 cfs from NW89-C1 used as concentration point C4 represents the flow that will be picked up by the Gilcrease Lateral.
- Flow from NW89-C3 and NW89-C4 enters the main line system through storm drains built with the Astoria at Town Center North subdivision.

- The 820 cfs at concentration point C10 consists of flow from basins NW55-C, NW66-C1, NW103-C1 and NW103-C2 and represents the flow that will be picked up by the Farm Lateral.
- Basins NW66-C2 and NW103-C3 flow into CH2MHill's section of proposed improvements.

| Concentration Point | HEC-1 Node | Area (sq mi) | Q100 (cfs) |
|---|---|---|---|
| C1 | 2CNW72C2 | 1.17 | 1657 |
| C2 | CNW71-E | 0.46 | 622 |
| C3 | COB1 | 1.63 | 2246 |
| C4 | NW89-C1 | 0.17 | 221 |
| C5 | COB2 | 1.88 | 2516 |
| C6 | COB3 | 1.9 | 2533 |
| C7 | CNW55-C | 0.68 | 788 |
| C8 | CFR1 | 0.72 | 812 |
| C9 | CFR2 | 0.73 | 816 |
| C10 | CFR3 | 0.74 | 820 |
| C11 | COB4 | 2.71 | 3224 |

NW72-C1
NW72-C2
NW71-E
NW89-C2
NW89-C1
NW89-C3
NW89-C4
NW55-C
NW66-C1
NW66-C2
NW103-C1
NW103-C2
NW103-C3
GRAND TETON DR
GILCREASE AVE
OSO BLANCA RD
FARM RD
GRAND CANYON DR
TEEPEE LN
FORT APACHE RD
95
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
98
274
118
2320
22A
34
2533
88
2599
320
49
18
16

**Centennial Parkway Channel West**

**Legend**

- Flow Arrow
- Concentration Point
- HEC-1 Basins

**Collector**

- Farm
- Gilcrease
- Grand Teton
- Main Line
- Offsite

N

0 250 500 1,000

Feet

Louis Berger

**Ultimate Conditions Drainage Map Figure 4.1**

# 5.0 Hydraulic Analysis and Design

This section discusses the proposed facility design and supporting hydraulic analyses for the Centennial Parkway Channel West project including the Main Storm Drain, Gilcrease Lateral, Farm Lateral and Grand Teton Lateral. The Centennial Parkway Channel West 100% Pre-Final Construction Plans, Sheets LBSD-01 through LBSD-10 in Appendix D, present the recommended storm drain improvements.

## 5.1 Main Storm Drain

The Main Storm Drain (Main SD) constructed by this Project extends from Grand Teton Drive to Durango Drive and consists of (see Sheets LBSD-01 through LBSD-06):

- a 15-foot x 9-foot RCB upstream of Grand Teton;
- a 27.25-foot x 7-foot to 16-foot x 7-foot transition structure downstream of Grand Teton drive;
- a 16-foot x 7-foot RCB downstream of Grand Teton;
- a 26.58-foot x 7-foot RCB downstream of the 16-foot x 7-foot RCB;
- a transition structure with pier that connects to the existing (2) 12-foot x 10-foot RCBs before Durango Drive;

### 5.1.1 Horizontal and Vertical Alignment

The horizontal and vertical alignment of the Main SD was dictated by existing utilities, upstream and downstream tie-in points, as well as lateral tie-in points. All sewer lines within the project limits are owned and maintained by the City; waterlines by Las Vegas Valley Water District; and gas lines by Southwest Gas.

To the maximum extent practical, the alignment was established by maintaining the following separation distances between utilities:

- Gas lines: 5 feet horizontally and 1 foot vertically, measured from the outside edge to the outside edge
- Sewer lines: 10 feet horizontally and 2 feet vertically, measured from the outside edge to outside edge
- Waterlines: 10 feet horizontally and 1.5 feet vertically, measured from the outside edge to the outside edge

The Main SD alignment is within the shoulder between US-95 and Oso Blanca Road which will ensure horizontal separation from utilities. Existing storm drains will need to be extended and lowered to avoid the 42-inch waterline and 12-inch sewer line.

### 5.1.2 Collection System

A local collection system is proposed as part of the Main SD (see Sheets LBSD-01 through LBSD-06). The collection system for the Main SD includes (from downstream to upstream):

- connection of the existing lateral storm drains between Grand Teton Drive and Farm Road to the new RCB;
- field inlets between the new storm drain and US-95 connecting to new RCB along the entire alignment;

Detailed sizing calculations for the proposed drop inlets and lateral storm drains are provided in Appendix B.2.

Upstream of Grand Teton Drive the project will construct two planned connections to the existing regional flood control facility (CN95 0218 and CN95 0313). The connections will redirect storm water into the Centennial Parkway system and eliminate flows from continuing east under US-95. These connections along with the other improvements proposed by Louis Berger and CH2MHill will complete the regional flood control infrastructure along US-95 from Deer Springs Way to Skye Canyon Park Drive (aka Horse Drive).

The first connection is a 12'x4' RCB that currently discharges into the US-95 right-of-way. The existing 12'x'4 RCB will be connected to an existing stub which will complete the Kyle Canyon Branch's confluence (CNKC 0000) with the regional facility along US-95 (CN95 0218).

The second connection is a 6'x3' RCB that currently discharges into the US-95 just east of the Oso Blanca Road and Tee Pee Lane intersection. The existing 6'x3' RCB will be connected to an existing stub on the existing regional flood control facility (CN95 0313).

### 5.1.3 Hydraulic Grade Line

As shown on the storm drain profile (Appendix D), the Main SD operates as open channel flow for its entire length except at the Grand Teton Confluence where the system is pressurized for a short reach.

## 5.2 Gilcrease Lateral

The Gilcrease Lateral ranges from a 48-inch RCP to a 68-inch x 43-inch HERCP along Gilcrease Avenue (see Sheet LBSD-08).

### 5.2.1 Horizontal and Vertical Alignment

The lateral crosses a 42-inch waterline and 12-inch sanitary sewer within Oso Blanca Road. The lateral system passes over both utilities, ensuring at least 1.5-feet of clearance above the waterline and 2-feet of clearance above the sanitary sewer. The proposed vertical alignment is in conflict with underground electric conduit along Oso Blanca Road. Options for lowering the profile to avoid the electric line would be in conflict with the existing water and sewer lines, therefore the existing electric is being relocated by NV Energy.

### 5.2.2 Collection System

Eight "DM" drop inlets are proposed along the Gilcrease alignment to pick up surface flow. There is an existing system of 24-inch RCP with drop inlets within Gilcrease Avenue that collects 36 cfs which was subtracted from the total flow of 221 cfs when determining the street flow distribution. Street flow calculations were performed using FlowMaster to determine how the flow was distributed across the road. At 185 cfs, the flow is above the crest of the street, so flow is split evenly to each side of the street. For major storms, the HCDDM requires the product of water depth and velocity (DxV) to be less than 8. Water depths and velocities were obtained from the FlowMaster analysis to determine the DxV value. In all instances, the DxV value is less than 8. Drop inlet sizing for the Gilcrease Lateral is summarized on Figure 5.1 and in Table 5.1.

**TABLE 5.1 GILCREASE AVENUE DROP INLET DESIGN**

| STRUCTURE ID | INLET SIZE (FT) | PIPE SIZE (IN) | STREET FLOW (CFS) | INTERCEPTED FLOW (CFS) | DEPTH (FT) | VELOCITY (FT/S) | DXV |
|---|---|---|---|---|---|---|---|
| 1a/1b | 22.5 | 30 | 92.5 | 51 | 0.69 | 10.44 | 7.2 |
| 2a/2b | 20 | 24 | 41 | 27 | 0.53 | 8.57 | 4.5 |
| 3a/3b | 20 | 18 | 15 | 12 | 0.39 | 6.70 | 2.6 |
| 4a/4b | 10 | 18 | 2.5 | 2.5 | 0.24 | 3.82 | 0.9 |

### 5.2.3 Hydraulic Grade Line

The hydraulic grade line shown on the plans indicate that the system is pressurized for portions of the lateral. At all locations, the HGL is more than one foot below the finished grade as required by the HCDDM.

## 5.3 Farm Lateral

The Farm Lateral consists of an 8-foot x 6-foot RCB under Farm Road and is a portion of a future MPU facility that will extend along Farm Road west of Grand Canyon Drive (see Sheet LBSD-09). The future MPU facility will extend west along Farm Road past Grand Canyon Drive and will intercept surface flow that is diverted into Farm Road between Grand Canyon Drive and Hualapai Way. The City is currently incorporating the Farm Road System into the 2018 Master Plan Update.

### 5.3.1 Horizontal and Vertical Alignment

The lateral crosses a 42-inch waterline and 12-inch sanitary sewer along the alignment. The design of the lateral system passes under both utilities, ensuring at least 1.5-feet of clearance below the waterline and 2-feet of clearance below the sanitary sewer.

### 5.3.2 Collection System

The proposed inlets were not designed to pick up all of the current flow in Farm Road (820 cfs) since the Farm Lateral will be extended in the future. Three "DM" drop inlets are proposed along Farm Road to capture as much flow as feasible within the project limits (316 cfs). Table 5.2 summarizes the interim condition drop inlet calculations.

When the Farm Lateral is extended west of Grand Canyon Drive only subbasins NW103-C1 and NW103-C3 and a portion of Oso Blanca Road will flow into the south half of Farm Road. Inlets 5b and 6 have adequate capacity to collect flow in the south half of Farm Road. The ultimate condition drop inlet sizing calculations are summarized on Figure 5.2 and in Table 5.3

**TABLE 5.2 FARM ROAD DROP INLET DESIGN – INTERIM CONDITIONS**

| STRUCTURE ID | INLET SIZE (FT) | PIPE SIZE (IN) | STREET FLOW (CFS) | INTERCEPTED FLOW (CFS) |
|---|---|---|---|---|
| 5a/5b | 20 | 36 | 410 | 112 |
| 6 | 20 | 30 | 298 | 92 |
| 7 | 5 | 18 | 298 | 19 |

**TABLE 5.3 FARM ROAD DROP INLET DESIGN – ULTIMATE CONDITIONS**

| STRUCTURE ID | INLET SIZE (FT) | PIPE SIZE (IN) | STREET FLOW (CFS) | INTERCEPTED FLOW (CFS) | DEPTH (FT) | VELOCITY (FT/S) | DXV |
|---|---|---|---|---|---|---|---|
| 5b | 20 | 36 | 34 | 22 | 0.48 | 8.88 | 4.3 |
| 7 | 5 | 18 | 16 | 16 | 0.71 | N/A Sump | |

### 5.3.3 Hydraulic Grade Line

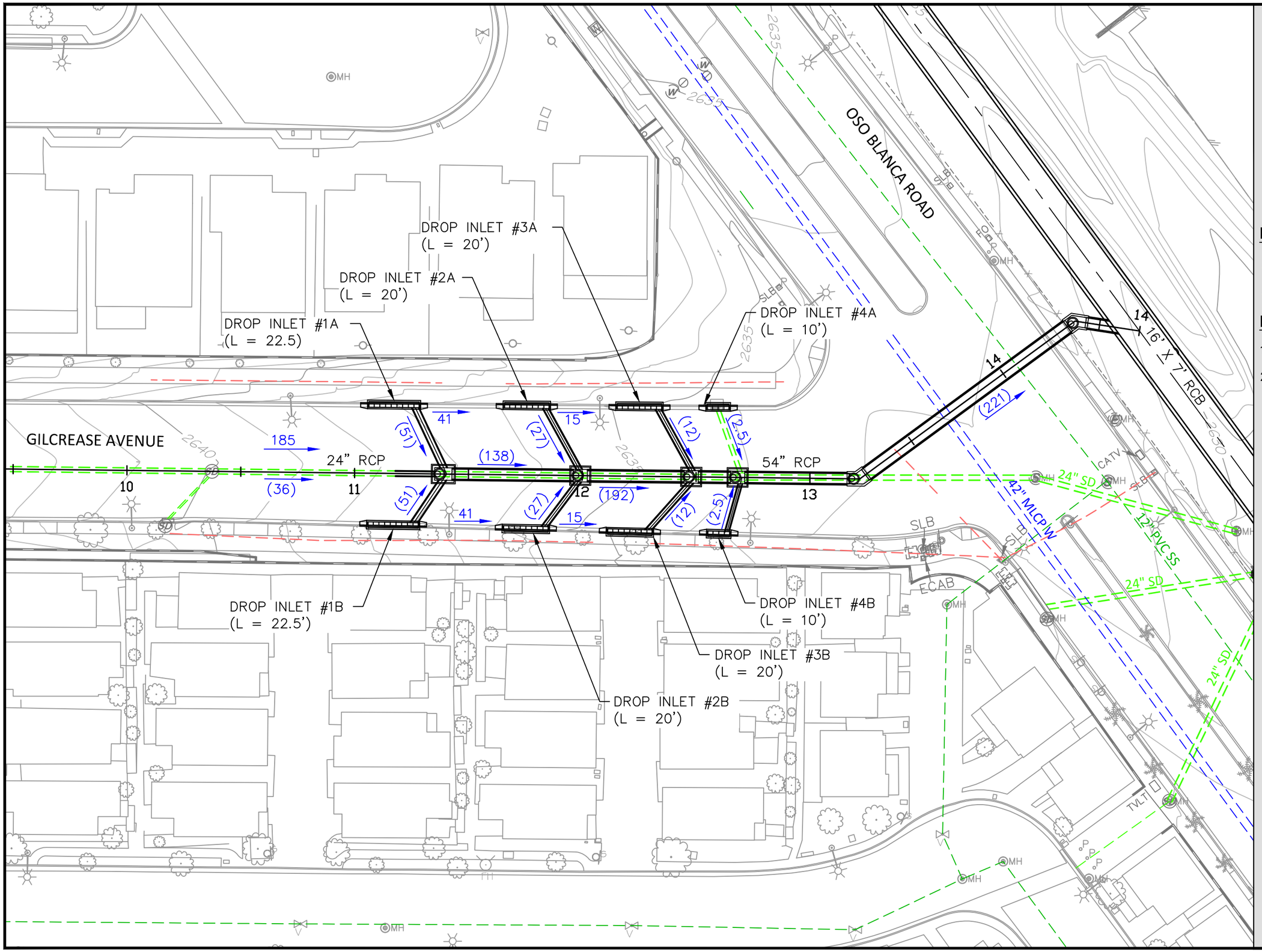
The hydraulic grade line shown on the plans indicate that the system is in open channel flow throughout the entire length.

## 5.4 Grand Teton Lateral

The Grand Teton Lateral connects the existing drainage system at Grand Teton to the Main Line SD. Currently, there is a concrete trapezoidal channel / multi-use trail that conveys surface flow and diverted flow from the Grand Teton Storm Drain to a 10'x10' RCB under Oso Blanca Road. The 10'x10' RCB combines with the existing 15'x9' RCB along Oso Blanca Road and discharges flow under US-95 to the east. The following changes will be made at Grand Teton Drive:

1. Remove the existing 15'x9' RCB and 10x'10' RCB confluence structure and continue the 15'x9' RCB south to the Grand Teton Storm Drain's outlet (see sheets LBSD-01 and LBSD-02).
2. Remove the concrete trapezoidal channel / multi-use trail and connect the existing drainage system to the Main Line Storm Drain (see sheet LBSD-07). The City does not want to perpetuate the Multi-Use Trail crossing under US-95, therefore, the existing 10'x10' RCB is being removed and/or abandoned as part of this project.
3. Removed the existing diversion structure in the Grand Teton Storm Drain and abandon the existing 5'x3' RCB that diverts flow into the existing concrete trapezoidal channel.

Construction of the above mentioned improvements will eliminate flows under US-95 and will complete the planned MPU facilities at Grand Teton Drive and Oso Blanca Road.




# Centennial Parkway Channel West - Durango Drive to Grand Teton Drive

## Legend

(XXX) → Pipe Flow (Interim)

XXX → Surface Flow (Interim)

## Notes:

1. All flows shown are from the 100-year storm event
2. Drop Inlet Calculations are provided in Appendix B.2.2

Louis Berger

Drop Inlet Layout
Gilcrease Avenue
Figure 5.1

Centennial Parkway Channel West - Durango Drive to Grand Teton Drive

## Legend

- (XXX) → Pipe Flow (Interim)
- XXX → Surface Flow (Interim)
- (XXX) → Pipe Flow (Future)
- XXX → Surface Flow (Future)

## Notes:

1. All flows shown are from the 100-year storm event
2. Drop Inlet Calculations are provided in Appendix B.2.2

0 40′ 80′

Louis Berger

Drop Inlet Layout
Farm Road
Figure 5.2

## 6.0 Utility Coordination

Louis Berger initially sent project location figures to relevant utilities including; Southern Nevada Water Authority (SNWA), City of Las Vegas Collection, Southwest Gas, Las Vegas Valley Water District (LVVWD), NV Energy Distribution & Transmission, CenturyLink, Cox Communications, AT&T, and ZAYO. Letters of no conflict were received from AT&T, ZAYO, and NV Energy Transmission. The other entities sent preliminary redlines to Louis Berger with general locations of their respective utilities. Louis Berger incorporated the approximate locations into final design plans to ensure utility horizontal clearances were retained.

LVVWD sent plan sheets within the area showing waterlines, including the 42-inch line under Oso Blanca Road. The plan sheets included plan and profile, and were used to determine the approximate vertical and horizontal locations of the pipe where it was relevant in the design of the Main SD and project laterals.

Sanitary sewer horizontal and vertical locations were obtained from as-builts found on the City's public record site (CLV). Sewer crossing elevations were determined by approximate distance and as-built inverts.

Potholes and manhole surveys were conducted to determine the exact horizontal and vertical utility locations that are in conflict with this project. The pothole information that has been incorporated into the final design and are included in Table 6.1. The pothole logs are also included on the Data CD in Appendix D. Existing encased electric lines along Oso Blanca are in conflict with the proposed Gilcrease Lateral. Louis Berger has coordinated the proposed storm drain alignment and profile with NV Energy for their relocation design. All other facilities are not in conflict with existing utilities.

### TABLE 6.1 POTHOLE INFORMATION

| Pothole Number | Sheet Number | TYPE | SIZE (INCHES) | DEPTH TO TOP | CONFLICT |
|---|---|---|---|---|---|
| 1 | LBU-01 | MLCP Water | 42 | N/A[(1)] | Protect-In-Place |
| 2 | LBU-08 | Electric | 2 | 4.01 | Protect-In-Place |
| 3 | LBU-08 | Irrigation | 2 | 0.33 | Protect-In-Place |
| | | (2) Plastic | 1 | 0.25 | Protect-In-Place |
| | | Electric | 2 | 3.84 | Protect-In-Place |
| 4 | LBU-08 | Electric | 2 | 3.68 | Protect-In-Place |
| 5 | LBU-08 | Direct Buried Cable | 1 | <0.58 | Protect-In-Place |
| | | Irrigation | 2 | 0.58 | Protect-In-Place |
| | | Electric | 2 | 3.83 | Protect-In-Place |
| 6 | LBU-08 | Electric | 2 | 3.95 | Protect-In-Place |
| 7 | LBU-08 | Direct Buried Cable | 0.5 | <1.00 | Protect-In-Place |
| | | Irrigation | 2 | <1.00 | Protect-In-Place |
| | | Electric | 2 | 4.37 | Protect-In-Place |
| 8 | LBU-08 | Electric | 2 | 2.37 | Protect-In-Place |
| 9 | LBU-08 | Electric | 2 | 3.40 | Protect-In-Place |

| Pothole Number | Sheet Number | Type | Size (inches) | Depth to Top | Conflict |
|---|---|---|---|---|---|
| 10 | LBU-08 | (3) Fiber Optic | 2 | 2.14 | Protect-In-Place |
| | | (4) Electric | 3,4 | 2.16 | Protect-In-Place |
| 11 | LBU-08 | MLCP Water | 42 | *11.17* | Protect-In-Place |
| 12 | LBU-08 | (2) Electric | 3 | 4.56 | Protect-In-Place |
| 13 | LBU-08 | Electric | Encasement | 5.25 | To Be Relocated by NVE |
| 14 | LBU-09 | Electric | 2 | 2.89 | Protect-In-Place |
| 15 | LBU-09 | Gas | 4 | 3.45 | Protect-In-Place |
| 16 | LBU-09 | (2) Electric | 4 | 3.93 | Protect-In-Place |
| | LBU-09 | (4) Telephone | 3 | 3.10 | Protect-In-Place |
| 17 | LBU-09 | Water | 12 | 3.54 | Protect-In-Place |
| 18 | *Not Used* | | | | |
| 19 | LBU-09 | Electric | 2 | 1.92 | Protect-In-Place |
| 20 | LBU-09 | Gas | 6 | 3.21 | Protect-In-Place |
| 21 | LBU-09 | MLCP Water | 42 | *10.3* | Protect-In-Place |
| 22 | LBU-09 | Water | 18 | 4.38 | Protect-In-Place |
| 23 | LBU-09 | Gas | *4* | *2.78* | Protect-In-Place |
| 24 | LBU-09 | PVC Water | 12 | *6.75* | Protect-In-Place |
| 25 | LBU-09 | Fiber Optic / Electric | 2,3,4 | 4.99 | Protect-In-Place |
| | | Electric | 6 | 5.86 | Protect-In-Place |

(1) Pothole stopped at 2.6 feet due to impenetrable soil. Waterline elevation shown on the Final Design Plans, 2640.6, is based on As-Built Plans provided by LWWD.

## 7.0 Right-of-Way

The entire project is within NDOT Right-of-Way, City Right-of-Way or an existing drainage easement. No permanent or temporary easements will be required to construct the storm drain or its appurtenant facilities.

## 8.0 Cost Estimate

Table 8.1 is a breakdown of the items and cost estimate for the Centennial Parkway Channel West Project. Construction of this project will be bid and administered by NDOT and funded by the CCRFCD. The total cost of the proposed improvements is estimated to be $10.5 million.

### TABLE 8.1 COST ESTIMATE

| NDOT ITEM | QUANTITY | UNIT | DESCRIPTION | UNIT PRICE | ITEM COST |
|---|---|---|---|---|---|
| 202 0256 | 70 | LINFT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | $ 90.00 | $ 6,300.00 |
| 202 0260 | 4 | EACH | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | $ 1,400.00 | $ 5,600.00 |
| 202 0385 | 4,980 | SQFT | REMOVE CONCRETE CHANNEL | $ 150.00 | $ 747,000.00 |
| 202 0400 | 343 | LINFT | REMOVAL OF CONCRETE BARRIER RAIL | $ 15.00 | $ 5,145.00 |
| 202 0450 | 4 | EACH | REMOVE END SECTION | $ 300.00 | $ 1,200.00 |
| 202 0515 | 60 | EACH | REMOVAL OF RAISED PAVEMENT MARKER | $ 1.00 | $ 60.00 |
| 202 0525 | 131 | EACH | REMOVE PAVEMENT MARKINGS | $ 50.00 | $ 6,550.00 |
| 202 0530 | 4 | EACH | REMOVAL OF HEADWALL | $ 1,200.00 | $ 4,800.00 |
| 202 0600 | 1 | LINFT | REMOVAL OF GATE | $ 500.00 | $ 500.00 |
| 202 0640 | 1 | LS | REMOVE RIPRAP | $ 5,000.00 | $ 5,000.00 |
| 202 0655 | 40 | CUYD | REMOVAL OF GROUTED RIPRAP | $ 25.00 | $ 1,000.00 |
| 202 1035 | 4 | EACH | REMOVAL OF MANHOLE | $ 1,500.00 | $ 6,000.00 |
| 202 1040 | 4 | EACH | REMOVAL OF DROP INLET | $ 1,400.00 | $ 5,600.00 |
| 202 1065 | 33 | SQYD | REMOVAL OF VALLEY GUTTER | $ 25.00 | $ 825.00 |
| 202 1070 | 37 | LINFT | REMOVAL OF CURB AND GUTTER | $ 5.00 | $ 185.00 |
| 202 1230 | 787 | LINFT | REMOVAL OF STORM DRAIN PIPE | $ 42.00 | $ 33,054.00 |
| 202 1290 | 559 | LINFT | REMOVE PAVEMENT MARKINGS | $ 0.50 | $ 279.50 |
| 202 1295 | 15 | SQYD | REMOVE PAVEMENT MARKINGS | $ 15.00 | $ 225.00 |
| 203 0140 | 1,265 | CUYD | ROADWAY EXCAVATION | $ 8.00 | $ 10,120.00 |
| 206 0110 | 45,102 | CUYD | STRUCTURE EXCAVATION | $ 10.00 | $ 451,015.00 |
| 207 0110 | 10,424 | CUYD | GRANULAR BACKFILL | $ 20.00 | $ 208,476.00 |
| 207 0150 | 5,917 | CUYD | SLURRY CEMENT BACKFILL | $ 150.00 | $ 887,490.00 |
| 302 0130 | 874 | TON | TYPE 1 CLASS B AGGREGATE BASE | $ 10.00 | $ 8,740.00 |
| 402 0190 | 665 | TON | PLANTMIX SURFACING (TYPE 2C)(WET) | $ 70.00 | $ 46,550.00 |

| NDOT ITEM | QUANTITY | UNIT | DESCRIPTION | UNIT PRICE | ITEM COST |
|---|---|---|---|---|---|
| 403 0120 | 23 | TON | PLANTMIX OPEN-GRADED SURFACING (1/2-INCH)(WET) | $ 90.00 | $ 2,070.00 |
| 502 0160 | 343 | LINFT | CONCRETE BARRIER RAIL (TYPE A) | $ 39.85 | $ 13,668.55 |
| 502 0920 | 8,946 | CUYD | CLASS A CONCRETE, MODIFIED (MAJOR) | $ 325.00 | $ 2,907,482.50 |
| 502 0930 | 120 | CUYD | CLASS A CONCRETE, MODIFIED (MINOR) | $ 1,300.00 | $ 156,468.00 |
| 502 1280 | 1,633 | LINFT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | $ 387.87 | $ 633,391.71 |
| 502 1518 | 578 | LINFT | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | $ 1,500.00 | $ 867,000.00 |
| 505 0100 | 2,202,322 | POUND | REINFORCING STEEL | $ 0.70 | $ 1,541,625.40 |
| 603 0170 | 108 | LINFT | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 70.00 | $ 7,560.00 |
| 603 0230 | 355 | LINFT | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 90.00 | $ 31,950.00 |
| 603 0290 | 103 | LINFT | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 90.00 | $ 9,270.00 |
| 603 0350 | 120 | LINFT | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 185.00 | $ 22,200.00 |
| 603 0410 | 70 | LINFT | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 120.00 | $ 8,400.00 |
| 603 0440 | 194 | LINFT | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 157.49 | $ 30,553.06 |
| 603 0490 | 141 | LINFT | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | $ 275.00 | $ 38,775.00 |
| 603 0900 | 117 | LINFT | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | $ 300.00 | $ 35,100.00 |
| 609 0220 | 4 | EACH | ADJUST MANHOLE | $ 250.00 | $ 1,000.00 |
| 609 0360 | 15 | EACH | SPECIAL MANHOLE (RCB) | $ 2,205.34 | $ 33,080.10 |
| 609 0380 | 2 | EACH | TYPE 1 MANHOLE (MODIFIED) | $ 4,500.00 | $ 9,000.00 |
| 609 0400 | 5 | EACH | TYPE 4 MANHOLE | $ 9,000.00 | $ 45,000.00 |
| 609 1030 | 37,080 | POUND | CASTINGS | $ 2.20 | $ 81,576.00 |
| 609 1040 | 13,807 | POUND | STRUCTURAL STEEL GRATES | $ 2.50 | $ 34,517.50 |
| 609 1410 | 114 | LINFT | ABANDON PIPE | $ 50.00 | $ 5,700.00 |
| 610 0170 | 93 | CUYD | RIPRAP (CLASS 150) | $ 110.00 | $ 10,230.00 |
| 610 0460 | 62 | CUYD | RIPRAP BEDDING,(CLASS 150) | $ 95.00 | $ 5,890.00 |
| 613 0130 | 1 | SQYD | DETECTABLE WARNINGS | $ 300.00 | $ 300.00 |
| 613 0690 | 37 | LINFT | CLASS A CONCRETE CURB AND GUTTER (TYPE 5) | $ 15.00 | $ 555.00 |
| 613 1200 | 33 | CUYD | CLASS A DRIVEWAYS | $ 300.00 | $ 9,900.00 |
| 613 1420 | 173 | SQYD | CLASS A CONCRETE RAMP (4-INCH) | $ 40.00 | $ 6,920.00 |
| 623 2835 | 211 | SQFT | REMOVE AND REPLACE CONCRETE SIDEWALK | $ 50.00 | $ 10,550.00 |
| 628 0120 | 1 | LS | MOBILIZATION | $ 451,000.00 | $ 451,000.00 |
| 633 0100 | 128 | EACH | NON-REFLECTIVE PAVEMENT MARKERS | $ 2.75 | $ 352.00 |

| NDOT ITEM | QUANTITY | UNIT | DESCRIPTION | UNIT PRICE | ITEM COST |
|---|---|---|---|---|---|
| 633 0110 | 58 | EACH | REFLECTIVE PAVEMENT MARKERS | $ 2.55 | $ 147.90 |
| 633 0180 | 5 | EACH | PERMANENT PAVEMENT MARKERS SPECIAL | $ 3.00 | $ 15.00 |
| 634 0100 | 130 | SQFT | PERMANENT PAVEMENT MARKING FILM (VARIES) | $ 10.00 | $ 1,300.00 |
| 634 0250 | 275 | LINFT | PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID WHITE) | $ 2.50 | $ 687.50 |
| 634 0350 | 284 | LINFT | PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID YELLOW) | $ 2.50 | $ 710.00 |
| 637 0130 | 1 | LS | WATER POLLUTION CONTROL PLAN | $ 5,000.00 | $ 5,000.00 |
| 637 0190 | 1 | LS | DUST CONTROL | $ 90,200.00 | $ 90,200.00 |
| | | | | | |
| | | | **SUB TOTAL** | | **$ 9,550,859.72** |

| | |
|---|---|
| **10% CONTINGENCY** | $ 955,085.97 |
| **TOTAL** | **$ 10,505,945.69** |

## 9.0 Conclusions and Recommendations

This study presents hydrologic and hydraulic analyses in support of the proposed Centennial Parkway Channel West design.

The hydrologic analysis utilized previous MPU hydrology with the following changes:

- Updated curve numbers and lag times based on new soils data
- Subdivided basins to reflect flow to collector systems
- Removed a flow split at the Farm Road & Fort Apache Road intersection to send all flow down Farm Road

Based on the ultimate conditions flow, final plans were prepared with the following recommended facilities:

Main SD

- a 15-foot x 9-foot RCB upstream of Grand Teton Drive
- a 27.25-foot x 7-foot to 16-foot x 7-foot transition structure downstream of Grand Teton drive
- a 16-foot x 7-foot RCB between Grand Teton Drive and Durango Drive
- a 26.58-foot x 7-foot RCB downstream of the 16-foot x 7-foot RCB
- a transition structure that connects to the existing (2) 12-foot x 10-foot RCBs before Durango drive
- Eight drop inlets along the alignment to pick up flow

Gilcrease Lateral

- a 24-inch RCP that connects to the existing storm drain under Gilcrease Avenue
- a 48-inch to 54-inch RCP to a 68-inch x 43-inch HERCP under Gilcrease Avenue
- Eight drop inlets along the alignment to pick up flow

Farm Lateral

- an 8-foot x 6-foot RCB under Farm Road
- Four drop inlets along the alignment to pick up flow

Construction of the recommended facilities will complete the planned MPU facilities from Durango Drive to Skye Canyon Park Drive (aka Horse Drive). The recommended facilities will collect runoff from the west and convey flows southward along US-95 as planned in the MPU.

The total cost of the proposed improvements is estimated to be $10.5 million, all of which will be funded by the Clark County Regional Flood Control District.

## 10.0 References


1. CCRFCD, 1999. Hydrologic Criteria and Drainage Design Manual, prepared by WRC Engineering and updated by Montgomery Watson for the Clark County Regional Flood Control District, August 1999, available at http://www.ccrfcd.org.

2. CCRFCD, 2013. Las Vegas Valley 2013 Master Plan Update – Volumes I and II, prepared by the Clark County Regional Flood Control District, August 2013, available at http://www.ccrfcd.org.

3. CLV, 1999. City of Las Vegas Northwest Neighborhood Study, Phase 2, prepared by PBS&J for the City of Las Vegas (CLV) Flood Control, September 1999.

4. City of Las Vegas Public Records, Development Record Search. Powered by SIRE. <http://www5.lasvegasnevada.gov/sirepub/docs.aspx?tab=RD>. Accessed August 2016.

5. Louis Berger, 2013. Final Design Report, Rancho-Fort Apache Storm Drain, prepared by The Louis Berger Group Inc., for the City of Las Vegas, April 2013.

6. NRCS, 1985. Soil Survey of the Las Vegas Valley, prepared by US Department of Agriculture, National Resource Conservation Service, July 1985.

7. NRCS, 2014d. Soil Survey Geographic (SSURGO) Database for Las Vegas Valley Area, Nevada, Part of Clark County, NV788, prepared by US Department of Agriculture, National Resource Conservation Service, August 22, 2014.

8. USACE, 1998. Flood Hydrograph Package (HEC-1) Computer Program and User's Manual, Version 4.1, prepared by U.S. Army Corps of Engineers Hydrologic Engineering Center, 1998.

9. WSPG, 2002. Water Surface Pressure Gradient Computer Program, Version 14.05, distributed by Civil Design Software Corporation, prepared originally by the Los Angeles Flood Control District.

# APPENDIX A - HYDROLOGIC PARAMETERS AND ANALYSIS


- A.1 Curve Number Calculations
- A.2 Lag Time Calculations
- A.3 HEC-1 Analysis
- A.4 Rational Method Analysis

# A.1 Curve Number Calculations

## Table A.1.1 Centennial Parkway Channel West

**Curve Number Calculations** BY: LDN CHKD BY: JSD

DATE: 9/12/2016 DATE: 9/13/2016

| Basin Name | Land Use | HSG | Subregion CN | Subregion Area (Acres) | Subbasin Area (Acres) | Percent of Subbasin | Cumulative Percent | Area Weighted CN | Cumulative CN | Composite CN |
|---|---|---|---|---|---|---|---|---|---|---|
| NW103-C1 | 7 | 191 | 88 | 8.15 | 8.2 | 100.0% | 100.0% | 88.00 | 88.00 | **88.0** |
| NW103-C2 | 7 | 191 | 88 | 0.01 | 4.8 | 0.2% | 0.2% | 0.20 | 0.20 | |
| NW103-C2 | 9 | 191 | 94 | 0.02 | 4.8 | 0.3% | 0.6% | 0.32 | 0.51 | |
| NW103-C2 | 9 | 610 | 96 | 0.09 | 4.8 | 1.8% | 2.4% | 1.74 | 2.25 | |
| NW103-C2 | 9 | 191 | 94 | 4.64 | 4.8 | 97.6% | 100.0% | 91.77 | 94.02 | **94.0** |
| NW103-C3 | 9 | 191 | 94 | 0.01 | 236.0 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW103-C3 | 9 | 191 | 94 | 0.01 | 236.0 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW103-C3 | 7 | 191 | 88 | 0.20 | 236.0 | 0.1% | 0.1% | 0.08 | 0.08 | |
| NW103-C3 | 7 | 191 | 88 | 0.30 | 236.0 | 0.1% | 0.2% | 0.11 | 0.20 | |
| NW103-C3 | 9 | 191 | 94 | 0.52 | 236.0 | 0.2% | 0.4% | 0.21 | 0.41 | |
| NW103-C3 | 9 | 191 | 94 | 0.77 | 236.0 | 0.3% | 0.8% | 0.30 | 0.71 | |
| NW103-C3 | 2 | 191 | 65 | 1.26 | 236.0 | 0.5% | 1.3% | 0.35 | 1.06 | |
| NW103-C3 | 6 | 191 | 84 | 1.77 | 236.0 | 0.8% | 2.1% | 0.63 | 1.69 | |
| NW103-C3 | 9 | 191 | 94 | 2.37 | 236.0 | 1.0% | 3.1% | 0.94 | 2.63 | |
| NW103-C3 | 9 | 191 | 94 | 5.89 | 236.0 | 2.5% | 5.5% | 2.34 | 4.97 | |
| NW103-C3 | 7 | 191 | 88 | 13.41 | 236.0 | 5.7% | 11.2% | 5.00 | 9.97 | |
| NW103-C3 | 9 | 610 | 96 | 19.38 | 236.0 | 8.2% | 19.4% | 7.88 | 17.85 | |
| NW103-C3 | 7 | 191 | 88 | 20.48 | 236.0 | 8.7% | 28.1% | 7.63 | 25.49 | |
| NW103-C3 | 7 | 191 | 88 | 33.07 | 236.0 | 14.0% | 42.1% | 12.33 | 37.82 | |
| NW103-C3 | 9 | 191 | 94 | 33.12 | 236.0 | 14.0% | 56.2% | 13.19 | 51.01 | |
| NW103-C3 | 9 | 191 | 94 | 39.95 | 236.0 | 16.9% | 73.1% | 15.91 | 66.92 | |
| NW103-C3 | 7 | 191 | 88 | 63.54 | 236.0 | 26.9% | 100.0% | 23.69 | 90.60 | **90.6** |
| NW28-C | 16 | 400 | 92 | 0.02 | 228.8 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW28-C | 16 | 191 | 87 | 0.02 | 228.8 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW28-C | 16 | 155 | 92 | 0.02 | 228.8 | 0.0% | 0.0% | 0.01 | 0.02 | |
| NW28-C | 1 | 155 | 86 | 0.02 | 228.8 | 0.0% | 0.0% | 0.01 | 0.03 | |
| NW28-C | 1 | 155 | 86 | 0.03 | 228.8 | 0.0% | 0.0% | 0.01 | 0.04 | |
| NW28-C | 16 | 191 | 87 | 0.15 | 228.8 | 0.1% | 0.1% | 0.06 | 0.10 | |
| NW28-C | 18 | 155 | 96 | 0.15 | 228.8 | 0.1% | 0.2% | 0.06 | 0.16 | |
| NW28-C | 1 | 400 | 87 | 0.15 | 228.8 | 0.1% | 0.2% | 0.06 | 0.22 | |
| NW28-C | 17 | 191 | 90 | 0.65 | 228.8 | 0.3% | 0.5% | 0.25 | 0.47 | |
| NW28-C | 18 | 155 | 96 | 1.35 | 228.8 | 0.6% | 1.1% | 0.57 | 1.04 | |
| NW28-C | 17 | 400 | 94 | 2.14 | 228.8 | 0.9% | 2.1% | 0.88 | 1.92 | |
| NW28-C | 18 | 155 | 96 | 2.55 | 228.8 | 1.1% | 3.2% | 1.07 | 2.99 | |
| NW28-C | 17 | 155 | 93 | 2.65 | 228.8 | 1.2% | 4.3% | 1.08 | 4.07 | |
| NW28-C | 17 | 191 | 90 | 3.19 | 228.8 | 1.4% | 5.7% | 1.25 | 5.32 | |
| NW28-C | 17 | 191 | 90 | 4.22 | 228.8 | 1.8% | 7.6% | 1.66 | 6.98 | |
| NW28-C | 18 | 400 | 96 | 5.42 | 228.8 | 2.4% | 9.9% | 2.28 | 9.26 | |
| NW28-C | 18 | 400 | 96 | 6.89 | 228.8 | 3.0% | 12.9% | 2.89 | 12.15 | |
| NW28-C | 17 | 155 | 93 | 7.13 | 228.8 | 3.1% | 16.1% | 2.90 | 15.05 | |
| NW28-C | 17 | 155 | 93 | 7.18 | 228.8 | 3.1% | 19.2% | 2.92 | 17.96 | |
| NW28-C | 16 | 400 | 92 | 18.37 | 228.8 | 8.0% | 27.2% | 7.39 | 25.35 | |
| NW28-C | 17 | 400 | 94 | 21.50 | 228.8 | 9.4% | 36.6% | 8.83 | 34.19 | |
| NW28-C | 17 | 155 | 93 | 26.27 | 228.8 | 11.5% | 48.1% | 10.68 | 44.86 | |
| NW28-C | 16 | 191 | 87 | 58.92 | 228.8 | 25.8% | 73.9% | 22.41 | 67.27 | |
| NW28-C | 16 | 155 | 92 | 59.79 | 228.8 | 26.1% | 100.0% | 24.04 | 91.32 | **91.3** |

**Table A.1.1 Centennial Parkway Channel West**

| Curve Number Calculations | | | | | | | | BY: LDN | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE: 9/12/2016 | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW29-C | 16 | 191 | 87 | 0.09 | 84.5 | 0.1% | 0.1% | 0.09 | 0.09 | |
| NW29-C | 18 | 191 | 95 | 0.13 | 84.5 | 0.2% | 0.3% | 0.15 | 0.24 | |
| NW29-C | 18 | 191 | 95 | 0.66 | 84.5 | 0.8% | 1.0% | 0.74 | 0.98 | |
| NW29-C | 17 | 400 | 94 | 2.40 | 84.5 | 2.8% | 3.9% | 2.66 | 3.64 | |
| NW29-C | 17 | 155 | 93 | 4.02 | 84.5 | 4.8% | 8.6% | 4.42 | 8.06 | |
| NW29-C | 18 | 155 | 96 | 4.08 | 84.5 | 4.8% | 13.5% | 4.64 | 12.70 | |
| NW29-C | 16 | 155 | 92 | 5.99 | 84.5 | 7.1% | 20.5% | 6.52 | 19.22 | |
| NW29-C | 17 | 191 | 90 | 7.66 | 84.5 | 9.1% | 29.6% | 8.15 | 27.37 | |
| NW29-C | 18 | 400 | 96 | 7.87 | 84.5 | 9.3% | 38.9% | 8.93 | 36.31 | |
| NW29-C | 17 | 155 | 93 | 9.27 | 84.5 | 11.0% | 49.9% | 10.20 | 46.51 | |
| NW29-C | 16 | 191 | 87 | 9.52 | 84.5 | 11.3% | 61.1% | 9.80 | 56.30 | |
| NW29-C | 16 | 400 | 92 | 9.95 | 84.5 | 11.8% | 72.9% | 10.83 | 67.13 | |
| NW29-C | 17 | 191 | 90 | 10.91 | 84.5 | 12.9% | 85.8% | 11.61 | 78.74 | |
| NW29-C | 18 | 155 | 96 | 12.00 | 84.5 | 14.2% | 100.0% | 13.63 | 92.37 | **92.4** |
| NW45-S | 18 | 155 | 96 | 1.20 | 174.2 | 0.7% | 0.7% | 0.66 | 0.66 | |
| NW45-S | 18 | 400 | 96 | 1.28 | 174.2 | 0.7% | 1.4% | 0.71 | 1.37 | |
| NW45-S | 18 | 155 | 96 | 1.58 | 174.2 | 0.9% | 2.3% | 0.87 | 2.24 | |
| NW45-S | 18 | 400 | 96 | 12.10 | 174.2 | 7.0% | 9.3% | 6.67 | 8.91 | |
| NW45-S | 18 | 191 | 95 | 15.25 | 174.2 | 8.8% | 18.0% | 8.32 | 17.23 | |
| NW45-S | 18 | 155 | 96 | 142.74 | 174.2 | 82.0% | 100.0% | 78.68 | 95.91 | **95.9** |
| NW55-C | 16 | 191 | 87 | 0.01 | 208.2 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW55-C | 4 | 191 | 76 | 0.01 | 208.2 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW55-C | 6 | 191 | 84 | 0.03 | 208.2 | 0.0% | 0.0% | 0.01 | 0.02 | |
| NW55-C | 16 | 191 | 87 | 0.04 | 208.2 | 0.0% | 0.0% | 0.02 | 0.04 | |
| NW55-C | 17 | 191 | 90 | 0.09 | 208.2 | 0.0% | 0.1% | 0.04 | 0.08 | |
| NW55-C | 2 | 191 | 65 | 0.09 | 208.2 | 0.0% | 0.1% | 0.03 | 0.10 | |
| NW55-C | 2 | 191 | 65 | 0.21 | 208.2 | 0.1% | 0.2% | 0.07 | 0.17 | |
| NW55-C | 16 | 191 | 87 | 0.63 | 208.2 | 0.3% | 0.5% | 0.26 | 0.43 | |
| NW55-C | 16 | 155 | 92 | 0.74 | 208.2 | 0.4% | 0.9% | 0.33 | 0.76 | |
| NW55-C | 17 | 191 | 90 | 0.79 | 208.2 | 0.4% | 1.3% | 0.34 | 1.10 | |
| NW55-C | 7 | 191 | 88 | 0.85 | 208.2 | 0.4% | 1.7% | 0.36 | 1.46 | |
| NW55-C | 16 | 400 | 92 | 5.03 | 208.2 | 2.4% | 4.1% | 2.22 | 3.69 | |
| NW55-C | 2 | 191 | 65 | 10.05 | 208.2 | 4.8% | 8.9% | 3.14 | 6.83 | |
| NW55-C | 6 | 191 | 84 | 10.16 | 208.2 | 4.9% | 13.8% | 4.10 | 10.93 | |
| NW55-C | 7 | 191 | 88 | 15.37 | 208.2 | 7.4% | 21.2% | 6.50 | 17.42 | |
| NW55-C | 6 | 191 | 84 | 15.53 | 208.2 | 7.5% | 28.6% | 6.27 | 23.69 | |
| NW55-C | 6 | 191 | 84 | 29.07 | 208.2 | 14.0% | 42.6% | 11.73 | 35.42 | |
| NW55-C | 16 | 191 | 87 | 38.98 | 208.2 | 18.7% | 61.3% | 16.29 | 51.71 | |
| NW55-C | 14 | 191 | 79 | 40.08 | 208.2 | 19.3% | 80.6% | 15.21 | 66.92 | |
| NW55-C | 17 | 191 | 90 | 40.39 | 208.2 | 19.4% | 100.0% | 17.46 | 84.39 | **84.4** |

**Table A.1.1 Centennial Parkway Channel West**

**Curve Number Calculations** BY: LDN CHKD BY: JSD

DATE: 9/12/2016 DATE: 9/13/2016

| Basin Name | Land Use | HSG | Subregion CN | Subregion Area (Acres) | Subbasin Area (Acres) | Percent of Subbasin | Cumulative Percent | Area Weighted CN | Cumulative CN | Composite CN |
|---|---|---|---|---|---|---|---|---|---|---|
| NW62-S | 16 | 314 | 82 | 0.01 | 132.9 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW62-S | 18 | 400 | 96 | 0.01 | 132.9 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW62-S | 18 | 400 | 96 | 0.03 | 132.9 | 0.0% | 0.0% | 0.02 | 0.03 | |
| NW62-S | 18 | 314 | 93 | 0.07 | 132.9 | 0.1% | 0.1% | 0.05 | 0.08 | |
| NW62-S | 18 | 314 | 93 | 0.09 | 132.9 | 0.1% | 0.2% | 0.06 | 0.14 | |
| NW62-S | 18 | 400 | 96 | 0.15 | 132.9 | 0.1% | 0.3% | 0.11 | 0.25 | |
| NW62-S | 18 | 400 | 96 | 0.21 | 132.9 | 0.2% | 0.4% | 0.15 | 0.40 | |
| NW62-S | 18 | 314 | 93 | 0.27 | 132.9 | 0.2% | 0.6% | 0.19 | 0.60 | |
| NW62-S | 18 | 314 | 93 | 0.39 | 132.9 | 0.3% | 0.9% | 0.27 | 0.87 | |
| NW62-S | 18 | 314 | 93 | 0.40 | 132.9 | 0.3% | 1.2% | 0.28 | 1.15 | |
| NW62-S | 17 | 314 | 86 | 0.62 | 132.9 | 0.5% | 1.7% | 0.40 | 1.55 | |
| NW62-S | 18 | 400 | 96 | 0.83 | 132.9 | 0.6% | 2.3% | 0.60 | 2.15 | |
| NW62-S | 18 | 314 | 93 | 2.03 | 132.9 | 1.5% | 3.8% | 1.42 | 3.57 | |
| NW62-S | 17 | 400 | 94 | 4.77 | 132.9 | 3.6% | 7.4% | 3.37 | 6.95 | |
| NW62-S | 18 | 314 | 93 | 5.15 | 132.9 | 3.9% | 11.3% | 3.61 | 10.55 | |
| NW62-S | 18 | 400 | 96 | 5.42 | 132.9 | 4.1% | 15.4% | 3.92 | 14.47 | |
| NW62-S | 18 | 400 | 96 | 6.57 | 132.9 | 4.9% | 20.3% | 4.74 | 19.22 | |
| NW62-S | 18 | 400 | 96 | 9.48 | 132.9 | 7.1% | 27.5% | 6.85 | 26.07 | |
| NW62-S | 18 | 314 | 93 | 24.43 | 132.9 | 18.4% | 45.9% | 17.10 | 43.17 | |
| NW62-S | 18 | 400 | 96 | 34.57 | 132.9 | 26.0% | 71.9% | 24.98 | 68.15 | |
| NW62-S | 18 | 400 | 96 | 37.35 | 132.9 | 28.1% | 100.0% | 26.99 | 95.14 | **95.1** |
| NW66-C1 | 6 | 191 | 84 | 0.02 | 24.8 | 0.1% | 0.1% | 0.08 | 0.08 | |
| NW66-C1 | 14 | 191 | 79 | 0.03 | 24.8 | 0.1% | 0.2% | 0.10 | 0.18 | |
| NW66-C1 | 7 | 191 | 88 | 0.19 | 24.8 | 0.8% | 1.0% | 0.68 | 0.86 | |
| NW66-C1 | 7 | 191 | 88 | 0.23 | 24.8 | 0.9% | 1.9% | 0.82 | 1.68 | |
| NW66-C1 | 6 | 191 | 84 | 10.27 | 24.8 | 41.5% | 43.4% | 34.84 | 36.52 | |
| NW66-C1 | 6 | 191 | 84 | 14.01 | 24.8 | 56.6% | 100.0% | 47.54 | 84.06 | **84.1** |
| NW66-C2 | 4 | 191 | 76 | 0.01 | 155.6 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW66-C2 | 4 | 191 | 76 | 0.02 | 155.6 | 0.0% | 0.0% | 0.01 | 0.02 | |
| NW66-C2 | 6 | 191 | 84 | 0.04 | 155.6 | 0.0% | 0.0% | 0.02 | 0.04 | |
| NW66-C2 | 9 | 191 | 94 | 0.07 | 155.6 | 0.0% | 0.1% | 0.04 | 0.08 | |
| NW66-C2 | 7 | 191 | 88 | 0.12 | 155.6 | 0.1% | 0.2% | 0.07 | 0.15 | |
| NW66-C2 | 7 | 191 | 88 | 0.30 | 155.6 | 0.2% | 0.4% | 0.17 | 0.32 | |
| NW66-C2 | 7 | 191 | 88 | 0.48 | 155.6 | 0.3% | 0.7% | 0.27 | 0.59 | |
| NW66-C2 | 17 | 191 | 90 | 0.60 | 155.6 | 0.4% | 1.1% | 0.35 | 0.94 | |
| NW66-C2 | 14 | 191 | 79 | 0.61 | 155.6 | 0.4% | 1.5% | 0.31 | 1.25 | |
| NW66-C2 | 7 | 191 | 88 | 0.66 | 155.6 | 0.4% | 1.9% | 0.37 | 1.62 | |
| NW66-C2 | 7 | 191 | 88 | 0.76 | 155.6 | 0.5% | 2.4% | 0.43 | 2.05 | |
| NW66-C2 | 7 | 191 | 88 | 0.81 | 155.6 | 0.5% | 2.9% | 0.46 | 2.51 | |
| NW66-C2 | 14 | 191 | 79 | 0.83 | 155.6 | 0.5% | 3.4% | 0.42 | 2.93 | |
| NW66-C2 | 7 | 191 | 88 | 0.88 | 155.6 | 0.6% | 4.0% | 0.50 | 3.43 | |
| NW66-C2 | 7 | 191 | 88 | 0.94 | 155.6 | 0.6% | 4.6% | 0.53 | 3.96 | |
| NW66-C2 | 6 | 191 | 84 | 4.18 | 155.6 | 2.7% | 7.3% | 2.26 | 6.22 | |
| NW66-C2 | 6 | 191 | 84 | 52.27 | 155.6 | 33.6% | 40.9% | 28.23 | 34.45 | |
| NW66-C2 | 6 | 191 | 84 | 91.96 | 155.6 | 59.1% | 100.0% | 49.66 | 84.11 | **84.1** |

**Table A.1.1 Centennial Parkway Channel West**

| Curve Number Calculations | | | | | | | | BY: LDN | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE: 9/12/2016 | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW71-E | 7 | 400 | 92 | 0.01 | 145.2 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW71-E | 6 | 191 | 84 | 0.01 | 145.2 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW71-E | 6 | 400 | 90 | 0.01 | 145.2 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW71-E | 7 | 191 | 88 | 0.03 | 145.2 | 0.0% | 0.0% | 0.02 | 0.03 | |
| NW71-E | 18 | 191 | 95 | 0.06 | 145.2 | 0.0% | 0.1% | 0.04 | 0.07 | |
| NW71-E | 6 | 191 | 84 | 0.09 | 145.2 | 0.1% | 0.1% | 0.05 | 0.13 | |
| NW71-E | 2 | 191 | 65 | 0.11 | 145.2 | 0.1% | 0.2% | 0.05 | 0.18 | |
| NW71-E | 9 | 400 | 96 | 0.12 | 145.2 | 0.1% | 0.3% | 0.08 | 0.26 | |
| NW71-E | 7 | 191 | 88 | 0.14 | 145.2 | 0.1% | 0.4% | 0.08 | 0.34 | |
| NW71-E | 7 | 400 | 92 | 0.16 | 145.2 | 0.1% | 0.5% | 0.10 | 0.44 | |
| NW71-E | 8 | 191 | 93 | 0.27 | 145.2 | 0.2% | 0.7% | 0.17 | 0.61 | |
| NW71-E | 6 | 191 | 84 | 0.32 | 145.2 | 0.2% | 0.9% | 0.19 | 0.80 | |
| NW71-E | 7 | 400 | 92 | 0.48 | 145.2 | 0.3% | 1.2% | 0.30 | 1.10 | |
| NW71-E | 8 | 400 | 95 | 0.53 | 145.2 | 0.4% | 1.6% | 0.35 | 1.45 | |
| NW71-E | 8 | 400 | 95 | 0.87 | 145.2 | 0.6% | 2.2% | 0.57 | 2.02 | |
| NW71-E | 18 | 400 | 96 | 0.95 | 145.2 | 0.7% | 2.9% | 0.63 | 2.65 | |
| NW71-E | 18 | 400 | 96 | 1.49 | 145.2 | 1.0% | 3.9% | 0.98 | 3.63 | |
| NW71-E | 7 | 191 | 88 | 2.05 | 145.2 | 1.4% | 5.3% | 1.24 | 4.87 | |
| NW71-E | 9 | 191 | 94 | 2.13 | 145.2 | 1.5% | 6.8% | 1.38 | 6.26 | |
| NW71-E | 6 | 400 | 90 | 2.90 | 145.2 | 2.0% | 8.8% | 1.80 | 8.06 | |
| NW71-E | 7 | 191 | 88 | 4.93 | 145.2 | 3.4% | 12.2% | 2.99 | 11.05 | |
| NW71-E | 7 | 191 | 88 | 5.36 | 145.2 | 3.7% | 15.9% | 3.25 | 14.30 | |
| NW71-E | 6 | 191 | 84 | 9.00 | 145.2 | 6.2% | 22.1% | 5.21 | 19.51 | |
| NW71-E | 7 | 191 | 88 | 10.29 | 145.2 | 7.1% | 29.1% | 6.24 | 25.74 | |
| NW71-E | 7 | 191 | 88 | 10.72 | 145.2 | 7.4% | 36.5% | 6.50 | 32.24 | |
| NW71-E | 7 | 400 | 92 | 11.45 | 145.2 | 7.9% | 44.4% | 7.26 | 39.50 | |
| NW71-E | 6 | 191 | 84 | 12.57 | 145.2 | 8.7% | 53.1% | 7.27 | 46.77 | |
| NW71-E | 6 | 400 | 90 | 15.67 | 145.2 | 10.8% | 63.9% | 9.71 | 56.48 | |
| NW71-E | 7 | 191 | 88 | 52.46 | 145.2 | 36.1% | 100.0% | 31.79 | 88.28 | **88.3** |

**Table A.1.1 Centennial Parkway Channel West**

| Curve Number Calculations | | | | | | | | BY: LDN | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE: 9/12/2016 | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW71-W | 16 | 191 | 87 | 0.01 | 66.6 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW71-W | 2 | 191 | 65 | 0.01 | 66.6 | 0.0% | 0.0% | 0.01 | 0.02 | |
| NW71-W | 8 | 400 | 95 | 0.01 | 66.6 | 0.0% | 0.0% | 0.02 | 0.04 | |
| NW71-W | 17 | 191 | 90 | 0.06 | 66.6 | 0.1% | 0.1% | 0.08 | 0.12 | |
| NW71-W | 16 | 191 | 87 | 0.06 | 66.6 | 0.1% | 0.2% | 0.08 | 0.19 | |
| NW71-W | 6 | 400 | 90 | 0.06 | 66.6 | 0.1% | 0.3% | 0.08 | 0.28 | |
| NW71-W | 6 | 191 | 84 | 0.09 | 66.6 | 0.1% | 0.5% | 0.12 | 0.39 | |
| NW71-W | 16 | 155 | 92 | 0.11 | 66.6 | 0.2% | 0.6% | 0.16 | 0.55 | |
| NW71-W | 18 | 400 | 96 | 0.13 | 66.6 | 0.2% | 0.8% | 0.18 | 0.73 | |
| NW71-W | 16 | 191 | 87 | 0.17 | 66.6 | 0.3% | 1.1% | 0.23 | 0.96 | |
| NW71-W | 7 | 400 | 92 | 0.22 | 66.6 | 0.3% | 1.4% | 0.30 | 1.26 | |
| NW71-W | 17 | 191 | 90 | 0.29 | 66.6 | 0.4% | 1.8% | 0.39 | 1.65 | |
| NW71-W | 6 | 191 | 84 | 0.45 | 66.6 | 0.7% | 2.5% | 0.56 | 2.21 | |
| NW71-W | 6 | 400 | 90 | 0.53 | 66.6 | 0.8% | 3.3% | 0.71 | 2.92 | |
| NW71-W | 18 | 155 | 96 | 0.62 | 66.6 | 0.9% | 4.2% | 0.90 | 3.82 | |
| NW71-W | 7 | 400 | 92 | 0.63 | 66.6 | 0.9% | 5.2% | 0.87 | 4.69 | |
| NW71-W | 18 | 155 | 96 | 1.11 | 66.6 | 1.7% | 6.8% | 1.60 | 6.29 | |
| NW71-W | 18 | 400 | 96 | 1.44 | 66.6 | 2.2% | 9.0% | 2.07 | 8.36 | |
| NW71-W | 18 | 191 | 95 | 1.44 | 66.6 | 2.2% | 11.2% | 2.05 | 10.41 | |
| NW71-W | 17 | 400 | 94 | 2.64 | 66.6 | 4.0% | 15.1% | 3.73 | 14.14 | |
| NW71-W | 18 | 400 | 96 | 2.83 | 66.6 | 4.2% | 19.4% | 4.07 | 18.21 | |
| NW71-W | 16 | 400 | 92 | 2.88 | 66.6 | 4.3% | 23.7% | 3.98 | 22.20 | |
| NW71-W | 17 | 400 | 94 | 7.62 | 66.6 | 11.4% | 35.1% | 10.75 | 32.94 | |
| NW71-W | 16 | 191 | 87 | 9.13 | 66.6 | 13.7% | 48.8% | 11.92 | 44.86 | |
| NW71-W | 18 | 400 | 96 | 16.57 | 66.6 | 24.9% | 73.7% | 23.87 | 68.74 | |
| NW71-W | 17 | 191 | 90 | 17.53 | 66.6 | 26.3% | 100.0% | 23.67 | 92.41 | **92.4** |

**Table A.1.1 Centennial Parkway Channel West**

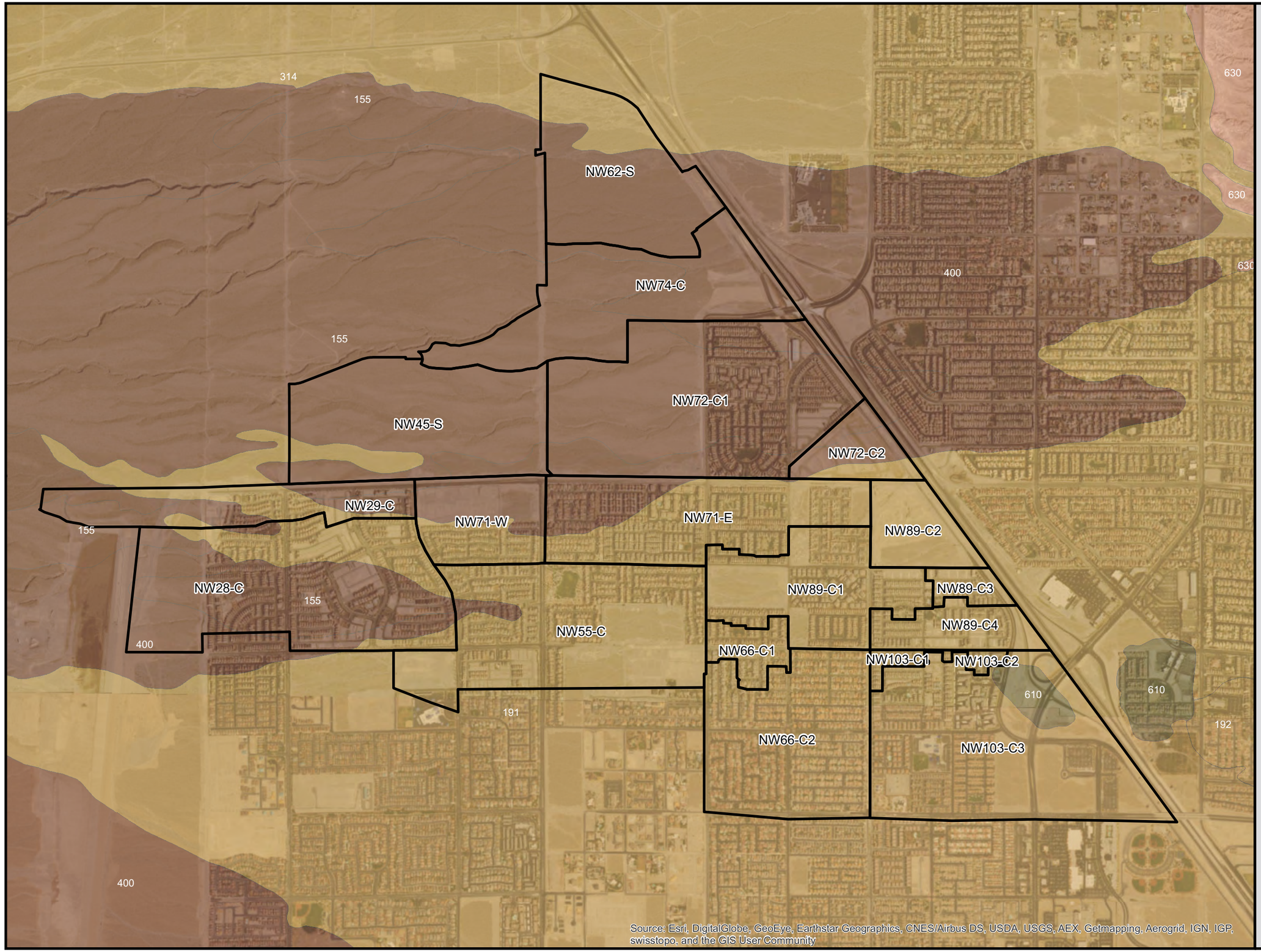
| Curve Number Calculations | | | | | | | | BY: LDN | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE: 9/12/2016 | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW72-C1 | 8 | 191 | 93 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW72-C1 | 6 | 155 | 90 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.00 | |
| NW72-C1 | 9 | 400 | 96 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW72-C1 | 6 | 400 | 90 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.01 | |
| NW72-C1 | 18 | 191 | 95 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.02 | |
| NW72-C1 | 8 | 155 | 95 | 0.01 | 246.4 | 0.0% | 0.0% | 0.00 | 0.02 | |
| NW72-C1 | 9 | 155 | 96 | 0.02 | 246.4 | 0.0% | 0.0% | 0.01 | 0.03 | |
| NW72-C1 | 7 | 155 | 92 | 0.02 | 246.4 | 0.0% | 0.0% | 0.01 | 0.03 | |
| NW72-C1 | 7 | 155 | 92 | 0.03 | 246.4 | 0.0% | 0.1% | 0.01 | 0.05 | |
| NW72-C1 | 9 | 155 | 96 | 0.07 | 246.4 | 0.0% | 0.1% | 0.03 | 0.07 | |
| NW72-C1 | 7 | 400 | 92 | 0.11 | 246.4 | 0.0% | 0.1% | 0.04 | 0.12 | |
| NW72-C1 | 8 | 155 | 95 | 0.16 | 246.4 | 0.1% | 0.2% | 0.06 | 0.18 | |
| NW72-C1 | 8 | 400 | 95 | 0.19 | 246.4 | 0.1% | 0.3% | 0.07 | 0.25 | |
| NW72-C1 | 7 | 191 | 88 | 0.70 | 246.4 | 0.3% | 0.5% | 0.25 | 0.50 | |
| NW72-C1 | 6 | 155 | 90 | 2.21 | 246.4 | 0.9% | 1.4% | 0.81 | 1.31 | |
| NW72-C1 | 7 | 400 | 92 | 3.09 | 246.4 | 1.3% | 2.7% | 1.15 | 2.46 | |
| NW72-C1 | 18 | 400 | 96 | 4.39 | 246.4 | 1.8% | 4.5% | 1.71 | 4.17 | |
| NW72-C1 | 7 | 155 | 92 | 4.46 | 246.4 | 1.8% | 6.3% | 1.67 | 5.84 | |
| NW72-C1 | 6 | 400 | 90 | 6.29 | 246.4 | 2.6% | 8.8% | 2.30 | 8.13 | |
| NW72-C1 | 7 | 155 | 92 | 6.62 | 246.4 | 2.7% | 11.5% | 2.47 | 10.61 | |
| NW72-C1 | 18 | 400 | 96 | 10.01 | 246.4 | 4.1% | 15.6% | 3.90 | 14.51 | |
| NW72-C1 | 7 | 400 | 92 | 10.76 | 246.4 | 4.4% | 20.0% | 4.02 | 18.53 | |
| NW72-C1 | 18 | 400 | 96 | 14.95 | 246.4 | 6.1% | 26.0% | 5.82 | 24.35 | |
| NW72-C1 | 7 | 400 | 92 | 16.83 | 246.4 | 6.8% | 32.9% | 6.28 | 30.63 | |
| NW72-C1 | 18 | 155 | 96 | 17.09 | 246.4 | 6.9% | 39.8% | 6.66 | 37.29 | |
| NW72-C1 | 7 | 155 | 92 | 19.69 | 246.4 | 8.0% | 47.8% | 7.35 | 44.65 | |
| NW72-C1 | 18 | 155 | 96 | 20.94 | 246.4 | 8.5% | 56.3% | 8.16 | 52.80 | |
| NW72-C1 | 18 | 155 | 96 | 28.73 | 246.4 | 11.7% | 68.0% | 11.20 | 64.00 | |
| NW72-C1 | 18 | 155 | 96 | 32.77 | 246.4 | 13.3% | 81.3% | 12.77 | 76.77 | |
| NW72-C1 | 7 | 155 | 92 | 46.18 | 246.4 | 18.7% | 100.0% | 17.25 | 94.02 | **94.0** |

**Table A.1.1 Centennial Parkway Channel West**

| Curve Number Calculations | | | | | | | | BY: LDN | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE: 9/12/2016 | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW72-C2 | 7 | 155 | 92 | 0.02 | 36.3 | 0.1% | 0.1% | 0.05 | 0.05 | |
| NW72-C2 | 7 | 400 | 92 | 0.10 | 36.3 | 0.3% | 0.3% | 0.24 | 0.29 | |
| NW72-C2 | 7 | 191 | 88 | 2.14 | 36.3 | 5.9% | 6.2% | 5.18 | 5.47 | |
| NW72-C2 | 7 | 155 | 92 | 2.28 | 36.3 | 6.3% | 12.5% | 5.78 | 11.25 | |
| NW72-C2 | 7 | 400 | 92 | 3.03 | 36.3 | 8.3% | 20.8% | 7.67 | 18.91 | |
| NW72-C2 | 9 | 155 | 96 | 5.30 | 36.3 | 14.6% | 35.4% | 14.00 | 32.92 | |
| NW72-C2 | 9 | 191 | 94 | 8.30 | 36.3 | 22.8% | 58.2% | 21.47 | 54.39 | |
| NW72-C2 | 9 | 400 | 96 | 15.18 | 36.3 | 41.8% | 100.0% | 40.09 | 94.48 | **94.5** |
| NW74-C | 7 | 400 | 92 | 0.05 | 157.8 | 0.0% | 0.0% | 0.03 | 0.03 | |
| NW74-C | 7 | 400 | 92 | 0.27 | 157.8 | 0.2% | 0.2% | 0.16 | 0.19 | |
| NW74-C | 18 | 400 | 96 | 0.31 | 157.8 | 0.2% | 0.4% | 0.19 | 0.37 | |
| NW74-C | 6 | 400 | 90 | 0.81 | 157.8 | 0.5% | 0.9% | 0.46 | 0.83 | |
| NW74-C | 7 | 400 | 92 | 1.37 | 157.8 | 0.9% | 1.8% | 0.80 | 1.63 | |
| NW74-C | 18 | 400 | 96 | 1.62 | 157.8 | 1.0% | 2.8% | 0.99 | 2.62 | |
| NW74-C | 18 | 400 | 96 | 1.70 | 157.8 | 1.1% | 3.9% | 1.04 | 3.66 | |
| NW74-C | 18 | 155 | 96 | 2.19 | 157.8 | 1.4% | 5.3% | 1.33 | 4.99 | |
| NW74-C | 18 | 400 | 96 | 7.03 | 157.8 | 4.5% | 9.7% | 4.28 | 9.27 | |
| NW74-C | 18 | 155 | 96 | 10.46 | 157.8 | 6.6% | 16.4% | 6.36 | 15.63 | |
| NW74-C | 17 | 400 | 94 | 10.54 | 157.8 | 6.7% | 23.0% | 6.28 | 21.91 | |
| NW74-C | 18 | 400 | 96 | 20.69 | 157.8 | 13.1% | 36.2% | 12.59 | 34.50 | |
| NW74-C | 18 | 155 | 96 | 22.05 | 157.8 | 14.0% | 50.1% | 13.42 | 47.92 | |
| NW74-C | 18 | 155 | 96 | 25.61 | 157.8 | 16.2% | 66.4% | 15.58 | 63.50 | |
| NW74-C | 18 | 155 | 96 | 25.83 | 157.8 | 16.4% | 82.7% | 15.72 | 79.22 | |
| NW74-C | 16 | 400 | 92 | 27.24 | 157.8 | 17.3% | 100.0% | 15.88 | 95.10 | **95.1** |

**Table A.1.1 Centennial Parkway Channel West**

| Curve Number Calculations | | | | | | | BY: LDN | | CHKD BY: JSD | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DATE: 9/12/2016 | | DATE: 9/13/2016 | |
| **Basin Name** | **Land Use** | **HSG** | **Subregion CN** | **Subregion Area (Acres)** | **Subbasin Area (Acres)** | **Percent of Subbasin** | **Cumulative Percent** | **Area Weighted CN** | **Cumulative CN** | **Composite CN** |
| NW89-C1 | 7 | 191 | 88 | 0.01 | 112.0 | 0.0% | 0.0% | 0.01 | 0.01 | |
| NW89-C1 | 6 | 191 | 84 | 0.02 | 112.0 | 0.0% | 0.0% | 0.02 | 0.02 | |
| NW89-C1 | 7 | 191 | 88 | 0.08 | 112.0 | 0.1% | 0.1% | 0.07 | 0.09 | |
| NW89-C1 | 8 | 191 | 93 | 0.19 | 112.0 | 0.2% | 0.3% | 0.15 | 0.24 | |
| NW89-C1 | 7 | 191 | 88 | 0.50 | 112.0 | 0.4% | 0.7% | 0.39 | 0.63 | |
| NW89-C1 | 8 | 191 | 93 | 1.16 | 112.0 | 1.0% | 1.8% | 0.97 | 1.60 | |
| NW89-C1 | 8 | 191 | 93 | 1.19 | 112.0 | 1.1% | 2.8% | 0.99 | 2.59 | |
| NW89-C1 | 8 | 191 | 93 | 2.41 | 112.0 | 2.1% | 5.0% | 2.00 | 4.59 | |
| NW89-C1 | 8 | 191 | 93 | 3.27 | 112.0 | 2.9% | 7.9% | 2.71 | 7.30 | |
| NW89-C1 | 8 | 191 | 93 | 3.78 | 112.0 | 3.4% | 11.3% | 3.14 | 10.44 | |
| NW89-C1 | 8 | 191 | 93 | 4.09 | 112.0 | 3.7% | 14.9% | 3.40 | 13.84 | |
| NW89-C1 | 8 | 191 | 93 | 4.35 | 112.0 | 3.9% | 18.8% | 3.61 | 17.46 | |
| NW89-C1 | 7 | 191 | 88 | 4.90 | 112.0 | 4.4% | 23.2% | 3.85 | 21.31 | |
| NW89-C1 | 7 | 191 | 88 | 6.59 | 112.0 | 5.9% | 29.1% | 5.18 | 26.48 | |
| NW89-C1 | 7 | 191 | 88 | 14.81 | 112.0 | 13.2% | 42.3% | 11.64 | 38.12 | |
| NW89-C1 | 7 | 191 | 88 | 31.65 | 112.0 | 28.3% | 70.5% | 24.86 | 62.99 | |
| NW89-C1 | 6 | 191 | 84 | 33.00 | 112.0 | 29.5% | 100.0% | 24.75 | 87.73 | **87.7** |
| NW89-C2 | 7 | 191 | 88 | 0.12 | 45.9 | 0.3% | 0.3% | 0.22 | 0.22 | |
| NW89-C2 | 7 | 191 | 88 | 0.17 | 45.9 | 0.4% | 0.6% | 0.33 | 0.56 | |
| NW89-C2 | 7 | 191 | 88 | 0.25 | 45.9 | 0.5% | 1.2% | 0.47 | 1.03 | |
| NW89-C2 | 7 | 191 | 88 | 7.78 | 45.9 | 16.9% | 18.1% | 14.91 | 15.94 | |
| NW89-C2 | 9 | 191 | 94 | 37.60 | 45.9 | 81.9% | 100.0% | 76.97 | 92.91 | **92.9** |
| NW89-C3 | 9 | 191 | 94 | 0.11 | 15.5 | 0.7% | 0.7% | 0.70 | 0.70 | |
| NW89-C3 | 7 | 191 | 88 | 3.06 | 15.5 | 19.7% | 20.5% | 17.35 | 18.05 | |
| NW89-C3 | 7 | 191 | 88 | 12.34 | 15.5 | 79.5% | 100.0% | 70.00 | 88.04 | **88.0** |
| NW89-C4 | 9 | 191 | 94 | 0.01 | 42.3 | 0.0% | 0.0% | 0.02 | 0.02 | |
| NW89-C4 | 9 | 191 | 94 | 0.02 | 42.3 | 0.0% | 0.1% | 0.04 | 0.06 | |
| NW89-C4 | 9 | 191 | 94 | 3.09 | 42.3 | 7.3% | 7.4% | 6.87 | 6.93 | |
| NW89-C4 | 7 | 191 | 88 | 3.69 | 42.3 | 8.7% | 16.1% | 7.69 | 14.62 | |
| NW89-C4 | 7 | 191 | 88 | 35.48 | 42.3 | 83.9% | 100.0% | 73.82 | 88.44 | **88.4** |




CITY OF LAS VEGAS NEVADA

**Centennial Parkway Channel West**

## Legend

- HEC-1 Basins

**HSG**

- A
- D
- Pits/Gravel
- Badland

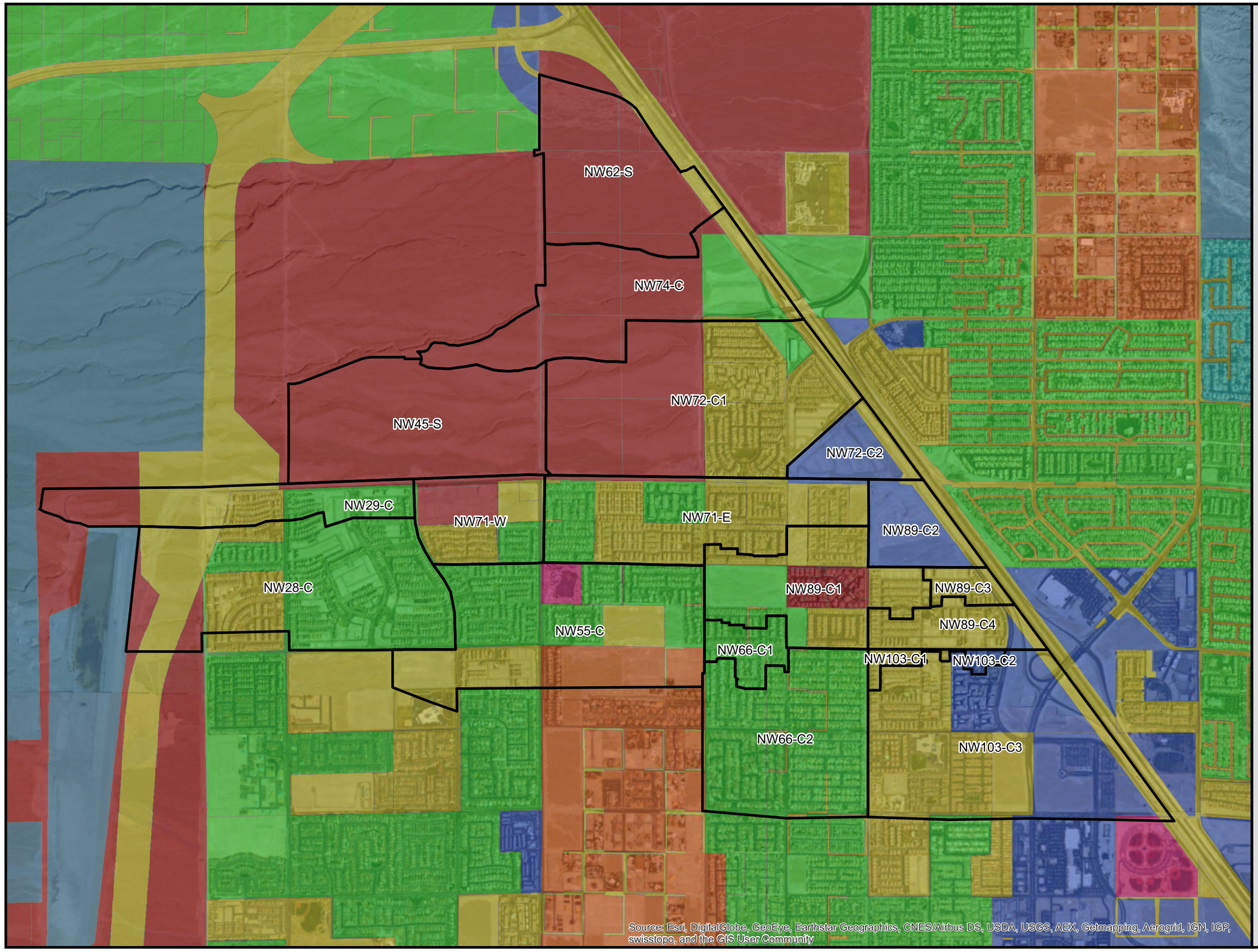
N

0 750 1,500 3,000

Feet

Louis Berger

**Soil Map**
**Figure A.1.1**




**Centennial Parkway Channel West**

**Legend**

HEC-1 Basins

**Land Use**

- Commercial, Retail, Casino, High Rise Condominiums
- High-Density Residential, 4-8 units per acre
- Low-Density Residential, 1-2 units per acre
- Medium-Density Residential, 2-4 units per acre
- Parks, Golf Courses
- Public Facility and Residential, 8-12 units per a*
- Rural, 0.5-1 units per acre
- Schools
- Undeveloped Land, Open Desert
- Very High-Density Residential, 12 units per acre *

N

0 750 1,500 3,000

Feet

Louis Berger

**Land Use Map**
**Figure A.1.2**

# A.2 Lag Time Calculations

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## TIME OF CONCENTRATION

**Table A.2.1**
**Louis Berger**

**Centennial Parkway Channel West**

**BY:** LDN
**DATE:** 10/20/16

| SUB-BASIN DATA | | | | | | INITIAL / OVERLAND TIME (Ti) | | | TRAVEL TIME (Tt) | | | | | Tc | Tc Check | Tlag | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIG: (1) | DEV./EX. (D or E) | CN | K (2) | AREA Ac (3) | AREA Mi^2 | INITIAL LENGTH Feet (4) | SLOPE % (5) | Ti Min (6) | TRAVEL LENGTH Feet (7) | SLOPE % (8) | V1 VELOCITY FPS (9a) | V2 VELOCITY FPS (9b) | Tt Min (10) | Min (13) | Min (14) | Tlag= 0.6Tc/60 Hours | RAINFALL Q100/Q10 Inches |
| NW103-C1 | D | 88 | 0.7716 | 8.20 | 0.013 | 100 | 1.0 | 5.9 | 1214 | 3.0 | 3.5 | 5.3 | 4.7 | 10.6 | 17.3 | **0.106** | 2.80 |
| NW103-C2 | D | 94 | 0.8508 | 4.80 | 0.008 | 100 | 1.0 | 4.5 | 564 | 1.6 | 2.5 | 3.9 | 3.5 | 8.0 | 13.7 | **0.080** | 2.80 |
| NW103-C3 | D | 90.6 | 0.8059 | 236.00 | 0.369 | 100 | 1.0 | 5.3 | 5610 | 2.5 | 3.2 | 4.8 | 20.3 | 25.6 | 41.7 | **0.256** | 2.80 |
| NW28-C | D | 91.3 | 0.8152 | 228.80 | 0.358 | 100 | 1.0 | 5.1 | 6500 | 3.5 | 3.8 | 5.7 | 19.8 | 24.9 | 46.7 | **0.249** | 3.02 |
| NW29-C | D | 92.4 | 0.8297 | 84.50 | 0.132 | 100 | 1.0 | 4.9 | 5650 | 3.8 | 3.9 | 6.0 | 16.5 | 21.4 | 41.9 | **0.214** | 3.00 |
| NW45-S | D | 95.9 | 0.8759 | 174.20 | 0.272 | 100 | 1.0 | 4.0 | 5300 | 3.6 | 3.8 | 5.8 | 16.0 | 20.0 | 40.0 | **0.200** | 2.91 |
| NW55-C | D | 84.4 | 0.7241 | 208.20 | 0.325 | 100 | 1.0 | 6.8 | 5800 | 2.7 | 3.3 | 5.0 | 20.2 | 26.9 | 42.8 | **0.269** | 2.93 |
| NW62-S | D | 95.1 | 0.8653 | 132.90 | 0.208 | 100 | 1.0 | 4.2 | 3750 | 2.1 | 3.0 | 4.5 | 14.9 | 19.2 | 31.4 | **0.192** | 2.77 |
| NW66-C1 | D | 84.1 | 0.7201 | 24.80 | 0.039 | 100 | 1.0 | 6.8 | 1217 | 3.1 | 3.6 | 5.4 | 4.6 | 11.4 | 17.3 | **0.114** | 2.88 |
| NW66-C2 | D | 84.1 | 0.7201 | 155.60 | 0.243 | 100 | 1.0 | 6.8 | 2723 | 3.0 | 3.5 | 5.3 | 9.4 | 16.2 | 25.7 | **0.162** | 2.88 |
| NW71-E | D | 88.3 | 0.7756 | 145.20 | 0.227 | 100 | 1.0 | 5.8 | 5213 | 3.3 | 3.7 | 5.6 | 16.4 | 22.2 | 39.5 | **0.222** | 2.85 |
| NW71-W | D | 92.4 | 0.8297 | 66.60 | 0.104 | 100 | 1.0 | 4.9 | 4200 | 2.4 | 3.1 | 4.7 | 15.7 | 20.6 | 33.9 | **0.206** | 2.92 |
| NW72-C1 | D | 94 | 0.8508 | 246.40 | 0.385 | 100 | 1.0 | 4.5 | 5439 | 3.0 | 3.5 | 5.3 | 17.9 | 22.4 | 40.8 | **0.224** | 2.80 |
| NW72-C2 | D | 94.5 | 0.8574 | 36.30 | 0.057 | 100 | 1.0 | 4.4 | 2464 | 2.2 | 3.0 | 4.6 | 9.9 | 14.3 | 24.2 | **0.143** | 2.80 |
| NW74-C | D | 95.1 | 0.8653 | 157.80 | 0.247 | 100 | 1.0 | 4.2 | 6600 | 3.3 | 3.7 | 5.6 | 20.5 | 24.7 | 47.2 | **0.247** | 2.80 |
| NW89-C1 | D | 87.7 | 0.7676 | 112.00 | 0.175 | 100 | 1.0 | 6.0 | 3487 | 3.0 | 3.5 | 5.3 | 11.7 | 17.7 | 29.9 | **0.177** | 2.80 |
| NW89-C2 | D | 92.9 | 0.8363 | 45.90 | 0.072 | 100 | 1.0 | 4.7 | 2239 | 2.0 | 2.8 | 4.3 | 9.7 | 14.4 | 23.0 | **0.144** | 2.80 |
| NW89-C3 | D | 88 | 0.7716 | 15.50 | 0.024 | 100 | 1.0 | 5.9 | 1370 | 2.1 | 2.9 | 4.5 | 6.1 | 12.0 | 18.2 | **0.120** | 2.80 |
| NW89-C4 | D | 88.4 | 0.7769 | 42.30 | 0.066 | 100 | 1.0 | 5.8 | 2767 | 2.3 | 3.1 | 4.6 | 10.9 | 16.7 | 25.9 | **0.167** | 2.80 |

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
Tc Check = L/180+10

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  Developed V1 = 20.2*(S/100)^1/2
Existing V2 = 29.4*(S/100)^1/2  Developed V2 = 30.6*(S/100)^1/2

**REFERENCE : 2008 LVV MPU & USDA NRCS NV788**

**STANDARD FORM 4**

# A.3 HEC-1 Analysis

- A.3.1 Ultimate Conditions 100-Year, 6-Hour Series B (Without Baseflow)

# A.3.1 Ultimate Conditions 100-Year, 6-Hour Series B (Without Baseflow)

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *               JUN   1998             *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   04JAN17  TIME  11:13:41  *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*    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    CENTENNIAL PARKWAY CHANNEL WEST
              2         ID    US95/CC215 TO DURANGO
              3         ID    RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
              4         ID    INPUT FILE = CENTULT3BXBF.DAT
              5         ID    DESCRIPTION = OFFSITE BASINS WITHOUT KYLE CANYON DB BASEFLOW
              6         ID    INPUT FILE DATE = JAN 2017
              7         ID    DESIGN STORM = 100-YEAR 6-HOUR STORM
              8         ID    STORM DISTRIBUTION = SDN3
              9         ID    MODELED BY LB (LEANDRA NELSON, E.I.)
             10         ID    CHECKED BY LB (JEFF DOUGLAS, P.E.)
             11         ID    STORM CENTERING = REMOVED DETENTION BASIN OUTFLOWS
```

```
  12          ID    DOWNSTREAM OF THE UPPER LAS VEGAS WASH DETENTION BASIN TO THE MOST
  13          ID    DOWNSTREAM POINT IN THE LOWER NORTHERN LAS VEGAS WASH WATERSHED
  14          ID    COMBINATION POINT DOWNSTREAM OF LOWER LAS VEGAS WASH DETENTION BASIN
  15          ID    WAS MODIFIED TO SIMULATE NECESSARY STORM CENTERINGS
  16          ID
  17          ID
  18          ID    REFERENCED HYDROLOGIC MODELS:
  19          ID    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
  20          ID    UPPER AND LOWER NORTHERN LAS VEGAS WASH WATERSHEDS
  21          ID    REVISED FINAL DESIGN REPORT FOR THE RANCHO DETENTION BASIN
  22          ID    PHASE II (VTN 2006)
  23          ID    RESPONSE TO COMMENTS ON THE CONCEPTUAL DRAINAGE STUDY FOR
  24          ID    NORTH LAS VEGAS 600-ACRE SITE (GC WALLACE 2006)
  25          ID    SECOND RESPONSE TO COMMENTS OF THE CONCEPTUAL DRAINAGE STUDY
  26          ID    FOR NORTH LAS VEGAS 2074-ACRE SITE (GC WALLACE 2006)
  27          ID    BASIN MAPS FOR SUPPLEMENT #2 TO ADDENDUM #2 TO THE MASTER
  28          ID    DRAINAGE STUDY FOR CLIFF'S EDGE/ PROVIDENCE (VTN 2004)
  29          ID    MASTER DRAINAGE STUDY FOR KYLE CANYON (GC WALLACE 2006)
  30          ID    TECHNICAL DRAINAGE STUDY FOR GRAND TETON DRIVE STROM DRAIN
  31          ID    AND AREA 1 ROADWAY IMPROVEMENTS  (GC WALLACE 2006)
  32          ID    90% FINAL DESIGN REPORT FOR RANCHO ROAD SYSTEM - EL CAMPO
  33          ID    GRANDE STORM DRAIN PROJECT (PBS&J 2007)
  34          ID    MPA FOR RACEL STREET COLLECTOR (LOUIS BERGER JANUARY 2007)
  35          ID    HYDROLOGIC MODEL FOR FLOYD LAMB NORTH AND SOUTH ENVIRONMENTAL
  36          ID    ENHANCEMENT AREAS (LOUIS BERGER  DECEMBER 7, 2007)
  37          ID
  38          ID
  39          ID
  40          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
  41          ID
  42          ID    AREA (SQUARE MILES)           DARF
  43          ID          0 - 0.5                 0.99
  44          ID          0.5 - 1                 0.975
  45          ID          1 - 2                   0.95
  46          ID          2 - 3                   0.925
  47          ID          3 - 4                   0.915
  48          ID          4 - 5                   0.908
  49          ID          5 - 6                   0.903
  50          ID          6 - 7                   0.895
  51          ID          7 - 8                   0.885
  52          ID
  53          IT       5       0       0     300
1                                          HEC-1 INPUT                                          PAGE  2

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

  54          IO       5       0       0
  55          IN       5       0       0
  56          JR    PREC    0.99   0.975    0.95   0.925   0.915   0.908   0.903   0.895   0.885
              *
```

```
57          KK  NW62-S
58          BA   0.208
59          PB    2.77
60          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
61          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
62          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
63          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
64          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
65          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
66          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
67          PC   0.998   0.999   1.000
68          LS       0    95.1
69          UD   0.192
            *

70          KK RNW62-S
71          KM  ROUTE NW62-S TO CNW74-C
72          KM  FACILITY = CENTENNIAL PARKWAY CHANNEL WEST/U.S. 95 FACILITY
73          KM  FACILITY ID-MILE = CN95 0333,0318,0313,0259
74          KM  LINING = RCB
75          RD    2100   0.015   0.015       0    TRAP      14       0
            *

76          KK  NW74-C
77          BA   0.247
78          PB    2.80
79          LS       0    95.1
80          UD   0.247
            *

81          KK CNW74-C
82          KM  COMBINE NW74-C AND RNW62-C
83          HC       2
            *

84          KKRCNW74-C
85          KM  ROUTE CNW74-C TO 2CNW72-C
86          KM  FACILITY = CENTENNIAL PARKWAY CHANNEL WEST/U.S. 95 FACILITY
87          KM  FACILITY ID-MILE = CN95 0259
88          KM  LINING = RCB
89          RD    1870   0.021   0.015       0    TRAP      16       0
            *

90          KK  NW45-S
91          BA   0.272
92          PB    2.91
93          LS       0    95.9
94          UD   0.200
            *
```

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

  95          KK RNW45-S
  96          KM  ROUTE NW45-S TO CNW72-C
  97          KM  FACILITY = CENTENNIAL PKWY CHANNEL WEST - KYLE CANYON BRANCH
  98          KM  FACILITY ID-MILE = CNKC 0050,0024,0007,0000
  99          KM  LINING = RCB
 100          RD    5460    0.03   0.015       0    TRAP       6       0
              *

 101          KK NW72-C1
 102          BA   0.385
 103          PB    2.80
 104          LS       0      94
 105          UD   0.224
              *

 106          KKCNW72-C1
 107          KM  COMBINE NW72-C1 AND RNW45-S
 108          HC       2
              *

 109          KKRCNW72-C1
 110          KM  ROUTE CNW72-C1 TO NW72-C2
 111          RD    1650   0.008   0.015       0    TRAP      15       0
              *

 112          KK NW72-C2
 113          BA   0.057
 114          PB    2.80
 115          LS       0    94.5
 116          UD   0.143
              *

 117          KKCNW72-C2
 118          KM  COMBINE NW72-C2 AND NW72-C1
 119          KM  RACEL AND US95
 120          HC       2
              *

 121          KK2CNW72C2
 122          KM  COMBINE CNW72-C AND CNW74-C
 123          KM  RANCHO ROAD SYSTEM @ RACEL
 124          HC       2
              *

 125          KK  NW29-C
 126          BA   0.132
 127          PB    3.00
 128          LS       0    92.4
```

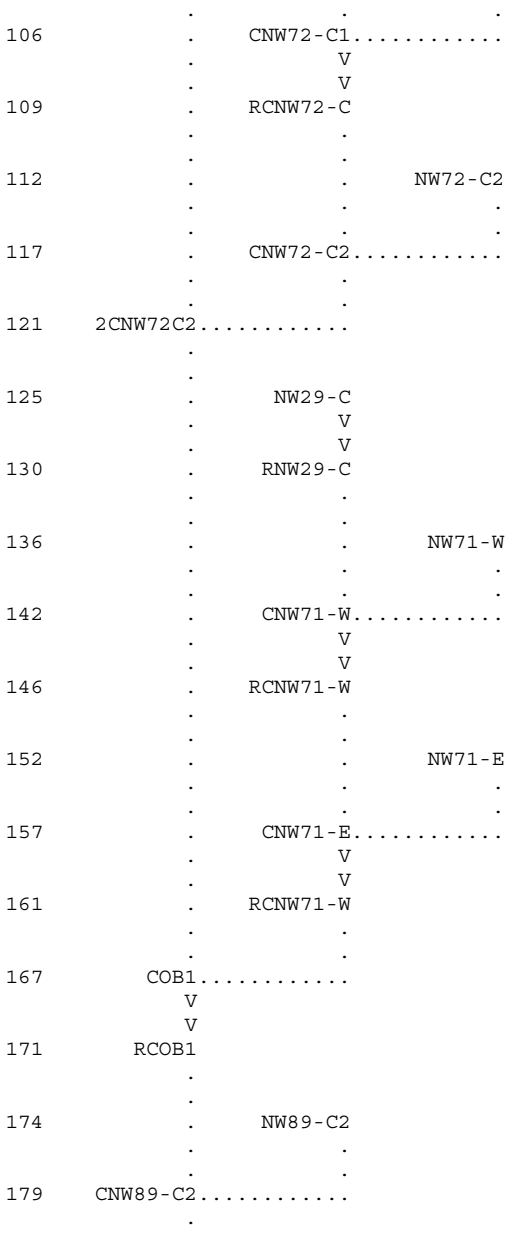
```
          129          UD   0.214
                       *
1                                          HEC-1 INPUT                                                  PAGE  4

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


          130          KK RNW29-C
          131          KM  ROUTE NW29-C TO CNW71-W
          132          KM  FACILITY = CENTENNIAL PARKWAY CHANNEL WEST/GRAND TETON BRANCH
          133          KM  FACILITY ID-MILE = CNGT 0118
          134          KM  LINING = ARCH CON
          135          RD    2100   0.037   0.015       0    TRAP       6       0
                       *

          136          KK  NW71-W
          137          BA   0.104
          138          BF       0
          139          PB    2.92
          140          LS       0    92.4
          141          UD   0.206
                       *

          142          KK CNW71-W
          143          KM  COMBINE RDNW29-C AND NW71-W
          144          KM  CENTENNIAL PKWY CHANNEL WEST/GRAND TETON BRANCH @ HUALAPAI
          145          HC       2
                       *

          146          KKRCNW71-W
          147          KM  ROUTE CNW71-W TO CNW71-E
          148          KM  FACILITY = CENTENNIAL PARKWAY CHANNEL WEST/GRAND TETON BRANCH
          149          KM  FACILITY ID-MILE = CNGT 0000,0043
          150          KM  LINING = RCB
          151          RD    6270   0.030   0.015       0    TRAP       6       0
                       *

          152          KK  NW71-E
          153          BA   0.227
          154          PB    2.85
          155          LS       0    88.3
          156          UD   0.222
                       *

          157          KK CNW71-E
          158          KM  COMBINE NW71-E AND RCNW71-W
          159          KM  CENTENNIAL PKWY CHANNEL WEST/GRAND TETON BRANCH @ US 95
          160          HC       2
                       *

          161          KKRCNW71-W
```

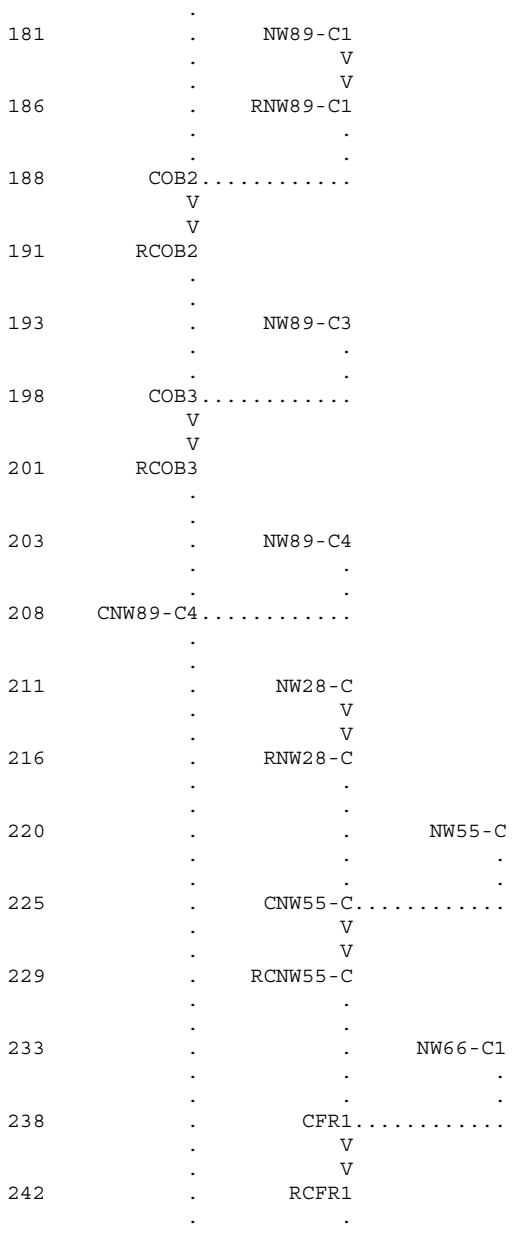
```
          162          KM  ROUTE CNW71-E TO COB1
          163          KM  FACILITY = CENTENNIAL PARKWAY CHANNEL WEST/GRAND TETON BRANCH
          164          KM  FACILITY ID-MILE = CNGT 0000,0043
          165          KM  LINING = RCB
          166          RD     885   0.030   0.015       0    TRAP       6       0
                       *
1                                        HEC-1 INPUT                                        PAGE  5

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


          167          KK    COB1
          168          KM  COMBINE 2CNW72-C AND C1
          169          KM  RANCHO ROAD SYSTEM FLOW @ GRAND TETON
          170          HC       2
                       *

          171          KK   RCOB1
          172          KM  ROUTE MAINLINE FLOW FROM GRAND TETON TO GILCREASE
          173          RD    1760   0.015   0.015       0    TRAP      16       0
                       *

          174          KK NW89-C2
          175          BA   0.072
          176          PB    2.80
          177          LS       0    92.9
          178          UD   0.144
                       *

          179          KKCNW89-C2
          180          HC       2
                       *

          181          KK NW89-C1
          182          BA   0.175
          183          PB    2.80
          184          LS       0    87.7
          185          UD   0.177
                       *

          186          KKRNW89-C1
          187          RD    1045   0.015   0.015       0    CIRC       4       0
                       *

          188          KK    COB2
          189          KM  MAINLINE FLOW DOWNSTREAM OF GILCREASE LATERAL
          190          HC       2
                       *

          191          KK   RCOB2
          192          RD     750   0.015   0.015       0    TRAP      16       0
```

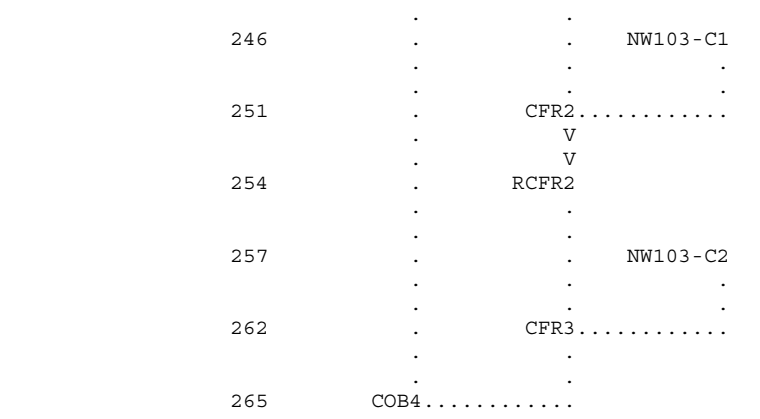
```
                *
          193   KK NW89-C3
          194   BA   0.024
          195   PB    2.80
          196   LS       0      88
          197   UD   0.120
                *
1                                          HEC-1 INPUT                                                    PAGE  6

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


          198   KK    COB3
          199   KM  COMBINE FLOWS FROM COB2 AND NW89-C3
          200   HC       2
                *

          201   KK   RCOB3
          202   RD     900   0.015   0.015       0    TRAP      16       0
                *

          203   KK NW89-C4
          204   BA   0.066
          205   PB    2.80
          206   LS       0    88.4
          207   UD   0.167
                *

          208   KKCNW89-C4
          209   KM  COMBINE FLOWS FROM NW89-C3 AND NW89-C4
          210   HC       2
                *

          211   KK  NW28-C
          212   BA   0.358
          213   PB    3.02
          214   LS       0    91.3
          215   UD   0.249
                *

          216   KK RNW28-C
          217   KM  ROUTE NW28-C TO CNW55-C
          218   KM  FARM
          219   RD    4000  0.0325   0.016       0    TRAP       0      50
                *

          220   KK  NW55-C
          221   BA   0.325
          222   PB    2.93
          223   LS       0    84.4
```

```
 224          UD   0.269
              *

 225          KK CNW55-C
 226          KM  COMBINE NW55-C AND RNW28-C
 227          KM  FARM AND GRAND CANYON
 228          HC       2
              *

 229          KKRCNW55-C
 230          KM  ROUTE DNW55-C TO TEE PEE
 231          KM  FARM LATERAL - FUTURE MPU FACILITY
 232          RD    1360   0.031   0.015       0    TRAP       8       0
              *
1                                      HEC-1 INPUT                                          PAGE  7

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


 233          KK NW66-C1
 234          BA   0.039
 235          PB    2.88
 236          LS       0    84.1
 237          UD   0.114
              *

 238          KK    CFR1
 239          KM  COMBINE DNW55-C AND NW66-C1
 240          KM  FARM AND TEE PEE
 241          HC       2
              *

 242          KK   RCFR1
 243          KM  ROUTE RCFR1 TO NW103-C1
 244          KM  FARM LATERAL - FUTURE MPU FACILITY
 245          RD    2625    0.03   0.015       0    TRAP       8       0
              *

 246          KKNW103-C1
 247          BA   0.013
 248          PB    2.80
 249          LS       0      88
 250          UD   0.106
              *

 251          KK    CFR2
 252          KM  COMBINE NW103-C1 AND NW66-C1
 253          HC       2
              *

 254          KK   RCFR2
```

```
            255           KM  ROUTE CFR2 TO NW103-C2
            256           RD     690   0.020   0.015       0    TRAP       8       0
                          *

            257           KKNW103-C2
            258           BA   0.008
            259           PB    2.80
            260           LS       0      94
            261           UD   0.080
                          *

            262           KK    CFR3
            263           KM  COMBINE CFR2 AND NW103-C2
            264           HC       2
                          *

            265           KK    COB4
            266           KM  MAINLINE FLOW AT US-95 AND DURANGO DRIVE
            267           HC       2
                          *
            268           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

    57      NW62-S
                V
                V
    70     RNW62-S
                .
                .
    76          .      NW74-C
                .           .
                .           .
    81     CNW74-C...........
                V
                V
    84    RCNW74-C
                .
                .
    90          .      NW45-S
                .           V
                .           V
    95          .     RNW45-S
                .           .
                .           .
   101          .           .     NW72-C1
                .           .           .
```


106 CNW72-C1
109 RCNW72-C
112 NW72-C2
117 CNW72-C2
121 2CNW72C2
125 NW29-C
130 RNW29-C
136 NW71-W
142 CNW71-W
146 RCNW71-W
152 NW71-E
157 CNW71-E
161 RCNW71-W
167 COB1
171 RCOB1
174 NW89-C2
179 CNW89-C2


181 NW89-C1
186 RNW89-C1
188 COB2
191 RCOB2
193 NW89-C3
198 COB3
201 RCOB3
203 NW89-C4
208 CNW89-C4
211 NW28-C
216 RNW28-C
220 NW55-C
225 CNW55-C
229 RCNW55-C
233 NW66-C1
238 CFR1
242 RCFR1




(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   04JAN17  TIME  11:13:41   *
 *                                       *
 *****************************************
```

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

CENTENNIAL PARKWAY CHANNEL WEST
US95/CC215 TO DURANGO
RECOMMENDED DRAINAGE SYSTEM WITH ULTIMATE DEVELOPMENT
INPUT FILE = CENTULT3BXBF.DAT
DESCRIPTION = OFFSITE BASINS WITHOUT KYLE CANYON DB BASEFLOW
INPUT FILE DATE = JAN 2017
DESIGN STORM = 100-YEAR 6-HOUR STORM
STORM DISTRIBUTION = SDN3
MODELED BY LB (LEANDRA NELSON, E.I.)
CHECKED BY LB (JEFF DOUGLAS, P.E.)
STORM CENTERING = REMOVED DETENTION BASIN OUTFLOWS
DOWNSTREAM OF THE UPPER LAS VEGAS WASH DETENTION BASIN TO THE MOST
DOWNSTREAM POINT IN THE LOWER NORTHERN LAS VEGAS WASH WATERSHED
COMBINATION POINT DOWNSTREAM OF LOWER LAS VEGAS WASH DETENTION BASIN
WAS MODIFIED TO SIMULATE NECESSARY STORM CENTERINGS

REFERENCED HYDROLOGIC MODELS:

```
                    CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT 2008 MASTER PLAN UPDATE
                    UPPER AND LOWER NORTHERN LAS VEGAS WASH WATERSHEDS
                    REVISED FINAL DESIGN REPORT FOR THE RANCHO DETENTION BASIN
                    PHASE II (VTN 2006)
                    RESPONSE TO COMMENTS ON THE CONCEPTUAL DRAINAGE STUDY FOR
                    NORTH LAS VEGAS 600-ACRE SITE (GC WALLACE 2006)
                    SECOND RESPONSE TO COMMENTS OF THE CONCEPTUAL DRAINAGE STUDY
                    FOR NORTH LAS VEGAS 2074-ACRE SITE (GC WALLACE 2006)
                    BASIN MAPS FOR SUPPLEMENT #2 TO ADDENDUM #2 TO THE MASTER
                    DRAINAGE STUDY FOR CLIFF'S EDGE/ PROVIDENCE (VTN 2004)
                    MASTER DRAINAGE STUDY FOR KYLE CANYON (GC WALLACE 2006)
                    TECHNICAL DRAINAGE STUDY FOR GRAND TETON DRIVE STROM DRAIN
                    AND AREA 1 ROADWAY IMPROVEMENTS  (GC WALLACE 2006)
                    90% FINAL DESIGN REPORT FOR RANCHO ROAD SYSTEM - EL CAMPO
                    GRANDE STORM DRAIN PROJECT (PBS&J 2007)
                    MPA FOR RACEL STREET COLLECTOR (LOUIS BERGER JANUARY 2007)
                    HYDROLOGIC MODEL FOR FLOYD LAMB NORTH AND SOUTH ENVIRONMENTAL
                    ENHANCEMENT AREAS (LOUIS BERGER  DECEMBER 7, 2007)


                    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

                    AREA (SQUARE MILES)           DARF
                          0 - 0.5                 0.99
                          0.5 - 1                 0.975
                          1 - 2                   0.95
                          2 - 3                   0.925
                          3 - 4                   0.915
                          4 - 5                   0.908
                          5 - 6                   0.903
                          6 - 7                   0.895
                          7 - 8                   0.885


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

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

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS
```

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

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .99       .98       .95       .93       .92       .91       .90       .89       .88
1
```

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

| | | | | | RATIOS APPLIED TO PRECIPITATION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPERATION | STATION | AREA | PLAN | | RATIO 1 .99 | RATIO 2 .98 | RATIO 3 .95 | RATIO 4 .93 | RATIO 5 .92 | RATIO 6 .91 | RATIO 7 .90 | RATIO 8 .89 | RATIO 9 .88 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW62-S | .21 | 1 | FLOW | 327. | 321. | 312. | 302. | 299. | 296. | 294. | 291. | 287. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RNW62-S | .21 | 1 | FLOW | 312. | 307. | 298. | 289. | 285. | 283. | 282. | 278. | 275. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW74-C | .25 | 1 | FLOW | 357. | 351. | 341. | 331. | 327. | 324. | 322. | 319. | 314. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW74-C | .45 | 1 | FLOW | 670. | 658. | 638. | 620. | 612. | 607. | 603. | 597. | 590. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCNW74-C | .45 | 1 | FLOW | 665. | 654. | 635. | 616. | 607. | 604. | 599. | 593. | 586. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW45-S | .27 | 1 | FLOW | 452. | 444. | 432. | 419. | 414. | 411. | 408. | 404. | 399. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROUTED TO | | | | | | | | | | | | | |
| + | RNW45-S | .27 | 1 | FLOW | 441. | 435. | 424. | 413. | 404. | 402. | 402. | 395. | 391. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW72-C1 | .38 | 1 | FLOW | 553. | 543. | 527. | 511. | 504. | 500. | 496. | 491. | 485. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW72-C1 | .66 | 1 | FLOW | 994. | 979. | 951. | 924. | 908. | 901. | 899. | 886. | 876. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCNW72-C | .66 | 1 | FLOW | 988. | 973. | 946. | 917. | 902. | 896. | 892. | 880. | 869. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW72-C2 | .06 | 1 | FLOW | 98. | 96. | 93. | 90. | 89. | 88. | 88. | 87. | 86. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW72-C2 | .71 | 1 | FLOW | 1067. | 1051. | 1022. | 991. | 974. | 968. | 963. | 950. | 939. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | 2CNW72C2 | 1.17 | 1 | FLOW | 1732. | 1705. | 1657. | 1606. | 1582. | 1571. | 1562. | 1543. | 1525. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW29-C | .13 | 1 | FLOW | 198. | 194. | 188. | 182. | 180. | 178. | 177. | 175. | 172. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RNW29-C | .13 | 1 | FLOW | 197. | 194. | 188. | 182. | 179. | 178. | 176. | 174. | 172. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW71-W | .10 | 1 | FLOW | 154. | 151. | 146. | 141. | 140. | 138. | 137. | 136. | 134. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW71-W | .24 | 1 | FLOW | 349. | 343. | 332. | 321. | 317. | 314. | 312. | 308. | 304. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCNW71-W | .24 | 1 | FLOW | 347. | 343. | 332. | 321. | 316. | 312. | 310. | 307. | 302. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW71-E | .23 | 1 | FLOW | 274. | 268. | 259. | 249. | 245. | 242. | 241. | 237. | 234. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW71-E | .46 | 1 | FLOW | 622. | 612. | 591. | 570. | 561. | 555. | 550. | 545. | 536. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCNW71-W | .46 | 1 | FLOW | 619. | 609. | 588. | 568. | 559. | 552. | 548. | 542. | 533. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | COB1 | 1.63 | 1 | FLOW | 2351. | 2314. | 2246. | 2174. | 2141. | 2124. | 2110. | 2085. | 2058. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCOB1 | 1.63 | 1 | FLOW | 2336. | 2298. | 2229. | 2157. | 2125. | 2108. | 2096. | 2069. | 2044. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW89-C2 | .07 | 1 | FLOW | 118. | 115. | 112. | 108. | 107. | 106. | 105. | 104. | 103. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | CNW89-C2 | 1.70 | 1 | FLOW | 2432. | 2392. | 2320. | 2245. | 2213. | 2194. | 2182. | 2154. | 2128. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW89-C1 | .17 | 1 | FLOW | 221. | 216. | 208. | 200. | 197. | 195. | 193. | 190. | 187. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RNW89-C1 | .17 | 1 | FLOW | 214. | 209. | 201. | 194. | 190. | 188. | 186. | 184. | 181. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | COB2 | 1.88 | 1 | FLOW | 2640. | 2596. | 2516. | 2434. | 2399. | 2378. | 2364. | 2334. | 2305. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCOB2 | 1.88 | 1 | FLOW | 2633. | 2589. | 2509. | 2428. | 2391. | 2372. | 2357. | 2326. | 2298. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | |
| + | NW89-C3 | .02 | 1 | FLOW | 34. | 33. | 32. | 31. | 30. | 30. | 30. | 29. | 29. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | |
| + | COB3 | 1.90 | 1 | FLOW | 2658. | 2613. | 2533. | 2451. | 2414. | 2394. | 2379. | 2348. | 2320. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | |
| + | RCOB3 | 1.90 | 1 | FLOW | 2649. | 2605. | 2525. | 2442. | 2406. | 2386. | 2369. | 2339. | 2310. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | | |
| + | NW89-C4 | .07 | 1 | FLOW | 88. | 86. | 83. | 80. | 79. | 78. | 77. | 76. | 75. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | | |
| + | CNW89-C4 | 1.97 | 1 | FLOW | 2728. | 2683. | 2599. | 2513. | 2477. | 2456. | 2439. | 2408. | 2378. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | | | |
| + | NW28-C | .36 | 1 | FLOW | 503. | 494. | 478. | 462. | 455. | 451. | 447. | 442. | 436. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | | | |
| + | RNW28-C | .36 | 1 | FLOW | 489. | 480. | 464. | 448. | 442. | 438. | 435. | 440. | 423. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| HYDROGRAPH AT | | | | | | | | | | | | | | |
| + | NW55-C | .32 | 1 | FLOW | 320. | 312. | 299. | 287. | 281. | 278. | 275. | 271. | 266. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 2 COMBINED AT | | | | | | | | | | | | | | |
| + | CNW55-C | .68 | 1 | FLOW | 805. | 788. | 760. | 732. | 721. | 713. | 707. | 709. | 687. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| ROUTED TO | | | | | | | | | | | | | | |
| + | RCNW55-C | .68 | 1 | FLOW | 802. | 785. | 757. | 729. | 718. | 710. | 704. | 705. | 684. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| HYDROGRAPH AT | | | | | | | | | | | | | | |
| + | NW66-C1 | .04 | 1 | FLOW | 49. | 48. | 46. | 44. | 43. | 43. | 42. | 42. | 41. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 2 COMBINED AT | | | | | | | | | | | | | | |
| + | CFR1 | .72 | 1 | FLOW | 829. | 812. | 783. | 754. | 742. | 734. | 728. | 729. | 708. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| ROUTED TO | | | | | | | | | | | | | | |
| + | RCFR1 | .72 | 1 | FLOW | 823. | 806. | 777. | 748. | 736. | 728. | 722. | 721. | 701. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| HYDROGRAPH AT | | | | | | | | | | | | | | |
| + | NW103-C1 | .01 | 1 | FLOW | 18. | 18. | 17. | 17. | 16. | 16. | 16. | 16. | 16. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 2 COMBINED AT | | | | | | | | | | | | | | |
| + | CFR2 | .73 | 1 | FLOW | 833. | 816. | 786. | 757. | 745. | 737. | 731. | 730. | 710. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| ROUTED TO | | | | | | | | | | | | | | |

```
+                 RCFR2        .73      1   FLOW          831.     814.     784.     754.     743.     734.     728.     727.     707.
                                            TIME          3.75     3.75     3.75     3.75     3.75     3.75     3.75     3.75     3.75

 HYDROGRAPH AT
+                NW103-C2      .01      1   FLOW           16.      15.      15.      14.      14.      14.      14.      14.      14.
                                            TIME          3.50     3.50     3.50     3.50     3.50     3.50     3.50     3.50     3.50

  2 COMBINED AT
+                  CFR3        .74      1   FLOW          837.     820.     790.     760.     748.     740.     734.     733.     713.
                                            TIME          3.75     3.75     3.75     3.75     3.75     3.75     3.75     3.75     3.75

  2 COMBINED AT
+                  COB4       2.71      1   FLOW         3516.    3453.    3340.    3224.    3175.    3147.    3124.    3086.    3041.
                                            TIME          3.67     3.67     3.67     3.67     3.67     3.67     3.67     3.67     3.67
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      VOLUME      DT       PEAK    TIME TO      VOLUME
                                                    PEAK                                      PEAK

                                (MIN)     (CFS)     (MIN)      (IN)    (MIN)     (CFS)     (MIN)       (IN)

         FOR PLAN = 1  RATIO=  .00
          RNW62-S  MANE         1.76    323.79    217.66      2.21     5.00    312.32    220.00        2.21


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2449E+02 EXCESS= .0000E+00 OUTFLOW= .2450E+02 BASIN STORAGE= .2084E-02 PERCENT ERROR=    .0


         FOR PLAN = 1  RATIO=  .00
          RNW62-S  MANE         1.77    319.11    217.40      2.17     5.00    307.07    220.00        2.17


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2404E+02 EXCESS= .0000E+00 OUTFLOW= .2405E+02 BASIN STORAGE= .2286E-02 PERCENT ERROR=    .0


         FOR PLAN = 1  RATIO=  .00
          RNW62-S  MANE         1.79    308.29    216.41      2.10     5.00    297.56    220.00        2.10


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2330E+02 EXCESS= .0000E+00 OUTFLOW= .2331E+02 BASIN STORAGE= .2344E-02 PERCENT ERROR=    .0


         FOR PLAN = 1  RATIO=  .00
          RNW62-S  MANE         1.81    301.20    217.25      2.03     5.00    289.41    220.00        2.03


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2256E+02 EXCESS= .0000E+00 OUTFLOW= .2256E+02 BASIN STORAGE= .2381E-02 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
           RNW62-S  MANE         1.82    295.84    216.52      2.01      5.00    285.16    220.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2226E+02 EXCESS= .0000E+00 OUTFLOW= .2226E+02 BASIN STORAGE= .2315E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW62-S  MANE         1.83    294.83    217.28      1.99      5.00    283.48    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2205E+02 EXCESS= .0000E+00 OUTFLOW= .2206E+02 BASIN STORAGE= .2379E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW62-S  MANE         1.83    291.50    217.84      1.97      5.00    281.72    220.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2190E+02 EXCESS= .0000E+00 OUTFLOW= .2191E+02 BASIN STORAGE= .2069E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW62-S  MANE         1.84    290.53    216.89      1.95      5.00    278.25    220.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2166E+02 EXCESS= .0000E+00 OUTFLOW= .2167E+02 BASIN STORAGE= .2086E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW62-S  MANE         1.85    284.42    218.02      1.93      5.00    275.18    220.00        1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2136E+02 EXCESS= .0000E+00 OUTFLOW= .2137E+02 BASIN STORAGE= .2009E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.12    665.52    220.36      2.22      5.00    664.73    220.00        2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5397E+02 EXCESS= .0000E+00 OUTFLOW= .5398E+02 BASIN STORAGE= .1665E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.13    654.06    220.75      2.18      5.00    653.97    220.00        2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5299E+02 EXCESS= .0000E+00 OUTFLOW= .5299E+02 BASIN STORAGE= .1724E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
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          RCNW74-C  MANE         1.14    635.38    220.03      2.12      5.00    635.24    220.00        2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5133E+02 EXCESS= .0000E+00 OUTFLOW= .5134E+02 BASIN STORAGE= .1771E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.15    616.60    220.30      2.05      5.00    615.53    220.00        2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4969E+02 EXCESS= .0000E+00 OUTFLOW= .4970E+02 BASIN STORAGE= .1670E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.16    608.47    220.33      2.02      5.00    607.40    220.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4904E+02 EXCESS= .0000E+00 OUTFLOW= .4904E+02 BASIN STORAGE= .1658E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.16    603.76    219.83      2.00      5.00    603.73    220.00        2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4858E+02 EXCESS= .0000E+00 OUTFLOW= .4858E+02 BASIN STORAGE= .1869E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.17    599.97    220.38      1.99      5.00    598.76    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4825E+02 EXCESS= .0000E+00 OUTFLOW= .4825E+02 BASIN STORAGE= .1878E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.17    593.71    220.20      1.97      5.00    592.82    220.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4773E+02 EXCESS= .0000E+00 OUTFLOW= .4773E+02 BASIN STORAGE= .1694E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW74-C  MANE         1.18    586.59    220.08      1.94      5.00    586.12    220.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4707E+02 EXCESS= .0000E+00 OUTFLOW= .4707E+02 BASIN STORAGE= .1731E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.32    449.30    218.06      2.43      5.00    441.18    220.00        2.42
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .3517E+02 EXCESS= .0000E+00 OUTFLOW= .3518E+02 BASIN STORAGE= .3374E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.34    440.93    217.18      2.38      5.00    435.22    220.00        2.39


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3457E+02 EXCESS= .0000E+00 OUTFLOW= .3459E+02 BASIN STORAGE= .3189E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.36    429.66    217.32      2.31      5.00    424.10    220.00        2.31


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3353E+02 EXCESS= .0000E+00 OUTFLOW= .3355E+02 BASIN STORAGE= .3120E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.39    417.57    217.50      2.24      5.00    412.85    220.00        2.24


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3250E+02 EXCESS= .0000E+00 OUTFLOW= .3252E+02 BASIN STORAGE= .3026E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.40    411.49    218.54      2.21      5.00    403.96    220.00        2.21


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3205E+02 EXCESS= .0000E+00 OUTFLOW= .3206E+02 BASIN STORAGE= .3113E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.41    407.20    219.29      2.19      5.00    401.74    220.00        2.19


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3177E+02 EXCESS= .0000E+00 OUTFLOW= .3178E+02 BASIN STORAGE= .3426E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.42    406.60    217.41      2.18      5.00    402.30    220.00        2.18


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3159E+02 EXCESS= .0000E+00 OUTFLOW= .3161E+02 BASIN STORAGE= .3080E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.43    401.83    218.27      2.15      5.00    394.97    220.00        2.15


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3123E+02 EXCESS= .0000E+00 OUTFLOW= .3125E+02 BASIN STORAGE= .3308E-02 PERCENT ERROR=   -.1
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          FOR PLAN = 1  RATIO=  .00
           RNW45-S  MANE         2.44    395.73    219.36      2.13      5.00    390.93    220.00        2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3082E+02 EXCESS= .0000E+00 OUTFLOW= .3084E+02 BASIN STORAGE= .3409E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.10    988.62    220.47      2.25      5.00    987.98    220.00        2.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7892E+02 EXCESS= .0000E+00 OUTFLOW= .7892E+02 BASIN STORAGE= .1952E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.10    972.94    219.67      2.21      5.00    972.86    220.00        2.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7752E+02 EXCESS= .0000E+00 OUTFLOW= .7752E+02 BASIN STORAGE= .2147E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.12    946.56    219.94      2.14      5.00    946.49    220.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7511E+02 EXCESS= .0000E+00 OUTFLOW= .7511E+02 BASIN STORAGE= .1983E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.13    918.49    220.29      2.08      5.00    917.32    220.00        2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7271E+02 EXCESS= .0000E+00 OUTFLOW= .7271E+02 BASIN STORAGE= .2264E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.14    902.61    220.64      2.04      5.00    902.13    220.00        2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7162E+02 EXCESS= .0000E+00 OUTFLOW= .7163E+02 BASIN STORAGE= .1932E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.14    896.82    220.16      2.02      5.00    895.99    220.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7094E+02 EXCESS= .0000E+00 OUTFLOW= .7094E+02 BASIN STORAGE= .2307E-02 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.14    893.47    220.42      2.01      5.00    892.18    220.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7059E+02 EXCESS= .0000E+00 OUTFLOW= .7060E+02 BASIN STORAGE= .2082E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.15    880.90    220.52      1.99      5.00    879.75    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6973E+02 EXCESS= .0000E+00 OUTFLOW= .6973E+02 BASIN STORAGE= .2020E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW72-C  MANE         1.15    870.53    220.42      1.96      5.00    869.19    220.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6877E+02 EXCESS= .0000E+00 OUTFLOW= .6877E+02 BASIN STORAGE= .2084E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.17    198.15    216.88      2.17      5.00    197.42    220.00        2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1527E+02 EXCESS= .0000E+00 OUTFLOW= .1527E+02 BASIN STORAGE= .1121E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.17    194.75    217.32      2.13      5.00    194.12    220.00        2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1497E+02 EXCESS= .0000E+00 OUTFLOW= .1497E+02 BASIN STORAGE= .1174E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.19    188.28    220.08      2.06      5.00    188.22    220.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1447E+02 EXCESS= .0000E+00 OUTFLOW= .1447E+02 BASIN STORAGE= .1079E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.21    182.18    216.94      1.99      5.00    181.66    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1397E+02 EXCESS= .0000E+00 OUTFLOW= .1397E+02 BASIN STORAGE= .1108E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.21    179.67    216.89      1.96      5.00    179.24    220.00        1.96
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1377E+02 EXCESS= .0000E+00 OUTFLOW= .1378E+02 BASIN STORAGE= .1117E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.22    178.08    220.15      1.94      5.00    177.96    220.00        1.94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1364E+02 EXCESS= .0000E+00 OUTFLOW= .1364E+02 BASIN STORAGE= .1079E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.22    176.88    217.09      1.92      5.00    176.40    220.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1354E+02 EXCESS= .0000E+00 OUTFLOW= .1354E+02 BASIN STORAGE= .1082E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.22    174.68    216.82      1.90      5.00    174.40    220.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1338E+02 EXCESS= .0000E+00 OUTFLOW= .1338E+02 BASIN STORAGE= .1155E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW29-C  MANE         1.23    172.20    216.80      1.87      5.00    171.98    220.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1318E+02 EXCESS= .0000E+00 OUTFLOW= .1318E+02 BASIN STORAGE= .1158E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         2.95    348.54    221.58      2.14      5.00    347.41    220.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2690E+02 EXCESS= .0000E+00 OUTFLOW= .2692E+02 BASIN STORAGE= .3692E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         2.98    344.19    220.16      2.10      5.00    343.48    220.00        2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2638E+02 EXCESS= .0000E+00 OUTFLOW= .2640E+02 BASIN STORAGE= .3666E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.01    332.65    219.92      2.03      5.00    332.50    220.00        2.03
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2550E+02 EXCESS= .0000E+00 OUTFLOW= .2551E+02 BASIN STORAGE= .3856E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.05    321.22    219.90      1.96      5.00    321.06    220.00        1.96


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2461E+02 EXCESS= .0000E+00 OUTFLOW= .2463E+02 BASIN STORAGE= .3906E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.07    318.06    221.09      1.93      5.00    316.08    220.00        1.93


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2427E+02 EXCESS= .0000E+00 OUTFLOW= .2428E+02 BASIN STORAGE= .4171E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.08    313.58    221.81      1.91      5.00    312.11    220.00        1.91


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2402E+02 EXCESS= .0000E+00 OUTFLOW= .2404E+02 BASIN STORAGE= .3681E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.09    310.10    219.43      1.89      5.00    309.90    220.00        1.89


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2384E+02 EXCESS= .0000E+00 OUTFLOW= .2385E+02 BASIN STORAGE= .4286E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.10    308.71    220.42      1.87      5.00    307.15    220.00        1.87


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2356E+02 EXCESS= .0000E+00 OUTFLOW= .2357E+02 BASIN STORAGE= .3609E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE         3.12    303.95    221.65      1.85      5.00    302.16    220.00        1.84


CONTINUITY SUMMARY (AC-FT) - INFLOW= .2321E+02 EXCESS= .0000E+00 OUTFLOW= .2322E+02 BASIN STORAGE= .3834E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .33    620.19    220.43      1.92      5.00    619.12    220.00        1.92


CONTINUITY SUMMARY (AC-FT) - INFLOW= .4729E+02 EXCESS= .0000E+00 OUTFLOW= .4729E+02 BASIN STORAGE= .4941E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .33    610.38    220.16      1.88      5.00    609.17    220.00        1.88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4632E+02 EXCESS= .0000E+00 OUTFLOW= .4632E+02 BASIN STORAGE= .4918E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .34    589.75    220.18      1.81      5.00    588.46    220.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4468E+02 EXCESS= .0000E+00 OUTFLOW= .4468E+02 BASIN STORAGE= .4996E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .34    569.38    220.32      1.74      5.00    567.59    220.00        1.74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4304E+02 EXCESS= .0000E+00 OUTFLOW= .4304E+02 BASIN STORAGE= .4812E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .34    560.53    220.32      1.72      5.00    558.92    220.00        1.72

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4239E+02 EXCESS= .0000E+00 OUTFLOW= .4239E+02 BASIN STORAGE= .4796E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .35    553.97    220.34      1.70      5.00    552.26    220.00        1.70

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4194E+02 EXCESS= .0000E+00 OUTFLOW= .4194E+02 BASIN STORAGE= .4796E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .35    549.68    220.31      1.68      5.00    547.97    220.00        1.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4160E+02 EXCESS= .0000E+00 OUTFLOW= .4160E+02 BASIN STORAGE= .4981E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW71-W  MANE          .35    543.28    220.20      1.66      5.00    541.92    220.00        1.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4108E+02 EXCESS= .0000E+00 OUTFLOW= .4108E+02 BASIN STORAGE= .4836E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
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          RCNW71-W  MANE          .35    534.66    220.25      1.64      5.00    533.19    220.00        1.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4044E+02 EXCESS= .0000E+00 OUTFLOW= .4044E+02 BASIN STORAGE= .4905E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .70   2343.18    220.57      2.15      5.00   2335.65    220.00        2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1870E+03 EXCESS= .0000E+00 OUTFLOW= .1870E+03 BASIN STORAGE= .1882E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .71   2305.77    220.56      2.11      5.00   2297.89    220.00        2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1835E+03 EXCESS= .0000E+00 OUTFLOW= .1835E+03 BASIN STORAGE= .1880E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .72   2235.05    220.34      2.04      5.00   2228.62    220.00        2.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1776E+03 EXCESS= .0000E+00 OUTFLOW= .1776E+03 BASIN STORAGE= .1770E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .73   2162.96    220.32      1.97      5.00   2156.84    220.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1717E+03 EXCESS= .0000E+00 OUTFLOW= .1717E+03 BASIN STORAGE= .1795E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .73   2129.19    220.20      1.94      5.00   2125.16    220.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1692E+03 EXCESS= .0000E+00 OUTFLOW= .1692E+03 BASIN STORAGE= .1864E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .73   2112.41    220.91      1.93      5.00   2107.61    220.00        1.93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1676E+03 EXCESS= .0000E+00 OUTFLOW= .1676E+03 BASIN STORAGE= .1911E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .74   2104.36    220.74      1.91      5.00   2095.94    220.00        1.91
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1665E+03 EXCESS= .0000E+00 OUTFLOW= .1665E+03 BASIN STORAGE= .1948E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .74   2074.60    220.32      1.89      5.00   2068.71    220.00        1.89


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1645E+03 EXCESS= .0000E+00 OUTFLOW= .1645E+03 BASIN STORAGE= .1851E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCOB1  MANE          .74   2052.35    220.73      1.86      5.00   2043.89    220.00        1.87


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1622E+03 EXCESS= .0000E+00 OUTFLOW= .1622E+03 BASIN STORAGE= .1781E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.00    219.18    216.63      1.59      5.00    214.02    215.00        1.60


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1488E+02 EXCESS= .0000E+00 OUTFLOW= .1488E+02 BASIN STORAGE= .1199E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.01    214.42    216.60      1.56      5.00    209.22    215.00        1.56


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1454E+02 EXCESS= .0000E+00 OUTFLOW= .1454E+02 BASIN STORAGE= .1206E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.02    206.83    216.23      1.50      5.00    201.42    215.00        1.50


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1397E+02 EXCESS= .0000E+00 OUTFLOW= .1397E+02 BASIN STORAGE= .1162E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.02    198.41    215.90      1.44      5.00    193.60    215.00        1.44


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1341E+02 EXCESS= .0000E+00 OUTFLOW= .1341E+02 BASIN STORAGE= .1251E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.03    195.26    216.61      1.41      5.00    190.17    215.00        1.41


CONTINUITY SUMMARY (AC-FT) - INFLOW= .1319E+02 EXCESS= .0000E+00 OUTFLOW= .1319E+02 BASIN STORAGE= .1193E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.03    193.53    216.08      1.40      5.00    188.32    215.00        1.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1303E+02 EXCESS= .0000E+00 OUTFLOW= .1303E+02 BASIN STORAGE= .1195E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.03    191.60    216.44      1.38      5.00    186.39    215.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1292E+02 EXCESS= .0000E+00 OUTFLOW= .1292E+02 BASIN STORAGE= .1238E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.03    189.18    215.99      1.37      5.00    184.22    215.00        1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1274E+02 EXCESS= .0000E+00 OUTFLOW= .1274E+02 BASIN STORAGE= .1218E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RNW89-C1  MANE         1.04    185.63    216.72      1.34      5.00    180.74    215.00        1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1252E+02 EXCESS= .0000E+00 OUTFLOW= .1252E+02 BASIN STORAGE= .1143E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .29   2635.37    220.17      2.09      5.00   2632.66    220.00        2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2098E+03 EXCESS= .0000E+00 OUTFLOW= .2098E+03 BASIN STORAGE= .7918E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .29   2591.67    220.21      2.05      5.00   2588.68    220.00        2.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2058E+03 EXCESS= .0000E+00 OUTFLOW= .2058E+03 BASIN STORAGE= .7538E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .29   2511.31    220.34      1.99      5.00   2509.26    220.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1991E+03 EXCESS= .0000E+00 OUTFLOW= .1991E+03 BASIN STORAGE= .7519E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2430.44    220.32      1.92      5.00   2427.77    220.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+03 EXCESS= .0000E+00 OUTFLOW= .1924E+03 BASIN STORAGE= .7579E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2393.78    220.14      1.89      5.00   2391.14    220.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1896E+03 EXCESS= .0000E+00 OUTFLOW= .1896E+03 BASIN STORAGE= .7798E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2374.84    220.30      1.87      5.00   2371.83    220.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1877E+03 EXCESS= .0000E+00 OUTFLOW= .1877E+03 BASIN STORAGE= .7757E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2360.21    220.21      1.86      5.00   2356.89    220.00        1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+03 EXCESS= .0000E+00 OUTFLOW= .1865E+03 BASIN STORAGE= .7791E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2329.20    220.15      1.84      5.00   2326.36    220.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1843E+03 EXCESS= .0000E+00 OUTFLOW= .1843E+03 BASIN STORAGE= .7901E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB2  MANE          .30   2300.58    220.34      1.81      5.00   2298.02    220.00        1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1816E+03 EXCESS= .0000E+00 OUTFLOW= .1816E+03 BASIN STORAGE= .7404E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .34   2653.13    220.26      2.09      5.00   2649.19    220.00        2.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2120E+03 EXCESS= .0000E+00 OUTFLOW= .2120E+03 BASIN STORAGE= .1002E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .35   2608.64    220.37      2.05      5.00   2605.17    220.00        2.05
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .2080E+03 EXCESS= .0000E+00 OUTFLOW= .2080E+03 BASIN STORAGE= .9038E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .35   2529.28    220.34      1.98      5.00   2524.78    220.00        1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2012E+03 EXCESS= .0000E+00 OUTFLOW= .2012E+03 BASIN STORAGE= .9110E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .35   2444.66    220.44      1.92      5.00   2441.56    220.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1944E+03 EXCESS= .0000E+00 OUTFLOW= .1944E+03 BASIN STORAGE= .9757E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .36   2410.27    220.35      1.89      5.00   2405.94    220.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1915E+03 EXCESS= .0000E+00 OUTFLOW= .1915E+03 BASIN STORAGE= .8902E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .36   2390.72    220.36      1.87      5.00   2386.12    220.00        1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1896E+03 EXCESS= .0000E+00 OUTFLOW= .1896E+03 BASIN STORAGE= .8943E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .36   2373.58    220.20      1.86      5.00   2369.43    220.00        1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1884E+03 EXCESS= .0000E+00 OUTFLOW= .1884E+03 BASIN STORAGE= .9716E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .36   2343.81    220.27      1.83      5.00   2339.23    220.00        1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1861E+03 EXCESS= .0000E+00 OUTFLOW= .1861E+03 BASIN STORAGE= .9824E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCOB3  MANE          .36   2315.02    220.27      1.81      5.00   2310.29    220.00        1.81
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .1834E+03 EXCESS= .0000E+00 OUTFLOW= .1834E+03 BASIN STORAGE= .9329E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    492.07    223.25      2.09      5.00    488.98    225.00        2.08


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3984E+02 EXCESS= .0000E+00 OUTFLOW= .3986E+02 BASIN STORAGE= .2102E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    482.47    223.25      2.05      5.00    479.61    225.00        2.04


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3903E+02 EXCESS= .0000E+00 OUTFLOW= .3905E+02 BASIN STORAGE= .2078E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    466.46    223.25      1.97      5.00    463.99    225.00        1.97


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3768E+02 EXCESS= .0000E+00 OUTFLOW= .3771E+02 BASIN STORAGE= .2039E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    450.45    223.25      1.90      5.00    448.35    225.00        1.90


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3635E+02 EXCESS= .0000E+00 OUTFLOW= .3637E+02 BASIN STORAGE= .1999E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    444.05    223.25      1.88      5.00    442.10    225.00        1.87


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3581E+02 EXCESS= .0000E+00 OUTFLOW= .3583E+02 BASIN STORAGE= .1983E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    439.56    223.25      1.86      5.00    437.72    225.00        1.85


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3544E+02 EXCESS= .0000E+00 OUTFLOW= .3546E+02 BASIN STORAGE= .1882E-02 PERCENT ERROR=   -.1


          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    436.36    223.25      1.84      5.00    434.59    225.00        1.84


CONTINUITY SUMMARY (AC-FT) - INFLOW= .3517E+02 EXCESS= .0000E+00 OUTFLOW= .3519E+02 BASIN STORAGE= .1874E-02 PERCENT ERROR=   -.1
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          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.50    440.03    225.00      1.82      5.00    440.03    225.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3481E+02 EXCESS= .0000E+00 OUTFLOW= .3482E+02 BASIN STORAGE= .1373E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
           RNW28-C  MANE         4.75    424.83    223.25      1.79      5.00    423.33    225.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3421E+02 EXCESS= .0000E+00 OUTFLOW= .3423E+02 BASIN STORAGE= .1846E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .51    802.90    225.25      1.79      5.00    801.72    225.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6516E+02 EXCESS= .0000E+00 OUTFLOW= .6516E+02 BASIN STORAGE= .8458E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .51    785.67    225.11      1.75      5.00    785.04    225.00        1.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6373E+02 EXCESS= .0000E+00 OUTFLOW= .6373E+02 BASIN STORAGE= .8611E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .52    758.06    225.26      1.68      5.00    756.78    225.00        1.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6135E+02 EXCESS= .0000E+00 OUTFLOW= .6135E+02 BASIN STORAGE= .8635E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .53    730.78    225.49      1.62      5.00    729.12    225.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5899E+02 EXCESS= .0000E+00 OUTFLOW= .5899E+02 BASIN STORAGE= .8560E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .53    718.97    225.28      1.59      5.00    717.58    225.00        1.59

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5804E+02 EXCESS= .0000E+00 OUTFLOW= .5804E+02 BASIN STORAGE= .8309E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
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          RCNW55-C  MANE          .53    710.88    225.20      1.58      5.00    709.79    225.00        1.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5738E+02 EXCESS= .0000E+00 OUTFLOW= .5738E+02 BASIN STORAGE= .8533E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .54    705.85    225.37      1.56      5.00    704.22    225.00        1.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5692E+02 EXCESS= .0000E+00 OUTFLOW= .5692E+02 BASIN STORAGE= .8683E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .54    706.34    225.18      1.55      5.00    705.12    225.00        1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5635E+02 EXCESS= .0000E+00 OUTFLOW= .5635E+02 BASIN STORAGE= .8267E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
          RCNW55-C  MANE          .54    685.43    225.26      1.52      5.00    684.06    225.00        1.52

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5523E+02 EXCESS= .0000E+00 OUTFLOW= .5523E+02 BASIN STORAGE= .8195E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE          .98    826.72    225.73      1.77      5.00    823.45    225.00        1.77

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6812E+02 EXCESS= .0000E+00 OUTFLOW= .6812E+02 BASIN STORAGE= .1636E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE          .99    809.09    225.66      1.73      5.00    806.14    225.00        1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6661E+02 EXCESS= .0000E+00 OUTFLOW= .6662E+02 BASIN STORAGE= .1645E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.00    781.11    225.99      1.67      5.00    776.96    225.00        1.67

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6412E+02 EXCESS= .0000E+00 OUTFLOW= .6412E+02 BASIN STORAGE= .1680E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.02    749.64    226.33      1.60      5.00    747.87    225.00        1.60
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CONTINUITY SUMMARY (AC-FT) - INFLOW= .6163E+02 EXCESS= .0000E+00 OUTFLOW= .6163E+02 BASIN STORAGE= .1783E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.03    739.23    225.73      1.57      5.00    736.14    225.00        1.58


CONTINUITY SUMMARY (AC-FT) - INFLOW= .6064E+02 EXCESS= .0000E+00 OUTFLOW= .6064E+02 BASIN STORAGE= .1810E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.03    730.93    225.69      1.56      5.00    727.98    225.00        1.56


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5995E+02 EXCESS= .0000E+00 OUTFLOW= .5995E+02 BASIN STORAGE= .1696E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.03    723.70    225.37      1.54      5.00    722.09    225.00        1.55


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5946E+02 EXCESS= .0000E+00 OUTFLOW= .5946E+02 BASIN STORAGE= .1612E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.03    724.81    226.33      1.53      5.00    721.45    225.00        1.53


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5885E+02 EXCESS= .0000E+00 OUTFLOW= .5886E+02 BASIN STORAGE= .1806E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR1  MANE         1.05    705.23    225.91      1.50      5.00    701.46    225.00        1.50


CONTINUITY SUMMARY (AC-FT) - INFLOW= .5768E+02 EXCESS= .0000E+00 OUTFLOW= .5769E+02 BASIN STORAGE= .1845E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .29    831.80    225.38      1.77      5.00    830.93    225.00        1.77


CONTINUITY SUMMARY (AC-FT) - INFLOW= .6930E+02 EXCESS= .0000E+00 OUTFLOW= .6930E+02 BASIN STORAGE= .4784E-03 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .29    814.88    225.25      1.73      5.00    813.51    225.00        1.73


CONTINUITY SUMMARY (AC-FT) - INFLOW= .6777E+02 EXCESS= .0000E+00 OUTFLOW= .6777E+02 BASIN STORAGE= .4948E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .30    785.43    225.32      1.66      5.00    784.05    225.00        1.66

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6523E+02 EXCESS= .0000E+00 OUTFLOW= .6523E+02 BASIN STORAGE= .4929E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .30    755.49    225.16      1.60      5.00    754.35    225.00        1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6270E+02 EXCESS= .0000E+00 OUTFLOW= .6270E+02 BASIN STORAGE= .4863E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .30    743.99    225.37      1.57      5.00    742.59    225.00        1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6169E+02 EXCESS= .0000E+00 OUTFLOW= .6169E+02 BASIN STORAGE= .4943E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .31    735.35    225.15      1.56      5.00    734.22    225.00        1.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6099E+02 EXCESS= .0000E+00 OUTFLOW= .6099E+02 BASIN STORAGE= .4923E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .31    730.04    225.27      1.54      5.00    728.47    225.00        1.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6049E+02 EXCESS= .0000E+00 OUTFLOW= .6049E+02 BASIN STORAGE= .4768E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .31    729.11    225.37      1.53      5.00    727.37    225.00        1.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5987E+02 EXCESS= .0000E+00 OUTFLOW= .5987E+02 BASIN STORAGE= .4730E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             RCFR2  MANE          .31    708.74    225.42      1.50      5.00    707.37    225.00        1.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5868E+02 EXCESS= .0000E+00 OUTFLOW= .5868E+02 BASIN STORAGE= .4706E-03 PERCENT ERROR=    .0
```

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

# A.4 Rational Method Analysis

**CENTENNIAL PARKWAY CHANNEL WEST**

**TABLE A.4.1: 25-YEAR RUNOFF CALCULATION SHEET**

By: NEL Checked By: JSD

Date: 10/19/2016 Date: 4/19/2017

| BASIN PROPERTIES | | | | | | | | | | | | SHEET FLOW TRAVEL TIME | | | | | | | | SHALLOW CONCENTRATED FLOW | | | | | TOTAL FLOW | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inlet No. | Inlet Sta | Total Area (acre) | Pavement C1 | Pavement A1 (acre) | Pavement CA1 (acre) | Gravel C2 | Gravel A2 (acre) | Gravel CA2 (acre) | Composite CA (acre) | Total Area A (sf) | Pavement P (sf) | Sheet S1 (ft/ft) | Sheet L1 (ft) | Surface | Manning's n | Est. I (in/hr) | Assumed Tc (min) | Error | T1 (min) | S2 (ft/ft) | L2 (ft) | Intercept k | V2 (ft/s) | T2 (min) | Tc (min) | K | I (in/hr) | Q (cfs) |
| (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) | (27) | (28) |
| 2.21 | 82+53 | 1.93 | 0.91 | 0.00 | 0.00 | 0.43 | 1.93 | 0.83 | 0.83 | 83874.71 | 0 | 0.0030 | 100 | gravel | 0.022 | 5.09 | 7.00 | 0.14 | 4.5 | 0.1558 | 1019.53 | 0.491 | 6.4 | 2.7 | 7.1 | 1.0 | 5.06 | 4.19 |
| 3.22 | 92+33 | 1.82 | 0.91 | 0.00 | 0.00 | 0.43 | 1.82 | 0.78 | 0.78 | 79121.1 | 0 | 0.0564 | 100 | gravel | 0.022 | 4.87 | 8.00 | 0.42 | 1.9 | 0.0203 | 900 | 0.491 | 2.3 | 6.5 | 8.4 | 1.0 | 4.78 | 3.73 |
| 4.22 | 99+84 | 1.48 | 0.91 | 0.00 | 0.00 | 0.43 | 1.48 | 0.64 | 0.64 | 64357.06 | 0 | 0.0193 | 88.043 | gravel | 0.022 | 4.10 | 13.00 | 0.41 | 2.6 | 0.0075 | 906.78 | 0.491 | 1.4 | 10.8 | 13.4 | 1.0 | 4.06 | 2.58 |
| 5.21 | 107+78 | 0.48 | 0.91 | 0.00 | 0.00 | 0.43 | 0.48 | 0.21 | 0.21 | 20842.97 | 0 | 0.0418 | 79.47 | gravel | 0.022 | 5.30 | 6.00 | 0.17 | 1.7 | 0.0113 | 456.08 | 0.491 | 1.7 | 4.4 | 6.2 | 1.0 | 5.27 | 1.08 |

# APPENDIX B - HYDRAULIC DESIGN AND ANALYSIS

- B.1 WSPG Analyses
- B.2 Lateral Facilities and Inlets

# B.1 WSPG Analyses

- B.1.1 Main Line - Upstream of Grand Teton WSPG
- B.1.2 Main Line - Downstream of Grand Teton WSPG
- B.1.3 Gilcrease Lateral WSPG
- B.1.4 Farm Lateral WSPG

# B.1.1 Main Line - Upstream of Grand Teton WSPG

Main Line - Upstream of Grand Teton WSPG
(N=0.013)

# Worksheet for Main Line SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.00410 | ft/ft |
| Height | 9.00 | ft |
| Bottom Width | 15.00 | ft |
| Discharge | 1657.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 6.55 | ft |
| Flow Area | 98.27 | ft² |
| Wetted Perimeter | 28.10 | ft |
| Hydraulic Radius | 3.50 | ft |
| Top Width | 15.00 | ft |
| Critical Depth | 7.24 | ft |
| Percent Full | 72.8 | % |
| Critical Slope | 0.00313 | ft/ft |
| Velocity | 16.86 | ft/s |
| Velocity Head | 4.42 | ft |
| Specific Energy | 10.97 | ft |
| Froude Number | 1.16 | |
| Discharge Full | 1968.67 | ft³/s |
| Slope Full | 0.00579 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 72.80 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Main Line SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.00410 | ft/ft |
| Height | 9.00 | ft |
| Bottom Width | 15.00 | ft |
| Discharge | 1657.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 6.55 | ft |
| Flow Area | 98.27 | ft² |
| Wetted Perimeter | 28.10 | ft |
| Hydraulic Radius | 3.50 | ft |
| Top Width | 15.00 | ft |
| Critical Depth | 7.24 | ft |
| Percent Full | 72.8 | % |
| Critical Slope | 0.00313 | ft/ft |
| Velocity | 16.86 | ft/s |
| Velocity Head | 4.42 | ft |
| Specific Energy | 10.97 | ft |
| Froude Number | 1.16 | |
| Discharge Full | 1968.67 | ft³/s |
| Slope Full | 0.00579 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 72.80 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                              0
T2 MAIN LINE - UPSTREAM OF GRAND TETON
T3 APR 2017 BY NEL
SO  -8180.6002645.310  3                          2651.860
R   -8170.6002645.350  3      .013                              .000    .000 0
R   -8142.6602645.470  3      .013                              .000    .000 0
R   -8103.8502645.630  3      .013                           -19.378    .000 0
R   -8036.2102645.900  3      .013                            19.378    .000 0
R   -7773.1302646.980  3      .013                              .000    .000 0
R   -7501.1402649.540  3      .013                              .000    .000 0
SH  -7501.1402649.540  3                          2656.090
CD   1  3   0    .000   7.000   16.000  .000  .000   .00
CD   2  3   0    .000   4.000    6.000  .000  .000   .00
CD   3  3   0    .000   9.000   15.000  .000  .000   .00
CD   4  3   0    .000   5.000   10.000  .000  .000   .00
CD   5  4   2    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.500     .000  .000  .000   .00
CD   7  4   2    .000   3.500     .000  .000  .000   .00
CD   8  3   1   0.670   9.000   25.670  .000  .000   .00
CD   9  3   0    .000   10.000  26.580  .000  .000   .00
CD  10  3   0    .000   5.000    8.000  .000  .000   .00
CD  11  3   0    .000   9.000   15.790  .000  .000   .00
Q          1657.000   .0
```

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -8180.600 | 2645.310 | 6.088 | 2651.398 | 1657.00 | 18.14 | 5.11 | 2656.51 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 10.000 | .0040 | | | | | .0050 | .05 | 6.09 | 1.30 | 6.61 | .013 | .00 | .00 | BOX |
| -8170.600 | 2645.350 | 6.073 | 2651.423 | 1657.00 | 18.19 | 5.14 | 2656.56 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 27.940 | .0043 | | | | | .0051 | .14 | 6.07 | 1.30 | 6.44 | .013 | .00 | .00 | BOX |
| -8142.660 | 2645.470 | 6.042 | 2651.512 | 1657.00 | 18.28 | 5.19 | 2656.70 | 1.36 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 38.810 | .0041 | | | | | .0052 | .20 | 7.40 | 1.31 | 6.54 | .013 | .00 | .00 | BOX |
| -8103.850 | 2645.630 | 5.987 | 2651.616 | 1657.00 | 18.45 | 5.29 | 2656.90 | .79 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 67.640 | .0040 | | | | | .0054 | .36 | 6.78 | 1.33 | 6.62 | .013 | .00 | .00 | BOX |
| -8036.210 | 2645.900 | 5.871 | 2651.771 | 1657.00 | 18.82 | 5.50 | 2657.27 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 130.106 | .0041 | | | | | .0059 | .76 | 5.87 | 1.37 | 6.55 | .013 | .00 | .00 | BOX |
| -7906.104 | 2646.434 | 5.641 | 2652.075 | 1657.00 | 19.58 | 5.96 | 2658.03 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 132.974 | .0041 | | | | | .0066 | .88 | 5.64 | 1.45 | 6.55 | .013 | .00 | .00 | BOX |
| -7773.130 | 2646.980 | 5.378 | 2652.358 | 1657.00 | 20.54 | 6.55 | 2658.91 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 20.590 | .0094 | | | | | .0070 | .14 | 5.38 | 1.56 | 4.85 | .013 | .00 | .00 | BOX |
| -7752.540 | 2647.174 | 5.413 | 2652.587 | 1657.00 | 20.41 | 6.47 | 2659.05 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 110.830 | .0094 | | | | | .0065 | .72 | 5.41 | 1.55 | 4.85 | .013 | .00 | .00 | BOX |
| -7641.710 | 2648.217 | 5.677 | 2653.895 | 1657.00 | 19.46 | 5.88 | 2659.77 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 69.164 | .0094 | | | | | .0057 | .39 | 5.68 | 1.44 | 4.85 | .013 | .00 | .00 | BOX |

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -7572.546 | 2648.868 | 5.955 | 2654.823 | 1657.00 | 18.55 | 5.34 | 2660.17 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 44.183 | .0094 | | | | | .0050 | .22 | 5.95 | 1.34 | 4.85 | .013 | .00 | .00 | BOX |
| -7528.363 | 2649.284 | 6.245 | 2655.529 | 1657.00 | 17.69 | 4.86 | 2660.39 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 27.223 | .0094 | | | | | .0044 | .12 | 6.25 | 1.25 | 4.85 | .013 | .00 | .00 | BOX |
| -7501.140 | 2649.540 | 6.550 | 2656.090 | 1657.00 | 16.87 | 4.42 | 2660.51 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |

Main Line - Upstream of Grand Teton WSPG
(N=0.015)

# Worksheet for Main Line SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.015 | |
| Channel Slope | 0.00410 | ft/ft |
| Height | 9.00 | ft |
| Bottom Width | 15.00 | ft |
| Discharge | 1657.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 7.29 | ft |
| Flow Area | 109.29 | ft² |
| Wetted Perimeter | 29.57 | ft |
| Hydraulic Radius | 3.70 | ft |
| Top Width | 15.00 | ft |
| Critical Depth | 7.24 | ft |
| Percent Full | 81.0 | % |
| Critical Slope | 0.00417 | ft/ft |
| Velocity | 15.16 | ft/s |
| Velocity Head | 3.57 | ft |
| Specific Energy | 10.86 | ft |
| Froude Number | 0.99 | |
| Discharge Full | 1706.18 | ft³/s |
| Slope Full | 0.00435 | ft/ft |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 80.95 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Main Line SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.015 | |
| Channel Slope | 0.00410 | ft/ft |
| Height | 9.00 | ft |
| Bottom Width | 15.00 | ft |
| Discharge | 1657.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 7.29 | ft |
| Flow Area | 109.29 | ft² |
| Wetted Perimeter | 29.57 | ft |
| Hydraulic Radius | 3.70 | ft |
| Top Width | 15.00 | ft |
| Critical Depth | 7.24 | ft |
| Percent Full | 81.0 | % |
| Critical Slope | 0.00417 | ft/ft |
| Velocity | 15.16 | ft/s |
| Velocity Head | 3.57 | ft |
| Specific Energy | 10.86 | ft |
| Froude Number | 0.99 | |
| Discharge Full | 1706.18 | ft³/s |
| Slope Full | 0.00435 | ft/ft |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 80.95 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                          0
T2 MAIN LINE - UPSTREAM OF GRAND TETON
T3 APR 2017 BY NEL
SO  -8180.6002645.310  3                          2652.600
R   -8170.6002645.350  3      .015                              .000    .000 0
R   -8142.6602645.470  3      .015                              .000    .000 0
R   -8103.8502645.630  3      .015                           -19.378    .000 0
R   -8036.2102645.900  3      .015                            19.378    .000 0
R   -7773.1302646.980  3      .015                              .000    .000 0
R   -7501.1402649.540  3      .015                              .000    .000 0
SH  -7501.1402649.540  3                          2656.830
CD   1  3   0    .000   7.000   16.000  .000  .000   .00
CD   2  3   0    .000   4.000    6.000  .000  .000   .00
CD   3  3   0    .000   9.000   15.000  .000  .000   .00
CD   4  3   0    .000   5.000   10.000  .000  .000   .00
CD   5  4   2    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.500     .000  .000  .000   .00
CD   7  4   2    .000   3.500     .000  .000  .000   .00
CD   8  3   1   0.670   9.000   25.670  .000  .000   .00
CD   9  3   0    .000   10.000  26.580  .000  .000   .00
CD  10  3   0    .000   5.000    8.000  .000  .000   .00
CD  11  3   0    .000   9.000   15.790  .000  .000   .00
Q          1657.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - UPSTREAM OF GRAND TETON
APR 2017 BY NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -8180.600 | 2645.310 | 7.290 | 2652.600 | 1657.00 | 15.15 | 3.57 | 2656.17 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 10.000 | .0040 | | | | | .0041 | .04 | 7.29 | .99 | 7.35 | .015 | .00 | .00 | BOX |
| -8170.600 | 2645.350 | 7.316 | 2652.666 | 1657.00 | 15.10 | 3.54 | 2656.21 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 1.409 | .0043 | | | | | .0041 | .01 | 7.32 | .98 | 7.16 | .015 | .00 | .00 | BOX |
| -8169.191 | 2645.356 | 7.316 | 2652.672 | 1657.00 | 15.10 | 3.54 | 2656.21 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |
| -8169.191 | 2645.356 | 7.165 | 2652.521 | 1657.00 | 15.42 | 3.69 | 2656.21 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 26.531 | .0043 | | | | | .0043 | .11 | 7.16 | 1.02 | 7.16 | .015 | .00 | .00 | BOX |
| -8142.660 | 2645.470 | 7.189 | 2652.659 | 1657.00 | 15.37 | 3.67 | 2656.33 | .48 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 38.810 | .0041 | | | | | .0044 | .17 | 7.67 | 1.01 | 7.27 | .015 | .00 | .00 | BOX |
| -8103.850 | 2645.630 | 7.008 | 2652.638 | 1657.00 | 15.76 | 3.86 | 2656.50 | .29 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 67.640 | .0040 | | | | | .0049 | .33 | 7.30 | 1.05 | 7.36 | .015 | .00 | .00 | BOX |
| -8036.210 | 2645.900 | 6.686 | 2652.586 | 1657.00 | 16.52 | 4.24 | 2656.82 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 33.219 | .0041 | | | | | .0053 | .18 | 6.69 | 1.13 | 7.28 | .015 | .00 | .00 | BOX |
| -8002.991 | 2646.036 | 6.555 | 2652.591 | 1657.00 | 16.85 | 4.41 | 2657.00 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 78.968 | .0041 | | | | | .0058 | .46 | 6.56 | 1.16 | 7.28 | .015 | .00 | .00 | BOX |
| -7924.023 | 2646.360 | 6.250 | 2652.610 | 1657.00 | 17.67 | 4.85 | 2657.46 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 76.763 | .0041 | | | | | .0066 | .51 | 6.25 | 1.25 | 7.28 | .015 | .00 | .00 | BOX |

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -7847.260 | 2646.676 | 5.959 | 2652.635 | 1657.00 | 18.54 | 5.34 | 2657.97 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 74.130 | .0041 | | | | | .0076 | .56 | 5.96 | 1.34 | 7.28 | .015 | .00 | .00 | BOX |
| -7773.130 | 2646.980 | 5.682 | 2652.662 | 1657.00 | 19.44 | 5.87 | 2658.53 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 15.684 | .0094 | | | | | .0080 | .13 | 5.68 | 1.44 | 5.37 | .015 | .00 | .00 | BOX |
| -7757.446 | 2647.128 | 5.702 | 2652.830 | 1657.00 | 19.37 | 5.83 | 2658.66 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 130.643 | .0094 | | | | | .0075 | .98 | 5.70 | 1.43 | 5.37 | .015 | .00 | .00 | BOX |
| -7626.803 | 2648.357 | 5.981 | 2654.338 | 1657.00 | 18.47 | 5.30 | 2659.64 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 66.747 | .0094 | | | | | .0066 | .44 | 5.98 | 1.33 | 5.37 | .015 | .00 | .00 | BOX |
| -7560.057 | 2648.986 | 6.273 | 2655.258 | 1657.00 | 17.61 | 4.82 | 2660.07 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 36.144 | .0094 | | | | | .0058 | .21 | 6.27 | 1.24 | 5.37 | .015 | .00 | .00 | BOX |
| -7523.913 | 2649.326 | 6.579 | 2655.905 | 1657.00 | 16.79 | 4.38 | 2660.28 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 17.714 | .0094 | | | | | .0051 | .09 | 6.58 | 1.15 | 5.37 | .015 | .00 | .00 | BOX |
| -7506.199 | 2649.492 | 6.900 | 2656.392 | 1657.00 | 16.01 | 3.98 | 2660.37 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |
| 5.059 | .0094 | | | | | .0045 | .02 | 6.90 | 1.07 | 5.37 | .015 | .00 | .00 | BOX |
| -7501.140 | 2649.540 | 7.238 | 2656.778 | 1657.00 | 15.26 | 3.62 | 2660.40 | .00 | 7.24 | 15.00 | 9.000 | 15.000 | .00 | 0 .0 |

# B.1.2 Main Line - Downstream of Grand Teton WSPG

Main Line - Downstream of Grand Teton WSPG
(N=0.013)

# Worksheet for Main Line SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.01100 | ft/ft |
| Height | 10.00 | ft |
| Bottom Width | 12.00 | ft |
| Discharge | 1612.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 5.54 | ft |
| Flow Area | 66.44 | ft² |
| Wetted Perimeter | 23.07 | ft |
| Hydraulic Radius | 2.88 | ft |
| Top Width | 12.00 | ft |
| Critical Depth | 8.25 | ft |
| Percent Full | 55.4 | % |
| Critical Slope | 0.00386 | ft/ft |
| Velocity | 24.26 | ft/s |
| Velocity Head | 9.15 | ft |
| Specific Energy | 14.69 | ft |
| Froude Number | 1.82 | |
| Discharge Full | 2808.12 | ft³/s |
| Slope Full | 0.03338 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 55.36 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                          0
T2 MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
T3 APR 2017 BY JSD/NEL
SO -11732.4402589.200 11                          2594.74
TS -11702.4402589.550 12      .013                                  .000
R  -11702.4402589.550 12      .013                                  .000
R  -11682.5402589.770  9      .013                                  .000    .000 0
JX -11682.4402589.780  9 10   .013  625.000         2589.780        .000    .000 0
R  -11475.0002592.100  1      .013                                  .000    .000 0
R  -11300.0002594.060  1      .013                                  .000    .000 0
R  -11100.5902600.160  1      .013                                  .000    .000 0
R  -11050.0002600.810  1      .013                                  .000    .000 0
R  -10766.5402604.520  1      .013                                  .000    .000 0
JX -10740.7802604.860  1  6   .013   66.000         2607.350        -35.0        2.952
R  -10646.6202606.080  1      .013                                10.789    .000 0
R  -10250.5302611.230  1      .013                               -13.671    .000 0
R  -10100.0002613.200  1      .013                                  .000    .000 0
R   -9750.0002617.750  1      .013                                  .000    .000 0
JX  -9734.3902617.950  1  5   .013   17.000         2620.950        -90.0   .000 0
R   -9700.0002618.400  1      .013                                  .000    .000 0
JX  -9600.3402619.610  1  2   .013  196.000         2621.150        -45.0   .000 0
R   -9400.0002621.850  1      .013                                  .000    .000 0
JX  -9246.5402623.560  1  7   .013   74.000         2626.050        -45.0   .000 0
R   -9050.0002625.730  1      .013                                  .000    .000 0
R   -8700.0002632.070  1      .013                                  .000    .000 0
R   -8456.9802638.260  1      .013                                  .000    .000 0
R   -8394.7602639.850  1      .013                                11.884    .000 0
R   -8332.5302641.440  1      .013                               -11.884    .000 0
R   -8290.6902642.500  1      .013                                  .000
TS  -8210.5902644.550  3      .013                                  .000
TS  -8180.6002645.310 13      .013                                  .000    .000 0
R   -8180.6002645.310  8      .013                                  .000    .000 0
SH  -8180.6002645.310  8                          2651.860
CD   1  3   0    .000   7.000   16.000  .000  .000   .00
CD   2  4   0    .000   4.500     .000  .000  .000   .00
CD   3  3   0    .000   7.000   26.580  .000  .000   .00
CD   4  3   0    .000   5.000   10.000  .000  .000   .00
CD   5  4   2    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.500     .000  .000  .000   .00
CD   7  4   2    .000   3.500     .000  .000  .000   .00
CD   8  3   1   0.670   7.000   27.250  .000  .000   .00
CD   9  3   0    .000   7.000   26.580  .000  .000   .00
CD  10  3   0    .000   6.000    8.000  .000  .000   .00
CD  11  3   1   2.250  10.000   26.250  .000  .000   .00
CD  12  3   1   0.670   7.000   26.580  .000  .000   .00
CD  13  3   1   0.670   7.000   26.580  .000  .000   .00
Q          2246.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
APR 2017 BY JSD/NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -11732.440 | 2589.200 | 8.246 | 2597.446 | 3224.00 | 16.29 | 4.12 | 2601.57 | .00 | 8.25 | 26.25 | 10.000 | 26.250 | .00 | 1 2.3 |
| TRANS STR | .0117 | | | | | .0039 | .12 | 8.25 | 1.05 | | .013 | .00 | .00 | BOX |
| -11702.440 | 2589.550 | 7.447 | 2596.997 | 3224.00 | 17.33 | 4.66 | 2601.66 | .00 | 7.00 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| 19.900 | .0111 | | | | | .0059 | .12 | 7.45 | 1.15 | 4.50 | .013 | .00 | .00 | BOX |
| -11682.540 | 2589.770 | 7.344 | 2597.114 | 3224.00 | 17.33 | 4.66 | 2601.78 | .00 | 7.00 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| JUNCT STR | .1005 | | | | | .0038 | .00 | 7.34 | 1.15 | | .013 | .00 | .00 | BOX |
| -11682.440 | 2589.780 | 9.241 | 2599.021 | 2599.00 | 13.97 | 3.03 | 2602.05 | .00 | 6.67 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| -11682.440 | 2589.780 | 5.425 | 2595.205 | 2599.00 | 29.94 | 13.92 | 2609.13 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 207.440 | .0112 | | | | | .0151 | 3.13 | 5.42 | 2.27 | 5.93 | .013 | .00 | .00 | BOX |
| -11475.000 | 2592.100 | 5.241 | 2597.341 | 2599.00 | 30.99 | 14.92 | 2612.26 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 175.000 | .0112 | | | | | .0167 | 2.92 | 5.24 | 2.39 | 5.93 | .013 | .00 | .00 | BOX |
| -11300.000 | 2594.060 | 5.049 | 2599.110 | 2599.00 | 32.17 | 16.07 | 2615.18 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 78.430 | .0306 | | | | | .0166 | 1.30 | 5.05 | 2.52 | 4.15 | .013 | .00 | .00 | BOX |
| -11221.570 | 2596.459 | 5.271 | 2601.730 | 2599.00 | 30.82 | 14.75 | 2616.48 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 67.714 | .0306 | | | | | .0146 | .99 | 5.27 | 2.37 | 4.15 | .013 | .00 | .00 | BOX |
| -11153.860 | 2598.531 | 5.528 | 2604.059 | 2599.00 | 29.38 | 13.41 | 2617.47 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 53.267 | .0306 | | | | | .0128 | .68 | 5.53 | 2.20 | 4.15 | .013 | .00 | .00 | BOX |
| -11100.590 | 2600.160 | 5.798 | 2605.958 | 2599.00 | 28.02 | 12.19 | 2618.15 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 50.590 | .0129 | | | | | .0119 | .60 | 5.80 | 2.05 | 5.64 | .013 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
APR 2017 BY JSD/NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -11050.000 | 2600.810 | 5.813 | 2606.623 | 2599.00 | 27.94 | 12.12 | 2618.75 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 283.460 | .0131 | | | | | .0114 | 3.24 | 5.81 | 2.04 | 5.61 | .013 | .00 | .00 | BOX |
| -10766.540 | 2604.520 | 5.970 | 2610.490 | 2599.00 | 27.21 | 11.50 | 2621.99 | .74 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0132 | | | | | .0117 | .30 | 6.71 | 1.96 | | .013 | .00 | .00 | BOX |
| -10740.780 | 2604.860 | 5.621 | 2610.481 | 2533.00 | 28.16 | 12.32 | 2622.80 | .79 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 94.160 | .0130 | | | | | .0123 | 1.16 | 6.41 | 2.09 | 5.53 | .013 | .00 | .00 | BOX |
| -10646.620 | 2606.080 | 5.640 | 2611.720 | 2533.00 | 28.07 | 12.23 | 2623.95 | .24 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 396.090 | .0130 | | | | | .0118 | 4.68 | 5.88 | 2.08 | 5.52 | .013 | .00 | .00 | BOX |
| -10250.530 | 2611.230 | 5.789 | 2617.019 | 2533.00 | 27.35 | 11.61 | 2628.63 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 150.530 | .0131 | | | | | .0111 | 1.67 | 5.79 | 2.00 | 5.51 | .013 | .00 | .00 | BOX |
| -10100.000 | 2613.200 | 5.891 | 2619.091 | 2533.00 | 26.87 | 11.21 | 2630.30 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 156.714 | .0130 | | | | | .0105 | 1.64 | 5.89 | 1.95 | 5.52 | .013 | .00 | .00 | BOX |
| -9943.286 | 2615.237 | 6.038 | 2621.276 | 2533.00 | 26.22 | 10.67 | 2631.95 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 193.286 | .0130 | | | | | .0095 | 1.84 | 6.04 | 1.88 | 5.52 | .013 | .00 | .00 | BOX |
| -9750.000 | 2617.750 | 6.333 | 2624.083 | 2533.00 | 25.00 | 9.70 | 2633.79 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0128 | | | | | .0090 | .14 | 6.33 | 1.75 | | .013 | .00 | .00 | BOX |

---------- WARNING - Flow depth near top of box conduit ----------

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
APR 2017 BY JSD/NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -9734.390 | 2617.950 | 6.237 | 2624.187 | 2516.00 | 25.21 | 9.87 | 2634.06 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 34.390 | .0131 | | | | | .0090 | .31 | 6.24 | 1.78 | 5.48 | .013 | .00 | .00 | BOX |
| -9700.000 | 2618.400 | 6.303 | 2624.702 | 2516.00 | 24.95 | 9.67 | 2634.37 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0121 | | | | | .0105 | 1.05 | 6.30 | 1.75 | | .013 | .00 | .00 | BOX |
| | | | ---------- WARNING - Flow depth near top of box conduit ---------- | | | | | | | | | | | |
| -9600.340 | 2619.610 | 5.317 | 2624.927 | 2320.00 | 27.27 | 11.55 | 2636.48 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 200.340 | .0112 | | | | | .0123 | 2.47 | 5.32 | 2.08 | 5.47 | .013 | .00 | .00 | BOX |
| -9400.000 | 2621.850 | 5.250 | 2627.100 | 2320.00 | 27.62 | 11.85 | 2638.95 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0111 | | | | | .0139 | 2.14 | 5.25 | 2.12 | | .013 | .00 | .00 | BOX |
| -9246.540 | 2623.560 | 4.779 | 2628.339 | 2246.00 | 29.37 | 13.40 | 2641.73 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 196.540 | .0110 | | | | | .0164 | 3.21 | 4.78 | 2.37 | 5.37 | .013 | .00 | .00 | BOX |
| -9050.000 | 2625.730 | 4.570 | 2630.300 | 2246.00 | 30.71 | 14.65 | 2644.95 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 350.000 | .0181 | | | | | .0170 | 5.95 | 4.57 | 2.53 | 4.51 | .013 | .00 | .00 | BOX |
| -8700.000 | 2632.070 | 4.644 | 2636.714 | 2246.00 | 30.23 | 14.19 | 2650.90 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 101.569 | .0255 | | | | | .0156 | 1.59 | 4.64 | 2.47 | 4.00 | .013 | .00 | .00 | BOX |
| -8598.431 | 2634.657 | 4.855 | 2639.512 | 2246.00 | 28.91 | 12.98 | 2652.49 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 80.270 | .0255 | | | | | .0137 | 1.10 | 4.86 | 2.31 | 4.00 | .013 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
APR 2017 BY JSD/NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -8518.161 | 2636.702 | 5.092 | 2641.794 | 2246.00 | 27.57 | 11.80 | 2653.59 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 61.181 | .0255 | | | | | .0120 | .73 | 5.09 | 2.15 | 4.00 | .013 | .00 | .00 | BOX |
| -8456.980 | 2638.260 | 5.341 | 2643.601 | 2246.00 | 26.28 | 10.73 | 2654.33 | 1.14 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 18.725 | .0256 | | | | | .0109 | .20 | 6.49 | 2.00 | 4.00 | .013 | .00 | .00 | BOX |
| -8438.256 | 2638.739 | 5.435 | 2644.173 | 2246.00 | 25.83 | 10.36 | 2654.53 | 1.11 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 43.496 | .0256 | | | | | .0100 | .44 | 6.54 | 1.95 | 4.00 | .013 | .00 | .00 | BOX |
| -8394.760 | 2639.850 | 5.700 | 2645.550 | 2246.00 | 24.63 | 9.42 | 2654.97 | 1.00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| .907 | .0255 | | | | | .0093 | .01 | 6.70 | 1.82 | 4.00 | .013 | .00 | .00 | BOX |
| -8393.853 | 2639.873 | 5.706 | 2645.580 | 2246.00 | 24.60 | 9.40 | 2654.98 | 1.00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 34.243 | .0255 | | | | | .0087 | .30 | 6.71 | 1.81 | 4.00 | .013 | .00 | .00 | BOX |
| -8359.609 | 2640.748 | 5.985 | 2646.733 | 2246.00 | 23.45 | 8.54 | 2655.28 | .91 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 27.079 | .0255 | | | | | .0077 | .21 | 6.90 | 1.69 | 4.00 | .013 | .00 | .00 | BOX |
| -8332.529 | 2641.440 | 6.277 | 2647.717 | 2246.00 | 22.36 | 7.77 | 2655.48 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 6.668 | .0253 | | | | | .0070 | .05 | 6.28 | 1.57 | 4.01 | .013 | .00 | .00 | BOX |
| -8325.861 | 2641.609 | 6.363 | 2647.972 | 2246.00 | 22.06 | 7.56 | 2655.53 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 19.961 | .0253 | | | | | .0065 | .13 | 6.36 | 1.54 | 4.01 | .013 | .00 | .00 | BOX |

---------- WARNING - Flow depth near top of box conduit ----------

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.013
APR 2017 BY JSD/NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -8305.900 | 2642.115 | 6.673 | 2648.788 | 2246.00 | 21.04 | 6.87 | 2655.66 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 15.210 | .0253 | | | | | .0077 | .12 | 6.67 | 1.44 | 4.01 | .013 | .00 | .00 | BOX |
| | | | | WARNING - Flow depth near top of box conduit | | | | | | | | | | |
| -8290.690 | 2642.500 | 7.000 | 2649.500 | 2246.00 | 20.05 | 6.24 | 2655.74 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| TRANS STR | .0256 | | | | | .0029 | .23 | 7.00 | 1.34 | | .013 | .00 | .00 | BOX |
| -8210.590 | 2644.550 | 9.821 | 2654.371 | 2246.00 | 12.07 | 2.26 | 2656.63 | .00 | 6.05 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| TRANS STR | .0253 | | | | | .0029 | .09 | 9.82 | .80 | | .013 | .00 | .00 | BOX |
| -8180.600 | 2645.310 | 9.068 | 2654.378 | 2246.00 | 12.07 | 2.26 | 2656.64 | .00 | 6.05 | 27.25 | 7.000 | 27.250 | .00 | 1 .7 |

Main Line - Downstream of Grand Teton WSPG
(N=0.015)

# Worksheet for Main Line SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.015 | |
| Channel Slope | 0.01100 | ft/ft |
| Height | 10.00 | ft |
| Bottom Width | 12.00 | ft |
| Discharge | 1612.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 6.16 | ft |
| Flow Area | 73.93 | ft² |
| Wetted Perimeter | 24.32 | ft |
| Hydraulic Radius | 3.04 | ft |
| Top Width | 12.00 | ft |
| Critical Depth | 8.25 | ft |
| Percent Full | 61.6 | % |
| Critical Slope | 0.00514 | ft/ft |
| Velocity | 21.80 | ft/s |
| Velocity Head | 7.39 | ft |
| Specific Energy | 13.55 | ft |
| Froude Number | 1.55 | |
| Discharge Full | 2433.70 | ft³/s |
| Slope Full | 0.02508 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 61.61 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Main Line SO

## GVF Output Data

| | | |
|---|---|---|
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 6.16 | ft |
| Critical Depth | 8.25 | ft |
| Channel Slope | 0.01100 | ft/ft |
| Critical Slope | 0.00514 | ft/ft |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                              0
T2 MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.015
T3 NEL 2017 BY JSD/NEL
SO -11732.4402589.200 11                          2595.360
TS -11702.4402589.550 12      .015                                .000
R  -11702.4402589.550 12      .015                                .000
R  -11682.5402589.770  9      .015                                .000    .000 0
JX -11682.4402589.780  9 10   .015  625.000         2589.780      .000    .000 0
R  -11475.0002592.100  1      .015                                .000    .000 0
R  -11300.0002594.060  1      .015                                .000    .000 0
R  -11100.5902600.160  1      .015                                .000    .000 0
R  -11050.0002600.810  1      .015                                .000    .000 0
R  -10766.5402604.520  1      .015                                .000    .000 0
JX -10740.7802604.860  1  6   .015   66.000         2607.350      -35.0        2.952
R  -10646.6202606.080  1      .015                              10.789    .000 0
R  -10250.5302611.230  1      .015                             -13.671    .000 0
R  -10100.0002613.200  1      .015                                .000    .000 0
R   -9750.0002617.750  1      .015                                .000    .000 0
JX  -9734.3902617.950  1  5   .015   17.000         2620.950      -90.0   .000 0
R   -9700.0002618.400  1      .015                                .000    .000 0
JX  -9600.3402619.610  1  2   .015  196.000         2621.150      -45.0   .000 0
R   -9400.0002621.850  1      .015                                .000    .000 0
JX  -9246.5402623.560  1  7   .015   74.000         2626.050      -45.0   .000 0
R   -9050.0002625.730  1      .015                                .000    .000 0
R   -8700.0002632.070  1      .015                                .000    .000 0
R   -8456.9802638.260  1      .015                                .000    .000 0
R   -8394.7602639.850  1      .015                              11.884    .000 0
R   -8332.5302641.440  1      .015                             -11.884    .000 0
R   -8290.6902642.500  1      .015                                .000
TS  -8210.5902644.550  3      .015                                .000
TS  -8180.6002645.310 13      .015                                .000    .000 0
R   -8180.6002645.310  8      .015                                .000    .000 0
SH  -8180.6002645.310  8                          2652.600
CD   1  3   0    .000   7.000   16.000  .000  .000   .00
CD   2  4   0    .000   4.500     .000  .000  .000   .00
CD   3  3   0    .000   7.000   26.580  .000  .000   .00
CD   4  3   0    .000   5.000   10.000  .000  .000   .00
CD   5  4   2    .000   2.500     .000  .000  .000   .00
CD   6  4   1    .000   3.500     .000  .000  .000   .00
CD   7  4   2    .000   3.500     .000  .000  .000   .00
CD   8  3   1   0.670   7.000   27.250  .000  .000   .00
CD   9  3   0    .000   7.000   26.580  .000  .000   .00
CD  10  3   0    .000   6.000    8.000  .000  .000   .00
CD  11  3   1   2.250  10.000   26.250  .000  .000   .00
CD  12  3   1   0.670   7.000   26.580  .000  .000   .00
CD  13  3   1   0.670   7.000   26.580  .000  .000   .00
Q          2246.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.015
NEL 2017 BY JSD/NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -11732.440 | 2589.200 | 8.246 | 2597.446 | 3224.00 | 16.29 | 4.12 | 2601.57 | .00 | 8.25 | 26.25 | 10.000 | 26.250 | .00 | 1 2.3 |
| TRANS STR | .0117 | | | | | .0051 | .15 | 8.25 | 1.05 | | .015 | .00 | .00 | BOX |
| -11702.440 | 2589.550 | 7.506 | 2597.056 | 3224.00 | 17.33 | 4.66 | 2601.72 | .00 | 7.00 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| 19.900 | .0111 | | | | | .0079 | .16 | 7.51 | 1.15 | 4.95 | .015 | .00 | .00 | BOX |
| -11682.540 | 2589.770 | 7.443 | 2597.213 | 3224.00 | 17.33 | 4.66 | 2601.88 | .00 | 7.00 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| JUNCT STR | .1005 | | | | | .0051 | .00 | 7.44 | 1.15 | | .015 | .00 | .00 | BOX |
| -11682.440 | 2589.780 | 9.340 | 2599.120 | 2599.00 | 23.21 | 8.36 | 2607.48 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 207.440 | .0112 | | | | | .0168 | 3.47 | 9.34 | 1.55 | 6.59 | .015 | .00 | .00 | BOX |
| -11475.000 | 2592.100 | 10.495 | 2602.595 | 2599.00 | 23.21 | 8.36 | 2610.96 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 175.000 | .0112 | | | | | .0168 | 2.93 | 10.49 | 1.55 | 6.58 | .015 | .00 | .00 | BOX |
| -11300.000 | 2594.060 | 11.466 | 2605.526 | 2599.00 | 23.21 | 8.36 | 2613.89 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 199.410 | .0306 | | | | | .0168 | 3.34 | 11.47 | 1.55 | 4.59 | .015 | .00 | .00 | BOX |
| -11100.590 | 2600.160 | 8.707 | 2608.866 | 2599.00 | 23.21 | 8.36 | 2617.23 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 50.590 | .0129 | | | | | .0168 | .85 | 8.71 | 1.55 | 6.26 | .015 | .00 | .00 | BOX |
| -11050.000 | 2600.810 | 8.904 | 2609.714 | 2599.00 | 23.21 | 8.36 | 2618.08 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 283.460 | .0131 | | | | | .0168 | 4.75 | 8.90 | 1.55 | 6.22 | .015 | .00 | .00 | BOX |
| -10766.540 | 2604.520 | 9.942 | 2614.462 | 2599.00 | 23.21 | 8.36 | 2622.82 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0132 | | | | | .0159 | .41 | .00 | 1.55 | | .015 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.015
NEL 2017 BY JSD/NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -10740.780 | 2604.860 | 10.758 | 2615.618 | 2533.00 | 22.62 | 7.94 | 2623.56 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 94.160 | .0130 | | | | | .0159 | 1.50 | .00 | 1.51 | 6.13 | .015 | .00 | .00 | BOX |
| -10646.620 | 2606.080 | 11.586 | 2617.667 | 2533.00 | 22.62 | 7.94 | 2625.61 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 396.090 | .0130 | | | | | .0159 | 6.30 | .00 | 1.51 | 6.12 | .015 | .00 | .00 | BOX |
| -10250.530 | 2611.230 | 13.358 | 2624.588 | 2533.00 | 22.62 | 7.94 | 2632.53 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 150.530 | .0131 | | | | | .0159 | 2.40 | 13.36 | 1.51 | 6.10 | .015 | .00 | .00 | BOX |
| -10100.000 | 2613.200 | 13.783 | 2626.983 | 2533.00 | 22.62 | 7.94 | 2634.93 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 350.000 | .0130 | | | | | .0159 | 5.57 | 13.78 | 1.51 | 6.12 | .015 | .00 | .00 | BOX |
| -9750.000 | 2617.750 | 14.802 | 2632.552 | 2533.00 | 22.62 | 7.94 | 2640.49 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0128 | | | | | .0157 | .25 | 14.80 | 1.51 | | .015 | .00 | .00 | BOX |
| -9734.390 | 2617.950 | 15.061 | 2633.011 | 2516.00 | 22.46 | 7.84 | 2640.85 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 34.390 | .0131 | | | | | .0157 | .54 | 15.06 | 1.50 | 6.07 | .015 | .00 | .00 | BOX |
| -9700.000 | 2618.400 | 15.151 | 2633.551 | 2516.00 | 22.46 | 7.84 | 2641.39 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0121 | | | | | .0133 | 1.33 | 15.15 | 1.50 | | .015 | .00 | .00 | BOX |
| -9600.340 | 2619.610 | 17.261 | 2636.871 | 2320.00 | 20.71 | 6.66 | 2643.53 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 200.340 | .0112 | | | | | .0133 | 2.67 | 17.26 | 1.38 | 6.06 | .015 | .00 | .00 | BOX |
| -9400.000 | 2621.850 | 17.695 | 2639.545 | 2320.00 | 20.71 | 6.66 | 2646.21 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| JUNCT STR | .0111 | | | | | .0125 | 1.92 | 17.70 | 1.38 | | .015 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
MAIN LINE - DOWNSTREAM OF GRAND TETON, N=0.015
NEL 2017 BY JSD/NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -9246.540 | 2623.560 | 18.750 | 2642.310 | 2246.00 | 20.05 | 6.24 | 2648.55 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 196.540 | .0110 | | | | | .0125 | 2.46 | 18.75 | 1.34 | 5.95 | .015 | .00 | .00 | BOX |
| -9050.000 | 2625.730 | 19.039 | 2644.769 | 2246.00 | 20.05 | 6.24 | 2651.01 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 350.000 | .0181 | | | | | .0125 | 4.38 | 19.04 | 1.34 | 4.98 | .015 | .00 | .00 | BOX |
| -8700.000 | 2632.070 | 17.077 | 2649.147 | 2246.00 | 20.05 | 6.24 | 2655.39 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 243.020 | .0255 | | | | | .0125 | 3.04 | 17.08 | 1.34 | 4.42 | .015 | .00 | .00 | BOX |
| -8456.980 | 2638.260 | 13.927 | 2652.187 | 2246.00 | 20.05 | 6.24 | 2658.43 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 62.221 | .0256 | | | | | .0125 | .78 | .00 | 1.34 | 4.41 | .015 | .00 | .00 | BOX |
| -8394.760 | 2639.850 | 13.569 | 2653.419 | 2246.00 | 20.05 | 6.24 | 2659.66 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 62.229 | .0255 | | | | | .0125 | .78 | .00 | 1.34 | 4.42 | .015 | .00 | .00 | BOX |
| -8332.530 | 2641.440 | 13.212 | 2654.652 | 2246.00 | 20.05 | 6.24 | 2660.90 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| 41.840 | .0253 | | | | | .0125 | .52 | 13.21 | 1.34 | 4.43 | .015 | .00 | .00 | BOX |
| -8290.690 | 2642.500 | 12.675 | 2655.175 | 2246.00 | 20.05 | 6.24 | 2661.42 | .00 | 7.00 | 16.00 | 7.000 | 16.000 | .00 | 0 .0 |
| TRANS STR | .0256 | | | | | .0038 | .31 | 12.68 | 1.34 | | .015 | .00 | .00 | BOX |
| -8210.590 | 2644.550 | 15.659 | 2660.209 | 2246.00 | 12.07 | 2.26 | 2662.47 | .00 | 6.05 | 26.58 | 7.000 | 26.580 | .00 | 0 .0 |
| TRANS STR | .0253 | | | | | .0038 | .11 | 15.66 | .80 | | .015 | .00 | .00 | BOX |
| -8180.600 | 2645.310 | 14.940 | 2660.250 | 2246.00 | 12.07 | 2.26 | 2662.51 | .00 | 6.05 | 27.25 | 7.000 | 27.250 | .00 | 1 .7 |

# B.1.3 Gilcrease Lateral WSPG

# Worksheet for Gilcrease Lateral SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.11730 | ft/ft |
| Diameter | 2.00 | ft |
| Discharge | 36.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.96 | ft |
| Flow Area | 1.49 | $ft^2$ |
| Wetted Perimeter | 3.06 | ft |
| Hydraulic Radius | 0.49 | ft |
| Top Width | 2.00 | ft |
| Critical Depth | 1.93 | ft |
| Percent Full | 47.9 | % |
| Critical Slope | 0.02215 | ft/ft |
| Velocity | 24.22 | ft/s |
| Velocity Head | 9.11 | ft |
| Specific Energy | 10.07 | ft |
| Froude Number | 4.95 | |
| Maximum Discharge | 83.34 | $ft^3/s$ |
| Discharge Full | 77.48 | $ft^3/s$ |
| Slope Full | 0.02533 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 47.89 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                          0
T2 GILCREASE AVENUE LATERAL
T3 APR 2017 BY NEL/RRD
SO  -1456.4552621.150 54      .013               2622.900
R   -1441.1242622.920 54      .013                                  .000    .000 0
R   -1437.1242623.120 54      .013                                  .000 -45.000 0
R   -1323.9172624.972 54      .013                                  .000    .000 0
R   -1319.9172625.172 54      .013                                  .000  36.899 0
R   -1272.1792626.207 54      .013                                  .000    .000 0
JX  -1268.1792626.407 54 18 18.013    2.500    2.5002626.4072626.407-76.0 75.0   0.000
R   -1251.7852626.815 54      .013                                  .000    .000 0
JX  -1247.7852627.015 54 24 24.013   12.000   12.0002627.0152627.015-60.0 49.0    .000
R   -1202.2042628.007 54      .013                                  .000    .000 0
JX  -1198.2042628.207 54 30 30.013   27.000   27.0002628.2072628.207-60.0 41.0    .000
R   -1142.4432629.402 48      .013                                  .000    .000 0
JX  -1138.4432629.602 48 30 30.013   51.000   51.0002629.6022629.602-64.0 57.0
WX  -1138.4432629.602 24
R   -1108.4402633.120 24      .013                                  .000    .000 0
SH  -1108.4402633.120 24                          2634.08
CD   1  4   0    .000   4.500     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
CD   4  4   1    .000   2.500     .000  .000  .000   .00
CD   1  4   0    .000   4.500     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
CD   4  4   1    .000   2.500     .000  .000  .000   .00
CD  18  4               1.500
CD  24  4               2.000
CD  30  4               2.500
CD  36  4               3.000
CD  42  4               3.500
CD  48  4               4.000
CD  54  4               4.500
CD  60  4               5.000
CD  66  4               5.500
CD  72  4               6.000
Q           36.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
GILCREASE AVENUE LATERAL
APR 2017 BY NEL/RRD

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -1456.455 | 2621.150 | 2.825 | 2623.975 | 221.00 | 21.03 | 6.87 | 2630.84 | .00 | 4.16 | 4.35 | 4.500 | .000 | .00 | 0 .0 |
| 2.214 | .1155 | | | | | .0239 | .05 | 2.82 | 2.38 | 1.78 | .013 | .00 | .00 | PIPE |
| -1454.241 | 2621.406 | 2.870 | 2624.275 | 221.00 | 20.64 | 6.62 | 2630.89 | .00 | 4.16 | 4.33 | 4.500 | .000 | .00 | 0 .0 |
| 5.135 | .1155 | | | | | .0220 | .11 | 2.87 | 2.31 | 1.78 | .013 | .00 | .00 | PIPE |
| -1449.106 | 2621.998 | 2.992 | 2624.990 | 221.00 | 19.68 | 6.02 | 2631.01 | .00 | 4.16 | 4.25 | 4.500 | .000 | .00 | 0 .0 |
| 4.345 | .1155 | | | | | .0196 | .09 | 2.99 | 2.13 | 1.78 | .013 | .00 | .00 | PIPE |
| -1444.762 | 2622.500 | 3.122 | 2625.622 | 221.00 | 18.77 | 5.47 | 2631.09 | .00 | 4.16 | 4.15 | 4.500 | .000 | .00 | 0 .0 |
| 3.638 | .1155 | | | | | .0175 | .06 | 3.12 | 1.96 | 1.78 | .013 | .00 | .00 | PIPE |
| -1441.124 | 2622.920 | 3.263 | 2626.183 | 221.00 | 17.89 | 4.97 | 2631.15 | .00 | 4.16 | 4.02 | 4.500 | .000 | .00 | 0 .0 |
| 4.000 | .0500 | | | | | .0161 | .06 | 3.26 | 1.80 | 2.26 | .013 | .00 | .00 | PIPE |
| -1437.124 | 2623.120 | 3.327 | 2626.447 | 221.00 | 17.53 | 4.77 | 2631.22 | .00 | 4.16 | 3.95 | 4.500 | .000 | .00 | 0 .0 |
| 113.207 | .0164 | | | | | .0154 | 1.74 | 3.33 | 1.73 | 3.27 | .013 | .00 | .00 | PIPE |
| -1323.917 | 2624.972 | 3.384 | 2628.356 | 221.00 | 17.23 | 4.61 | 2632.96 | .00 | 4.16 | 3.89 | 4.500 | .000 | .00 | 0 .0 |
| 4.000 | .0500 | | | | | .0147 | .06 | 3.38 | 1.67 | 2.26 | .013 | .00 | .00 | PIPE |
| -1319.917 | 2625.172 | 3.469 | 2628.642 | 221.00 | 16.80 | 4.38 | 2633.02 | .00 | 4.16 | 3.78 | 4.500 | .000 | .00 | 0 .0 |
| 7.677 | .0217 | | | | | .0141 | .11 | 3.47 | 1.59 | 2.94 | .013 | .00 | .00 | PIPE |
| -1312.240 | 2625.339 | 3.509 | 2628.848 | 221.00 | 16.61 | 4.28 | 2633.13 | .00 | 4.16 | 3.73 | 4.500 | .000 | .00 | 0 .0 |
| 24.855 | .0217 | | | | | .0133 | .33 | 3.51 | 1.55 | 2.94 | .013 | .00 | .00 | PIPE |

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1287.385 | 2625.877 | 3.690 | 2629.567 | 221.00 | 15.84 | 3.89 | 2633.46 | .00 | 4.16 | 3.46 | 4.500 | .000 | .00 | 0 .0 |
| 15.206 | .0217 | | | | | .0121 | .18 | 3.69 | 1.39 | 2.94 | .013 | .00 | .00 | PIPE |
| -1272.179 | 2626.207 | 3.898 | 2630.105 | 221.00 | 15.10 | 3.54 | 2633.64 | .00 | 4.16 | 3.06 | 4.500 | .000 | .00 | 0 .0 |
| JUNCT STR | .0500 | | | | | .0120 | .05 | 3.90 | 1.22 | | .013 | .00 | .00 | PIPE |
| -1268.179 | 2626.407 | 3.644 | 2630.052 | 216.00 | 15.65 | 3.81 | 2633.86 | .00 | 4.13 | 3.53 | 4.500 | .000 | .00 | 0 .0 |
| 2.103 | .0249 | | | | | .0122 | .03 | 3.64 | 1.40 | 2.76 | .013 | .00 | .00 | PIPE |
| -1266.076 | 2626.459 | 3.672 | 2630.132 | 216.00 | 15.54 | 3.75 | 2633.88 | .00 | 4.13 | 3.49 | 4.500 | .000 | .00 | 0 .0 |
| 10.266 | .0249 | | | | | .0117 | .12 | 3.67 | 1.37 | 2.76 | .013 | .00 | .00 | PIPE |
| -1255.810 | 2626.715 | 3.878 | 2630.593 | 216.00 | 14.82 | 3.41 | 2634.00 | .00 | 4.13 | 3.11 | 4.500 | .000 | .00 | 0 .0 |
| 4.025 | .0249 | | | | | .0108 | .04 | 3.88 | 1.21 | 2.76 | .013 | .00 | .00 | PIPE |
| -1251.785 | 2626.815 | 4.132 | 2630.947 | 216.00 | 14.13 | 3.10 | 2634.05 | .00 | 4.13 | 2.47 | 4.500 | .000 | .00 | 0 .0 |
| JUNCT STR | .0500 | | | | | .0100 | .04 | 4.13 | 1.00 | | .013 | .00 | .00 | PIPE |
| -1247.785 | 2627.015 | 5.328 | 2632.343 | 192.00 | 12.07 | 2.26 | 2634.61 | .00 | 3.98 | .00 | 4.500 | .000 | .00 | 0 .0 |
| 45.581 | .0218 | | | | | .0095 | .43 | 5.33 | .00 | 2.67 | .013 | .00 | .00 | PIPE |
| -1202.204 | 2628.007 | 4.770 | 2632.777 | 192.00 | 12.07 | 2.26 | 2635.04 | .00 | 3.98 | .00 | 4.500 | .000 | .00 | 0 .0 |
| JUNCT STR | .0500 | | | | | .0072 | .03 | 4.77 | .00 | | .013 | .00 | .00 | PIPE |
| -1198.204 | 2628.207 | 6.423 | 2634.630 | 138.00 | 10.98 | 1.87 | 2636.50 | .00 | 3.49 | .00 | 4.000 | .000 | .00 | 0 .0 |
| 55.761 | .0214 | | | | | .0092 | .51 | 6.42 | .00 | 2.36 | .013 | .00 | .00 | PIPE |

CENTENNIAL PARKWAY CHANNEL WEST
GILCREASE AVENUE LATERAL
APR 2017 BY NEL/RRD

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1142.443 | 2629.402 | 5.742 | 2635.145 | 138.00 | 10.98 | 1.87 | 2637.02 | .00 | 3.49 | .00 | 4.000 | .000 | .00 | 0 .0 |
| JUNCT STR | .0500 | | | | | .0049 | .02 | 5.74 | .00 | | .013 | .00 | .00 | PIPE |
| -1138.443 | 2629.602 | 7.765 | 2637.367 | 36.00 | 2.86 | .13 | 2637.49 | .00 | 1.79 | .00 | 4.000 | .000 | .00 | 0 .0 |
| WALL | EXIT | | | | | | | | | | | | | |
| -1138.443 | 2629.602 | 7.766 | 2637.368 | 36.00 | 11.46 | 2.04 | 2639.41 | .00 | 1.93 | .00 | 2.000 | .000 | .00 | 0 .0 |
| 22.355 | .1173 | | | | | .0253 | .57 | 7.77 | .00 | .96 | .013 | .00 | .00 | PIPE |
| -1116.088 | 2632.223 | 5.708 | 2637.932 | 36.00 | 11.46 | 2.04 | 2639.97 | .00 | 1.93 | .00 | 2.000 | .000 | .00 | 0 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |
| -1116.088 | 2632.223 | .959 | 2633.183 | 36.00 | 24.17 | 9.07 | 2642.26 | .00 | 1.93 | 2.00 | 2.000 | .000 | .00 | 0 .0 |
| 7.648 | .1173 | | | | | .1167 | .89 | .96 | 4.93 | .96 | .013 | .00 | .00 | PIPE |
| -1108.440 | 2633.120 | .960 | 2634.080 | 36.00 | 24.15 | 9.06 | 2643.14 | .00 | 1.93 | 2.00 | 2.000 | .000 | .00 | 0 .0 |

# B.1.4 Farm Lateral WSPG

Farm Lateral WSPG
(N=0.013)

# Worksheet for Farm Lateral SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.01200 | ft/ft |
| Height | 6.00 | ft |
| Bottom Width | 8.00 | ft |
| Discharge | 820.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 4.85 | ft |
| Flow Area | 38.81 | ft² |
| Wetted Perimeter | 17.70 | ft |
| Hydraulic Radius | 2.19 | ft |
| Top Width | 8.00 | ft |
| Critical Depth | 6.89 | ft |
| Percent Full | 80.9 | % |
| Critical Slope | 0.00492 | ft/ft |
| Velocity | 21.13 | ft/s |
| Velocity Head | 6.94 | ft |
| Specific Energy | 11.79 | ft |
| Froude Number | 1.69 | |
| Discharge Full | 860.87 | ft³/s |
| Slope Full | 0.01322 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 80.85 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Farm Lateral SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.04000 | ft/ft |
| Height | 6.00 | ft |
| Bottom Width | 8.00 | ft |
| Discharge | 820.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 3.09 | ft |
| Flow Area | 24.75 | ft² |
| Wetted Perimeter | 14.19 | ft |
| Hydraulic Radius | 1.74 | ft |
| Top Width | 8.00 | ft |
| Critical Depth | 6.89 | ft |
| Percent Full | 51.6 | % |
| Critical Slope | 0.00492 | ft/ft |
| Velocity | 33.13 | ft/s |
| Velocity Head | 17.06 | ft |
| Specific Energy | 20.15 | ft |
| Froude Number | 3.32 | |
| Discharge Full | 1571.73 | ft³/s |
| Slope Full | 0.14696 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 51.57 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                          0
T2 FARM ROAD LATERAL - ULTIMATE CONDITIONS
T3 APR 2017 BY NEL
SO  -1682.4402589.780  1                          2594.63
R   -1550.0002591.260  1      .013                              .000    .000 0
R   -1474.9602592.100  1      .013                              .000    .000 0
R   -1402.6402592.910  1      .013                              .000    .000 0
R   -1350.0002593.500  1      .013                           -20.106    .000 0
R   -1263.2702594.920  1      .013                           -33.129    .000 0
R   -1150.0002596.780  1      .013                              .000    .000 0
R    -996.0002599.310  1      .013                              .000    .000 0
R    -925.2302600.070  1      .013                             8.110    .000 0
R    -854.4602600.820  1      .013                            -8.110    .000 0
R    -838.2502601.000  1      .013                              .000    .000 0
R    -700.0002606.520  1      .013                              .000    .000 0
R    -500.0002612.520  1      .013                              .000    .000 0
SH   -500.0002612.520  1                          2615.61
CD   1  3   0    .000   6.000    8.000  .000  .000   .00
Q           820.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
FARM ROAD LATERAL - ULTIMATE CONDITIONS
APR 2017 BY NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -1682.440 | 2589.780 | 4.583 | 2594.363 | 820.00 | 22.36 | 7.77 | 2602.13 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 132.440 | .0112 | | | | | .0147 | 1.94 | 4.58 | 1.84 | 4.99 | .013 | .00 | .00 | BOX |
| -1550.000 | 2591.260 | 4.404 | 2595.664 | 820.00 | 23.27 | 8.41 | 2604.07 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 75.040 | .0112 | | | | | .0160 | 1.20 | 4.40 | 1.95 | 4.98 | .013 | .00 | .00 | BOX |
| -1474.960 | 2592.100 | 4.282 | 2596.382 | 820.00 | 23.94 | 8.90 | 2605.28 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 72.320 | .0112 | | | | | .0174 | 1.26 | 4.28 | 2.04 | 4.98 | .013 | .00 | .00 | BOX |
| -1402.640 | 2592.910 | 4.149 | 2597.058 | 820.00 | 24.71 | 9.48 | 2606.54 | 1.01 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 52.640 | .0112 | | | | | .0187 | .99 | 5.16 | 2.14 | 4.98 | .013 | .00 | .00 | BOX |
| -1350.000 | 2593.500 | 4.043 | 2597.543 | 820.00 | 25.35 | 9.98 | 2607.52 | 1.06 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 86.730 | .0164 | | | | | .0199 | 1.72 | 5.11 | 2.22 | 4.31 | .013 | .00 | .00 | BOX |
| -1263.270 | 2594.920 | 3.968 | 2598.887 | 820.00 | 25.83 | 10.36 | 2609.25 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 113.270 | .0164 | | | | | .0213 | 2.41 | 3.97 | 2.29 | 4.30 | .013 | .00 | .00 | BOX |
| -1150.000 | 2596.780 | 3.845 | 2600.625 | 820.00 | 26.66 | 11.04 | 2611.66 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 35.032 | .0164 | | | | | .0225 | .79 | 3.84 | 2.40 | 4.30 | .013 | .00 | .00 | BOX |
| -1114.968 | 2597.355 | 3.800 | 2601.156 | 820.00 | 26.97 | 11.30 | 2612.45 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 118.968 | .0164 | | | | | .0244 | 2.91 | 3.80 | 2.44 | 4.30 | .013 | .00 | .00 | BOX |
| -996.000 | 2599.310 | 3.623 | 2602.934 | 820.00 | 28.29 | 12.43 | 2615.36 | .40 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 8.543 | .0107 | | | | | .0262 | .22 | 4.02 | 2.62 | 5.06 | .013 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
FARM ROAD LATERAL - ULTIMATE CONDITIONS
APR 2017 BY NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -987.457 | 2599.402 | 3.601 | 2603.003 | 820.00 | 28.46 | 12.58 | 2615.58 | .40 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 62.227 | .0107 | | | | | .0283 | 1.76 | 4.00 | 2.64 | 5.06 | .013 | .00 | .00 | BOX |
| -925.230 | 2600.070 | 3.433 | 2603.504 | 820.00 | 29.85 | 13.84 | 2617.34 | .44 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 15.175 | .0106 | | | | | .0306 | .46 | 3.88 | 2.84 | 5.09 | .013 | .00 | .00 | BOX |
| -910.055 | 2600.231 | 3.391 | 2603.622 | 820.00 | 30.22 | 14.18 | 2617.81 | .45 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 55.595 | .0106 | | | | | .0333 | 1.85 | 3.85 | 2.89 | 5.09 | .013 | .00 | .00 | BOX |
| -854.460 | 2600.820 | 3.234 | 2604.054 | 820.00 | 31.70 | 15.60 | 2619.66 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 16.210 | .0111 | | | | | .0361 | .59 | 3.23 | 3.11 | 5.00 | .013 | .00 | .00 | BOX |
| -838.250 | 2601.000 | 3.188 | 2604.188 | 820.00 | 32.16 | 16.06 | 2620.24 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 138.250 | .0399 | | | | | .0359 | 4.96 | 3.19 | 3.17 | 3.10 | .013 | .00 | .00 | BOX |
| -700.000 | 2606.520 | 3.251 | 2609.771 | 820.00 | 31.53 | 15.43 | 2625.20 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 17.262 | .0300 | | | | | .0351 | .61 | 3.25 | 3.08 | 3.44 | .013 | .00 | .00 | BOX |
| -682.738 | 2607.038 | 3.241 | 2610.279 | 820.00 | 31.63 | 15.53 | 2625.81 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 182.738 | .0300 | | | | | .0377 | 6.88 | 3.24 | 3.10 | 3.44 | .013 | .00 | .00 | BOX |
| -500.000 | 2612.520 | 3.090 | 2615.610 | 820.00 | 33.17 | 17.09 | 2632.70 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |

Farm Lateral WSPG
(N=0.015)

# Worksheet for Farm Lateral SO

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.015 | |
| Channel Slope | 0.01200 | ft/ft |
| Height | 6.00 | ft |
| Bottom Width | 8.00 | ft |
| Discharge | 820.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 5.42 | ft |
| Flow Area | 43.35 | ft² |
| Wetted Perimeter | 18.84 | ft |
| Hydraulic Radius | 2.30 | ft |
| Top Width | 8.00 | ft |
| Critical Depth | 6.89 | ft |
| Percent Full | 90.3 | % |
| Critical Slope | 0.00655 | ft/ft |
| Velocity | 18.92 | ft/s |
| Velocity Head | 5.56 | ft |
| Specific Energy | 10.98 | ft |
| Froude Number | 1.43 | |
| Discharge Full | 746.09 | ft³/s |
| Slope Full | 0.00993 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 90.31 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Farm Lateral SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.015 | |
| Channel Slope | 0.04000 | ft/ft |
| Height | 6.00 | ft |
| Bottom Width | 8.00 | ft |
| Discharge | 820.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 3.44 | ft |
| Flow Area | 27.48 | ft² |
| Wetted Perimeter | 14.87 | ft |
| Hydraulic Radius | 1.85 | ft |
| Top Width | 8.00 | ft |
| Critical Depth | 6.89 | ft |
| Percent Full | 57.3 | % |
| Critical Slope | 0.00655 | ft/ft |
| Velocity | 29.84 | ft/s |
| Velocity Head | 13.83 | ft |
| Specific Energy | 17.27 | ft |
| Froude Number | 2.84 | |
| Discharge Full | 1362.17 | ft³/s |
| Slope Full | 0.11037 | ft/ft |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 57.26 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL PARKWAY CHANNEL WEST                                          0
T2 FARM ROAD LATERAL - ULTIMATE CONDITIONS
T3 APR 2017 BY NEL
SO  -1682.4402589.780  1                         2595.200
R   -1550.0002591.260  1      .015                             .000    .000 0
R   -1474.9602592.100  1      .015                             .000    .000 0
R   -1402.6402592.910  1      .015                             .000    .000 0
R   -1350.0002593.500  1      .015                          -20.106    .000 0
R   -1263.2702594.920  1      .015                          -33.129    .000 0
R   -1150.0002596.780  1      .015                             .000    .000 0
R    -996.0002599.310  1      .015                             .000    .000 0
R    -925.2302600.070  1      .015                            8.110    .000 0
R    -854.4602600.820  1      .015                           -8.110    .000 0
R    -838.2502601.000  1      .015                             .000    .000 0
R    -700.0002606.520  1      .015                             .000    .000 0
R    -500.0002612.520  1      .015                             .000    .000 0
SH   -500.0002612.520  1                         2615.960
CD   1  3   0    .000   6.000    8.000  .000  .000   .00
Q           820.000   .0
```

CENTENNIAL PARKWAY CHANNEL WEST
FARM ROAD LATERAL - ULTIMATE CONDITIONS
APR 2017 BY NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -1682.440 | 2589.780 | 5.336 | 2595.116 | 820.00 | 19.21 | 5.73 | 2600.85 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 132.440 | .0112 | | | | | .0131 | 1.74 | 5.34 | 1.47 | 5.57 | .015 | .00 | .00 | BOX |
| -1550.000 | 2591.260 | 5.131 | 2596.391 | 820.00 | 19.98 | 6.20 | 2602.59 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 75.040 | .0112 | | | | | .0144 | 1.08 | 5.13 | 1.55 | 5.57 | .015 | .00 | .00 | BOX |
| -1474.960 | 2592.100 | 4.974 | 2597.074 | 820.00 | 20.61 | 6.59 | 2603.67 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 72.320 | .0112 | | | | | .0157 | 1.14 | 4.97 | 1.63 | 5.57 | .015 | .00 | .00 | BOX |
| -1402.640 | 2592.910 | 4.792 | 2597.702 | 820.00 | 21.39 | 7.10 | 2604.81 | .76 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 52.640 | .0112 | | | | | .0172 | .91 | 5.55 | 1.72 | 5.56 | .015 | .00 | .00 | BOX |
| -1350.000 | 2593.500 | 4.642 | 2598.142 | 820.00 | 22.08 | 7.57 | 2605.71 | .81 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 86.730 | .0164 | | | | | .0183 | 1.59 | 5.45 | 1.81 | 4.81 | .015 | .00 | .00 | BOX |
| -1263.270 | 2594.920 | 4.570 | 2599.490 | 820.00 | 22.43 | 7.81 | 2607.30 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 113.270 | .0164 | | | | | .0194 | 2.20 | 4.57 | 1.85 | 4.80 | .015 | .00 | .00 | BOX |
| -1150.000 | 2596.780 | 4.438 | 2601.218 | 820.00 | 23.10 | 8.28 | 2609.50 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 44.860 | .0164 | | | | | .0206 | .92 | 4.44 | 1.93 | 4.80 | .015 | .00 | .00 | BOX |
| -1105.140 | 2597.517 | 4.372 | 2601.889 | 820.00 | 23.45 | 8.54 | 2610.42 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 109.140 | .0164 | | | | | .0224 | 2.44 | 4.37 | 1.98 | 4.80 | .015 | .00 | .00 | BOX |
| -996.000 | 2599.310 | 4.168 | 2603.479 | 820.00 | 24.59 | 9.39 | 2612.87 | .30 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 21.726 | .0107 | | | | | .0244 | .53 | 4.47 | 2.12 | 5.66 | .015 | .00 | .00 | BOX |

CENTENNIAL PARKWAY CHANNEL WEST
FARM ROAD LATERAL - ULTIMATE CONDITIONS
APR 2017 BY NEL

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -974.274 | 2599.543 | 4.087 | 2603.630 | 820.00 | 25.08 | 9.77 | 2613.40 | .31 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 49.044 | .0107 | | | | | .0268 | 1.31 | 4.40 | 2.19 | 5.66 | .015 | .00 | .00 | BOX |
| -925.230 | 2600.070 | 3.896 | 2603.967 | 820.00 | 26.31 | 10.75 | 2614.71 | .34 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 27.571 | .0106 | | | | | .0296 | .82 | 4.24 | 2.35 | 5.69 | .015 | .00 | .00 | BOX |
| -897.659 | 2600.362 | 3.786 | 2604.148 | 820.00 | 27.07 | 11.38 | 2615.53 | .36 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 43.199 | .0106 | | | | | .0329 | 1.42 | 4.15 | 2.45 | 5.69 | .015 | .00 | .00 | BOX |
| -854.460 | 2600.820 | 3.610 | 2604.430 | 820.00 | 28.39 | 12.52 | 2616.95 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 16.210 | .0111 | | | | | .0359 | .58 | 3.61 | 2.63 | 5.59 | .015 | .00 | .00 | BOX |
| -838.250 | 2601.000 | 3.544 | 2604.544 | 820.00 | 28.92 | 12.99 | 2617.53 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 138.250 | .0399 | | | | | .0354 | 4.89 | 3.54 | 2.71 | 3.44 | .015 | .00 | .00 | BOX |
| -700.000 | 2606.520 | 3.650 | 2610.169 | 820.00 | 28.09 | 12.25 | 2622.42 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 54.059 | .0300 | | | | | .0345 | 1.86 | 3.65 | 2.59 | 3.82 | .015 | .00 | .00 | BOX |
| -645.941 | 2608.142 | 3.608 | 2611.750 | 820.00 | 28.41 | 12.53 | 2624.28 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |
| 145.941 | .0300 | | | | | .0374 | 5.46 | 3.61 | 2.64 | 3.82 | .015 | .00 | .00 | BOX |
| -500.000 | 2612.520 | 3.440 | 2615.960 | 820.00 | 29.80 | 13.79 | 2629.75 | .00 | 6.00 | 8.00 | 6.000 | 8.000 | .00 | 0 .0 |

# B.1.5 Grand Teton Lateral WSPG

# Worksheet for Grand Teton SH

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.01990 | ft/ft |
| Diameter | 3.50 | ft |
| Discharge | 77.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.84 | ft |
| Flow Area | 5.12 | ft² |
| Wetted Perimeter | 5.67 | ft |
| Hydraulic Radius | 0.90 | ft |
| Top Width | 3.50 | ft |
| Critical Depth | 2.75 | ft |
| Percent Full | 52.5 | % |
| Critical Slope | 0.00638 | ft/ft |
| Velocity | 15.05 | ft/s |
| Velocity Head | 3.52 | ft |
| Specific Energy | 5.36 | ft |
| Froude Number | 2.19 | |
| Maximum Discharge | 152.66 | ft³/s |
| Discharge Full | 141.92 | ft³/s |
| Slope Full | 0.00586 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 52.49 | % |
| Downstream Velocity | Infinity | ft/s |

```
T1 CENTENNIAL CHANNEL PARKWAY WEST                                              0
T2 GRAND TETON LATERAL
T3 APR 2017 BY NEL
SO  -4229.0002647.730  1                          2651.780
R   -4096.6302650.400  1      .013                                 .000    .000 0
JX  -4092.6302650.600  1  2   .013    7.000         2652.200        90.0         .000
R   -4045.0602653.300  1      .013                                 .000  -2.741 0
R   -4040.1402653.500  1      .013                                 .000 -28.420 0
R   -4008.0602657.073  1      .013                                 .000    .000 0
SH  -4008.0602657.073  1                          2659.013
CD   1  4   1    .000   3.500     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
Q            77.000   .0
```

CENTENNIAL CHANNEL PARKWAY WEST
GRAND TETON LATERAL
APR 2017 BY NEL

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/ Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -4229.000 | 2647.730 | 1.825 | 2649.555 | 84.00 | 16.56 | 4.26 | 2653.81 | .00 | 2.86 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 47.096 | .0202 | | | | | .0253 | 1.19 | 1.82 | 2.42 | 1.93 | .013 | .00 | .00 | PIPE |
| -4181.904 | 2648.680 | 1.778 | 2650.458 | 84.00 | 17.11 | 4.55 | 2655.01 | .00 | 2.86 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 48.412 | .0202 | | | | | .0282 | 1.37 | 1.78 | 2.55 | 1.93 | .013 | .00 | .00 | PIPE |
| -4133.492 | 2649.656 | 1.713 | 2651.369 | 84.00 | 17.95 | 5.00 | 2656.37 | .00 | 2.86 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 36.862 | .0202 | | | | | .0321 | 1.18 | 1.71 | 2.73 | 1.93 | .013 | .00 | .00 | PIPE |
| -4096.630 | 2650.400 | 1.650 | 2652.050 | 84.00 | 18.82 | 5.50 | 2657.55 | .00 | 2.86 | 3.49 | 3.500 | .000 | .00 | 1 .0 |
| JUNCT STR | .0500 | | | | | .0410 | .16 | 1.65 | 2.94 | | .013 | .00 | .00 | PIPE |
| -4092.630 | 2650.600 | 1.429 | 2652.029 | 77.00 | 20.85 | 6.75 | 2658.78 | .00 | 2.74 | 3.44 | 3.500 | .000 | .00 | 1 .0 |
| .021 | .0568 | | | | | .0479 | .00 | 1.43 | 3.55 | 1.36 | .013 | .00 | .00 | PIPE |
| -4092.608 | 2650.601 | 1.429 | 2652.030 | 77.00 | 20.85 | 6.75 | 2658.78 | .00 | 2.74 | 3.44 | 3.500 | .000 | .00 | 1 .0 |
| 47.548 | .0568 | | | | | .0450 | 2.14 | 1.43 | 3.55 | 1.36 | .013 | .00 | .00 | PIPE |
| -4045.060 | 2653.300 | 1.481 | 2654.781 | 77.00 | 19.88 | 6.14 | 2660.92 | .00 | 2.74 | 3.46 | 3.500 | .000 | .00 | 1 .0 |
| 4.920 | .0406 | | | | | .0421 | .21 | 1.48 | 3.31 | 1.50 | .013 | .00 | .00 | PIPE |
| -4040.140 | 2653.500 | 1.480 | 2654.980 | 77.00 | 19.89 | 6.14 | 2661.12 | .00 | 2.74 | 3.46 | 3.500 | .000 | .00 | 1 .0 |
| 2.077 | .1114 | | | | | .0414 | .09 | 1.48 | 3.31 | 1.14 | .013 | .00 | .00 | PIPE |
| -4038.063 | 2653.731 | 1.495 | 2655.227 | 77.00 | 19.64 | 5.99 | 2661.21 | .00 | 2.74 | 3.46 | 3.500 | .000 | .00 | 1 .0 |
| 6.683 | .1114 | | | | | .0382 | .26 | 1.50 | 3.25 | 1.14 | .013 | .00 | .00 | PIPE |

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| -4031.379 | 2654.476 | 1.550 | 2656.026 | 77.00 | 18.72 | 5.44 | 2661.47 | .00 | 2.74 | 3.48 | 3.500 | .000 | .00 | 1 .0 |
| 5.617 | .1114 | | | | | .0336 | .19 | 1.55 | 3.03 | 1.14 | .013 | .00 | .00 | PIPE |
| -4025.763 | 2655.101 | 1.608 | 2656.709 | 77.00 | 17.85 | 4.95 | 2661.66 | .00 | 2.74 | 3.49 | 3.500 | .000 | .00 | 1 .0 |
| 4.759 | .1114 | | | | | .0295 | .14 | 1.61 | 2.83 | 1.14 | .013 | .00 | .00 | PIPE |
| -4021.004 | 2655.631 | 1.668 | 2657.299 | 77.00 | 17.02 | 4.50 | 2661.80 | .00 | 2.74 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 4.048 | .1114 | | | | | .0260 | .11 | 1.67 | 2.64 | 1.14 | .013 | .00 | .00 | PIPE |
| -4016.956 | 2656.082 | 1.731 | 2657.813 | 77.00 | 16.23 | 4.09 | 2661.90 | .00 | 2.74 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 3.453 | .1114 | | | | | .0229 | .08 | 1.73 | 2.46 | 1.14 | .013 | .00 | .00 | PIPE |
| -4013.503 | 2656.467 | 1.797 | 2658.264 | 77.00 | 15.47 | 3.72 | 2661.98 | .00 | 2.74 | 3.50 | 3.500 | .000 | .00 | 1 .0 |
| 2.942 | .1114 | | | | | .0201 | .06 | 1.80 | 2.29 | 1.14 | .013 | .00 | .00 | PIPE |
| -4010.561 | 2656.794 | 1.867 | 2658.661 | 77.00 | 14.75 | 3.38 | 2662.04 | .00 | 2.74 | 3.49 | 3.500 | .000 | .00 | 1 .0 |
| 2.501 | .1114 | | | | | .0178 | .04 | 1.87 | 2.13 | 1.14 | .013 | .00 | .00 | PIPE |
| -4008.060 | 2657.073 | 1.940 | 2659.013 | 77.00 | 14.07 | 3.07 | 2662.09 | .00 | 2.74 | 3.48 | 3.500 | .000 | .00 | 1 .0 |

# B.2 Lateral Facilities and Inlets

- B.2.1 Gilcrease Avenue Drop Inlets
- B.2.2 Farm Road Drop Inlets
- B.2.3 Main Line Field Inlets

# B.2.1 Gilcrease Avenue Drop Inlets

**TABLE B.2.1: DROP INLET DEPTH CALCULATIONS - GILCREASE LATERAL**
**Centennial Parkway Channel West**
**LBG Project: 20041569**

**By: LDN**
**Checked By: JSD**
**Date: 04/21/17**

| Inlet Name | Structure ID | Station & Offset | Inlet Type | Pipe | | | | | Drop Inlet | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size d | Area | Slope S | Flow Q | Velocity v | Curb Height CF | Minimum Depth V | Actual Depth D | DI Configuration | 100-yr Flow | Intercepted | Bypass | Depth | V | DxV | Flow Source |
| | | | | (inches) | (sq feet) | (ft/ft) | (cfs) | (ft/s) | (feet) | (feet) | (feet) | | (cfs) | (cfs) | (cfs) | (ft) | (ft/s) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (22) |
| #1a | 8.20 | "GA" 11+16.98,29.71' LT | "DM" DROP INLET (L=22.5') | 30 | 4.91 | 0.0397 | 51.3 | 10.4 | 0.83 | 5.87 | 6.00 | On Grade | 92.50 | 51.26 | 41.24 | 0.69 | 10.44 | 7.20 | Gilcrease Watershed |
| #1b | 8.21 | "GA" 11+17.18,22.11' RT | "DM" DROP INLET (L=22.5') | 30 | 4.91 | 0.0551 | 51.3 | 10.4 | 0.83 | 5.87 | 6.00 | On Grade | 92.50 | 51.26 | 41.24 | 0.69 | 10.44 | 7.20 | Gilcrease Watershed |
| #2a | 8.22 | "GA" 11+75.29,30.02' LT | "DM" DROP INLET (L=20') | 24 | 3.14 | 0.0656 | 26.6 | 8.5 | 0.83 | 4.67 | 5.00 | On Grade | 41.24 | 26.59 | 14.65 | 0.53 | 8.57 | 4.54 | Bypass from #1a |
| #2b | 8.23 | "GA" 11+75.49,23.15' RT | "DM" DROP INLET (L=20') | 24 | 3.14 | 0.0793 | 26.6 | 8.5 | 0.83 | 4.67 | 5.00 | On Grade | 41.24 | 26.59 | 14.65 | 0.53 | 8.57 | 4.54 | Bypass from #1b |
| #3a | 8.24 | "GA" 12+24.77,30.18' LT | "DM" DROP INLET (L=20') | 18 | 1.77 | 0.0924 | 12.4 | 7.0 | 0.83 | 3.75 | 4.00 | On Grade | 14.65 | 12.36 | 2.29 | 0.39 | 6.70 | 2.61 | Bypass from #2a |
| #3b | 8.25 | "GA" 12+21.19,24.08' RT | "DM" DROP INLET (L=20') | 18 | 1.77 | 0.1031 | 12.4 | 7.0 | 0.83 | 3.75 | 4.00 | On Grade | 14.65 | 12.36 | 2.29 | 0.39 | 6.70 | 2.61 | Bypass from #2b |
| #4a | 8.26 | "GA" 12+59.45,30.88' LT | "DM" DROP INLET (L=10') | 18 | 1.77 | 0.0301 | 2.3 | 1.3 | 0.83 | 2.86 | 3.60 | On Grade | 2.29 | 2.25 | 0.04 | 0.24 | 3.82 | 0.92 | Bypass from #3a |
| #4b | 8.27 | "GA" 12+60.23,24.38' RT | "DM" DROP INLET (L=10') | 18 | 1.77 | 0.1734 | 2.3 | 1.3 | 0.83 | 2.89 | 3.00 | On Grade | 2.29 | 2.25 | 0.04 | 0.24 | 3.82 | 0.92 | Bypass from #3a |

V = CF + 0.5 +1.2 ($v^2$/2g) + d/Cos(S) Source: CCRFCD HCDDM Equation 801

V = Depth of the catch basin from the pipe invert to the top of the curb in feet

CF = Vertical dimension of the curb face in feet.

v = Average velocity of the flow in the pipe, assuming a full pipe section in feet per second.

d = Diameter of the connector pipe in feet.

S = Slope of the connector pipe

Note: The term 1.2 (v2/2g) inludes an entrance loss of 0.2 of the velocity head.

v = Q / A

Q = Flow intercepted by the drop inlet, in cubic feet per second.

A = Cross sectional area of the pipe, in square feet.

# Worksheet for #1_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 92.50 | ft³/s |
| Slope | | 0.02900 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 22.00 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 22.00 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 55.42 | % |
| Intercepted Flow | 51.26 | ft³/s |
| Bypass Flow | 41.24 | ft³/s |
| Spread | 29.64 | ft |
| Depth | 0.69 | ft |
| Flow Area | 8.86 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 10.44 | ft/s |
| Splash Over Velocity | 42.00 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.33 | |
| Grate Flow Ratio | 0.15 | |
| Equivalent Cross Slope | 0.06142 | ft/ft |
| Active Grate Length | 11.00 | ft |
| Length Factor | 0.11 | |
| Total Interception Length | 100.29 | ft |

# Worksheet for Pipe 1a (8.20)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.03970 | ft/ft |
| Diameter | 2.50 | ft |
| Discharge | 51.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.43 | ft |
| Flow Area | 2.90 | $ft^2$ |
| Wetted Perimeter | 4.29 | ft |
| Hydraulic Radius | 0.68 | ft |
| Top Width | 2.47 | ft |
| Critical Depth | 2.31 | ft |
| Percent Full | 57.2 | % |
| Critical Slope | 0.01340 | ft/ft |
| Velocity | 17.56 | ft/s |
| Velocity Head | 4.79 | ft |
| Specific Energy | 6.22 | ft |
| Froude Number | 2.86 | |
| Maximum Discharge | 87.91 | $ft^3/s$ |
| Discharge Full | 81.72 | $ft^3/s$ |
| Slope Full | 0.01546 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 57.23 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Pipe 1b (8.21)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.05510 | ft/ft |
| Diameter | 2.50 | ft |
| Discharge | 51.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.29 | ft |
| Flow Area | 2.56 | $ft^2$ |
| Wetted Perimeter | 4.01 | ft |
| Hydraulic Radius | 0.64 | ft |
| Top Width | 2.50 | ft |
| Critical Depth | 2.31 | ft |
| Percent Full | 51.7 | % |
| Critical Slope | 0.01340 | ft/ft |
| Velocity | 19.90 | ft/s |
| Velocity Head | 6.15 | ft |
| Specific Energy | 7.45 | ft |
| Froude Number | 3.46 | |
| Maximum Discharge | 103.56 | $ft^3/s$ |
| Discharge Full | 96.28 | $ft^3/s$ |
| Slope Full | 0.01546 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 51.74 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for #2_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 41.24 | ft³/s |
| Slope | | 0.02900 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 19.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 19.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 64.48 | % |
| Intercepted Flow | 26.59 | ft³/s |
| Bypass Flow | 14.65 | ft³/s |
| Spread | 21.78 | ft |
| Depth | 0.53 | ft |
| Flow Area | 4.81 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 8.57 | ft/s |
| Splash Over Velocity | 31.33 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.34 | |
| Grate Flow Ratio | 0.20 | |
| Equivalent Cross Slope | 0.07735 | ft/ft |
| Active Grate Length | 9.75 | ft |
| Length Factor | 0.16 | |
| Total Interception Length | 62.21 | ft |

# Worksheet for Pipe 2a (8.22)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.06560 | ft/ft |
| Diameter | 2.00 | ft |
| Discharge | 27.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.96 | ft |
| Flow Area | 1.49 | $ft^2$ |
| Wetted Perimeter | 3.06 | ft |
| Hydraulic Radius | 0.49 | ft |
| Top Width | 2.00 | ft |
| Critical Depth | 1.81 | ft |
| Percent Full | 48.0 | % |
| Critical Slope | 0.01250 | ft/ft |
| Velocity | 18.12 | ft/s |
| Velocity Head | 5.10 | ft |
| Specific Energy | 6.06 | ft |
| Froude Number | 3.70 | |
| Maximum Discharge | 62.32 | $ft^3/s$ |
| Discharge Full | 57.94 | $ft^3/s$ |
| Slope Full | 0.01425 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 47.97 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Pipe 2b (8.23)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.07930 | ft/ft |
| Diameter | 2.00 | ft |
| Discharge | 27.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.91 | ft |
| Flow Area | 1.39 | $ft^2$ |
| Wetted Perimeter | 2.96 | ft |
| Hydraulic Radius | 0.47 | ft |
| Top Width | 1.99 | ft |
| Critical Depth | 1.81 | ft |
| Percent Full | 45.4 | % |
| Critical Slope | 0.01250 | ft/ft |
| Velocity | 19.44 | ft/s |
| Velocity Head | 5.87 | ft |
| Specific Energy | 6.78 | ft |
| Froude Number | 4.10 | |
| Maximum Discharge | 68.52 | $ft^3/s$ |
| Discharge Full | 63.70 | $ft^3/s$ |
| Slope Full | 0.01425 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 45.45 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for #3_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 14.65 | ft³/s |
| Slope | | 0.02900 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 19.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 19.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 84.35 | % |
| Intercepted Flow | 12.36 | ft³/s |
| Bypass Flow | 2.29 | ft³/s |
| Spread | 14.55 | ft |
| Depth | 0.39 | ft |
| Flow Area | 2.19 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 6.70 | ft/s |
| Splash Over Velocity | 31.33 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.45 | |
| Grate Flow Ratio | 0.31 | |
| Equivalent Cross Slope | 0.10743 | ft/ft |
| Active Grate Length | 9.75 | ft |
| Length Factor | 0.29 | |
| Total Interception Length | 33.07 | ft |

# Worksheet for Pipe 3a (8.24)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.09240 | ft/ft |
| Diameter | 1.50 | ft |
| Discharge | 12.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.64 | ft |
| Flow Area | 0.71 | $ft^2$ |
| Wetted Perimeter | 2.13 | ft |
| Hydraulic Radius | 0.34 | ft |
| Top Width | 1.48 | ft |
| Critical Depth | 1.31 | ft |
| Percent Full | 42.5 | % |
| Critical Slope | 0.01180 | ft/ft |
| Velocity | 16.79 | ft/s |
| Velocity Head | 4.38 | ft |
| Specific Energy | 5.02 | ft |
| Froude Number | 4.26 | |
| Maximum Discharge | 34.35 | $ft^3/s$ |
| Discharge Full | 31.93 | $ft^3/s$ |
| Slope Full | 0.01305 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 42.47 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Pipe 3b (8.25)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.10310 | ft/ft |
| Diameter | 1.50 | ft |
| Discharge | 12.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.62 | ft |
| Flow Area | 0.69 | $ft^2$ |
| Wetted Perimeter | 2.09 | ft |
| Hydraulic Radius | 0.33 | ft |
| Top Width | 1.48 | ft |
| Critical Depth | 1.31 | ft |
| Percent Full | 41.2 | % |
| Critical Slope | 0.01180 | ft/ft |
| Velocity | 17.47 | ft/s |
| Velocity Head | 4.74 | ft |
| Specific Energy | 5.36 | ft |
| Froude Number | 4.51 | |
| Maximum Discharge | 36.28 | $ft^3/s$ |
| Discharge Full | 33.73 | $ft^3/s$ |
| Slope Full | 0.01305 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 41.22 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for #4_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 2.29 | ft³/s |
| Slope | | 0.01900 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 9.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 9.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 98.16 | % |
| Intercepted Flow | 2.25 | ft³/s |
| Bypass Flow | 0.04 | ft³/s |
| Spread | 7.27 | ft |
| Depth | 0.24 | ft |
| Flow Area | 0.60 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 3.82 | ft/s |
| Splash Over Velocity | 12.68 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.30 | |
| Grate Flow Ratio | 0.59 | |
| Equivalent Cross Slope | 0.18942 | ft/ft |
| Active Grate Length | 4.75 | ft |
| Length Factor | 0.50 | |
| Total Interception Length | 9.51 | ft |

# Worksheet for Pipe 4a (8.26)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.03010 | ft/ft |
| Diameter | 1.50 | ft |
| Discharge | 2.50 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.38 | ft |
| Flow Area | 0.35 | $ft^2$ |
| Wetted Perimeter | 1.57 | ft |
| Hydraulic Radius | 0.22 | ft |
| Top Width | 1.30 | ft |
| Critical Depth | 0.60 | ft |
| Percent Full | 25.0 | % |
| Critical Slope | 0.00502 | ft/ft |
| Velocity | 7.23 | ft/s |
| Velocity Head | 0.81 | ft |
| Specific Energy | 1.19 | ft |
| Froude Number | 2.47 | |
| Maximum Discharge | 19.60 | $ft^3/s$ |
| Discharge Full | 18.22 | $ft^3/s$ |
| Slope Full | 0.00057 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 25.02 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Pipe 4b (8.27)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.17340 | ft/ft |
| Diameter | 1.50 | ft |
| Discharge | 2.50 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.24 | ft |
| Flow Area | 0.19 | $ft^2$ |
| Wetted Perimeter | 1.24 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 1.11 | ft |
| Critical Depth | 0.60 | ft |
| Percent Full | 16.2 | % |
| Critical Slope | 0.00502 | ft/ft |
| Velocity | 13.42 | ft/s |
| Velocity Head | 2.80 | ft |
| Specific Energy | 3.04 | ft |
| Froude Number | 5.77 | |
| Maximum Discharge | 47.05 | $ft^3/s$ |
| Discharge Full | 43.74 | $ft^3/s$ |
| Slope Full | 0.00057 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 16.23 | % |
| Downstream Velocity | Infinity | ft/s |

# B.2.2 Farm Road Drop Inlets

**TABLE B.2.2: DROP INLET DEPTH CALCULATIONS - FARM LATERAL**
**Centennial Parkway Channel West**
**LBG Project: 20041569**

**By: LDN**
**Checked By: JSD**
**Date: 04/21/17**

| Inlet Name | Structure ID | Station & Offset | Inlet Type | Pipe | | | | | Drop Inlet | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Size d | Area | Slope S | Flow Q | Velocity v | Curb Height CF | Minimum Depth V | Actual Depth D | DI Configuration | 100-yr Flow | Intercepted[1] | Bypass | Depth | V | DxV | Flow Source |
| | | | | (inches) | (sq feet) | (ft/ft) | (cfs) | (ft/s) | (feet) | (feet) | (feet) | | (cfs) | (cfs) | (cfs) | (ft) | (ft/s) | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (22) |
| #5a | 9.20 | "FR" 5+74.09,43.21' LT | "DM" DROP INLET (L=20') | 36 | 7.07 | 0.0938 | 112.2 | 15.9 | 0.83 | 9.04 | 9.00 | On Grade | 410.00 | 112.20 | 297.80 | 1.09 | 16.39 | 17.87 | Farm Watershed |
| #5b | 9.21 | "FR" 6+85.46,22.88' RT | "DM" DROP INLET (L=20') | 36 | 7.07 | 0.2040 | 112.2 | 15.9 | 0.83 | 9.09 | 9.80 | On Grade | 410.00 | 112.20 | 297.80 | 1.09 | 16.39 | 17.87 | Farm Watershed |
| #6 | 9.22 | "FR" 7+86.84,43.26' LT | "DM" DROP INLET (L=20') | 30 | 4.91 | 0.1600 | 92.0 | 18.7 | 0.83 | 10.41 | 10.00 | On Grade | 297.80 | 92.00 | 205.80 | 0.98 | 15.14 | 14.84 | Bypass from #5a |
| #7 | 9.23 | "FR" 7+72.08,22.93' RT | "DM" DROP INLET (L=5') | 18 | 1.77 | 0.3069 | 19.4 | 11.0 | 0.83 | 5.15 | 10.00 | On Grade | 297.80 | 19.39 | 278.41 | 0.98 | 15.14 | 14.84 | Bypass from #5b |

1) Interim Conditions

V = CF + 0.5 +1.2 ($v^2$/2g) + d/Cos(S) Source: CCRFCD HCDDM Equation 801

V = Depth of the catch basin from the pipe invert to the top of the curb in feet

CF = Vertical dimension of the curb face in feet.

v = Average velocity of the flow in the pipe, assuming a full pipe section in feet per second.

d = Diameter of the connector pipe in feet.

S = Slope of the connector pipe

Note: The term 1.2 (v2/2g) inludes an entrance loss of 0.2 of the velocity head.

v = Q / A

Q = Flow intercepted by the drop inlet, in cubic feet per second.

A = Cross sectional area of the pipe, in square feet.

# Worksheet for #5_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 410.00 | ft³/s |
| Slope | | 0.03600 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 19.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 19.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 27.37 | % |
| Intercepted Flow | 112.20 | ft³/s |
| Bypass Flow | 297.80 | ft³/s |
| Spread | 49.94 | ft |
| Depth | 1.09 | ft |
| Flow Area | 25.01 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 16.39 | ft/s |
| Splash Over Velocity | 31.33 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.14 | |
| Grate Flow Ratio | 0.08 | |
| Equivalent Cross Slope | 0.04398 | ft/ft |
| Active Grate Length | 9.75 | ft |
| Length Factor | 0.04 | |
| Total Interception Length | 244.38 | ft |

# Worksheet for Pipe 5a

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.09380 | ft/ft |
| Diameter | 3.00 | ft |
| Discharge | 112.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.58 | ft |
| Flow Area | 3.79 | $ft^2$ |
| Wetted Perimeter | 4.88 | ft |
| Hydraulic Radius | 0.78 | ft |
| Top Width | 3.00 | ft |
| Critical Depth | 2.93 | ft |
| Percent Full | 52.8 | % |
| Critical Slope | 0.02513 | ft/ft |
| Velocity | 29.57 | ft/s |
| Velocity Head | 13.58 | ft |
| Specific Energy | 15.17 | ft |
| Froude Number | 4.63 | |
| Maximum Discharge | 219.73 | $ft^3/s$ |
| Discharge Full | 204.26 | $ft^3/s$ |
| Slope Full | 0.02820 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 52.82 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for Pipe 5b

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.20400 | ft/ft |
| Diameter | 3.00 | ft |
| Discharge | 112.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.27 | ft |
| Flow Area | 2.84 | $ft^2$ |
| Wetted Perimeter | 4.24 | ft |
| Hydraulic Radius | 0.67 | ft |
| Top Width | 2.96 | ft |
| Critical Depth | 2.93 | ft |
| Percent Full | 42.2 | % |
| Critical Slope | 0.02512 | ft/ft |
| Velocity | 39.47 | ft/s |
| Velocity Head | 24.21 | ft |
| Specific Energy | 25.48 | ft |
| Froude Number | 7.11 | |
| Maximum Discharge | 324.04 | $ft^3/s$ |
| Discharge Full | 301.24 | $ft^3/s$ |
| Slope Full | 0.02820 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 42.23 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for #6_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 297.80 | ft³/s |
| Slope | | 0.03600 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 19.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 19.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 30.98 | % |
| Intercepted Flow | 92.25 | ft³/s |
| Bypass Flow | 205.55 | ft³/s |
| Spread | 44.28 | ft |
| Depth | 0.98 | ft |
| Flow Area | 19.67 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 15.14 | ft/s |
| Splash Over Velocity | 31.33 | ft/s |
| Frontal Flow Factor | 1.00 | |
| Side Flow Factor | 0.16 | |
| Grate Flow Ratio | 0.10 | |
| Equivalent Cross Slope | 0.04719 | ft/ft |
| Active Grate Length | 9.75 | ft |
| Length Factor | 0.05 | |
| Total Interception Length | 204.83 | ft |

# Worksheet for Pipe 6

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.16000 | ft/ft |
| Diameter | 2.50 | ft |
| Discharge | 92.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.34 | ft |
| Flow Area | 2.68 | $ft^2$ |
| Wetted Perimeter | 4.10 | ft |
| Hydraulic Radius | 0.65 | ft |
| Top Width | 2.49 | ft |
| Critical Depth | 2.48 | ft |
| Percent Full | 53.5 | % |
| Critical Slope | 0.04670 | ft/ft |
| Velocity | 34.38 | ft/s |
| Velocity Head | 18.37 | ft |
| Specific Energy | 19.71 | ft |
| Froude Number | 5.85 | |
| Maximum Discharge | 176.48 | $ft^3/s$ |
| Discharge Full | 164.06 | $ft^3/s$ |
| Slope Full | 0.05031 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 53.55 | % |
| Downstream Velocity | Infinity | ft/s |

# Worksheet for #7_DM_Inlet

## Project Description

| | |
|---|---|
| Solve For | Efficiency |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 297.80 | ft³/s |
| Slope | | 0.03600 | ft/ft |
| Gutter Width | | 1.50 | ft |
| Gutter Cross Slope | | 0.08 | ft/ft |
| Road Cross Slope | | 0.02 | ft/ft |
| Roughness Coefficient | | 0.013 | |
| Local Depression | | 4.00 | in |
| Local Depression Width | | 1.50 | ft |
| Grate Width | | 1.50 | ft |
| Grate Length | | 4.50 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |
| Curb Opening Length | | 4.50 | ft |

## Options

| | |
|---|---|
| Calculation Option | Use Both |
| Grate Flow Option | Exclude None |

## Results

| | | |
|---|---|---|
| Efficiency | 6.51 | % |
| Intercepted Flow | 19.39 | ft³/s |
| Bypass Flow | 278.41 | ft³/s |
| Spread | 44.28 | ft |
| Depth | 0.98 | ft |
| Flow Area | 19.67 | ft² |
| Gutter Depression | 0.09 | ft |
| Total Depression | 0.43 | ft |
| Velocity | 15.14 | ft/s |
| Splash Over Velocity | 8.64 | ft/s |
| Frontal Flow Factor | 0.41 | |
| Side Flow Factor | 0.01 | |
| Grate Flow Ratio | 0.10 | |
| Equivalent Cross Slope | 0.04719 | ft/ft |
| Active Grate Length | 2.25 | ft |
| Length Factor | 0.01 | |
| Total Interception Length | 204.83 | ft |

# Worksheet for Pipe 7

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.30690 | ft/ft |
| Diameter | 1.50 | ft |
| Discharge | 19.00 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.59 | ft |
| Flow Area | 0.65 | $ft^2$ |
| Wetted Perimeter | 2.03 | ft |
| Hydraulic Radius | 0.32 | ft |
| Top Width | 1.47 | ft |
| Critical Depth | 1.46 | ft |
| Percent Full | 39.3 | % |
| Critical Slope | 0.02896 | ft/ft |
| Velocity | 29.45 | ft/s |
| Velocity Head | 13.48 | ft |
| Specific Energy | 14.07 | ft |
| Froude Number | 7.83 | |
| Maximum Discharge | 62.59 | $ft^3/s$ |
| Discharge Full | 58.19 | $ft^3/s$ |
| Slope Full | 0.03272 | ft/ft |
| Flow Type | SuperCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.000 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 39.32 | % |
| Downstream Velocity | Infinity | ft/s |

# B.2.3 Main Line Field Inlets

# Worksheet for Main Line Field Inlet

## Project Description

| | |
|---|---|
| Solve For | Spread |

## Input Data

| | | | |
|---|---|---|---|
| Discharge | | 8.40 | $ft^3/s$ |
| Left Side Slope | | 3.00 | ft/ft (H:V) |
| Right Side Slope | | 3.00 | ft/ft (H:V) |
| Bottom Width | | 2.00 | ft |
| Grate Width | | 2.00 | ft |
| Grate Length | | 3.00 | ft |
| Local Depression | | 0.00 | in |
| Local Depression Width | | 0.00 | ft |
| Grate Type | P-50 mm (P-1-7/8") | | |
| Clogging | | 50.00 | % |

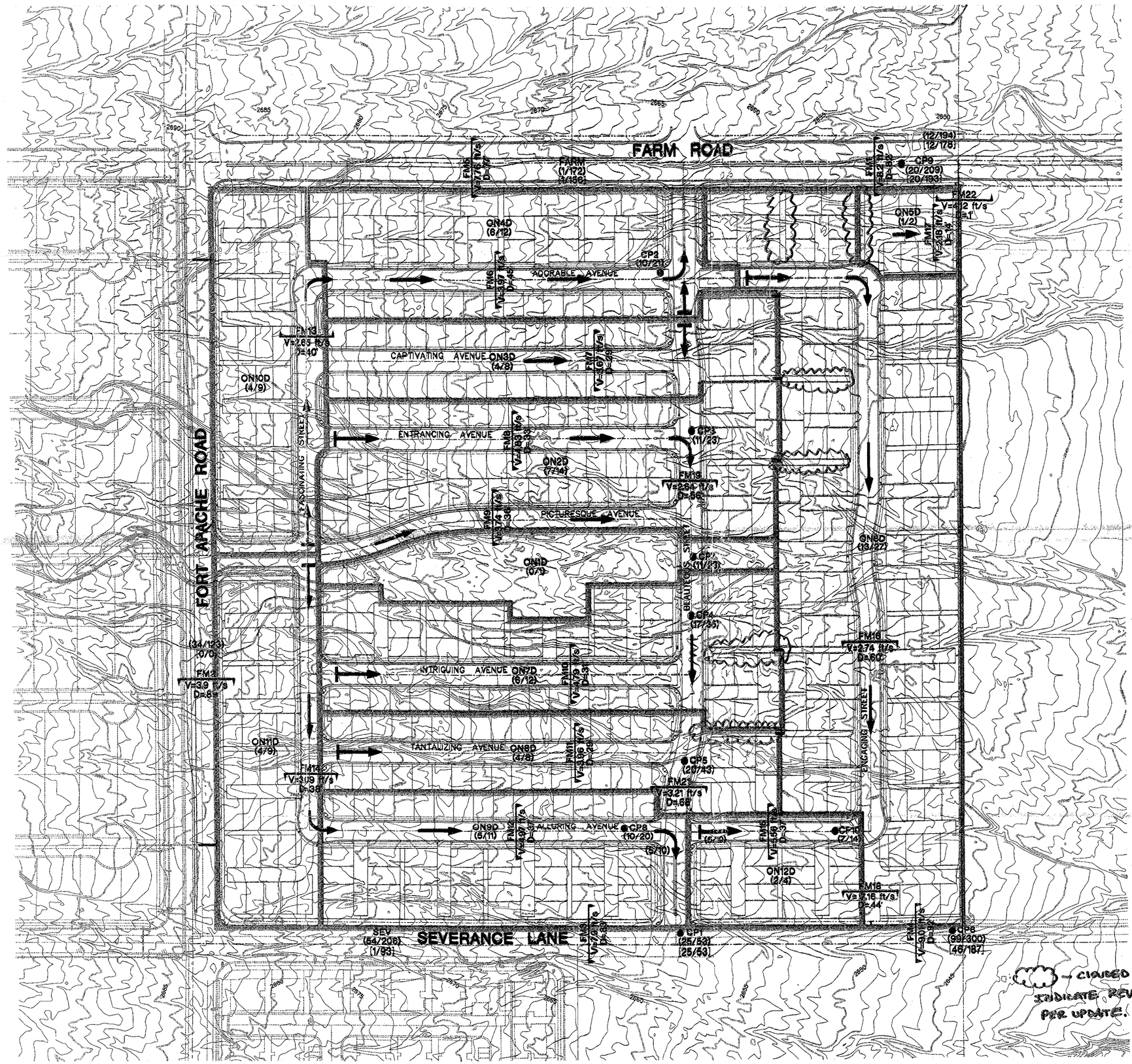
## Results

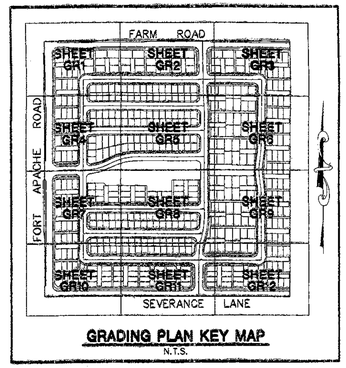
| | | |
|---|---|---|
| Spread | 4.98 | ft |
| Depth | 0.50 | ft |
| Wetted Perimeter | 5.14 | ft |
| Top Width | 4.98 | ft |
| Open Grate Area | 2.70 | $ft^2$ |
| Active Grate Weir Length | 8.00 | ft |

# APPENDIX C - REFERENCE MATERIAL

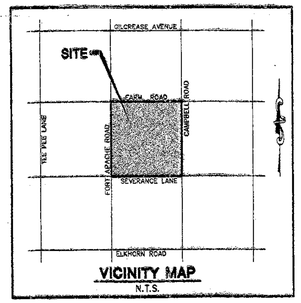
- C.1 Drainage Maps
- C.2 Reference Plans

# C.1 Drainage Maps




GRADING PLAN KEY MAP
N.T.S.




VICINITY MAP
N.T.S.

GRAPHIC SCALE
80 0 40 80 160
1" = 80'

NORTH

**DRAINAGE LEGEND**

| | |
|---|---|
| ▬ | BASIN BOUNDARY |
| V (100) | VELOCITY OF 100-YEAR FLOW IN FEET PER SECOND |
| (2/8) | INTERIM FLOW PRODUCED DURING 10/100-YEAR STORM |
| [2/8] | FUTURE FLOW PRODUCED DURING 10/100-YEAR STORM |
| ← | DIRECTION OF FLOW |
| ● | CONCENTRATION POINT |
| FM A | FLOWMASTER CROSS SECTION |
| ON1D | BASIN NAME |

Reference Material from UPDATE #2 (ASTORIA TOWN CENTER-SOUTH).

**LEGAL DESCRIPTION**
BEING A PORTION OF THE NORTHWEST QUARTER (NW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 7, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

**BENCHMARKS**
PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CLARK COUNTY BENCHMARK : CC90017N8
ELEVATION : 799.117 METERS (2621.77 FEET)
RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.16.

**BASIS OF BEARINGS**
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), DETERMINED BY CLARK COUNTY GIS CONTROL POINTS 802, 803, 804 AND 805, AS SHOWN ON THE RECORD OF SURVEY FOR THE CLARK COUNTY SURVEYOR, FILED IN BOOK 88 OF SURVEYS AT PAGE 31.

- CLOSED AREAS INDICATE REVISION PER UPDATE.

This grading plan is a part of drainage study # 3373-3 which was received on 6/18/03 and approved on 7/22/03 Page 1 of 9.

Call before you Dig 1-800-227-2600

Call before you Overhead 1-702-593-6111

**ASTORIA HOMES**
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 252-1188

CITY OF LAS VEGAS

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

| REV | DATE | BY | REVISION |
|---|---|---|---|

# OVERALL DRAINAGE PLAN

# ASTORIA AT TOWN CENTER - SOUTH

DRAWN BY: dh/JP — JUNE 2003
DESIGNED BY: dh — JUNE 2003
CHECKED BY: — JUNE 2003
PROJECT NO: 5902 — SCALE: 1"=80' HORIZ. N/A VERT.

PROFESSIONAL ENGINEER-STATE OF NEVADA — CHRISTOPHER R. CHILDS — No. 13956 — CIVIL — EXPIRES 06-30-05 — 9/26/03

SHEET DR1
1 OF 1 SHEETS
DRAWING NO.

FUTURE DRAINAGE CONDITIONS

| BASIN/CONC. POINT | AREA (Acres) | Q10 (cfs) | Q100 (cfs) |
|---|---|---|---|
| DEON1 | 3.39 | 4 | 11 |
| DEON2 | 14.41 | 15 | 39 |
| DEON3 | 3.09 | 4 | 10 |
| DEON4 | 15.03 | 16 | 44 |
| DEON5 | 7.08 | 9 | 19 |
| DEOF1 | 0.55 | 1 | 2 |
| DEOF2* | 0.27 | 130 | 197 |
| DEOF3 | 0.66 | 1 | 2 |
| DEOF4 | 0.88 | 2 | 4 |
| FUOF1 | 2.50 | 3 | 6 |
| PT1 | - | 131 | 284 |
| PT2 | - | 133 | 289 |
| PT4 | - | 9 | 19 |
| PT5 | - | 12 | 25 |
| PT6 | - | 21 | 52 |
| PT7 | - | 152 | 457 |

*Base flow added per Northwest Neighborhood Study

FUTURE STREET CAPACITIES

| STREET SECTION | Q10/Q100 (cfs) | D(10)/D(100) (ft) | V(10)/V(100) (ft/s) | V x D |
|---|---|---|---|---|
| TEE PEE LANE (SEC 1-1) | 1/2 | .28/.33 | 1.66/1.91 | .36/.63 |
| GILCREASE AVE (SEC 2-2) | 31/384 | .69/.97 | 1.75/2.17 | 1.21/2.10 |
| GILCREASE AVE (SEC 3-3) | 133/288 | .76/.93 | 1.82/2.20 | 1.37/2.04 |
| FORT APACHE RD (SEC 4-4) | 8/13 | .51/.63 | 2.11/2.55 | 1.11/1.61 |
| PRIVATE STREET (SEC 5-5) | 4/8 | .16/.12 | 1.02/1.68 | .16/.21 |
| PRIVATE STREET (SEC 6-6) | 9/12 | .22/.30 | 1.25/1.78 | .40/.71 |
| PRIVATE STREET (SEC 7-7) | 21/52 | .53/.68 | 2.34/2.85 | 1.83/2.85 |

*Street capacities did not change from interim condition

LEGEND

- DEON1 BASIN NAME
- BASIN BOUNDARY
- FLOW ARROW
- PT1 CONCENTRATION POINT
- 1-1 STREET SECTION

NORTH

0 30 60 120

1" = 60 FT

FLOWS REFERENCED FROM NORTHWEST NEIGHBORHOOD STUDY

3248
2/1/03
2/18/03

TOWN CENTER VENTURES

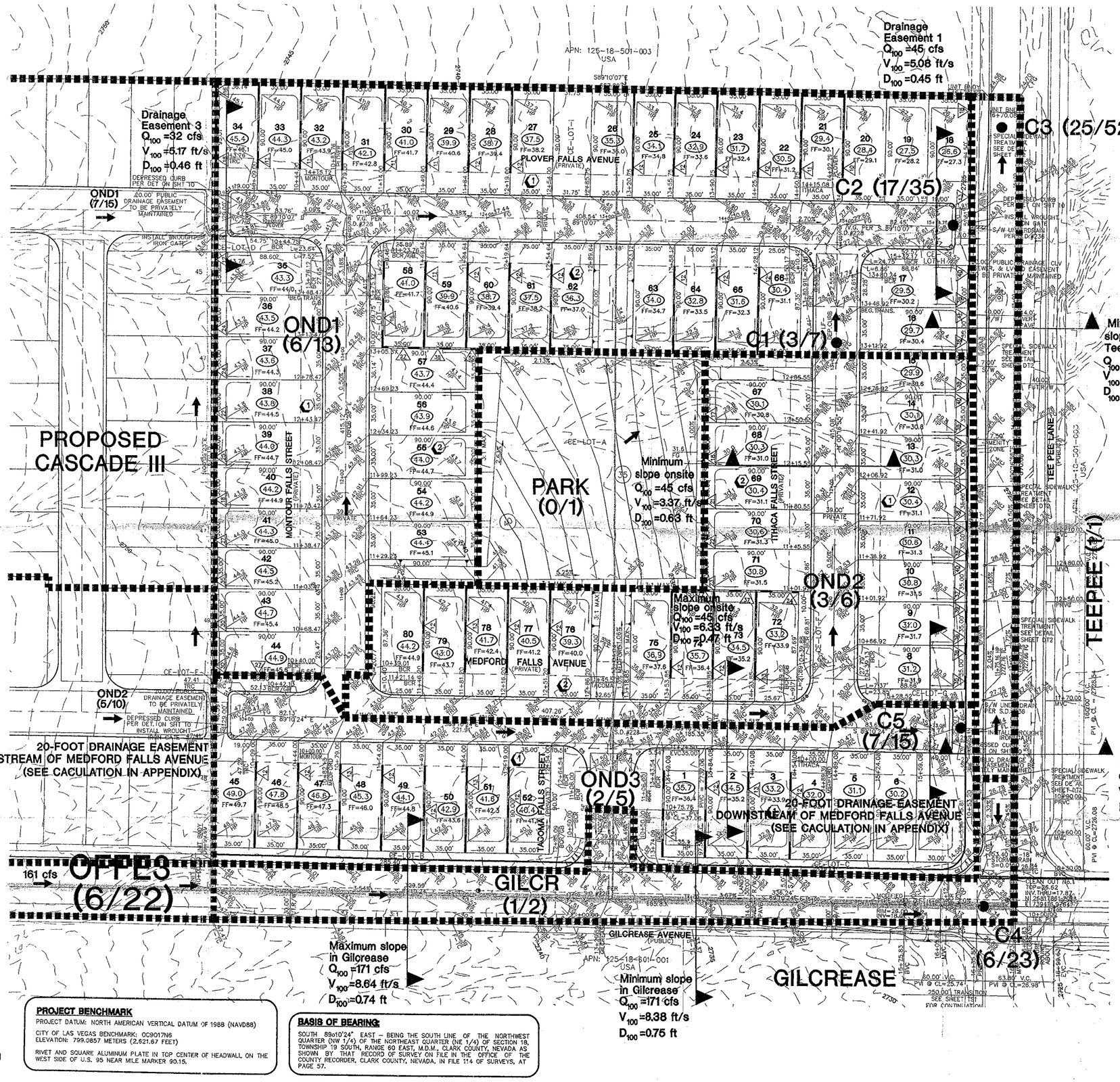
FIGURE 10
FUTURE ON-SITE BASINS

AVANTINE / BARADA

TETRA TECH, INC.
INFRASTRUCTURE SOUTHWEST GROUP
401 N. Buffalo Dr. Suite 103, Las Vegas, Nevada 89145 (702) 242-4200

DRAWN BY | QUALITY CONTROL BY
DESIGNED BY | QUALITY CONTROL BY
CHECKED BY | SCALE
PROJECT NO P10034-0001

SHEET 1 OF 1
DRAWING NO




VICINITY MAP
N.T.S.

HUALAPAI WAY | HORSE DR. | RACEL ST. | GRAND TETON DR. | JO MARCY DRIVE | GILCREASE AVENUE | GRAND CANYON | U.S. 95 | TEE PEE LANE | SITE | FORT APACHE RD.

This grading plan is a part of drainage study # 3570 as received 03-26-04

## LEGEND

| | |
|---|---|
| FG | FINISH GRADE |
| FL | FLOW LINE |
| TC | TOP OF CURB |
| TRC | TOP OF ROLL CURB |
| EAC | EDGE OF ASPHALT PAVEMENT |
| F– | FUTURE (FUT.) |
| X– | EXISTING (EX.) |
| VG | VALLEY GUTTER |
| NG | NATURAL GROUND |
| H.P. | HIGH POINT |
| L.P. | LOW POINT |
| C/L | CENTER LINE |
| O/C | OFFSET CROWN |
| BC | BACK OF CURB |
| BCR | BEGIN CURB RETURN |
| TF | TOP OF FOOTING |
| GB | GRADE BREAK |
| PC | POINT OF CURVATURE |
| PT | POINT OF TANGENCY |
| PRC | POINT OF REVERSE CURVATURE |
| PCC | POINT OF COMPOUND CURVATURE |
| BVC | BEGIN VERTICAL CURVE |
| MVC | MID-POINT OF VERTICAL CURVE |
| EVC | END VERTICAL CURVE |
| PRVC | POINT OF REVERSE VERTICAL CURVE |
| PVI | POINT OF VERTICAL INTERSECTION |
| TPW | TOP OF PLANTER WALL |
| TRW | TOP OF RETAINMENT WALL |
| TOP | TOP OF CHANNEL/SCARP |
| TOE | TOE OF CHANNEL/SCARP |
| TOB | TOP OF BOX |
| PP | POWER POLE |
| TRANS. | TRANSITION |
| RET. | RETAINMENT |
| INT. | INTERSECTION |
| D.G. | DESIGN GRADE |
| TSW | TOP OF SIDEWALK |
| FF= | FINISH FLOOR |
| GFF= | GARAGE FINISH FLOOR |
| BFE= | BASE FLOOD ELEVATION |
| RCP | REINFORCED CONCRETE PIPE |
| SD | STORM DRAIN |
| DI | DROP INLET |
| R/W | RIGHT-OF-WAY |
| S/W | SIDEWALK |
| BCL | BACK OF CURB LENGTH |
| | EX. CONTOUR(5' INTERVAL) |
| | EX. CONTOUR(1' INTERVAL) |
| | PROPOSED CONTOUR |
| 42.1 | PROPOSED PAD GRADE |
| 42.1 | FUT./EXIST. PAD GRADE |
| 0.50% | SLOPE AND FLOW DIRECTION |
| | EDGE OF EXIST A.C. |
| | SAW CUT & MATCH A.C. |
| OR | SIDEWALK RAMP |
| | PAD SWALE SLOPES |
| | SCARP AREA |
| 27 | LOT NUMBER |
| 1 | BLOCK NUMBER |
| 4 | RETAINING HEIGHT (FEET) |
| | SIGHT VISIBILITY ZONES |
| | PROJECT BOUNDARY LINE |
| | SETBACK LINE |
| | R/W OR P/L |
| | CENTER LINE |
| | BACK OF CURB |
| | LIP OF GUTTER |
| | EXIST. IMPROVEMENTS |
| | FUTURE IMPROVEMENTS |
| | RETAINING WALL |
| | CONC. BLOCK WALL |
| | EXIST.CONC. BLOCK WALL |
| | EXIST. DIRT ROAD |
| | EXIST. AC |
| | CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE |
| | MATCHLINE |

## DRAINAGE LEGEND

| | |
|---|---|
| | EX. BASIN BOUNDARY |
| | BASIN BOUNDARY |
| 9/17 | 10 YEAR / 100 YEAR FLOW (CFS) |
| OND | BASIN NAME |
| | DIRECTION OF FLOW |
| | FLOWMASTER CROSS SECTION |
| | COMBINATION POINT |
| Q100 | 100 – YEAR FLOW IN CUBIC FEET PER SECOND |
| V100 | 100 – YEAR VELOCITY IN FEET PER SECOND |
| D100 | 100 – YEAR DEPTH IN FEET |

GRAPHIC SCALE
1" = 40'

REVISION | DATE | BY

CITY OF LAS VEGAS

STANPARK HOMES
3320 NORTH BUFFALO DRIVE SUITE 207
LAS VEGAS, NEVADA 89129
(702) 396-3887

nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7590 FAX (702) 362-2597

DRAINAGE BASIN MAP

CASCADE

DRAWN BY: DF | DESIGNED BY: DF | CHECKED BY: | PROJECT NO: 6079 | SCALE: 1"=40' HORIZ. N/A VERT. | AUG 2002 | AUG 2002

PROFESSIONAL ENGINEER STATE OF NEVADA AARON M. YAMACHIKA CIVIL No. 15079
EXP. 6/30/04

SHEET DR1 OF SHEETS
DRAWING NO. H

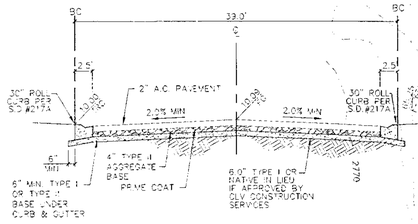
W.O. 6079-3

J:\6079-3\dwg\6079DP1-UPD.DWG, 04/30/2003 03:35:58 PM, cvisz, oce9400cond.pc3

H:\6079\DWG\6079-GRADING (DR1)

| BACK OF CURB TABLE | | | | |
|---|---|---|---|---|
| CURVE | LENGTH | RADIUS | DELTA | TANGENT |
| C1 | 39.11' | 25.00' | 89°37'40" | 24.84' |
| C2 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C3 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C4 | 31.18' | 20.00' | 89°16'29" | 19.75' |
| C5 | 31.67' | 20.00' | 90°43'31" | 20.25' |
| C6 | 31.16' | 20.00' | 89°16'13" | 19.75' |
| C7 | 31.67' | 20.00' | 90°43'47" | 20.26' |
| C8 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C9 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C10 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C11 | 7.85' | 5.00' | 90°00'00" | 5.00' |
| C12 | 31.10' | 20.00' | 89°05'40" | 19.69' |
| C13 | 31.73' | 20.00' | 90°54'20" | 20.32' |
| C14 | 43.89' | 169.50 | 14°50'06" | 22.07' |
| C15 | 33.79' | 130.50 | 14°50'06" | 16.99' |
| C16 | 43.89' | 169.50 | 14°50'06" | 22.07' |
| C17 | 33.79' | 130.50 | 14°50'06" | 16.99' |
| C18 | 31.73' | 20.00' | 90°54'03" | 20.32' |
| C19 | 31.10' | 20.00' | 89°05'57" | 19.69' |
| C20 | 39.43' | 25.00' | 90°22'20" | 25.16' |
| C21 | 47.60' | 30.00' | 90°54'20" | 30.48' |
| C22 | 31.76' | 100.00' | 18°11'42" | 16.01 |
| C23 | 31.76' | 100.00' | 18°11'42" | 16.01 |

| RAMP TABLE CASE I | | |
|---|---|---|
| RAMP | LENGTH "A" | LENGTH "B" |
| | 8.00' | 8.00' |
| | 9.50' | 4.50' |
| | 15.00' | 4.50' |




**STREET SECTION**
39' PRIVATE STREET
N.T.S.

**NOTE:**
SEE SHEET C3 - "CONSTRUCTION NOTES" FOR ALL APPLICABLE CLARK COUNTY UNIFORM STANDARD DRAWING NUMBERS.

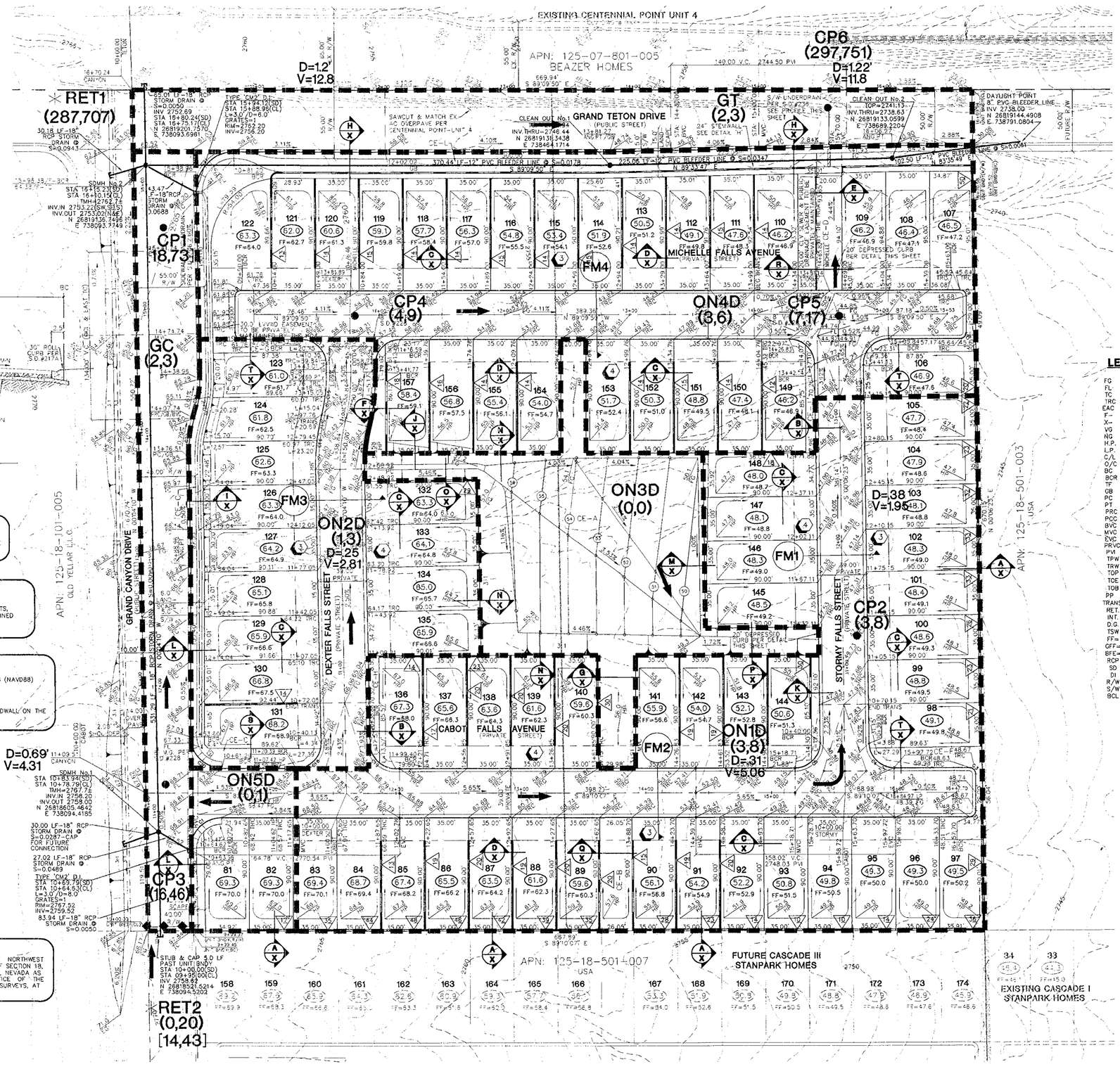
**NOTE:**
ALL PRIVATE STREETS ARE P.U.E.'S, PUBLIC SEWER EASEMENTS, AND PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED BY THE HOA.

**PROJECT BENCHMARK**
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CITY OF LAS VEGAS BENCHMARK: 0C3017N6
ELEVATION: 799.0857 METERS (2,621.67 FEET)
RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

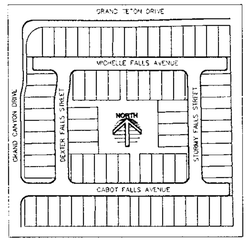
| FLOOD CONTROL QUANTITIES PRIVATE | |
|---|---|
| ITEM | QTY |
| 2 COURSE SOLID GROUTED WALL | 1048 LF |
| 3 COURSE STEMWALL | 551 LF |
| STAMPED CONCRETE PAVERS | 5550 SF |

**BASIS OF BEARING:**
SOUTH 89°10'24" EAST - BEING THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA AS SHOWN BY THAT RECORD OF SURVEY ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 114 OF SURVEYS, AT PAGE 57.

Avoid cutting underground utility lines. It's costly.
**Call before you Dig 1-800-227-2600**
Avoid overhead power line contact
**Call before you OVERHEAD 1-702-593-6111**




**VICINITY MAP**
N.T.S.




**KEY MAP**
N.T.S.

**LEGEND**

| | | | |
|---|---|---|---|
| FG | FINISH GRADE | | EX. CONTOUR(5' INTERVAL) |
| FL | FLOW LINE | | EX. CONTOUR(1' INTERVAL) |
| TC | TOP OF CURB | | PROPOSED CONTOUR |
| TRC | TOP OF ROLL CURB | (42.1) | PROPOSED PAD GRADE |
| EAC | EDGE OF ASPHALT PAVEMENT | 42.1 | FUT./EXIST. PAD GRADE |
| F- | FUTURE (FUT.) | 0.50% | SLOPE AND FLOW DIRECTION |
| X- | EXISTING (EX.) | | EDGE OF EXIST A.C. |
| VG | VALLEY GUTTER | | SAW CUT & MATCH A.C. |
| NG | NATURAL GROUND | | SIDEWALK RAMP |
| H.P. | HIGH POINT | FL OR | PAD SWALE SLOPES |
| L.P. | LOW POINT | | SCARP AREA |
| C/L | CENTER LINE | 27 | LOT NUMBER |
| O/C | OFFSET CROWN | 1 | BLOCK NUMBER |
| BC | BACK OF CURB | A | MAX. RETAINING HEIGHT (FEET) |
| BCR | BEGIN CURB RETURN | | SIGHT VISIBILITY ZONES |
| TF | TOP OF FOOTING | | PROJECT BOUNDARY LINE |
| GB | GRADE BREAK | | SETBACK LINE |
| PC | POINT OF CURVATURE | | R/W OR P/L |
| PT | POINT OF TANGENCY | | CENTER LINE |
| PRC | POINT OF REVERSE CURVATURE | | BACK OF CURB |
| PCC | POINT OF COMPOUND CURVATURE | | LIP OF GUTTER |
| BVC | BEGIN VERTICAL CURVE | | EXIST. IMPROVEMENTS |
| MVC | MID-POINT OF VERTICAL CURVE | | FUTURE IMPROVEMENTS |
| EVC | END VERTICAL CURVE | | RETAINING WALL |
| PRVC | POINT OF REVERSE VERTICAL CURVE | | CONC. BLOCK WALL |
| PVI | POINT OF VERTICAL INTERSECTION | | EXIST.CONC. BLOCK WALL |
| TPW | TOP OF PLANTER WALL | | EXIST. DIRT ROAD |
| TRW | TOP OF RETAINMENT WALL | | EXIST. AC |
| TCP | TOP OF CHANNEL/SCARP | | CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE |
| TOE | TOE OF CHANNEL/SCARP | | MATCHLINE |
| TOB | TOP OF BOX | | |
| PP | POWER POLE | | |
| TRANS. | TRANSITION | | |
| RET. | RETAINMENT | | |
| INT. | INTERSECTION | | |
| D.G. | DESIGN GRADE | | |
| TSW | TOP OF SIDEWALK | | |
| FF= | FINISH FLOOR | | |
| GFF= | GARAGE FINISH FLOOR | | |
| BFE= | BASE FLOOD ELEVATION | | |
| RCP | REINFORCED CONCRETE PIPE | | |
| SD | STORM DRAIN | | |
| DI | DROP INLET | | |
| R/W | RIGHT-OF-WAY | | |
| S/W | SIDEWALK | | |
| BCL | BACK OF CURB LENGTH | | |

**LEGEND** (DRAINAGE)

| | |
|---|---|
| ON1D | - BASIN NAME |
| *RET1 | - REFERENCED FLOW FROM NORTH NEIGHBORHOOD STUDY |
| D= | - DEPTH OF FLOW (ft) |
| V= | - VELOCITY OF FLOW (ft/s) |
| FM1 | - FLOWMASTER SECTION |
| → | - DIRECTION OF FLOW |
| CP1 | - COMBINATION POINT |
| (0,0) | - ULTIMATE - 10yr cfs, 100yr cfs |
| [14,43] | - INTERIM - 10yr cfs, 100yr cfs |

This grading plan is part of drainage study #3266 which was received on 5/19/03 and rejected on 5/22/03 and approved on 6/23/03 Page 4 of 4.

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

AARON M. YAMACHIKA, P.E. #15079 — 5/12/03 DATE

"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT."

| REVISION | BY | DATE |
|---|---|---|

CITY OF LAS VEGAS

**STANPARK HOMES**
3300 NORTH BUFFALO DRIVE, SUITE 207
LAS VEGAS, NEVADA 89129
(702)396-3887


vtn nevada
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS


DRAWN BY: DF — JAN 2003
DESIGNED BY: DF — JAN 2003
CHECKED BY: CZ — JAN 2003
PROJECT NO: 6079-2
SCALE: 1"=40' HORIZ, N/A VERT.

SESSIONAL ENGINEER, STATE OF NEVADA, AARON M. YAMACHIKA, CIVIL, No. 15079, EXP. 6/30/04, 5/12/03

**DRAINAGE PLAN**
**CASCADE II**

SHEET DR1 OF SHEETS
DRAWING NO.

H:\6079-2\DWG\6079-2GR.DWG (DR1)

H:\6079-2\DWG\6079-2GR.dwg, DR1, 5/12/2003 09:33:11 AM

Avoid cutting underground utility lines. It's costly.

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

Avoid overhead power line contact

**Call before you OVERHEAD 1-702-593-6111**

GRAPHIC SCALE

40 0 20 40 80

1" = 40'

NORTH

HUALAPAI WAY

HORSE DR.

RACEL ST.

GRAND TETON DR.

JO MARCY DRIVE

GILCREASE AVENUE

GRAND CANYON

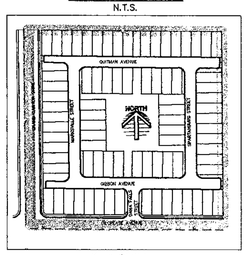
TEE PEE LANE

U.S.A.

SITE

FORT APACHE RD.

**VICINITY MAP**
N.T.S.




**KEY MAP**
N.T.S.

**LEGEND**

| | | | |
|---|---|---|---|
| FG | FINISH GRADE | 2400 | EX. CONTOUR(5' INTERVAL) |
| FL | FLOW LINE | | EX. CONTOUR(1' INTERVAL) |
| TC | TOP OF CURB | | PROPOSED CONTOUR |
| TRC | TOP OF ROLL CURB | 42.1 | PROPOSED PAD GRADE |
| EAC | EDGE OF ASPHALT PAVEMENT | | |
| F- | FUTURE (FUT.) | 42.1 | FUT./EXIST. PAD GRADE |
| X- | EXISTING (EX.) | 0.50% | SLOPE AND FLOW DIRECTION |
| VG | VALLEY GUTTER | | |
| NG | NATURAL GROUND | | EDGE OF EXIST A.C. |
| H.P. | HIGH POINT | | SAW CUT & MATCH A.C. |
| L.P. | LOW POINT | OR | SIDEWALK RAMP |
| C/L | CENTER LINE | | |
| O/C | OFFSET CROWN | | PAD SWALE SLOPES |
| BC | BACK OF CURB | | |
| BCR | BEGIN CURB RETURN | | SCARP AREA |
| TF | TOP OF FOOTING | 27 | LOT NUMBER |
| GB | GRADE BREAK | | |
| PC | POINT OF CURVATURE | | BLOCK NUMBER |
| PT | POINT OF TANGENCY | | |
| PRC | POINT OF REVERSE CURVATURE | | MAX. RETAINING HEIGHT (FEET) |
| PCC | POINT OF COMPOUND CURVATURE | | |
| BVC | BEGIN VERTICAL CURVE | | SIGHT VISIBILITY ZONES |
| MVC | MID-POINT OF VERTICAL CURVE | | |
| EVC | END VERTICAL CURVE | | PROJECT BOUNDARY LINE |
| PRVC | POINT OF REVERSE VERTICAL CURVE | | |
| PVI | POINT OF VERTICAL INTERSECTION | | SETBACK LINE |
| TPW | TOP OF PLANTER WALL | | |
| TRW | TOP OF RETAINMENT WALL | | R/W OR P/L |
| TOP | TOP OF CHANNEL/SCARP | | |
| TOE | TOE OF CHANNEL/SCARP | | CENTER LINE |
| TOB | TOP OF BOX | | |
| PP | POWER POLE | | BACK OF CURB |
| TRANS. | TRANSITION | | LIP OF GUTTER |
| RET. | RETAINMENT | | EXIST. IMPROVEMENTS |
| INT. | INTERSECTION | | |
| D.G. | DESIGN GRADE | | FUTURE IMPROVEMENTS |
| TSW | TOP OF SIDEWALK | | RETAINING WALL |
| FF= | FINISH FLOOR | | CONC. BLOCK WALL |
| GFF= | GARAGE FINISH FLOOR | | EXIST.CONC. BLOCK WALL |
| BFE= | BASE FLOOD ELEVATION | | EXIST. DIRT ROAD |
| RCP | REINFORCED CONCRETE PIPE | | EXIST. AC |
| SD | STORM DRAIN | | CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE |
| DI | DROP INLET | | MATCHLINE |
| R/W | RIGHT-OF-WAY | | |
| S/W | SIDEWALK | | |
| BCL | BACK OF CURB LENGTH | | |

| CURVE TABLE | | | | |
|---|---|---|---|---|
| CURVE | LENGTH | RADIUS | DELTA | TANGENT |
| C1 | 7.85 | 5.00 | 90°00'00" | 5.00 |
| C2 | 8.55 | 5.06 | 96°43'25" | 5.70 |
| C3 | 22.61 | 20.00 | 64°46'48" | 12.69 |
| C4 | 8.55 | 20.00 | 24°29'59" | 4.34 |
| C5 | 31.16 | 20.00 | 89°16'46" | 19.75 |
| C6 | 5.65 | 20.00 | 16°10'58" | 2.84 |
| C7 | 26.08 | 20.00 | 74°42'33" | 15.22 |
| C8 | 31.67 | 20.00 | 90°43'31" | 20.25 |
| C9 | 7.85 | 5.00 | 89°59'47" | 5.00 |
| C10 | 7.85 | 5.00 | 90°00'00" | 5.00 |
| C11 | 7.85 | 5.00 | 90°00'00" | 5.00 |
| C12 | 1.01 | 5.00 | 11°32'13" | 0.51 |
| C13 | 31.19 | 20.00 | 89°05'57" | 19.69 |
| C14 | 31.73 | 20.00 | 90°53'46" | 20.32 |
| C15 | 7.85 | 5.00 | 90°00'00" | 5.00 |
| C16 | 7.85 | 5.00 | 90°00'00" | 5.00 |
| C17 | 10.47 | 20.00 | 30°00'00" | 5.36 |
| C18 | 20.94 | 20.00 | 60°00'00" | 11.55 |
| C19 | 31.42 | 20.00 | 90°00'00" | 20.00 |
| C20 | 31.42 | 20.00 | 90°00'00" | 20.00 |
| C21 | 38.88 | 25.00 | 89°06'14" | 24.61 |
| C22 | 23.56 | 15.42 | 87°33'53" | 14.77 |
| C23 | 31.10 | 20.00 | 89°06'14" | 19.67 |
| C24 | 31.42 | 20.00 | 90°00'00" | 20.00 |
| C25 | 23.56 | 15.00 | 90°00'00" | 15.00 |
| C26 | 20.94 | 20.00 | 60°00'00" | 11.55 |
| C27 | 10.47 | 20.00 | 30°00'00" | 5.36 |
| C28 | 31.42 | 20.00 | 90°00'00" | 20.00 |
| C29 | 20.02 | 20.00 | 57°21'12" | 10.94 |
| C30 | 11.65 | 20.00 | 33°22'01" | 5.99 |
| C31 | 31.67 | 20.00 | 90°43'14" | 20.25 |
| C32 | 11.65 | 20.00 | 33°22'01" | 5.99 |
| C33 | 19.46 | 20.00 | 55°44'29" | 10.58 |
| C34 | 31.10 | 20.00 | 89°06'14" | 19.69 |
| C35 | 20.08 | 20.00 | 57°32'02" | 10.98 |
| C36 | 11.65 | 20.00 | 33°22'01" | 5.99 |
| C37 | 31.73 | 20.00 | 90°54'03" | 20.32 |
| C38 | 11.65 | 20.00 | 33°22'01" | 5.99 |
| C39 | 19.52 | 20.00 | 55°54'29" | 10.61 |
| C40 | 31.16 | 20.00 | 89°16'29" | 19.75 |

**DRAINAGE LEGEND**

- BASIN BOUNDARY
- 9/17 — 10 YEAR / 100 YEAR FLOW (CFS)
- OND — BASIN NAME
- DIRECTION OF FLOW
- FLOWMASTER CROSS SECTION
- COMBINATION POINT

Q100 — 100 - YEAR FLOW IN CFS
V100 — 100 YEAR VELOCITY IN FEET PER SECOND
D100 — 100 YEAR FLOW DEPTH IN FEET
OND — DRAINAGE BASIN NAME OR NORTHWEST NEIGHBORHOOD STUDY

This grading plan is a part of drainage study # 3334 which was received on 7/10/03 and approved on 7-18-03. Page 2 Of 5.

**PROJECT BENCHMARK**
PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
CITY OF LAS VEGAS BENCHMARK: 09017N6
ELEVATION: 799.0857 METERS (2,621.67 FEET)
RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARING:**
SOUTH 89°10'24" EAST — BEING THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA AS SHOWN BY THAT RECORD OF SURVEY ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA, IN FILE 114 OF SURVEYS, AT PAGE 57.

AARON M. YAMACHIKA, P.E. #15079 — 7/10/03 DATE

"I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT."

**STANPARK HOMES**
3320 NORTH BUFFALO DRIVE, SUITE 207
LAS VEGAS, NEVADA 89129
(702) 396-3887

CITY OF LAS VEGAS, NEVADA

vtn nevada — CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH.: (702) 873-7550 FAX (702) 362-2597

| REV | DATE | BY | REVISION |
|---|---|---|---|

DRAINAGE PLAN

CASCADE III

DRAWN BY: HLA — APRIL 2003
DESIGNED BY: CZ — APRIL 2003
CHECKED BY: CZ — APRIL 2003
PROJECT NO: 6079-3
SCALE: 1"=40' HORIZ. N/A VERT.

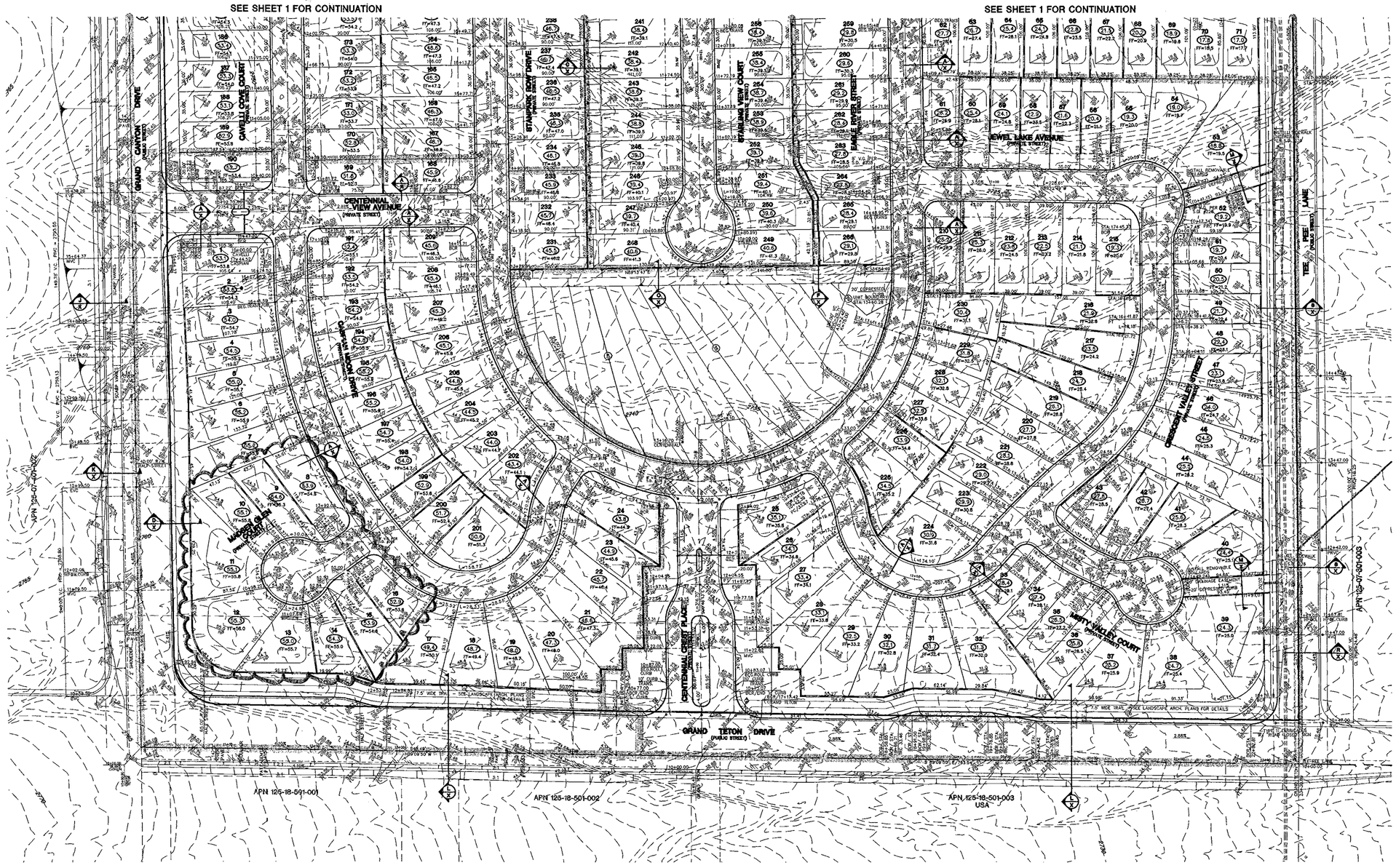
EXPIRES 06-30-04
PROFESSIONAL ENGINEER SITE — AARON M. YAMACHIKA — CIVIL — No. 15079 — REGISTERED — 7/10/03

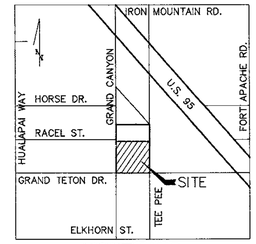
SHEET DR1 OF SHEETS
DRAWING NO.

...dwg\UNIT3\6079-3GR.dwg, DR1, 07/10/2003 12:35:08 PM

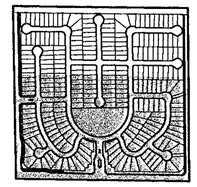
SEE SHEET 1 FOR CONTINUATION

SEE SHEET 1 FOR CONTINUATION




**VICINITY MAP**
N.T.S.



**KEYMAP**
N.T.S

## LEGEND

| | |
|---|---|
| FG | FINISH GRADE |
| FL | FLOW LINE |
| TC | TOP OF CURB |
| TRC | TOP OF ROLL CURB |
| BAC | EDGE OF ASPHALT PAVEMENT |
| FUT. | FUTURE |
| EXIST | EXISTING (EX.) |
| VG | VALLEY GUTTER |
| NG | NATURAL GROUND |
| H.P. | HIGH POINT |
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| TPW | TOP OF PLANTER WALL |
| TRW | TOP OF RETAINMENT WALL |
| TOP | TOP OF CHANNEL/SCARP |
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| TOB | TOP OF BOX |
| PP | POWER POLE |
| TRANS. | TRANSITION |
| RET. | RETAINMENT |
| INT. | INTERSECTION |
| D.G. | DESIGN GRADE |
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| GFF= | GARAGE FINISH FLOOR |
| BFE= | BASE FLOOD ELEVATION |
| R/W | RIGHT-OF-WAY |
| S/W | SIDEWALK |
| 2400 | EX. CONTOUR(5' INTERVAL) |
| | EX. CONTOUR(1' INTERVAL) |
| | PROPOSED CONTOUR |
| 42.1 | PROPOSED PAD GRADE |
| 42.1 | FUT./EXIST. PAD GRADE |
| 0.50% | SLOPE AND FLOW DIRECTION |
| | EDGE OF EXIST A.C. |
| | SAW CUT & MATCH A.C. |
| | SIDEWALK RAMP |
| | PAD SWALE SLOPES |
| | SCARP AREA |
| 27 | LOT NUMBER |
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| | RETAINING HEIGHT (FEET) |
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| | CENTER LINE |
| | RETAINING WALL |
| | CONC. BLOCK WALL |
| | EXIST. CONC. BLOCK WALL |
| | EXIST. DIRT ROAD |
| | EXIST. AC |
| | CONSTRUCTION PHASE LINE OR UNIT BOUNDARY LINE |
| | MATCHLINE |

## HC RAMP TABLE

| NO. | 'A' LENGTH | 'B' LENGTH |
|---|---|---|
| 1 | 8.00' | 8.00' |
| 2 | 4.50' | 15.00' |

**NOTE:**

ALL STREETS LABELLED AS PRIVATE ARE PUBLIC DRAINAGE EASEMENTS TO BE PRIVATELY MAINTAINED.

ALL PUBLIC DRAINAGE EASEMENTS ARE TO BE MAINTAINED BY H.O.A.

**BENCHMARK**

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK: 0C90171N5
NAVD88 ELEVATION: 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

Avoid cutting underground utility lines. It's costly.
**Call before you Dig 1-800-227-2600**

Avoid overhead power line contact. It's costly.
**Call before you Overhead 1-702-593-6111**

**BASIS OF BEARING:**

N 89°10'14" W BEING THE SOUTH LINE OF SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHERS QUARTER (SE 1/4) OF SECTION 7, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., PER RECORD OF SURVEY FILE 87, PAGE 9, CLARK COUNTY, NEVADA.

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

GRAPHIC SCALE
60 0 30 60 120
1" = 60'

**BEAZER HOMES**
4675 S. FORT APACHE RD. SUITE 200
LAS VEGAS, NEVADA 89147
(702)837-2100

**CITY OF LAS VEGAS**

vtn nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597

| REV | DATE | BY |
|---|---|---|
| | REVISION | |

**MASTER GRADING PLAN**

**CENTENNIAL POINT**

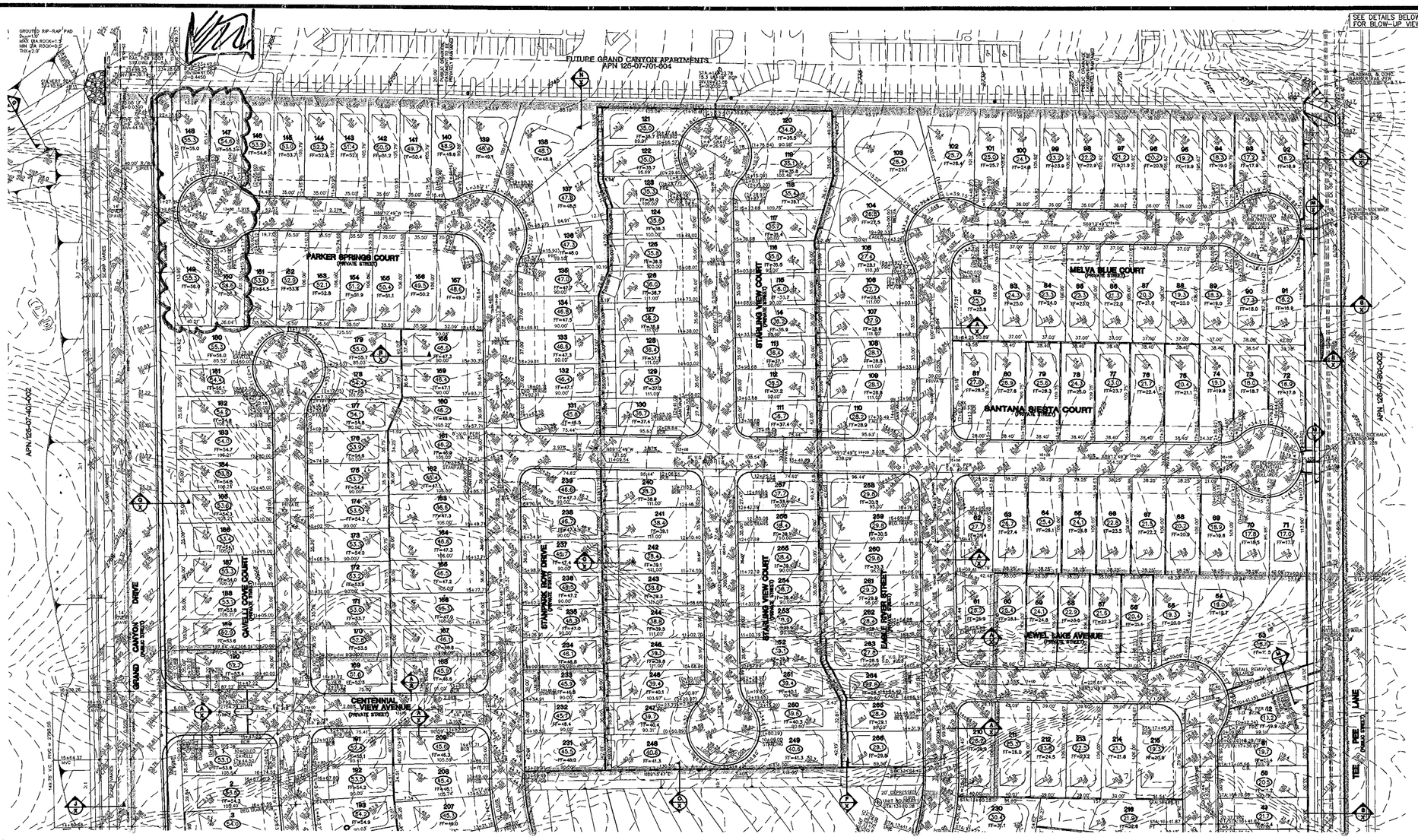
APRIL 2001

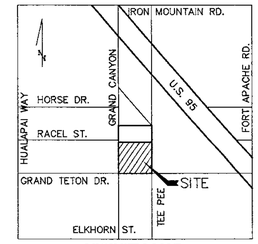
DRAWN BY: DF
DESIGNED BY:
CHECKED BY:
PROJECT NO: 5787
SCALE: 1"=60' HORIZ. N/A VERT.

This plan is a part of the engineering study for the Centennial Point Subdivision

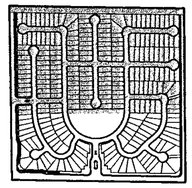
PROFESSIONAL ENGINEER & STATE OF NEVADA
AARON M. YANAGIHARA
No. 9079
4/26/01

SHEET
GR2
2 OF 2 SHEETS
DRAWING NO.




**VICINITY MAP**
N.T.S.



**KEYMAP**
N.T.S

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| | PROJECT BOUNDARY LINE |
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| | EXIST. IMPROVEMENTS |
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| | CENTER LINE |
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ALL PUBLIC DRAINAGE EASEMENTS ARE TO BE MAINTAINED BY H.O.A.

**BENCHMARK**

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK: OC9017N6
NAVD88 ELEVATION: 799.117 METERS (2621.77 FEET)

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| HC RAMP TABLE | | |
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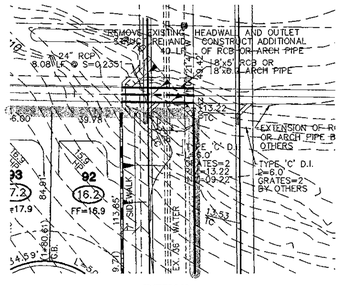
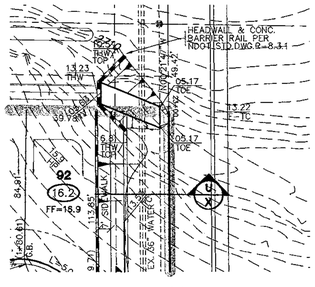
| 2 | 4.50' | 15.00' |




**DETAIL**
FUTURE IMPROVEMENTS
TEE PEE ROAD
SCALE: 1"=40'




**DETAIL**
PROPOSED IMPROVEMENTS
TEE PEE ROAD
SCALE: 1"=40'

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

GRAPHIC SCALE
60 0 30 60 120
1" = 60'

**CITY OF LAS VEGAS**

**BEAZER HOMES**
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2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
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**nevada** CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS


| REV | DATE | BY | REVISION |
|---|---|---|---|

**MASTER GRADING PLAN**

**CENTENNIAL POINT**

DRAWN BY: DF
DESIGNED BY:
CHECKED BY:
APRIL 2001
PROJECT NO: 5787
SCALE: 1"=60' HORIZ. N/A VERT.

working plans
not for construction

AARON M. YAMACHIKA
PROFESSIONAL ENGINEER - STATE OF NEVADA
No. 12079

SHEET GR1.
1 OF 2 SHEETS
DRAWING NO.

H:\5787\5787GRDWG (BR-GR1)

(AREA 5)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.05-ACRES

(AREA 6)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.2-ACRES

(AREA 7)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.2-ACRES

(AREA 1)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.3-ACRES

(AREA 2)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.08-ACRES

OSO BLANCA ROAD

FARM ROAD

SEVERENCE LANE

OS01 (1/3)
OS02 (2/3)
OS03 (1/2)
OS04 (1/3)

CP-1 (4/10)$_{SD}$
CP-2 (5/12)$_{SD}$
CP-3 (2/4)
CP-4 (2/29)$_{SD}$
CP-5 (2/4)
CP-6 (3/6)

ON1D (3/7)
ON2D (1/2)
ON3D (4/9)
ON4D (1/3)
ON5D (1/3)
ON6D (2/6)
ON7D (4/8)
ON8D (0/1)
ON9D (1/3)
ON10D (3/7)
ON11D (1/2)
ON12D (3/6)
ON13D (2/4)

((28/226))**
[28/210]**

((25/220))**
[25/204]**

((21/211))**
[21/195]**

((20/209))*
[20/193]*

((104/311))**
[51/198]**

((102/307))**
[49/194]**

((99/301))**
[46/188]**

((99/300))*
[46/187]*

(AREA 4)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.04-ACRES

(AREA 3)
CROSS HATCHED AREA
TRIBUTARY TO PROPOSED
STORM DRAIN = 0.2-ACRES

LEGEND

- SITE BOUNDARY
- BASIN DELINEATION
- COMBINATION POINT
- ON1D – BASIN NAME
- CP-3 – COMBINATION POINT NAME
- (2/5) – (10/100) YEAR STORM EVENT
- DIRECTION OF FLOW
- ((20/209)) – INTERIM FLOW
- [20/193] – ULTIMATE FLOW
- FLOWMASTER SECTION
- FM-1 – FLOWMASTER NAME
- (4/11)$_{SD}$ – FLOW INSIDE STORM DRAIN

* FLOW VALUES REFERENCED FROM ASTORIA AT TOWN CENTER.

** REFERENCED FLOW IS STRAIGHT ADDED TO CP FLOW.

NORTH

GRAPHIC SCALE

60 0 30 60 120

1" = 60'

This grading plan is a part of drainage study # 4117 which was received on 10/22/07 and reviewed on 11/5/07. Page 17 of 49.

CONSULTING

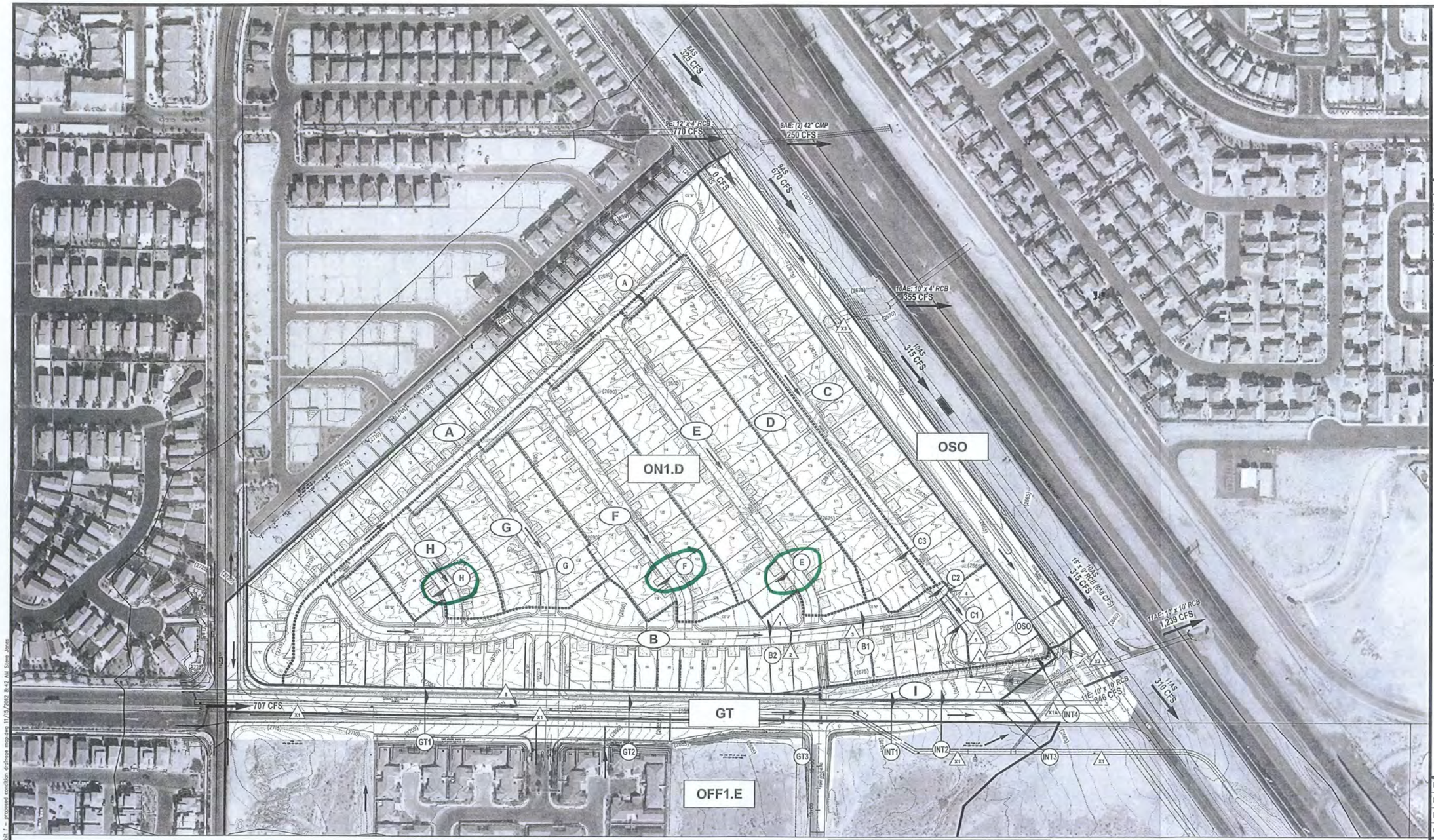
FAIRFIELD AT FARM / US95
Update #1

BASIN AREA EXHIBIT

DRAWN BY: JAY/SSB
DESIGNED BY:
CHECKED BY:
PROJECT NO: 6622-1
SCALE: 1"=60' HORZ. VERT.

FIGURE 7

**Fort Apache Ranch**




N

0 100 200
SCALE – 1" = 100' FEET

8.46

## LEGEND

- BASIN BOUNDARY
- ON1 — BASIN ID
- PRO-RATED SUBBASIN BOUNDARY
- A — PRO-RATED SUBBASIN ID
- FLOW DIRECTION
- 1 — FLOWMASTER SECTION
- XXX CFS — 100-YR FLOW RATE

**Onsite & Local Offsite Flow Rate Summary**
Proposed Drainage Condition

| Basin ID | Area (ac) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|
| ON1.D | 28.1 | 79 | 38 |
| OSO | 2.8 | 10 | 5 |
| GT | 2.7 | 716[1] | 292[1] |
| OFF1.E | 23.3 | 41 | 12 |

1 - Includes 707/287 cfs from Grand Teton Drive, referenced from CLV NWNS & Teton Storm Drain Plans.

**Prorated Flow Summary**

| Subbasin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
|---|---|---|---|
| ON1.D | 79 | 28.1 | 2.8 |
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| A | 10 | 3.6 | 2.8 |
| B | 21 | 7.4 | 2.8 |
| C | 9 | 3.2 | 2.8 |
| D | 7 | 2.6 | 2.8 |
| E | 12 | 4.4 | 2.8 |
| F | 8 | 3.0 | 2.8 |
| G | 6 | 2.0 | 2.8 |
| H | 4 | 1.3 | 2.8 |
| I | 2 | 0.6 | 2.8 |
| *TOTAL* | *79* | *28.1* | *2.8* |

**Street Flow Summary - Proposed Condition Flow Rates (100-Yr)**

| Street Section ID | Contributing Basins | Slope (%) | Q (cfs) | Depth (ft) | Velocity (ft/s) | D*V |
|---|---|---|---|---|---|---|
| A | A | 2.20 | 10 | 0.45 | 4.01 | 1.8 |
| B1 | Bypass(Section D2) + 1/3(B) + E | 4.38 | 34 | 0.47 | 5.92 | 2.8 |
| B2 | 2/3(B) + F + G + H | 2.59 | 32 | 0.50 | 4.73 | 2.4 |
| C1 | Bypass(Section C2) + (Section B1) + (I cfs) | 0.50 | 44 | 1.05 | 3.88 | 4.1 |
| C2 | A + C + D - (1 cfs) | 1.00 | 25 | 0.77 | 4.35 | 3.4 |
| C3 | A + C + D - (2 cfs) | 1.31 | 24 | 0.73 | 4.77 | 3.5 |
| E | E - (1 cfs) | 0.92 | 11 | 0.60 | 3.42 | 2.1 |
| F | F - (1 cfs) | 0.81 | 7 | 0.54 | 2.91 | 1.5 |
| G | G - (1 cfs) | 0.50 | 5 | 0.52 | 2.23 | 1.2 |
| H | H - (2 cfs) | 1.73 | 2 | 0.32 | 2.99 | 0.9 |
| GT1 | GT | 2.65 | 716 | 1.18 | 12.18 | 14.4 |
| GT2 | GT + OFF1.E | 5.14 | 757 | 1.09 | 14.91 | 16.3 |
| GT3 | GT + OFF1.E | 0.50 | 757 | 1.95 | 7.68 | 15.0 |
| OSO | OSO | 0.88 | 10 | 0.40 | 2.79 | 1.1 |

**Street Flow Summary - Proposed Condition Flow Rates (10-Yr)**

| Street Section ID | Contributing Basins | Slope (%) | Q (cfs) | Depth (ft) | Velocity (ft/s) | D*V | Dry Lane Width (ft) |
|---|---|---|---|---|---|---|---|
| GT1 | GT | 2.65 | 292 | 0.59 | 8.62 | 7.7 | N/A |
| GT2 | GT + OFF1.E | 5.14 | 304 | 0.81 | 10.54 | 8.7 | N/A |
| GT3 | GT + OFF1.E | 0.50 | 304 | 1.36 | 5.59 | 7.7 | N/A |
| OSO | OSO | 0.88 | 5 | 0.35 | 2.80 | 0.7 | 17.5 |

**Summary of Flood Control Facilities**

| Drainage Facility ID | Proposed Condition $Q_{100}$ (cfs) | Size & Type | Comment |
|---|---|---|---|
| X1 | N/A | 10-ft by 5-ft RCB | CCRFCD Regional Facility CNGT 0000 |
| X1A | N/A | 5-ft by 3-ft RCB | Interim Flow Facility from CNGT 0000, prior to extension in US-95 |
| X2 | 846 | 10-ft by 10-ft RCB | Existing Condition Flow = 585 cfs |
| X3 | N/A | (2) 10-ft by 4-ft RCB | To Be Abandoned in Place, Existing Condition Flow = 15 cfs |
| 1 | 11 | 15.0-ft Type CM2 Drop Inlet | 18-inch RCP Lateral |
| 2 | 8 | 7.5-ft Type CM2 Drop Inlet | 18-inch RCP Lateral |
| 3 | 17 | 15-inch RCP | |
| 4 | 16 | 10.0-ft Type CM2 Drop Inlet | 24-inch RCP Lateral |
| 5 | 33 | 30-inch RCP | |
| 6 | 44 | 17.5-ft Type CM2 Drop Inlet | Trunk Storm Drain Thru |
| 7 | 77 | 42-inch RCP | Daylights toward Facility X2 Inlet Channel |
| 8 | N/A | 7.5-ft Type CM2 Drop Inlet | Connection to existing 24-inch RCP Stub from CNGT 0000. Not required for flow collection in proposed condition. |

X - Denotes an existing facility.

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

| NO. | DESCRIPTION | DATE | BY | APP. DATE | APP. |
|---|---|---|---|---|---|
| | | | | | |

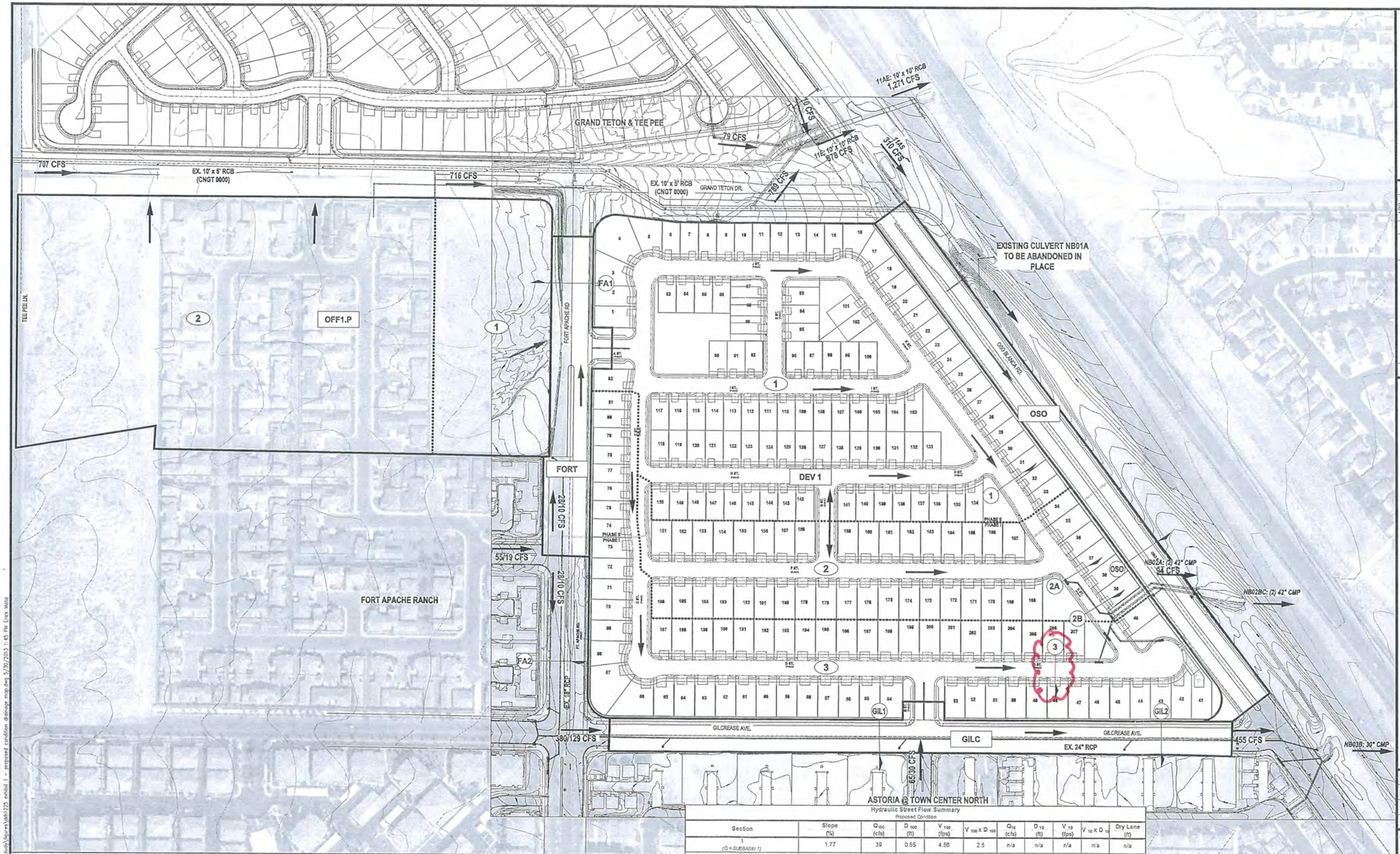
DR HORTON
GRAND TETON & TEE PEE
PROPOSED CONDITION DRAINAGE MAP

DATE: 11/15/2012
DRAFTER: SMJ
DESIGNER: SMJ
CHECKED: MJF

PROJECT NO.
DRH1213.000

**EXHIBIT F**
SHEET 1 OF 1

J:\drh1213-000 grand teton\drainage\technical study\figures\exhibit f - proposed condition drainage map.dwg 11/15/2012 8:42 AM Steve Jones




N

SCALE — 1" = 100' FEET (0, 100, 200)

LEGEND

- BASIN BOUNDARY
- BASIN ID
- FLOW DIRECTION
- PRORATE BASIN ID
- FLOWMASTER SECTION
- PRORATED BASIN BOUNDARY
- PHASE LINE

**100-Yr Prorated Flow Summary**

| Basin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
|---|---|---|---|
| DEV 1 | 84 | 31.1 | 2.7 |
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| 1 | 39 | 14.5 | 2.7 |
| 2 | 18 | 6.6 | 2.7 |
| 3 | 27 | 10.0 | 2.7 |
| *TOTAL* | *84* | *31.1* | *2.7* |
| | | | |
| Basin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| OFF1.P | 38 | 18.1 | 2.1 |
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| 1 | 8 | 4.0 | 2.1 |
| 2 | 30 | 14.1 | 2.1 |
| *TOTAL* | *38* | *18.1* | *2.1* |

**10-Yr Prorated Flow Summary**

| Basin | $Q_{10}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
|---|---|---|---|
| DEV 1 | 38 | 31.1 | 1.2 |
| Subbasin | $Q_{10}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| 1 | 18 | 14.5 | 1.2 |
| 2 | 8 | 6.6 | 1.2 |
| 3 | 12 | 10.0 | 1.2 |
| *TOTAL* | *38* | *31.1* | *1.2* |
| | | | |
| Basin | $Q_{10}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| OFF1.P | 14 | 18.1 | 0.8 |
| Subbasin | $Q_{10}$ (cfs) | Area (acres) | Unit Flow (cfs/acre) |
| 1 | 3 | 4.0 | 0.8 |
| 2 | 11 | 14.1 | 0.8 |
| *TOTAL* | *14* | *18.1* | *0.8* |

**ASTORIA @ TOWN CENTER NORTH**

Hydraulic Street Flow Summary

Proposed Condition

| Section | Slope (%) | $Q_{100}$ (cfs) | $D_{100}$ (ft) | $V_{100}$ (fps) | $V_{100} \times D_{100}$ | $Q_{10}$ (cfs) | $D_{10}$ (ft) | $V_{10}$ (fps) | $V_{10} \times D_{10}$ | Dry Lane (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 *(Q = SUBBASIN 1)* | 1.77 | 39 | 0.55 | 4.56 | 2.5 | n/a | n/a | n/a | n/a | n/a |
| 2A *(Q = SUBBASIN 1 + 2)* | 1.78 | 57 | 0.61 | 5.31 | 3.2 | n/a | n/a | n/a | n/a | n/a |
| 2B* *(Q = SUBBASIN 1 + 2)* | 1.78 | 41 | 0.56 | 4.66 | 2.6 | n/a | n/a | n/a | n/a | n/a |
| 3 *(Q = SUBBASIN 3)* | 2.72 | 27 | 0.47 | 4.68 | 2.2 | n/a | n/a | n/a | n/a | n/a |
| GIL1 *(Q = NWINS(380))* | 3.48 | 380 | 0.94 | 10.32 | 9.7 | n/a | n/a | n/a | n/a | n/a |
| GIL2 *(Q = NWINS(380) + ASTORIA(85) + GILC)* | 1.86 | 455 | 1.11 | 9.07 | 10.1 | n/a | n/a | n/a | n/a | n/a |
| FA1 *(Q = FARANCH + FORT + OFF1.P-1)* | 2.86 | 43 | 0.57 | 5.37 | 3.1 | 17 | 0.40 | 4.82 | 1.93 | 29 [1] |
| FA2 *(Q = FARANCH)* | 0.50 | 28 | 0.57 | 2.44 | 1.4 | 10 | 0.42 | 2.02 | 0.85 | 14 [1] |
| OSO *(Q = OSO)* | 1.82 | 11 | 0.37 | 3.72 | 1.4 | 6 | 0.33 | 2.89 | 0.95 | 18.5 [2] |

1 - CDRFCD CRITERIA TO PROVIDE 12' DRY LANE (EXCLUDING CENTER TURN LANE) DURING 10-YR STORM EVENT

2 - NDOT CRITERIA TO PROVIDE HALF TRAVEL LANE DRY DURING 10-YR STORM EVENT. TOTAL TRAVEL LANE PROPOSED = 26.5-FT

* DOWNSTREAM OF DROP INLET

**FLOW RATE SUMMARY TABLE**

PROPOSED CONDITION

| Basin ID/ Concentration Point ID | Area (acres) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|
| DEV1 | 31.1 | 84 | 38 |
| OFF1.P | 18.1 | 38 | 14 |
| OSO | 3.2 | 11 | 6 |
| PORT | 2.0 | 7 | 4 |
| GILC | 2.9 | 10 | 6 |

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 234-3300 FAX (702) 234-3399

| NO. | DESCRIPTION | DATE | BY | APP. DATE | APP. |
|---|---|---|---|---|---|

DR HORTON

OSO BLANCA & GRAND TETON

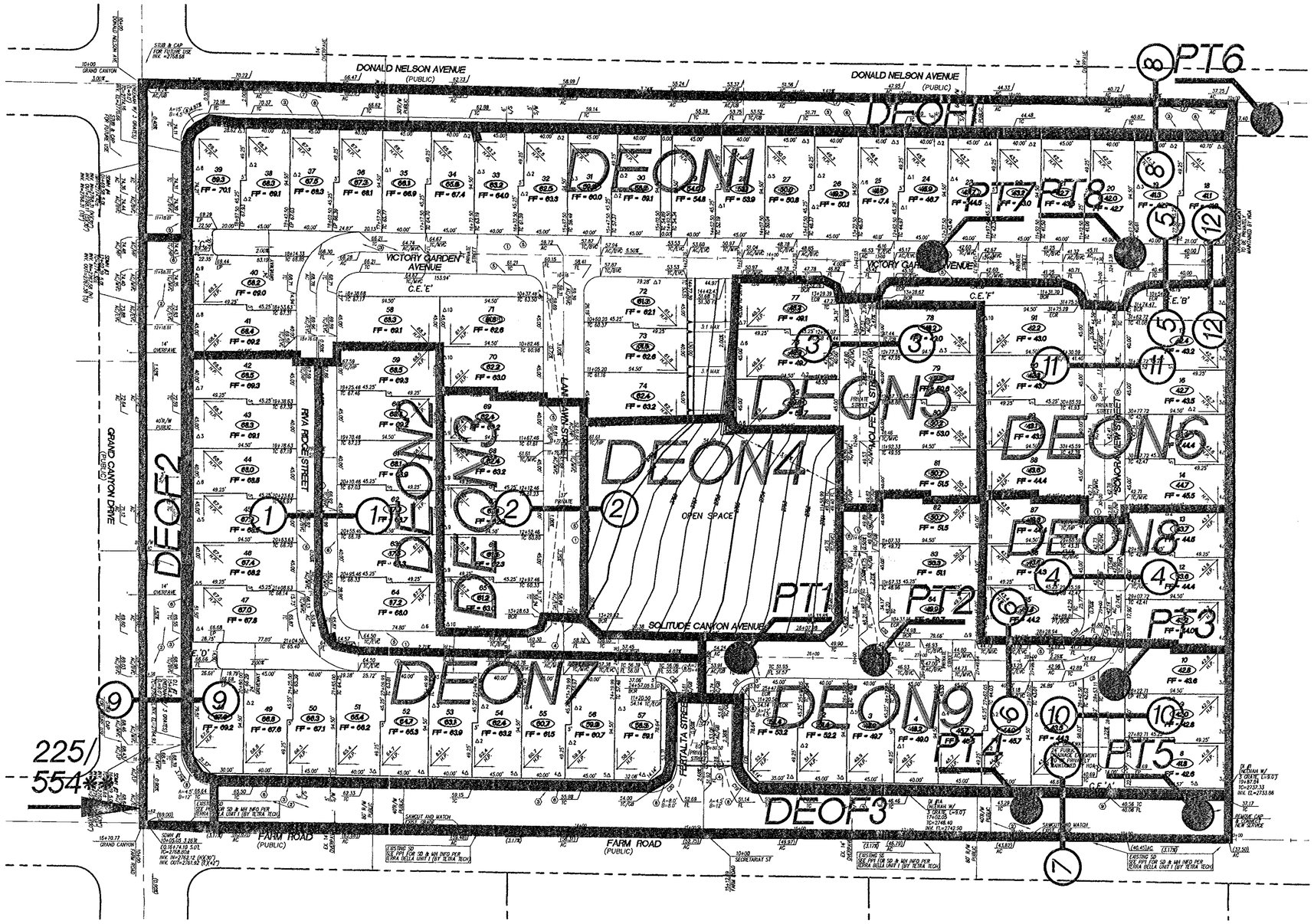
PROPOSED CONDITION DRAINAGE MAP

DATE: MAY 2013
DRAFTER: ETM
DESIGNER: SMJ
CHECKED: MJF
PROJECT NO. DRH1225.000

**EXHIBIT F**

SHEET 1 OF 1

J:\drh1225 oso blanca grand teton\drainage\vctechnical study\fig-ex\drh1225 exhibit f - proposed condition drainage map dwg 5/30/2013 1:45 PM Erick Mota




NORTH

W E

S

50 0 25 50 100

1" = 50

LEGEND

- SITE BOUNDARY
- EXON1 BASIN NAME
- ①—① STREET SECTION
- FLOW DIRECTION
- CONCENTRATION POINT
- ** FLOW PER NORTHWEST NEIGHBORHOOD STUDY

FUTURE DRAINAGE CONDITION

| BASIN/ PT | AREA (ACRES) | Q10/100 (CFS) |
|---|---|---|
| DEON1 | 4.15 | 4/10 |
| DEON2 | 0.89 | 1/2 |
| DEON3 | 0.68 | 1/2 |
| DEON4 | 1.13 | <1/1 |
| DEON5 | 0.81 | 1/2 |
| DEON6 | 1.12 | 1/3 |
| DEON7 | 1.96 | 2/5 |
| DEON8 | 0.70 | 1/2 |
| DEON9 | 1.84 | 2/5 |
| DEOF1 | 0.67 | 1/2 |
| DEOF2 | 0.44 | <1/1 |
| DEOF3 | 0.92 | 226/556 |
| PT1 | – | 2/4 |
| PT2 | – | 2/5 |
| PT3 | – | 4/12 |
| PT4 | – | 228/561 |
| PT5 | – | 228/562 |
| PT6 | – | 7/17 |
| PT7 | – | 5/12 |
| PT8 | – | 6/15 |

* FLOWS CHANGED FROM INTERIM CONDITION

FUTURE STREET CAPACITY

| STREET SECTION | Q10/Q100 (CFS) | D10/D100 (FT) | V10/V100 (FT/S) |
|---|---|---|---|
| RIVA RIDGE ST (SEC 1–1) | 1/2 | 0.30/0.36 | 1.27/1.49 |
| LANI DAWN (SEC 2–2) | 1/2 | 0.23/0.27 | 1.53/1.71 |
| MOLFETTA ST (SEC 3–3) | 1/2 | 0.23/0.24 | 2.59/2.59 |
| SONORA VIEW ST (SEC 4–4) | 1/2 | 0.25/0.30 | 1.15/1.31 |
| VICTORY GARDEN AV (SEC 5–5) | 6/15 | 0.37/0.47 | 2.13/2.65 |
| SOLITUDE CANYON AV (SEC 6–6) | 2/5 | 0.23/0.31 | 2.99/3.65 |
| FARM ROAD (SEC 7–7)* | 228/561 | 0.84/1.09 | 8.24/11.75 |
| DONALD NELSON AV (SEC 8–8)* | 1/2 | 0.17/0.23 | 3.31/2.86 |
| GRAND CANYON DR (SEC 9–9)* | 1/1 | 0.21/0.21 | 1.98/1.98 |
| 24' EASEMENT (SEC 10–10) | 4/12 | 0.14/0.21 | 2.23/3.46 |
| SONORA VIEW ST (SEC 11–11) | 1/3 | 0.22/0.30 | 1.60/1.94 |
| 20' EASEMENT (SEC 12–12) | 6/15 | 0.21/0.30 | 2.66/3.83 |

* FLOWS CHANGED FROM INTERIM CONDITION

This grading plan is a part of drainage study # 3341 which was received on 5/13/03 and Rejected on 6/27/03. Page 11 Of 11

| REV. | DATE | BY | REVISION |
|---|---|---|---|
| | | | |

TETRA TECH, INC.
INFRASTRUCTURE SERVICES GROUP
401 N. Buffalo Dr. Suite 100, Las Vegas, Nevada 89145 (702) 242-4200

KIMBALL HILL
LAS VEGAS, NEVADA

SHEET: FIGURE 9
FUTURE ON-SITE DRAINAGE BASINS

TITLE: TERRASANO
CITY OF LAS VEGAS

DRAWN BY: | DESIGNED BY: | CHECKED BY: | QUALITY CONTROL BY: | QUALITY CONTROL BY: | SCALE:

PROJECT NO. P08179-0006

SEAL

SHEET 1
1 OF 1
DRAWING NO.

# C.2 Reference Plans

- C.2.1 Astoria at Town Center North - Unit 1
- C.2.2 Astoria at Town Center North - Unit 2
- C.2.3 Astoria at Town Center North - Unit 2A
- C.2.4 Grand Teton Drive Storm Drain
- C.2.5 Horse Drive Improvements

# C.2.1 Astoria at Town Center North - Unit 1

# IMPROVEMENT PLANS

FOR

# ASTORIA AT TOWN CENTER - NORTH

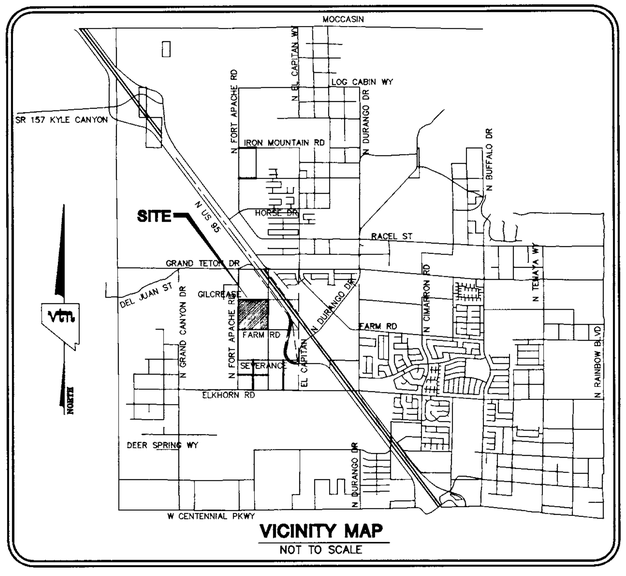
# UNIT 1

## CITY OF LAS VEGAS
## STATE OF NEVADA

APN 125-17-201-001

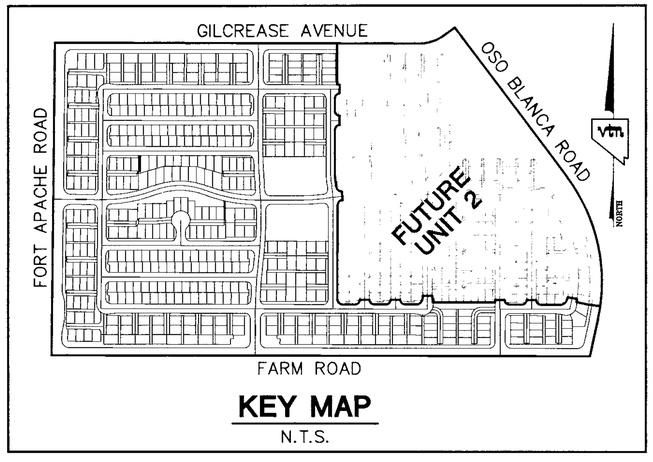
APN 125-17-201-002

| REV# | REV# DESCRIPTION | SHEETS | APPD BY | DATE APPD |
|---|---|---|---|---|
| 1 | REMOVED COMMON LOT & REVISED PROP. LINES | UT 13 & 15 | | |
| 2 | REMOVED COMMON LOT & REVISED PROP. LINES | UT 11 & 23 | | |
| 3 | REMOVED COMMON LOT & REVISED PROP. LINES | UT 2 & 14 | KB | 6/4/8 |
| 4 | REMOVED COMMON LOT & REVISED PROP. LINES | UT 1 | | |
| 1 | PROP. LINE & GRADING CHANGES | GR 1,2,3,6,9,11,12,13 | | |
| 1 | ADDED DETAILS TO REFLECT CHANGES TO THE PL'S | DT 1 & 3 | | |




VICINITY MAP

NOT TO SCALE




KEY MAP

N.T.S.

**DEVELOPER**
THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188
CONTACT RICK BARRON

**OWNER**
ASTORIA NORTHWEST 40 LLC
c/o THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION

**LEGAL DESCRIPTION**
PROPERTY DESCRIBED IN A PRELIMINARY TITLE REPORT PROVIDED BY NEVADA TITLE COMPANY, No. 01-12-1405-JAH, DATED AS OF DEC 12, 2001

APN 125-17-201-001

GOVERNMENT LOT 5, LYING WITH THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA

**BENCHMARKS**
PROJECT DATUM.. NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799 0857 METERS (2621 67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U S 95 NEAR MILE MARKER 90 15

**BASIS OF BEARINGS**
NORTH 00°37'42" EAST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 OF SURVEYS, AT PAGE 57.

**NOTE:**
PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP): (1) A "NOTICE TO INTENT" TO DISCHARGE, (2) A REQUEST FOR INCLUSION IN THE STORM WATER PERMIT No NV0021911, AND (3) A STORM WATER POLLUTION PREVENTION PLAN (SWPPP). FOR MORE INFORMATION, PLEASE CALL CLIFF LAWSON WITH THE NDEP (775) 687-9429 A STORM WATER ATTENDANT AT (775) 687-9417.

Avoid cutting underground utility lines It's costly
**Call before you Dig**
1-800-227-2600

Avoid overhead power line contact It's costly
**Call before you Overhead**
1-702-227-2929

111447
72472 ecm 72718

## APPROVALS

8-16-2004
**CITY ENGINEER** CHARLIE KAJKOWSKI PE# 4784

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

8.10.04
M. Margo Wheeler, AICP, Current Planning Manager — **DATE**

**PLANNING**
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

4.7.04
**CITY FIRE MARSHAL** — **DATE**

8/11-4
**LAS VEGAS VALLEY WATER DISTRICT** — **DATE**
(SEE SHEETS UT1-UT22, DT1).

**NEVADA POWER COMPANY** — **DATE**

Juanita Liddell 7-13-04
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 WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

Ron Castle 7-8-04
**SOUTHWEST GAS COMPANY** — **DATE**

7/12/04
**COX COMMUNICATION** LAS VEGAS INC. — **DATE**

13 Feb 04
**SPRINT** Brian T. Williman — **DATE**

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.

PROFESSIONAL ENGINEER STATE OF NEVADA CHRISTOPHER R. GRUBBS CIVIL No. 13956
EXPIRES 06-30-09
06/03/08

PROFESSIONAL ENGINEER STATE OF NEVADA CHRISTOPHER R. GRUBBS CIVIL No. 13956
EXPIRES 06-30-05

**THE ASTORIA CORPORATION**
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CITY OF LAS VEGAS**

vtn nevada
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

| REV | DATE | BY | REVISION |
|---|---|---|---|

H:\astoria\01\6049cs01.dwg cv 07/09/2004 09:35:58 AM kmp T:\6049\MYLAR\cs3-1.1

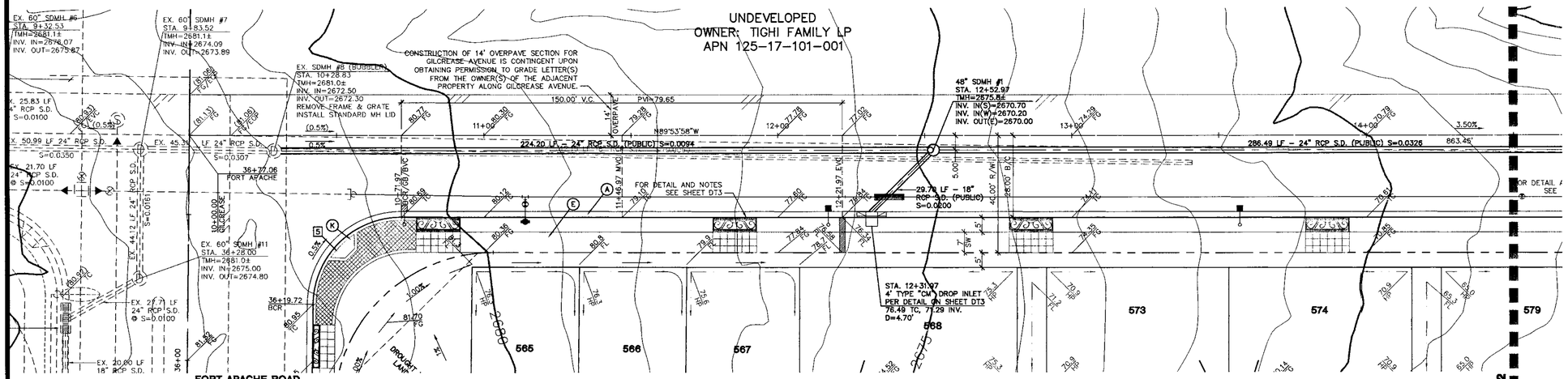
**COVER SHEET**

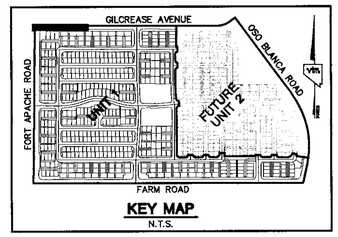
**ASTORIA AT TOWN CENTER - NORTH UNIT 1**

DRAWN BY: tp MAY 2004
DESIGNED BY: tp MAY 2004
CHECKED BY: CRG MAY 2004
PROJECT NO: 6049-1
SCALE: HORIZ. N/A VERT. N/A

SHEET C1
1 OF 11 SHEETS

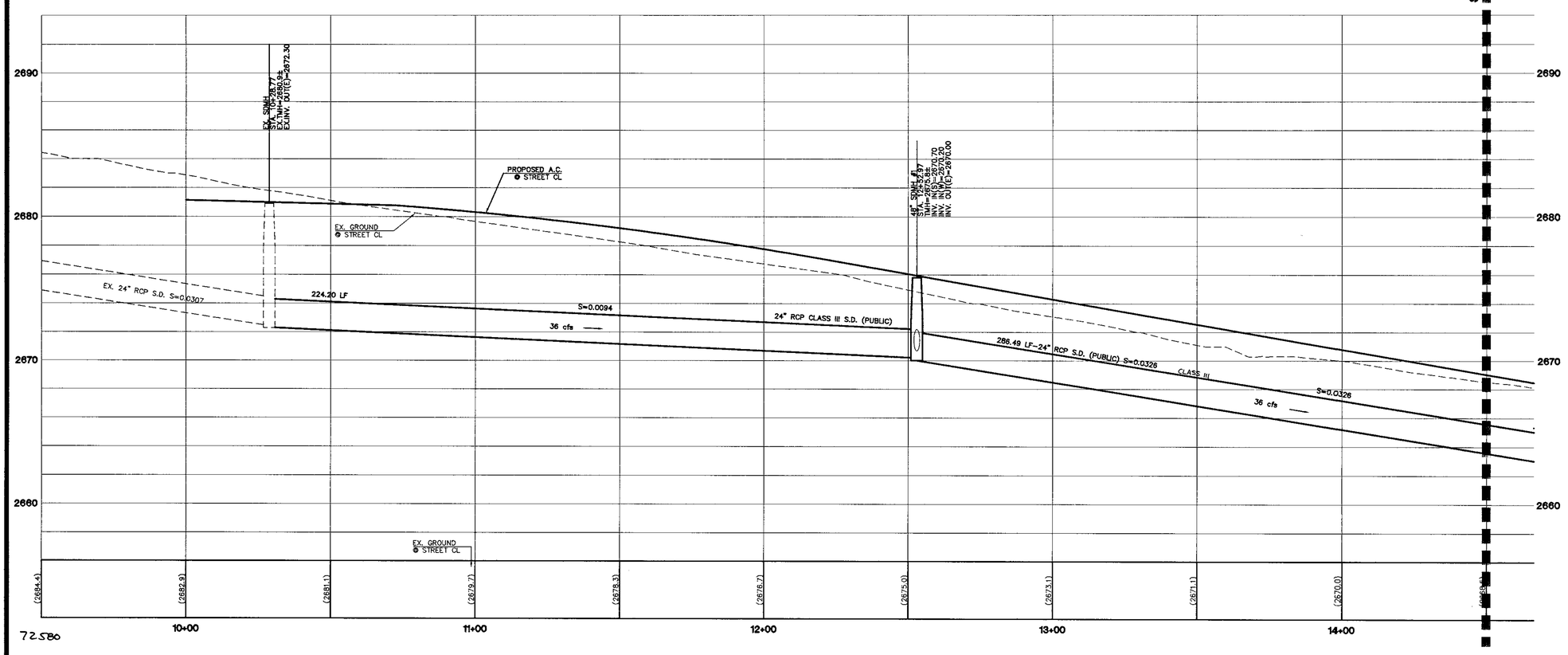
DRAWING NO. 1074933




KEY MAP
N.T.S.

# GILCREASE AVENUE - 24" STORM DRAIN




72.580

GRAPHIC SCALE
20 0 10 20 40
1" = 20'

NORTH

| D-LOAD TABLE | |
|---|---|
| CLASS | MINIMUM DEPTH |
| I | 27" |
| II | 24" |
| III | 18" |
| IV | 12" |

**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**BENCHMARKS**
PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), DETERMINED BY CLARK COUNTY GIS CONTROL POINTS 802, 803, 804, AND 805, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Avoid cutting underground utility lines. It's costly.
Call before you Dig
1-800-227-2600

Avoid overhead power line contact. It's costly.
Call before you Overhead
1-702-593-8111

| REV | DATE | BY | REVISION |
|---|---|---|---|

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THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

CITY OF LAS VEGAS

vtn nevada
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS


STORM DRAIN
GILCREASE AVENUE
PLAN AND PROFILE

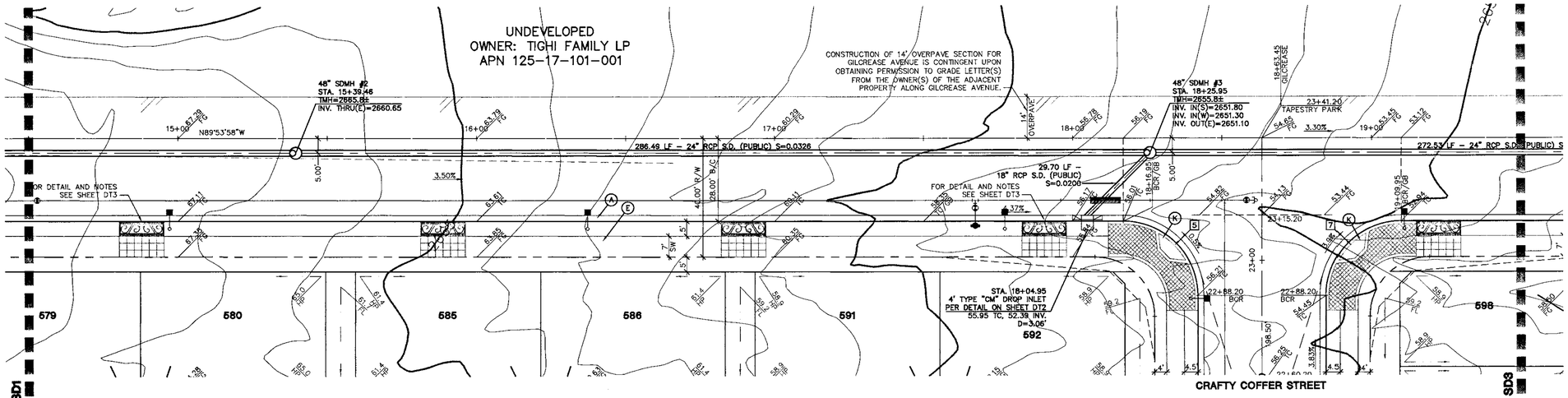
ASTORIA AT
TOWN CENTER - NORTH
UNIT 1

| | | |
|---|---|---|
| DRAWN BY: dtb | MAY 2004 | |
| DESIGNED BY: dtb | MAY 2004 | |
| CHECKED BY: CRG | MAY 2004 | SCALE: 1"=20' HORIZ. 1"=4' VERT. |
| PROJECT NO: 5049-1 | | |

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRIBBLE
CIVIL
No. 13956
EXPIRES 06-30-05

SHEET
SD1
109 OF 112 SHEETS

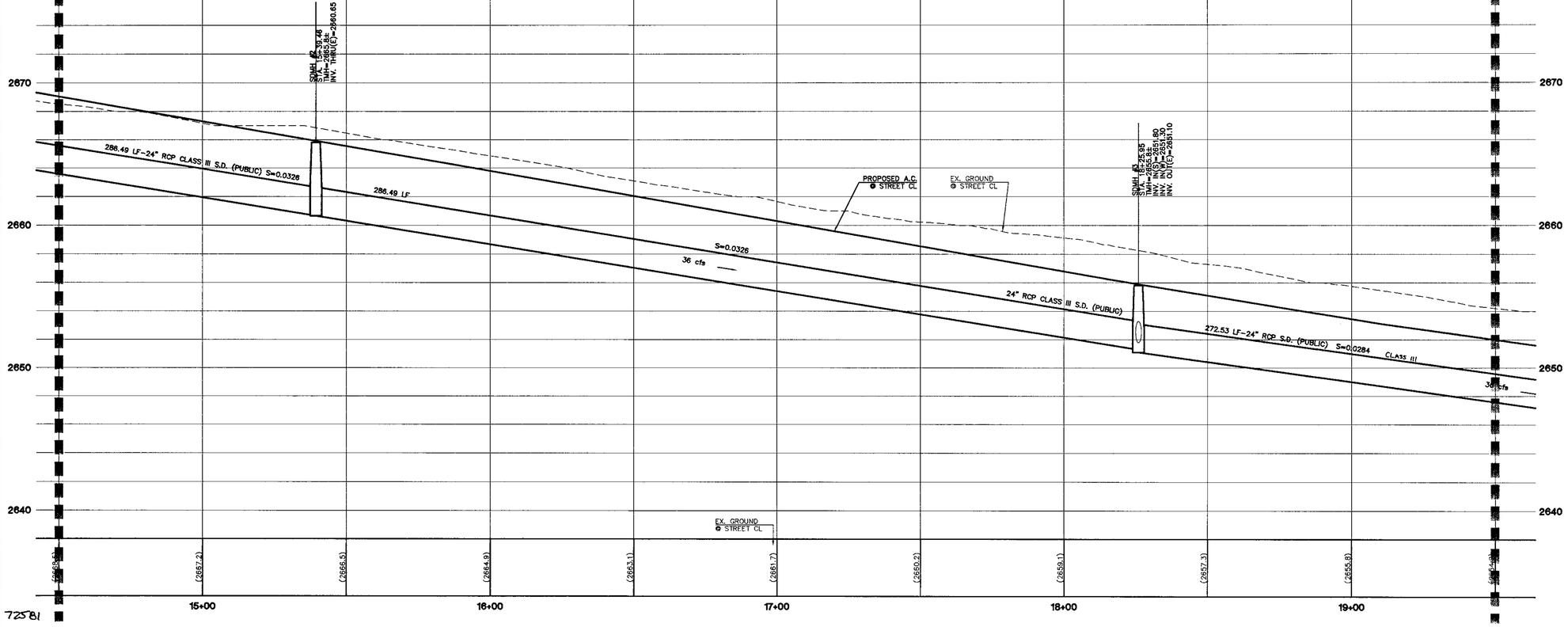
DRAWING NO.
1074837




STA. 14+50.00 MATCHLINE - SEE SHEET SD1

STA. 19+50.00 MATCHLINE - SEE SHEET SD3

# GILCREASE AVENUE - 24" STORM DRAIN




| D-LOAD TABLE | |
|---|---|
| CLASS | MINIMUM DEPTH |
| I | 27" |
| II | 24" |
| III | 18" |
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**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**BENCHMARKS**
PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), DETERMINED BY CLARK COUNTY GIS CONTROL POINTS 802, 803, 804, AND 805, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

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Avoid overhead power line contact. It's costly. **Call before you Overhead** 1-702-593-6111

| REVISION | BY | DATE | REV |
|---|---|---|---|

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THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

CITY OF LAS VEGAS

vtn nevada
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STORM DRAIN
GILCREASE AVENUE
PLAN AND PROFILE

ASTORIA AT
TOWN CENTER - NORTH
UNIT 1

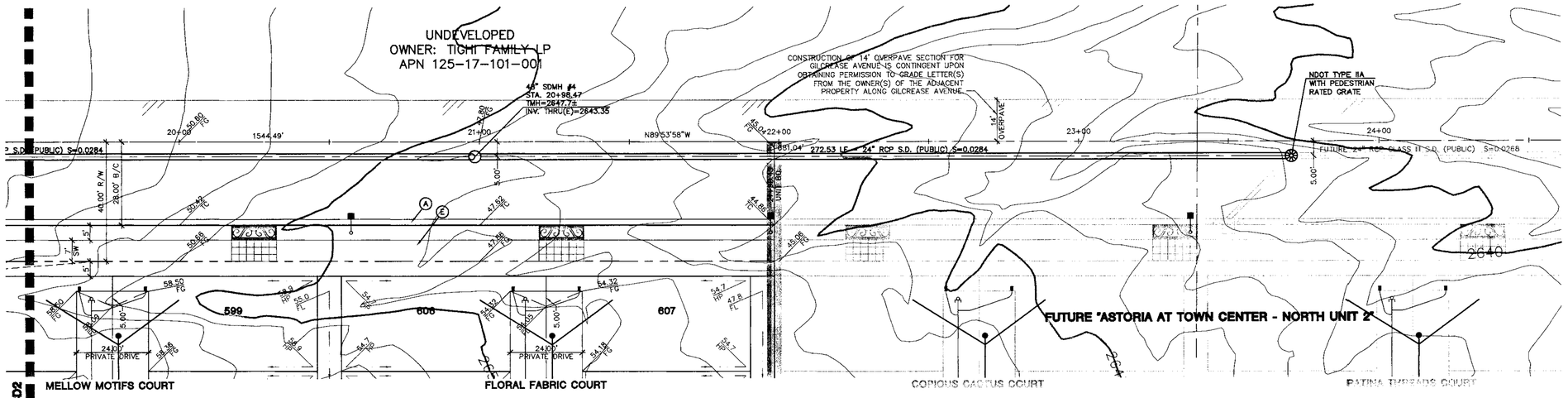
| DRAWN BY: | DESIGNED BY: | CHECKED BY: | PROJECT NO: | SCALE: |
|---|---|---|---|---|
| dtb | dtb | CRG | 6049-1 | 1"=20' HORIZ. 1"=4' VERT. |
| MAY 2004 | MAY 2004 | MAY 2004 | | |

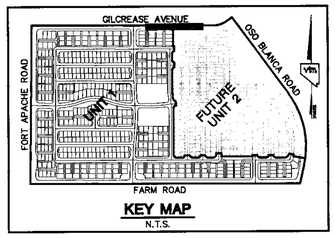
PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRUBBS
No. 13956
CIVIL
EXPIRES 06-30-05
8/10/04

SHEET
SD2
110 OF 112 SHEETS

DRAWING NO.
1074883

72581

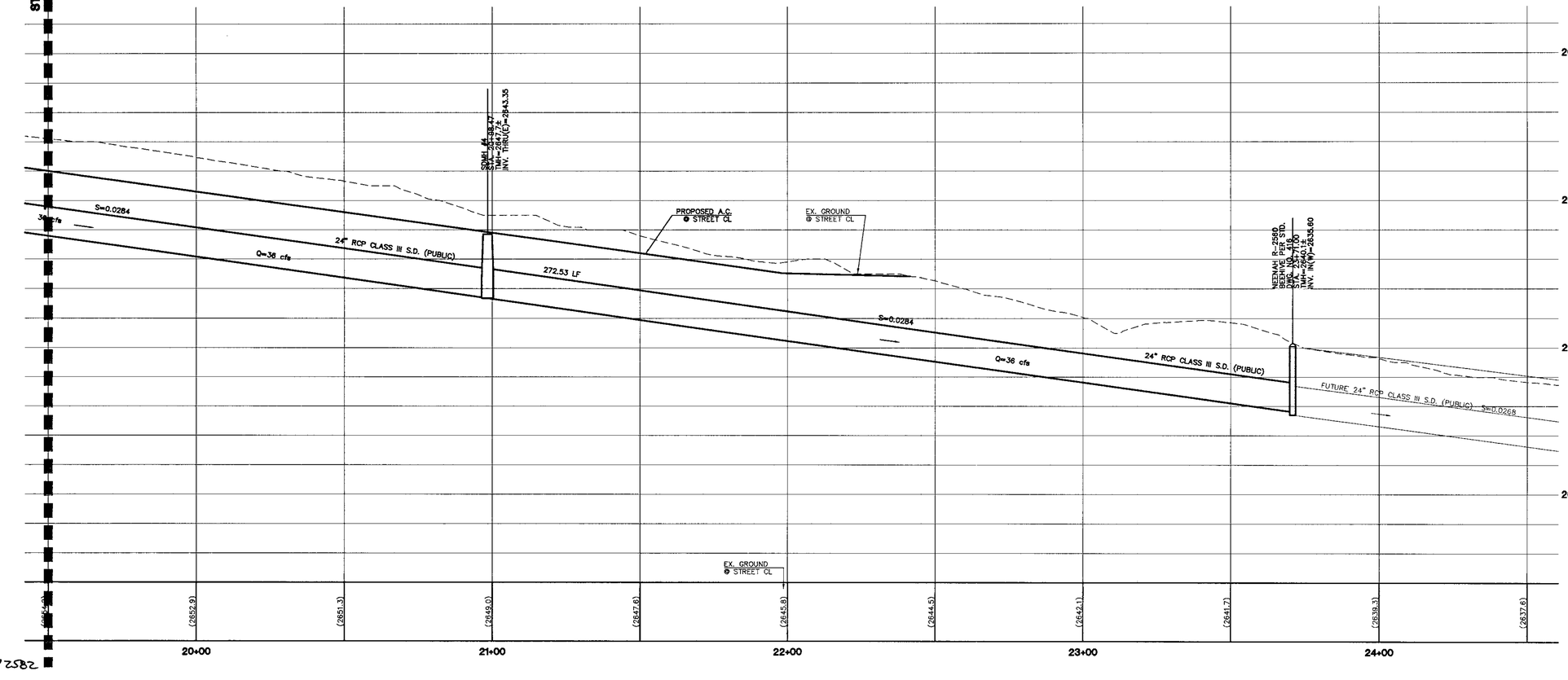



**KEY MAP**
N.T.S.

STA. 19+50.00 MATCHLINE - SEE SHEET SD2

# GILCREASE AVENUE - 24" STORM DRAIN




## CONTRACTOR NOTE

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

## BENCHMARKS

PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

## BASIS OF BEARINGS

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72582

REVISION | BY | DATE | REV

H:\650\fmond\01650406S1.dwg, sd3, 08/10/2004 07:32:08 AM, mfreed, TDS600MAP.LAR, pc3, 1:20

**THE ASTORIA CORPORATION**
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CITY OF LAS VEGAS**

vtn nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597

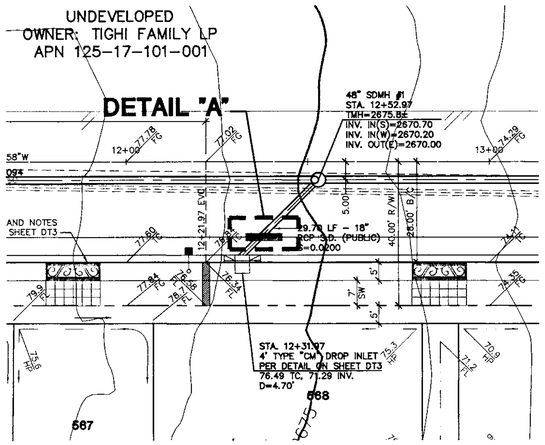
**STORM DRAIN GILCREASE AVENUE PLAN AND PROFILE**

**ASTORIA AT TOWN CENTER - NORTH UNIT 1**

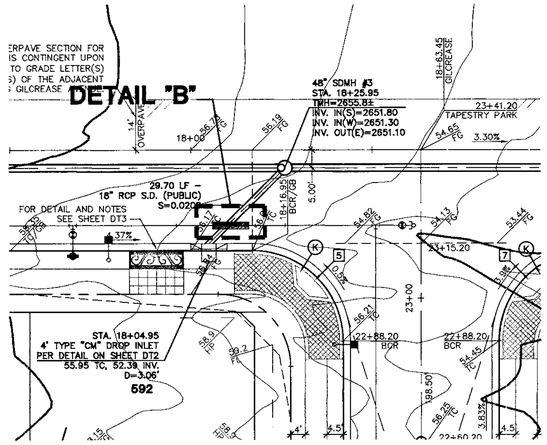
DRAWN BY: dtb — MAY 2004
DESIGNED BY: dtb — MAY 2004
CHECKED BY: CRG — MAY 2004
PROJECT NO: 0650-1
SCALE: HORIZ. 1"=20' VERT. 1"=4'

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRUBBS
No. 13956
CIVIL
EXPIRES 06-30-05
8/10/04

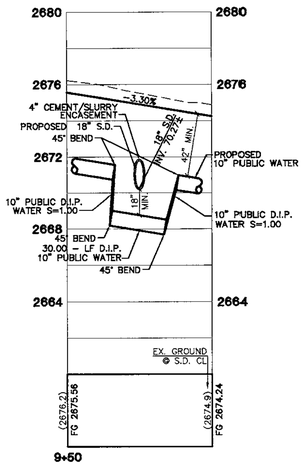
SHEET
**SD3**
111 OF 112 SHEETS
DRAWING NO.
1074833



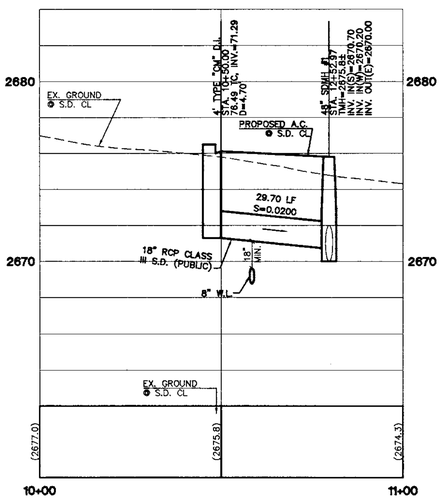

## GILCREASE AVENUE - 18" S.D. LATERAL (WEST)

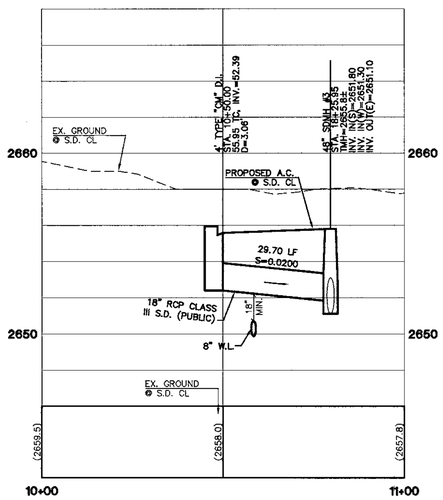


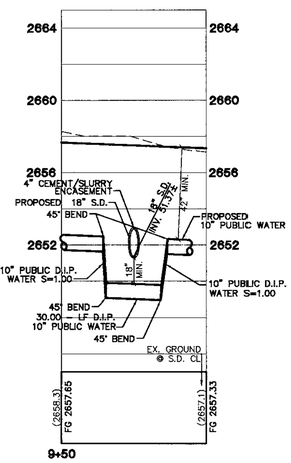

## GILCREASE AVENUE - 18" S.D. LATERAL (CENTER)



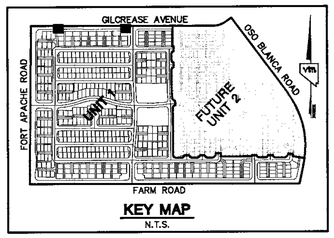

## DETAIL "A"




## DETAIL "B"




**KEY MAP**
N.T.S.

GRAPHIC SCALE
20 0 10 20 40
1" = 20'

**D-LOAD TABLE**

| CLASS | MINIMUM DEPTH |
|---|---|
| I | 27" |
| II | 24" |
| III | 18" |
| IV | 12" |

**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**BENCHMARKS**
PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**
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**THE ASTORIA CORPORATION**
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CITY OF LAS VEGAS**

vtn nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597

| REV | DATE | BY | REVISION |
|---|---|---|---|

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**STORM DRAIN GILCREASE AVENUE PLAN AND PROFILE**

**ASTORIA AT TOWN CENTER - NORTH UNIT 1**

| | | | |
|---|---|---|---|
| DRAWN BY: dtb | MAY 2004 | SCALE: | HORIZ. 1"=20' VERT. 1"=4' |
| DESIGNED BY: dtb | MAY 2004 | | |
| CHECKED BY: CRG | MAY 2004 | | |
| PROJECT NO: 604d-1 | | | |

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GIBBS
No. 13956
EXPIRES 06-30-05
8/10/04

SHEET
**SD4**
**112** OF **112** SHEETS

DRAWING NO.
10744853

72583

# C.2.2 Astoria at Town Center North - Unit 2

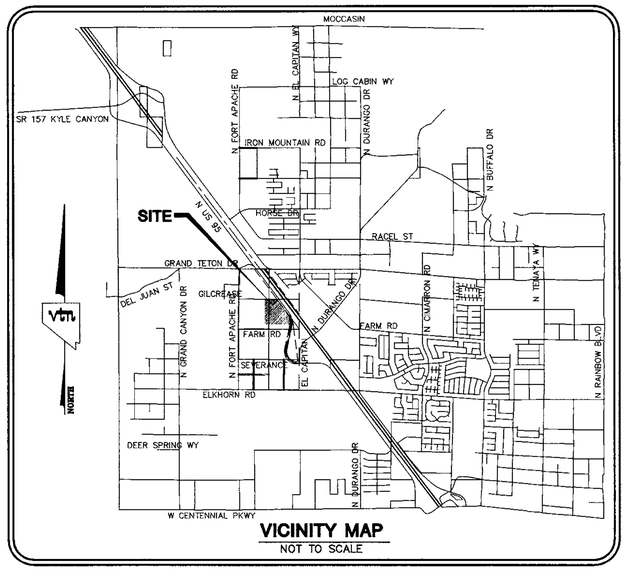
# IMPROVEMENT PLANS

FOR

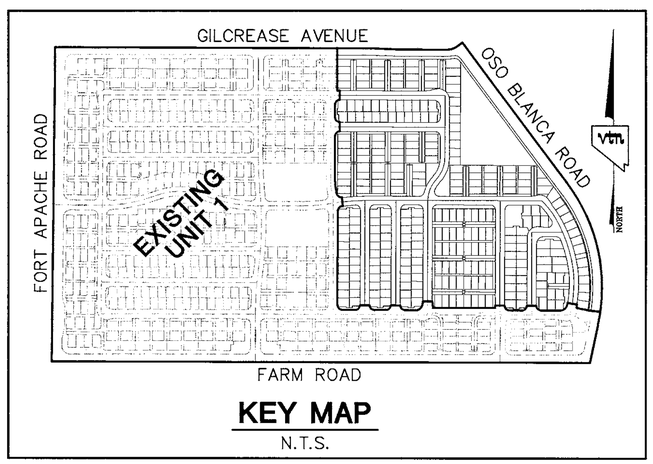
# ASTORIA AT TOWN CENTER - NORTH UNIT 2

## CITY OF LAS VEGAS
## STATE OF NEVADA

APN 125-17-201-002
APN 125-17-201-001




VICINITY MAP
NOT TO SCALE




KEY MAP
N.T.S.

**DEVELOPER**
THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188
CONTACT: RICK BARRON

**OWNER**
ASTORIA NORTHWEST 40 LLC
c/o THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**LEGAL DESCRIPTION**
PROPERTY DESCRIBED IN A PRELIMINARY TITLE REPORT PROVIDED BY NEVADA TITLE COMPANY, No. 01-12-1405-JAH, DATED AS OF DEC. 12, 2001

APN 125-17-201-001/APN 125-17-201-002

GOVERNMENT LOT 5, LYING WITH THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA

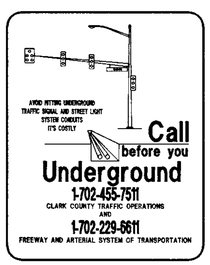
**BENCHMARKS**
PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.0857 METERS (2621.67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**
NORTH 00°37'40" EAST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 OF SURVEYS, AT PAGE 57.

**NOTE:**
PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP): (1) A "NOTICE TO INTENT" TO DISCHARGE, (2) A REQUEST FOR INCLUSION IN THE STORM WATER PERMIT No. NV0021911, AND (3) A STORM WATER POLLUTION PREVENTION PLAN (SWPPP). FOR MORE INFORMATION, PLEASE CALL CLIFF LAWSON WITH THE NDEP (775) 687-9429 A STORM WATER ATTENDANT AT (775) 687-9417.



## APPROVALS

11-2-2004
**CITY ENGINEER** CHARLIE KAJKOWSKI PE# 4784

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

10/27/04
M. Margo Wheeler, AICP, Current Planning Manager **DATE**

**PLANNING**
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

10/27/04
**CITY FIRE MARSHAL** **DATE**

**LAS VEGAS VALLEY WATER DISTRICT** **DATE**
(SEE SHEETS C1, C2, UT1-UT9) PROJECT 109251

Sandy Larsen 9-30-04
**NEVADA POWER COMPANY** **DATE**

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 WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

Ron Castle 9-30-04
**SOUTHWEST GAS COMPANY** **DATE**

Hisel Gonzales 10/1/04
**COX COMMUNICATIONS LV, INC.** **DATE**

PROJECT NAME: Astoria @ Town Center North - Unit 2 & C-1, C-2 UT1-UT9
This project water plan complies with the Las Vegas Valley Water District's technical requirements. However, this water plan is
***NOT APPROVED FOR CONSTRUCTION***
at this time and this signature does not provide or imply a water commitment.
LVVWD 10/25/04 DATE
ESN.052

Hollis M Berry 9-30-04
**SPRINT** HOLLIS M. BERRY JR. **DATE**

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.

| REV | DATE | BY | REVISION |
|---|---|---|---|

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9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

CITY OF LAS VEGAS

vtn nevada
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PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

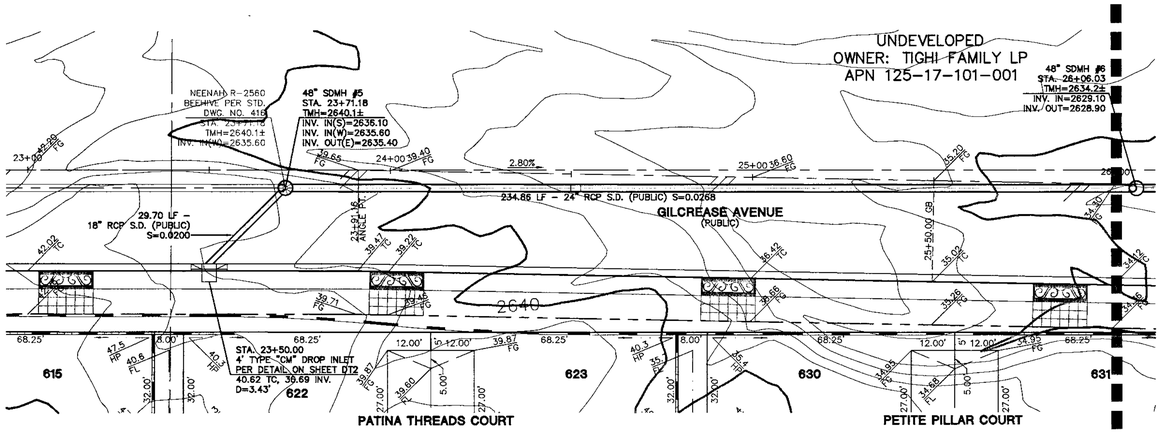
ASTORIA AT TOWN CENTER - NORTH UNIT 2

DRAWN BY: sp JUNE 2004
DESIGNED BY: tp JUNE 2004
CHECKED BY: CRG JUNE 2004
PROJECT NO: 6049-2
SCALE: HORIZ. N/A VERT. N/A

PROFESSIONAL ENGINEER - STATE OF NEVADA - CHRISTOPHER R. GILBREAS - No. 13956 - CIVIL
EXPIRES 06-30-05

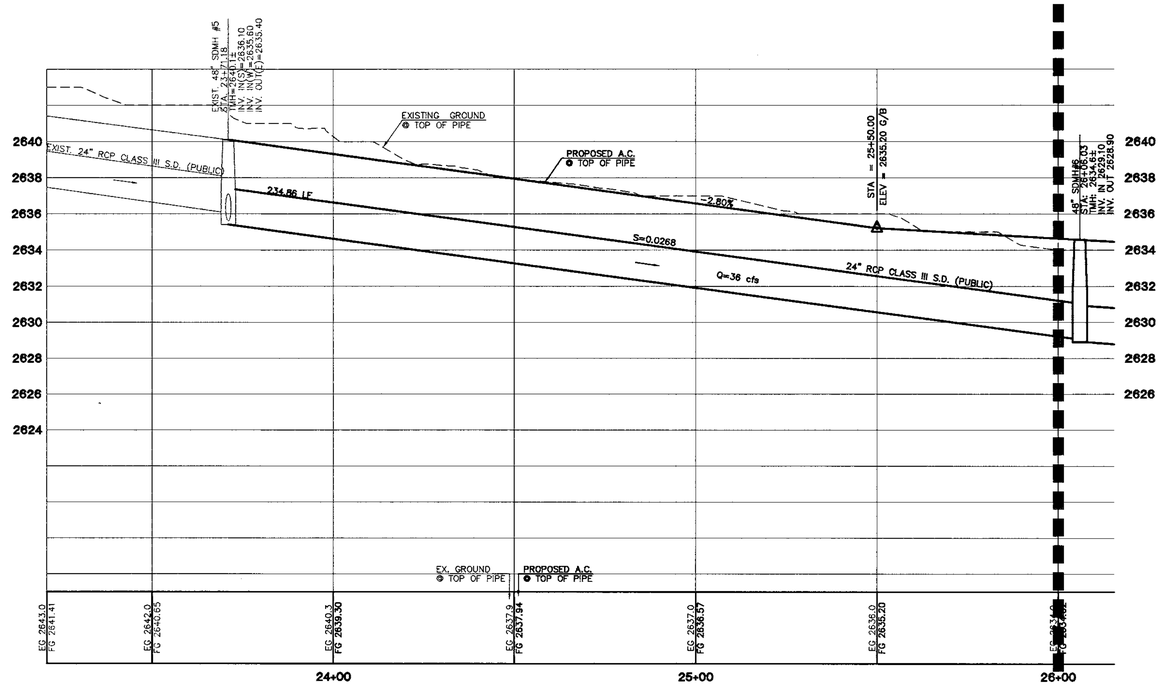
SHEET C1
1 OF 61 SHEETS
DRAWING NO. 1074833-2

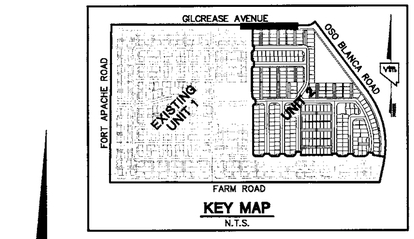
44300




# GILCREASE AVENUE - 24" STORM DRAIN

MATCHLINE - SEE SHEET SD2
STA. 26+00.00




NORTH

GRAPHIC SCALE

20 0 10 20 40

1" = 20'

**CONTRACTOR NOTE**

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**BENCHMARKS**

PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : CC9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DEFINED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83), EAST ZONE (2701), DETERMINED BY CLARK COUNTY GIS CONTROL POINTS 802, 803, 804, AND 805, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN BOOK 88 OF SURVEYS, AT PAGE 53.

Avoid cutting underground utility lines. It's costly.
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1-800-227-2600

Avoid overhead power line contact. It's costly.
**Call before you Overhead**
1-702-593-6111

| REV | DATE | BY | REVISION |
|---|---|---|---|
| | | | |

**THE ASTORIA CORPORATION**
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CITY OF LAS VEGAS**

vtn nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2597

**STORM DRAIN GILCREASE AVENUE PLAN AND PROFILE**

**ASTORIA AT TOWN CENTER - NORTH UNIT 2**

DRAWN BY: tp — JUNE 2004
DESIGNED BY: stb — JUNE 2004
CHECKED BY: CRG — JUNE 2004
PROJECT NO: 0049-2
SCALE: HORIZ. 1"=20' VERT. 1"=4'

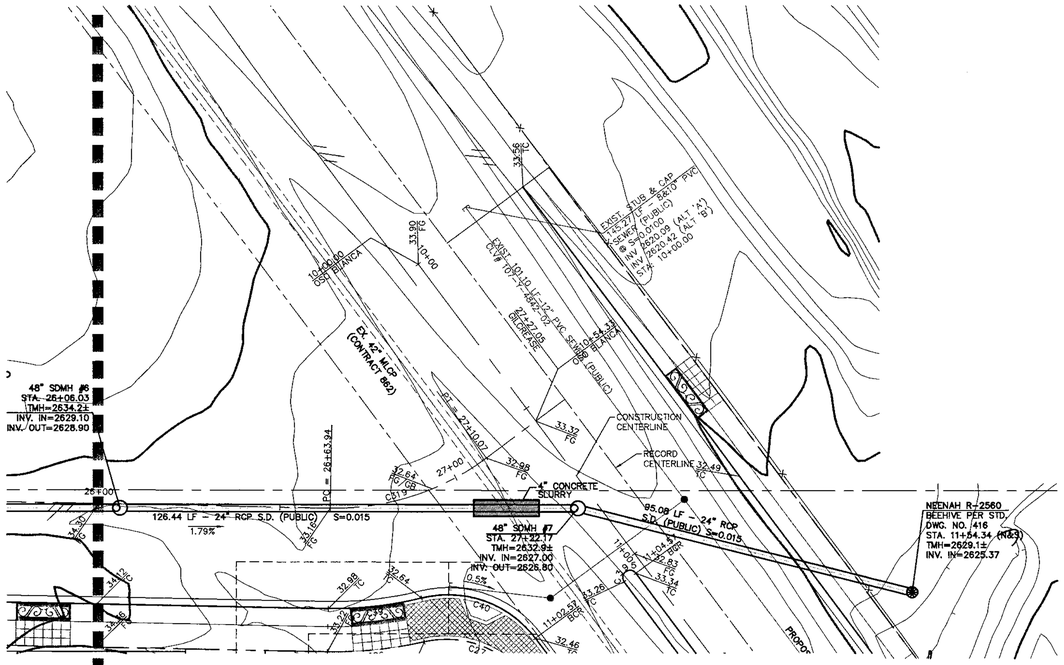
PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRUBBS
No. 13956
CIVIL
EXPIRES 06-30-05
10/22/04

SHEET
SD1
57 OF 61 SHEETS

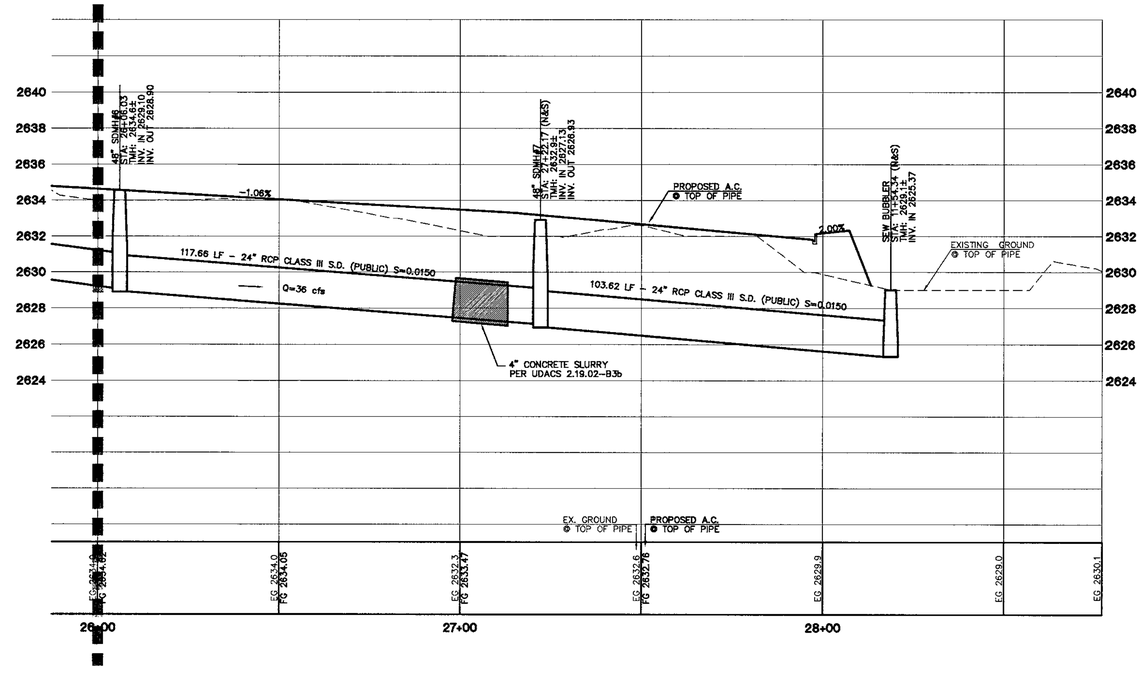
DRAWING NO.
1027488 55-7

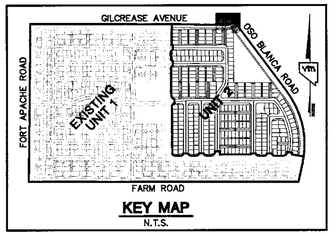
drafted: C:\Docs\Proj\SD2.dwg, ref: 10/22/2004 10:03:33 AM, by:tp, T:\0049\DWG\LAR.ctb, 1:20

A-1356




## GILCREASE AVENUE - 24" STORM DRAIN




NORTH

GRAPHIC SCALE

20 0 10 20 40

1" = 20'

**CONTRACTOR NOTE**

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**BENCHMARKS**

PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**

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| REV | DATE | BY | REVISION |
|---|---|---|---|
| | | | |

**THE ASTORIA CORPORATION**
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LAS VEGAS, NEVADA 89134
(702) 257-1188

**CITY OF LAS VEGAS**

vtn nevada
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

**STORM DRAIN GILCREASE AVENUE PLAN AND PROFILE**

**ASTORIA AT TOWN CENTER - NORTH UNIT 2**

DRAWN BY: tp — JUNE 2004
DESIGNED BY: dtb — JUNE 2004
CHECKED BY: CRG — JUNE 2004
PROJECT NO: 8049-2
SCALE: 1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRUBBS
No. 13956
CIVIL
EXPIRES 06-30-05
10/22/04

SHEET
**SD2**
58 OF 61 SHEETS
DRAWING NO.
1674188-2

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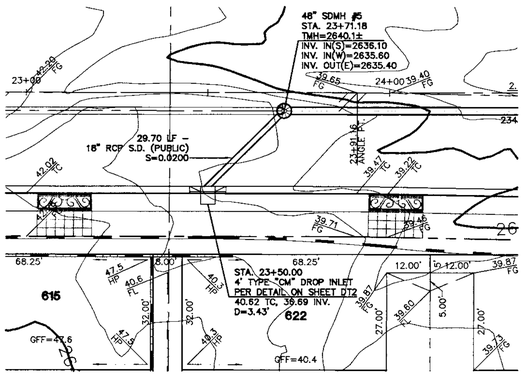
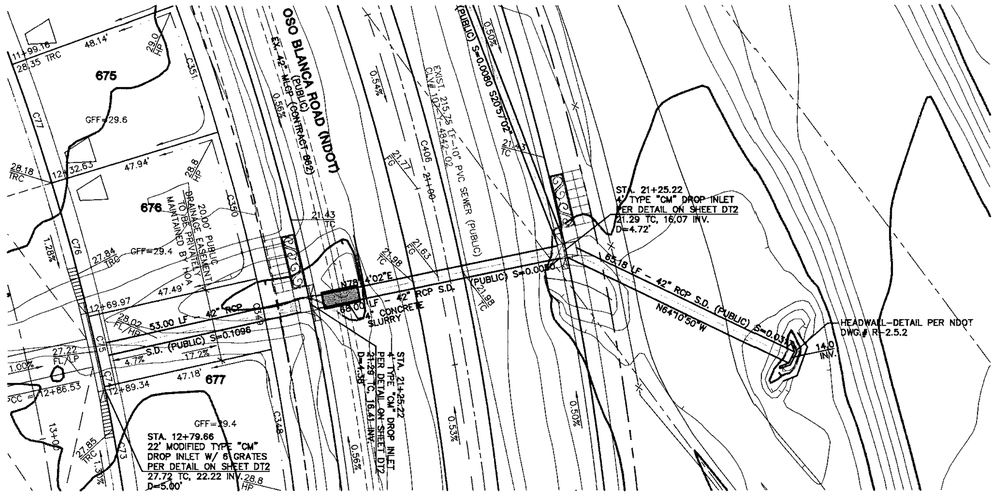
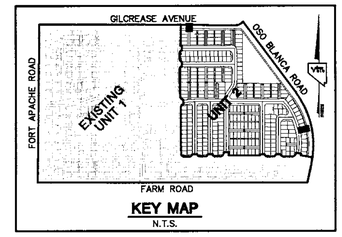



## GILCREASE AVENUE - 18" S.D. LATERAL (WEST)




## DRAINAGE EASMENT 42" RCP S.D.



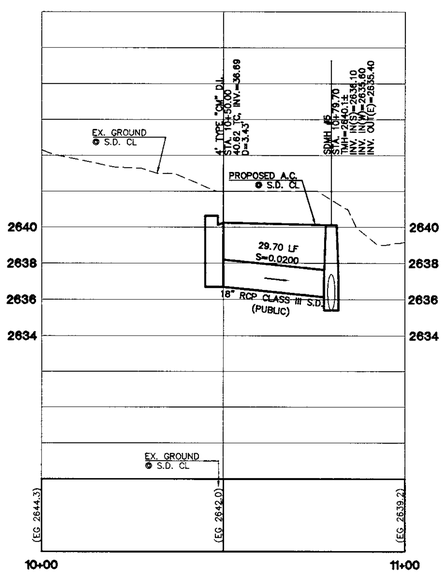
GRAPHIC SCALE

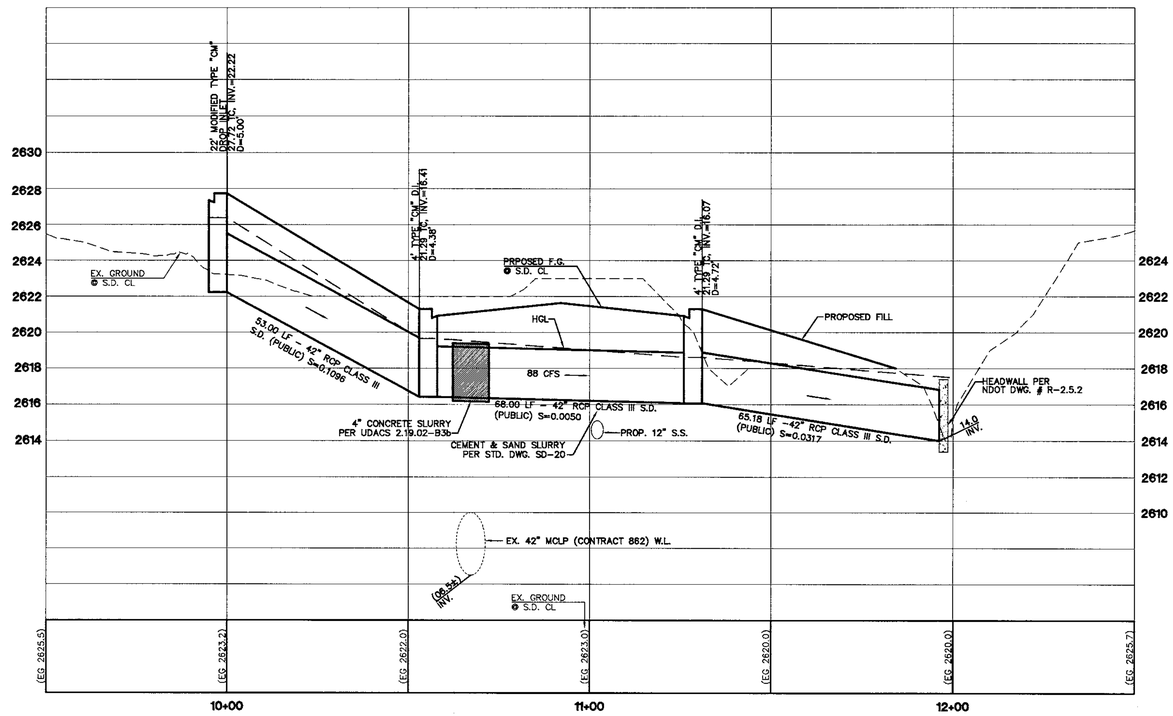
20 0 10 20 40

1" = 20'

**D-LOAD TABLE**

| CLASS | MINIMUM DEPTH |
|---|---|
| I | 27" |
| II | 24" |
| III | 18" |
| IV | 12" |




**CONTRACTOR NOTE**

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**BENCHMARKS**

PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.117 METERS (2621.77 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**

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1-702-593-8111

| REV | DATE | BY | REVISION |
|---|---|---|---|
| | | | |

**CITY OF LAS VEGAS**

**THE ASTORIA CORPORATION**
9555 HERB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
vtn nevada CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

**STORM DRAIN - GILCREASE AV. & DRAINAGE EASEMENT PLAN AND PROFILE**

**ASTORIA AT TOWN CENTER - NORTH UNIT 2**

| | | | |
|---|---|---|---|
| DRAWN BY: dtb/tp | JUNE 2004 | SCALE: | 1"=20' HORIZ. 1"=4' VERT. |
| DESIGNED BY: dtb/tp | JUNE 2004 | | |
| CHECKED BY: CRG | JUNE 2004 | | |
| PROJECT NO: 5049-2 | | | |

PROFESSIONAL ENGINEER-STATE OF NEVADA
CHRISTOPHER R. GRUBBS
CIVIL
No. 13958
EXPIRES 06-30-05
10/22/04

SHEET
**SD3**
59 OF 61 SHEETS

DRAWING NO.
1074489-2

S:\Software\CD\5049\dwg\SD3.dwg, tab: 1, 10/22/2004 10:05:36 AM, tmyle, TDS600MPS.ctb, pen1.ctb

# C.2.3 Astoria at Town Center North - Unit 2A

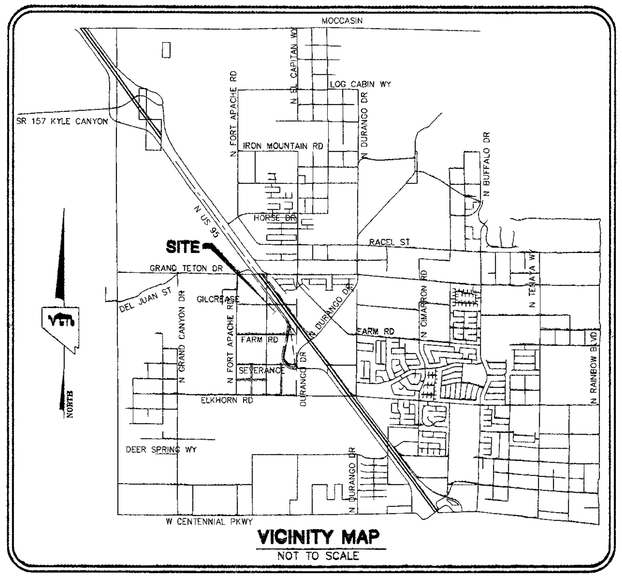
# IMPROVEMENT PLANS

FOR

# ASTORIA AT TOWN CENTER - NORTH UNIT 2A

## CITY OF LAS VEGAS
## STATE OF NEVADA

APN 125-17-211-306




VICINITY MAP
NOT TO SCALE

**DEVELOPER**
THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188
CONTACT: RICK BARRON

**OWNER**
ASTORIA NORTHWEST 40 LLC
c/o THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

**CONTRACTOR NOTE**
CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

**LEGAL DESCRIPTION**
PROPERTY DESCRIBED IN A PRELIMINARY TITLE REPORT PROVIDED BY NEVADA TITLE COMPANY, No 01-12-1405-JAH, DATED AS OF DEC 12, 2001

APN 125-17-211-306

GOVERNMENT LOT 5, LYING WITH THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA

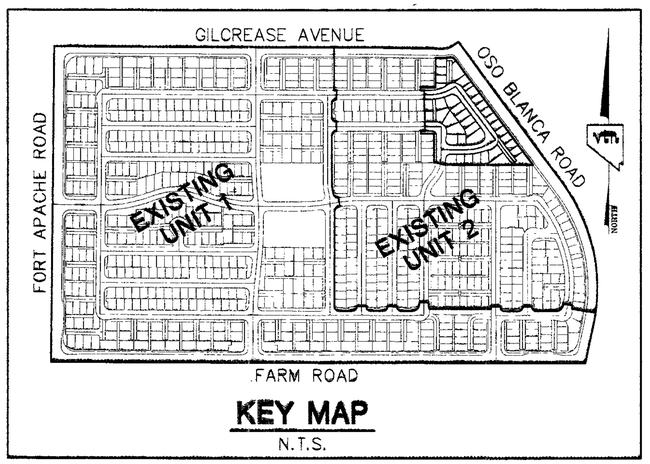
**BENCHMARKS**
PROJECT DATUM - NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK - 0C9017N6
ELEVATION 799.0857 METERS (2621 67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S 95 NEAR MILE MARKER 90.15.

**BASIS OF BEARINGS**
NORTH 00°37'42" EAST, BEING THE BEARING OF THE WEST LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON A RECORD OF SURVEY ON FILE IN THE CLARK COUNTY, NEVADA, RECORDER'S OFFICE, IN FILE 114 OF SURVEYS, AT PAGE 57.

**NOTE:**
PROJECTS THAT DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). (1) A "NOTICE TO INTENT" TO DISCHARGE, (2) A REQUEST FOR INCLUSION IN THE STORM WATER PERMIT No. NVO021911, AND (3) A STORM WATER POLLUTION PREVENTION PLAN (SWPPP). FOR MORE INFORMATION, PLEASE CALL CLIFF LAWSON WITH THE NDEP (775) 687-9429 A STORM WATER ATTENDANT AT (775) 687-9417.




KEY MAP
N.T.S.

## APPROVALS

CITY ENGINEER — CHARLIE KAJKOWSKI PE# 4784 — 1/27/2006

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER DEVIATIONS FROM STANDARD THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

M. Margo Wheeler, AICP, Director of Planning and Development — 1/25/06 DATE

**PLANNING**
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

CITY FIRE MARSHAL — 1-4-06 DATE

LAS VEGAS VALLEY WATER DISTRICT — DATE
(SEE SHEETS C1, UT1-UT4) PROJECT 111684
ESS1

NEVADA POWER COMPANY — 1.6.06 DATE

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 WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS COMPANY — 12-20-05 DATE

COX COMMUNICATIONS LV, INC. — 12.21.05 DATE

PROJECT NAME Astoria at Town Center North Unit 2A

This project water plan complies with the Las Vegas Valley Water District's technical requirements However, this water plan is

NOT APPROVED FOR CONSTRUCTION

at this time and this signature does not provide or imply a water commitment

LVVWD Preliminary Shell (CITY1-0049, ESS1) — 01/04/06 DATE
ESN 052 — REVISED 08/01/04

SPRINT — 12-21-05 DATE

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.

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THE ASTORIA CORPORATION
9555 DEL WEBB BOULEVARD
LAS VEGAS, NEVADA 89134
(702) 257-1188

CITY OF LAS VEGAS

VTN nevada
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550 FAX (702) 362-2597
CONSULTING ENGINEERS ● PLANNERS ● LAND SURVEYORS

COVER SHEET

ASTORIA AT TOWN CENTER - NORTH UNIT 2A

DRAWN BY: JP
DESIGNED BY:
CHECKED BY: CRG
AUGUST 2005
AUGUST 2005
PROJECT NO: 6049-2A
SCALE: N/A HORIZ. N/A VERT.

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER R. GRUBBS
CIVIL
No. 13966
EXPIRES 06-30-07
12/20/05

SHEET
C1
1 OF 18 SHEETS

DRAWING NO.
1074833-2A

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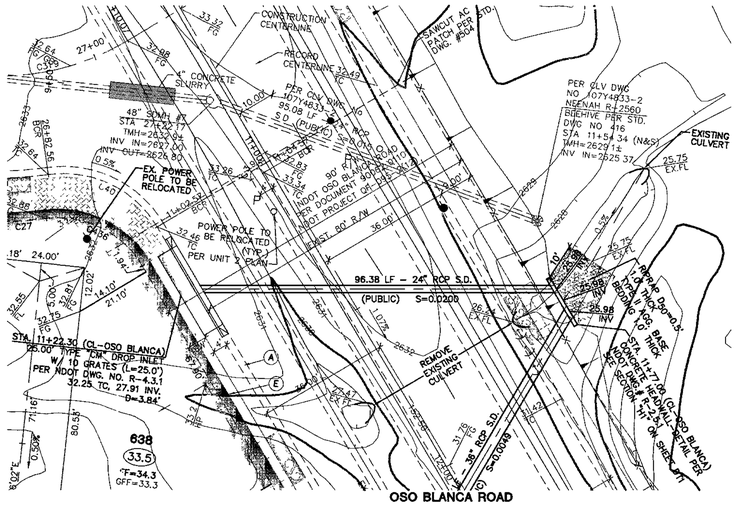
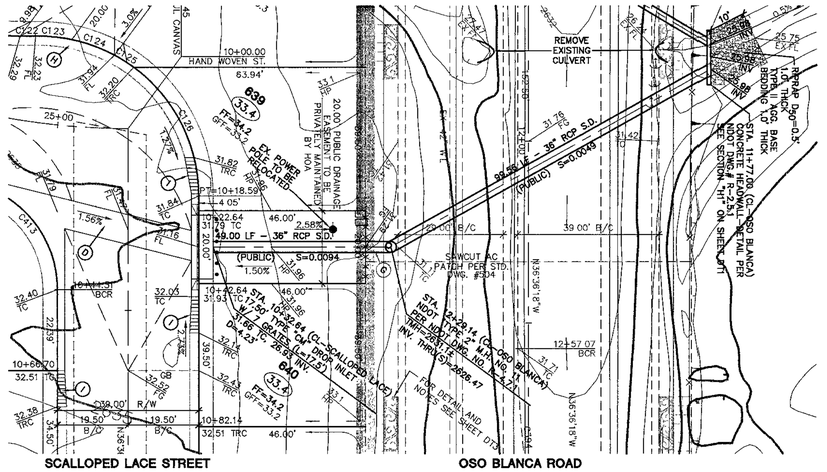
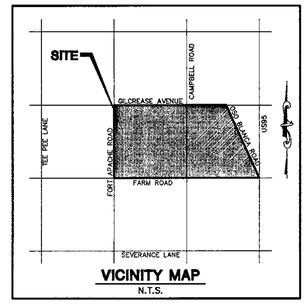
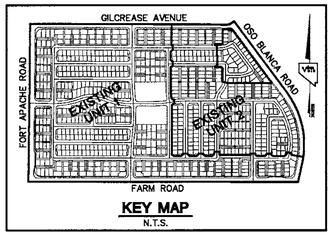
87606




## CONSTRUCTION NOTES

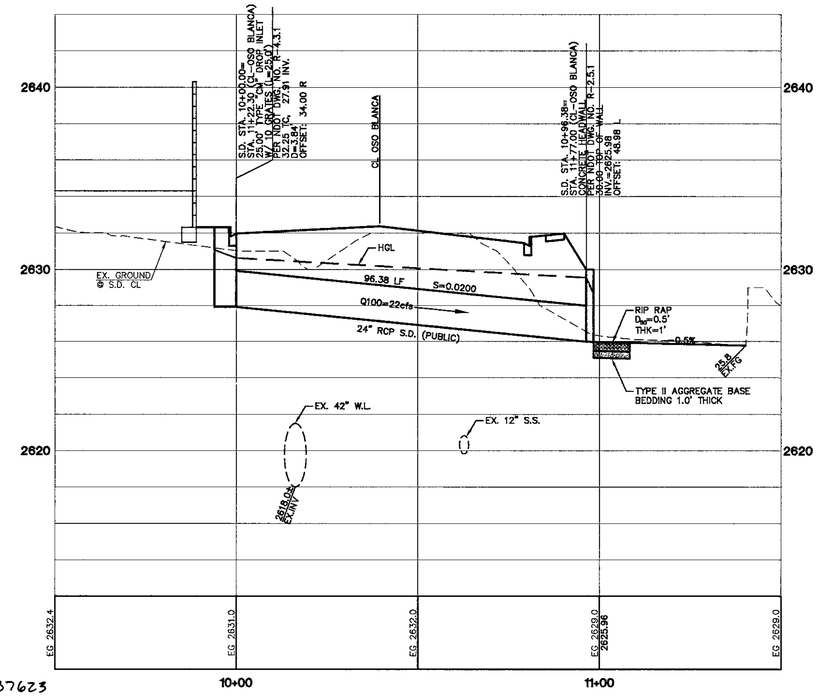
- (A) CONSTRUCT 24" "L" TYPE CURB & GUTTER PER STD. DWG. NO. 216
- (B) CONSTRUCT 30" "ROLL" TYPE CURB & GUTTER PER STD. DWG. NO. 217A
- (C) CONSTRUCT "A" TYPE ISLAND CURB PER STD. DWG. NO. 219
- (D) CONSTRUCT CONCRETE CROSS GUTTER PER STD. DWG. NO. 228
- (E) CONSTRUCT CONCRETE SIDEWALK PER STD. DWG. NO. 234
- (F) CONSTRUCT SIDEWALK RAMP (CASE I) PER STD. DWG. NO. 235 A&B PER TABLE THIS SHT.
- (G) CONSTRUCT 2' WIDE UNDER SIDEWALK DRAIN PER STD. DWG. NO. 236
- (H) CONSTRUCT 24' DEPRESSED CURB SECTION PER DETAIL "KK" ON SHEET DT1
- (I) CONSTRUCT 10' "L" TO "ROLL" CURB TRANSITION PER DETAIL "LL" ON SHEET DT1
- (J) CONSTRUCT BUS TURN-OUT PER STD. DWG. NO. 234.1
- (K) CONSTRUCT SIDEWALK RAMP (MODIFIED CASE II) PER TOWN CENTER DEVELOPMENT STANDARDS.

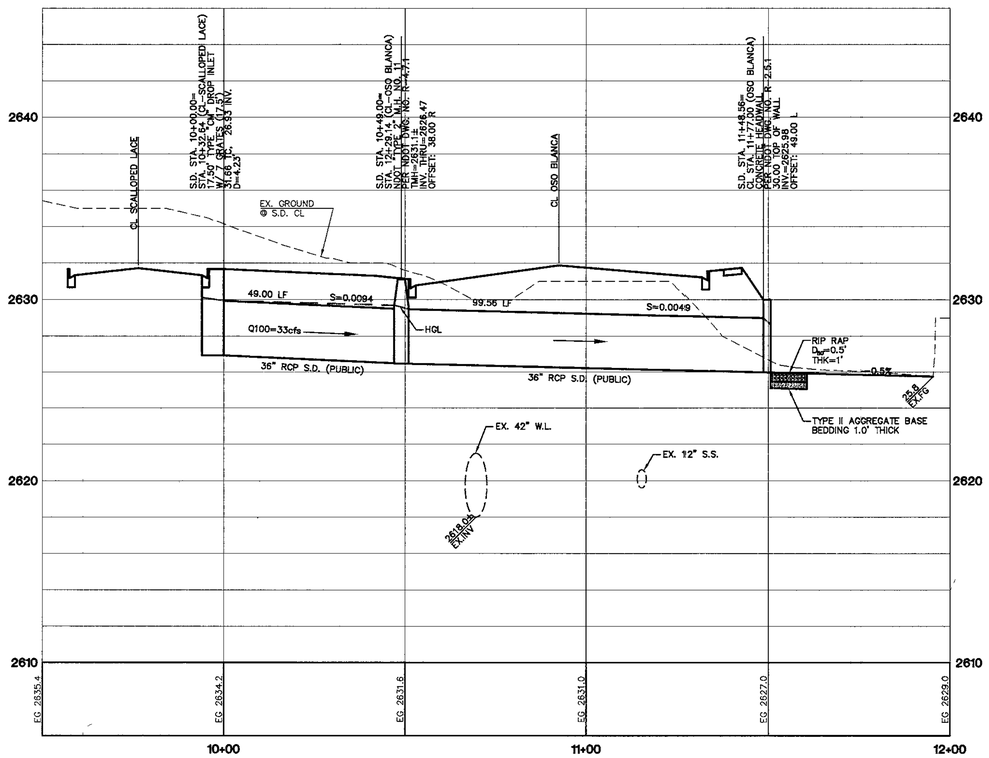
GRAPHIC SCALE

20 0 10 20 40

1" = 20'

NORTH




## BENCHMARKS

PROJECT DATUM : NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CLARK COUNTY BENCHMARK : 0C9017N6
ELEVATION : 799.0857 METERS (2621.67 FEET)

RIVET AND SQUARE ALUMINUM PLATE IN TOP CENTER OF HEADWALL ON THE WEST SIDE OF U.S. 95 NEAR MILE MARKER 90.15.

## BASIS OF BEARINGS

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## LEGAL DESCRIPTION

BEING A PORTION OF THE NORTHWEST QUARTER (NW 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 17, TOWNSHIP 19 SOUTH, RANGE 60 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA.

## CONTRACTOR NOTE

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| REV | DATE | BY | REMISION |
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**CITY OF LAS VEGAS**

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PH. (702) 873-7500 FAX (702) 362-2597

# STORM DRAIN PLAN AND PROFILE OSO BLANCA ROAD

## ASTORIA AT TOWN CENTER - NORTH UNIT 2A

DRAWN BY: dtb — AUGUST 2005
DESIGNED BY: dtb — AUGUST 2005
CHECKED BY: CRG — AUGUST 2005
PROJECT NO: 6048-2A
SCALE: 1"=20' HORIZ. 1"=4' VERT.

PROFESSIONAL ENGINEER - STATE OF NEVADA
CHRISTOPHER R. CRUSOE
No. 13956
CIVIL
EXPIRES 06-30-07
1/5/06

SHEET
**SD1**
18 OF 18 SHEETS

DRAWING NO.
1074833-2A

87623

I:\6048\Civil\02c\6048c02d.dwg, WT, 1/5/2006 1:48:06 PM, brucp, T:\6048\MAP\LAR pc3, 1:20

# C.2.4 Grand Teton Drive Storm Drain

# IMPROVEMENT PLANS

# GRAND TETON DRIVE STORM DRAIN

## TEE PEE LN. TO US-95

CITY OF LAS VEGAS
STATE OF NEVADA

Mayor:
OSCAR B. GOODMAN

Councilmen:
GARY REESE (MAYOR PRO-TEM)

STEVE WOLFSON
LOIS TARKANIAN
STEVEN D. ROSS
RICKI Y. BARLOW
DAVID W. STEINMAN (INTERIM)

City Manager:
ELIZABETH N. FRETWELL

Director of Public Works
JORGE CERVANTES, P.E., P.T.O.E.

City Engineer:
CHERI EDELMAN, P.E.

WELLS CARGO, INC.
AS-BUILT DRAWINGS

| | |
|---|---|
| Project Manager | [illegible] |
| Superintendent | [illegible] |
| Foreman | [illegible] |
| Project No. | [illegible] |
| Date | 5/14/10 |

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

FUNDED BY:

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

123944

APPROVALS

| | |
|---|---|
| CITY ENGINEER | 4/23/09 DATE |
| PROJECT MANAGER | 4/14/09 DATE |
| CONSTRUCTION MANAGEMENT | 4/14/09 DATE |
| CITY TRAFFIC ENGINEER | 4/14/09 DATE |
| NV ENERGY | 11-24-08 DATE |
| SOUTHWEST GAS CORPORATION | 12-18-08 DATE |
| COX COMMUNICATION, LAS VEGAS, INC. | 11-20-08 DATE |
| EMBARQ CORPORATION | 11/21/08 DATE |
| LAS VEGAS VALLEY WATER DISTRICT<br>Project #114322 (G-1, G-3, C-1, SD-1, SD-2, SD-4, SD-7) | 12-01-08 DATE |
| CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT | 12/9/2008 DATE |

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY 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 COMMISSIONS RULES AND REGULATIONS.

THE AFFIXED EMBARQ 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.

Call before you Underground 1-702-455-7511 (SUB-SURFACE WATER, SEWER & TRAFFIC SYSTEM CONDUITS) 1-702-492-7300 (RESIDENTIAL SEWER, WATER & TRAFFIC SYSTEM CONDUITS) (NEVADA DEPARTMENT OF TRANSPORTATION N.D.O.T.)

Call before you Overhead 1-702-227-2929 (NEVADA POWER OVERHEAD AND UNDERGROUND POWER LINES, IT'S COSTLY)

Call 811 or 1-800-227-2600 (ALL OTHER UTILITIES) 1-702-455-7544

BID NO. 08.1730.33
HTE NO. 22726

| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE: | DESCRIPTION | APP'D |

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

poggemeyer design group, Inc.
6980 Sonoma Ranch Road, Suite 110 - Las Vegas, NV 89128 - p) 702.255.8100 - f) 702.255.8375

TITLE: GRAND TETON DRIVE STORM DRAIN

SHEET: COVER SHEET

| | | | |
|---|---|---|---|
| DRAWN BY: BKG/BMR | 11/18/08 | SCALE: N/A | HORIZ N/A |
| DESIGNED BY: BMR/JLW | 11/18/08 | | VERT |
| CHECKED BY: MBR/JSL | 11/18/08 | PROJECT NO: 03188-C | |

06/30/10
11/18/08

Sheet G-1
1 of 30
DRAWING NO. 107V3757

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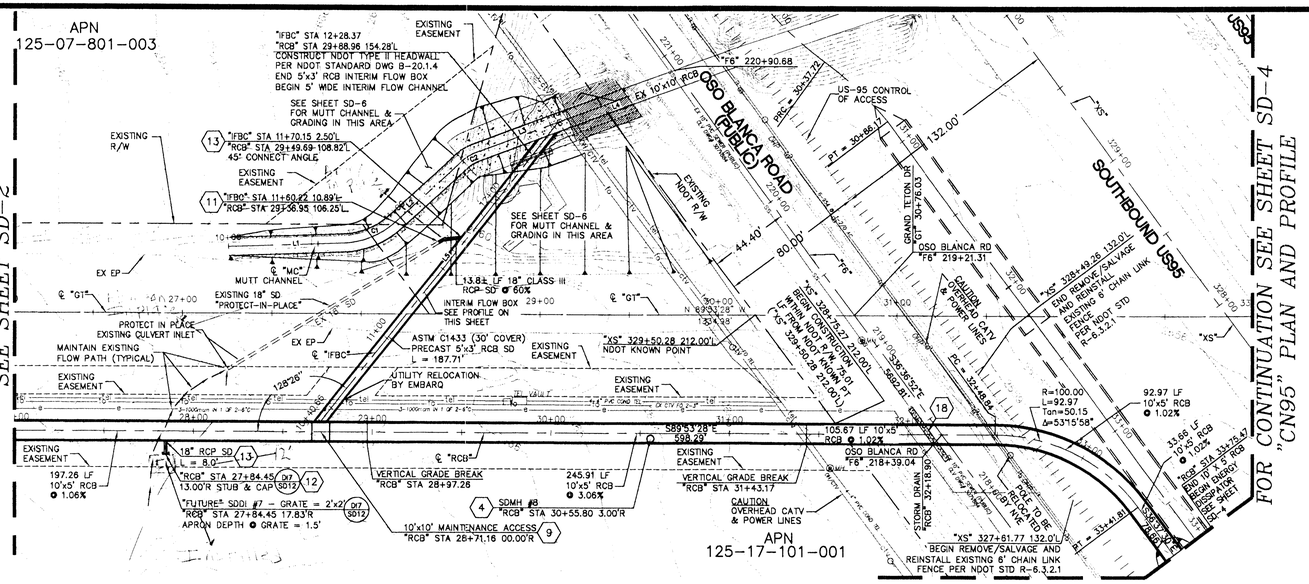


## PLAN - STORM DRAIN

SCALE: 1"=40'

## STORM DRAIN NOTES

(4) CONSTRUCT 48" TYPE 1A MANHOLE WITH 30" MANWAY. SEE DETAIL 1 SHEET SD-14

(9) CONSTRUCT 10'x10' REINFORCED CONCRETE MAINTENANCE ACCESS VAULT AND WEIR. SEE DETAILS SHEET SD-18

(11) CONSTRUCT ANGLED RCP CONNECTION. SEE DETAIL 2 SHEET SD-14

(12) BRICK AND MORTAR PLUG EXISTING RCP PER DETAIL 4 SHEET SD-15

(13) PIPE PENETRATION OF RCB TO BE PER DETAIL 6 SHEET SD-14

(17) PRE-CAST RCB PER SPECIAL PROVISIONS OR CAST IN PLACE RCB PER NDOT STD. DWG. B-20.1.2

(18) INSTALL PROTECTION OF SEWER MAIN EXTENDED 10' PAST EACH SIDE OF STORM DRAIN PER DCSWCS DWG NO. SD-20

## UTILITY NOTES:

1. UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS 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.
2. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO PROTECT ALL EXISTING UTILITIES DURING CONSTRUCTION. ANY UTILITIES DAMAGED DURING CONSTRUCTION MUST BE REPAIRED IMMEDIATELY AND TO THE OWNERS SATISFACTION AT THE CONTRACTORS EXPENSE.

GRAPHIC SCALE

40 0 20 40 80

( IN FEET )
1 inch = 40 ft.

| LINE TABLE | | | | |
|---|---|---|---|---|
| LINE | LENGTH | BEARING | BEGIN STA | END STA |
| L1 | 64.39' | N88°07'05"E | "MC" 10+00.00 | "MC" 10+64.39 |
| L2 | 50.88' | N47°53'23"E | "MC" 10+95.98 | "MC" 11+46.86 |
| L3 | 55.76 | N70°01'46"E | "MC" 11+54.59 | "MC" 12+10.35 |
| L4 | 36.55 | N69°49'51"E | "MC" 12+10.35 | "MC" 12+46.90 |
| L5 | 212.64 | N38°32'25"E | "IFBC" 10+40.66 | "IFBC" 12+53.30 |

| CURVE TABLE | | | | | | |
|---|---|---|---|---|---|---|
| CURVE | RADIUS | LENGTH | TANGENT | DELTA | BEGIN STA | END STA |
| C1 | 45.00 | 31.60 | 16.48 | 40°13'42" | "MC" 10+64.39 | "MC" 10+95.98 |
| C2 | 20.00 | 7.73 | 3.91 | 22°08'24" | "MC" 11+46.86 | "MC" 11+54.59 |


AVOID HITTING UNDERGROUND WATER, SEWER, ELECTRIC AND STREET LIGHT SYSTEM CONDUITS. IT'S QUICK!
Call before you Underground
1-702-455-7511
CLARK COUNTY WATER RECLAMATION DISTRICT
1-702-632-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY!
Call before you Overhead
1-702-227-2929
NEVADA POWER (UNDERGROUND AND OVERHEAD) ELECTRIC SERVICES
Call before you Dig
Call 811
1-800-227-2600
SOUTHWEST GAS CORPORATION
1-702-455-7564





## PROFILE - STORM DRAIN "RCB"

SCALE: 1"=40' H; 1"=4' V




## PROFILE - INTERIM FLOW BOX "IFBC"

SCALE: 1"=40' H; 1"=4' V

HTE NO. 22726

123946

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| REVISIONS | | | |
|---|---|---|---|
| NO. | DATE: | DESCRIPTION | APP'D |


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

poggemeyer design group, inc.
6980 Smoke Ranch Road, Suite 110 - Las Vegas, NV 89128 - p (702) 255-8100 - f (702) 255-8375

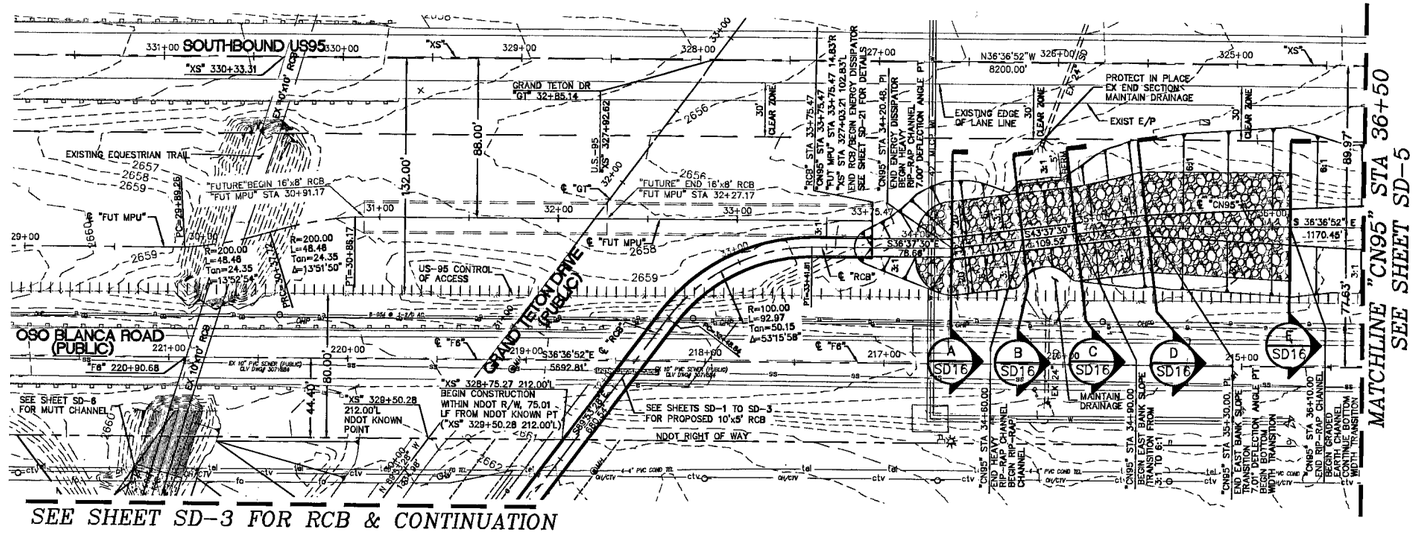

TITLE: GRAND TETON DRIVE STORM DRAIN

SHEET: STORM DRAIN - PLAN AND PROFILE "RCB" STA. 27+00 TO STA. 34+00

| DRAWN BY: | DESIGNED BY: | CHECKED BY: | PROJECT NO: |
|---|---|---|---|
| AP | JMC | JSL/JLW | 03188-C |
| 11/20/08 | 11/20/08 | 11/20/08 | SCALE: 1"=40' HORIZ 1"=4' VERT |

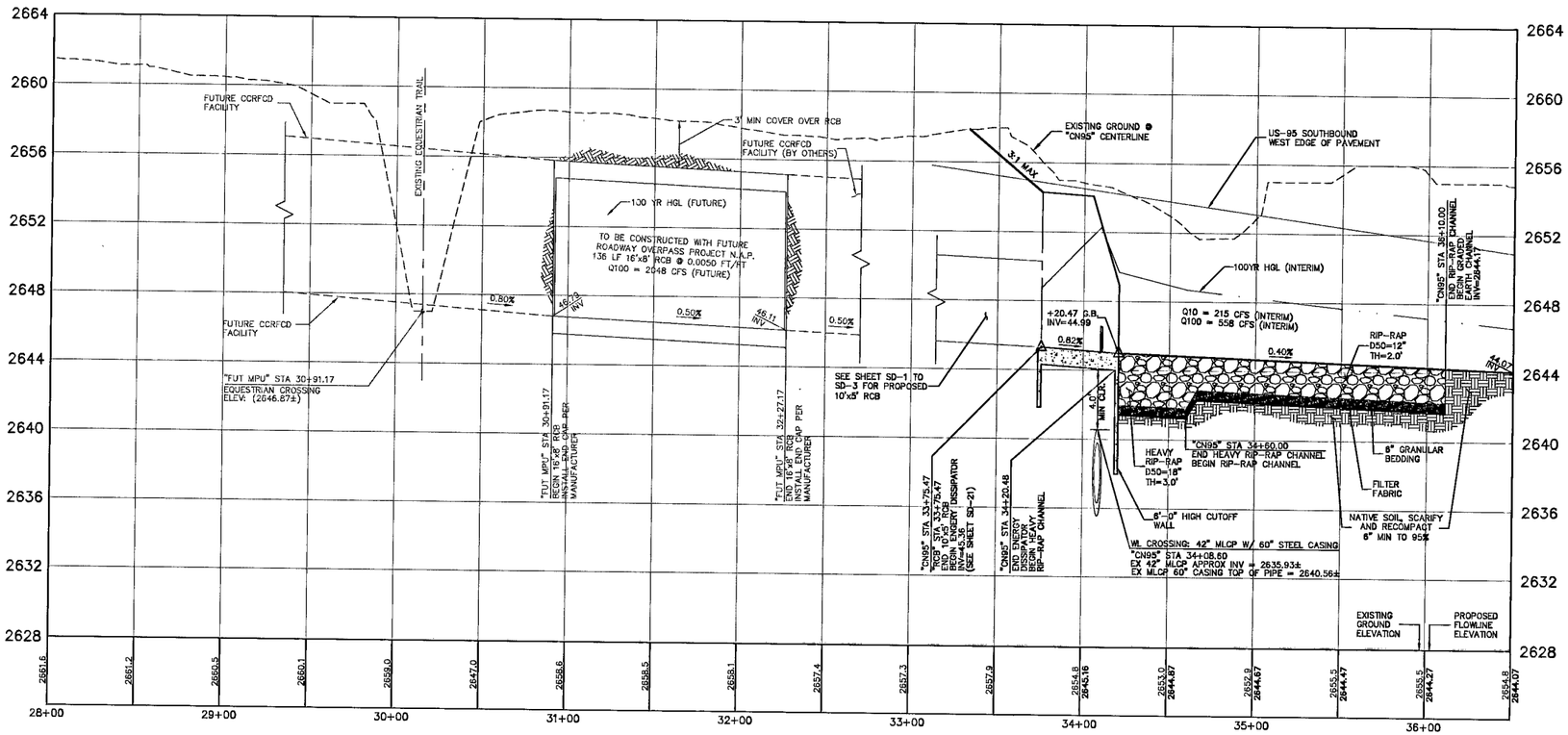
PROFESSIONAL ENGINEER STATE OF NEVADA
JOSEPH L. WEED
EXP. 6-30-10
CIVIL
No. 18599
11/08

Sheet SD-3
10 of 30
DRAWING NO. 107V3757




## PLAN - CN95 CHANNEL

SCALE: 1"=40'




## PROFILE - CN95 CHANNEL

SCALE: 1"=40' H; 1"=4' V

## UTILITY NOTES

1. UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTORS 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.
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GRAPHIC SCALE

( IN FEET )
1 inch = 40 ft.

APPROVED FOR CONSTRUCTION
1ST AMD 12-01-08
LAS VEGAS VALLEY WATER DISTRICT – PROJECT # 114322 DATE 12-8-08

Call before you Underground 1-702-455-7511 (Clark County Public Works) 1-702-492-5300 (Clark Co. Water Reclamation) 1-702-486-3180 (Nevada Dept. of Transportation R.A.I.S.)
Call before you Overhead 1-702-227-2929 (Nevada Power Employment and Safety Services Department)
Call 811 1-800-227-2600 (Clark County Traffic Systems) 1-702-455-7544

HTE NO. 22726

REVISIONS

| NO. | DATE: | DESCRIPTION | APP'D |
|---|---|---|---|

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

poggemeyer design group, inc.
6960 Smoke Ranch Road, Suite 110 - Las Vegas, NV 89128 - p) 702.255.8100 - f) 702.255.8375

TITLE: GRAND TETON DRIVE STORM DRAIN

SHEET: CN95 CHANNEL - PLAN AND PROFILE "CN95" STA. 28+00 TO STA. 36+50

| | | | |
|---|---|---|---|
| DRAWN BY: AP | 11/20/08 | SCALE: | 1"=40' HORIZ |
| DESIGNED BY: JMC | 11/20/08 | | 1"=4' VERT |
| CHECKED BY: JSL/JLW | 11/20/08 | PROJECT NO: | 03188-C |

PROFESSIONAL ENGINEER STATE OF NEVADA JOSEPH L. WEED EXP. 6-30-10 CIVIL No. 18559 12/1/08

Sheet SD-4
11 of 30
DRAWING NO. 107V3757

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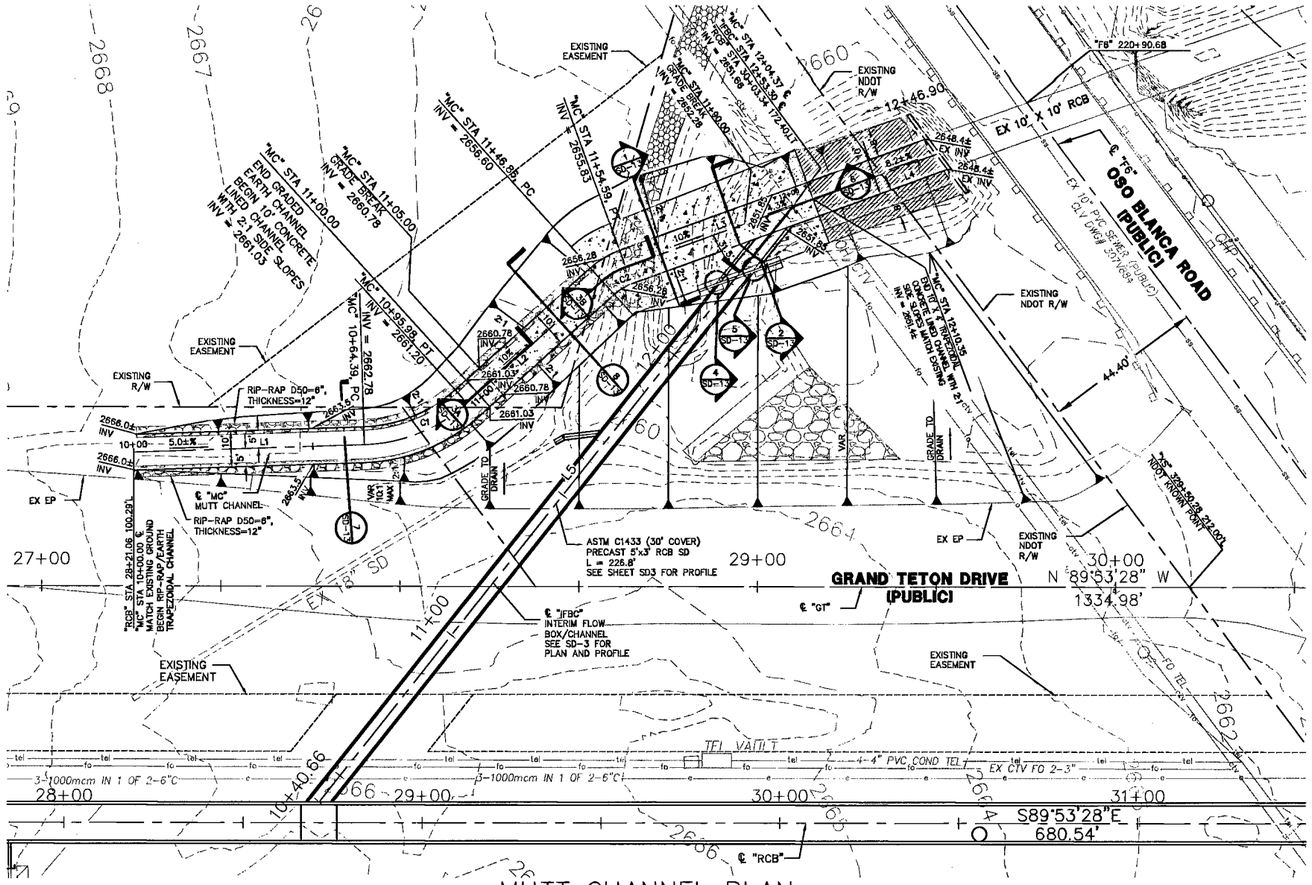
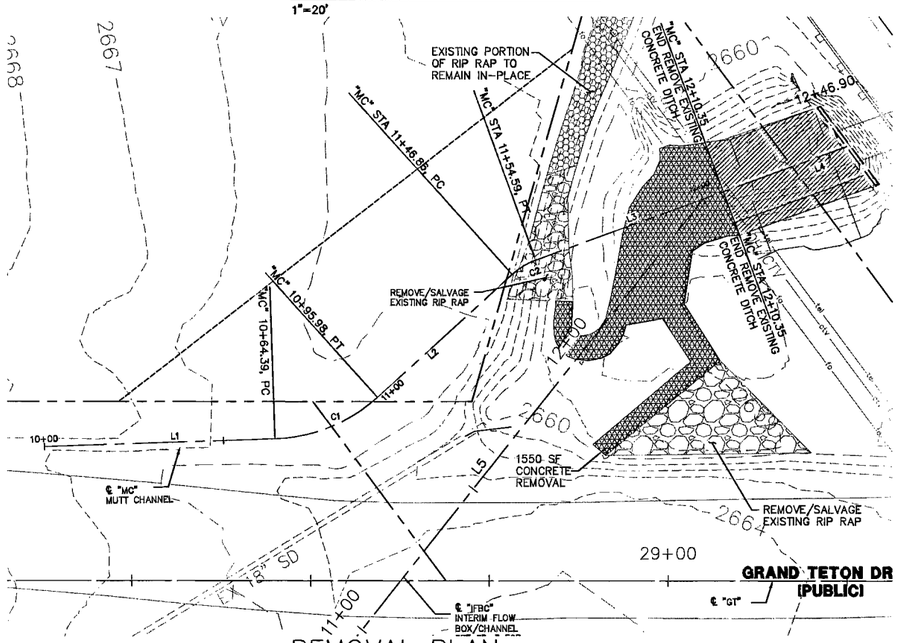



MUTT CHANNEL PLAN
1"=20'




REMOVAL PLAN
1"=20'

## LEGEND

- EXISTING PORTION OF CONCRETE LINING TO REMAIN IN-PLACE
- PROPOSED CONCRETE LINING
- REMOVE EXISTING CONCRETE DITCH
- EXISTING PORTION OF RIP RAP TO REMAIN IN-PLACE
- REMOVE/SALVAGE EXISTING RIP RAP

GRAPHIC SCALE
20 0 10 20 40
( IN FEET )
1 inch = 20 ft.

### LINE TABLE

| LINE | LENGTH | BEARING | BEGIN STA | END STA |
|---|---|---|---|---|
| L1 | 64.39' | N88°07'05"E | "MC" 10+00.00 | "MC" 10+64.39 |
| L2 | 50.88' | N47°53'23"E | "MC" 10+95.98 | "MC" 11+46.86 |
| L3 | 55.76 | N70°01'46"E | "MC" 11+54.59 | "MC" 12+10.35 |
| L4 | 36.55 | N69°49'51"E | "MC" 12+10.35 | "MC" 12+46.90 |
| L5 | 212.64 | N38°32'25"E | "JFBC" 10+40.66 | "JFBC" 12+53.30 |

### CURVE TABLE

| CURVE | RADIUS | LENGTH | TANGENT | DELTA | BEGIN STA | END STA |
|---|---|---|---|---|---|---|
| C1 | 45.00 | 31.50 | 16.48 | 40°3'42" | "MC" 10+64.39 | "MC" 10+95.98 |
| C2 | 20.00 | 7.73 | 3.91 | 22°08'24" | "MC" 11+46.86 | "MC" 11+54.59 |

### CHANNEL BOTTOM TRANSVERSE GRADES8

| GRADE | BEGIN STA | END STA |
|---|---|---|
| 5.0±% | "MC" 10+00.00 | "MC" 11+05.00 |
| 10.00% | "MC" 11+46.86 | "MC" 11+90.00 |
| 4.30% | "MC" 11+90.00 | "MC" 12+10.35 |
| 8.24% | "MC" 12+10.35 | "MC" 12+46.90 |

UTILITY NOTES:

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Call before you Underground 1-702-455-7511 (CLARK COUNTY, NEVADA REGIONS) 1-702-432-5300 (STATEWIDE EXCEPT CLARK COUNTY, NEVADA REGIONS) (STATEWIDE EXCEPT CLARK COUNTY, NEVADA REGIONS AND NEVADA DEPARTMENT OF TRANSPORTATION DISTRICTS)

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.

Call before you Overhead 1-702-227-2929 (NEVADA POWER CONTRACTORS AND SAFETY DEPARTMENT)

Call before you Dig 811 1-800-227-2600 (CLARK COUNTY, NEVADA REGIONS) 1-702-455-7544

HTE NO. 22726

| NO. | DATE: | DESCRIPTION | APP'D |
|---|---|---|---|
| | | REVISIONS | |

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

poggemeyer design group, inc.
8960 Spanish Ranch Road, Suite 110 • Las Vegas, NV 89128 • (t) 702.255.8700 • (f) 702.255.8775

TITLE: GRAND TETON DRIVE STORM DRAIN

SHEET: MUTT CHANNEL PLAN AND REMOVALS

| | | | |
|---|---|---|---|
| DRAWN BY: AP | 11/20/08 | SCALE: 1"=20' | HORIZ N/A |
| DESIGNED BY: JMC | 11/20/08 | | VERT |
| CHECKED BY: JSL/JLW | 11/20/08 | PROJECT NO: 03188-C | |

PROFESSIONAL ENGINEER — JOSEPH L WEED — EXP. 6-30-10 — CIVIL — No. 18559 — STATE OF NEVADA

Sheet SD-6
13 of 30
DRAWING NO. 107V3757

116944

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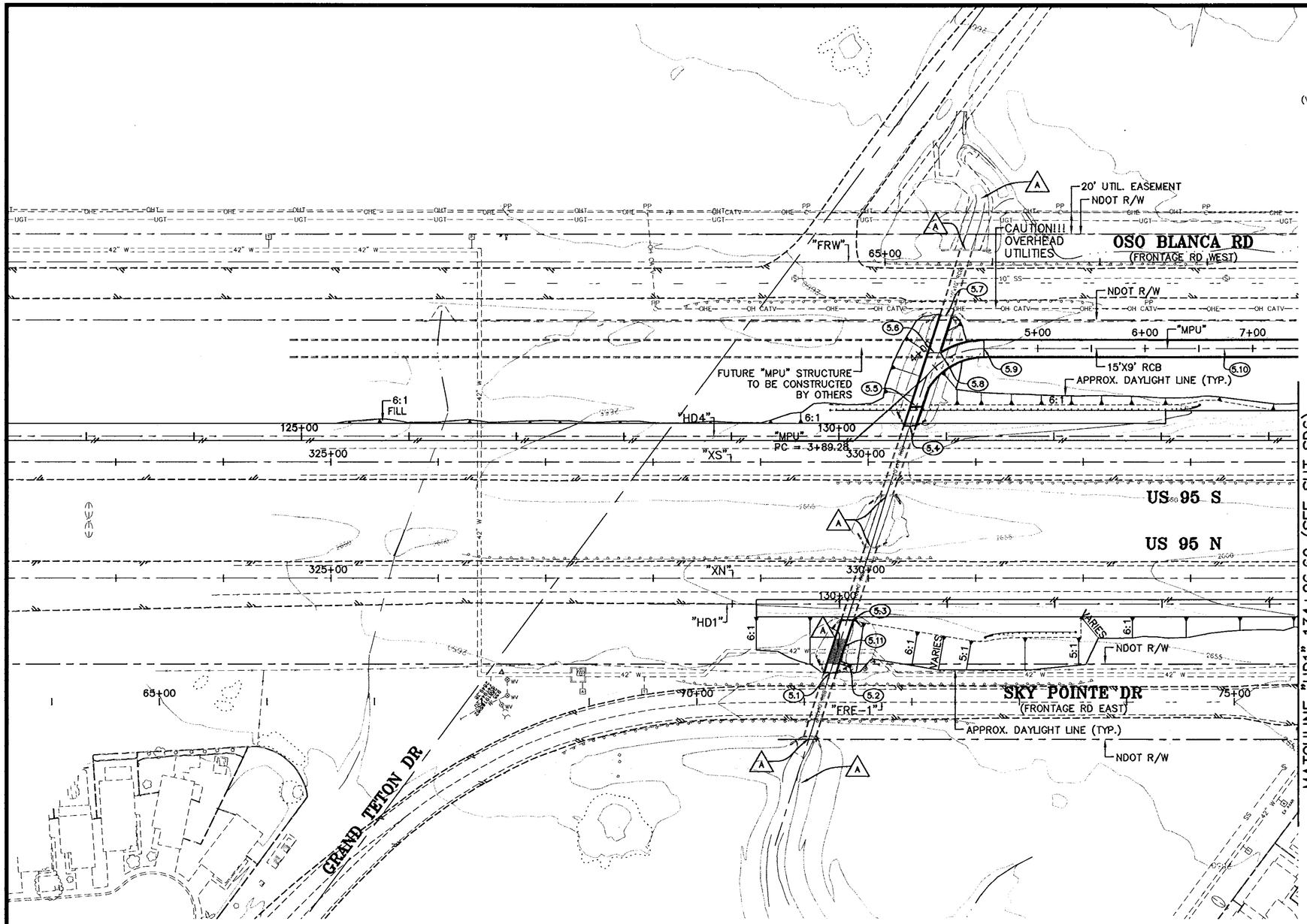
# C.2.5 Horse Drive Improvements




GRAPHIC SCALE
50 0 25 50 100
( IN FEET )
1 inch = 50 ft.
(VERIFY SCALE – PLANS MAY HAVE BEEN REDUCED)

NORTH

## LEGEND:

- DENOTES PBS (PLANTMIX BITUMINOUS SURFACE)
- DENOTES CONCRETE PAVEMENT
- 16' WIDE NDOT MAINT. ACCESS SEE DETAIL ON SHEET SD1
- RIPRAP
- RCB W/POLYURETHANE ELASTOMERIC SEALANT
- [#] GRADING KEYNOTE

## DRAINAGE CONSTRUCTION NOTES:

(5.1) "XN" 329+64.75, 87.29' RT.
REMOVE EXISTING HEADWALL
EXTEND 10'x10' RCB CULVERT 52.29 L.F.
(PER NDOT STD. DWG. B-20.1.7)
CONNECT TO EXISTING 10'x10' RCB
SEE SHEET SD32

(5.2) "XN" 329+82.39, 81.41' RT
INSTALL NDOT TYPE 2A DROP INLET
(PER NDOT STD. DWG. R-4.2.1)
INSTALL 8.75 L.F. 24" RCP
CONNECT TO EXISTING RCB
SEE SHEET SD35

(5.3) "XN" 329+80.38, 39.15' RT.
REMOVE EXISTING HEADWALL
EXTEND RCB CULVERT
(PER NDOT STD. DWG. B-20.1.7)
SEE SHEET SD32

(5.4) "XS" 330+39.17, 34.60' LT.
REMOVE EXISTING HEADWALL
EXTEND 10'X10' RCB CULVERT 18.32 L.F.
(PER NDOT STD. DWG. B-20.1.7)
SEE SHEET SD32

(5.5) "XS" 330+45.01, 51.89' LT.="MPU" 3+59.42
END 10'x10' RCB
BEGIN JUNCTION STRUCTURE
SEE SHEET SD32 & S3

(5.6) "FRW" 65+46.17, 84.39' RT.
END 10'x10' RCB
BEGIN JUNCTION STRUCTURE
SEE SHEET SD32 & S3

(5.7) "FRW" 65+56.94, 49.23' RT.
REMOVE EXISTING HEADWALL
EXTEND 10'x10' RCB CULVERT 36.79 L.F.
(PER NDOT STD. DWG. B-20.1.7
SEE SHEET SD32

(5.8) "MPU" 4+11.57
END JUNCTION STRUCTURE
BEGIN 15'x11' RECT CHANNEL
SEE SHEET S3

(5.9) "MPU" 4+50.00
END 15'x11' RECT. CHANNEL
CONSTRUCT HEADWALL
BEGIN 15'x9' RCB
SEE SHEET SD18 & S3

(5.10) "MPU" 4+50.00 TO "MPU" 7+42.47
INSTALL 292.47 L.F. 15'x9' RCB
SEE SHEET SD18

(5.11) "XN" 329+74.65, 56.73' RT. TO "XN" 329+67.31, 79.28' RT.
RCB TO BE CONSTRUCTED W/PRECAST REINFORCED CONCRETE SECTIONS, INSTALLED W/WATERTIGHT JOINTS USING AGENCY APPROVED ELASTOMERIC JOINT SEALANT W/PROVISIONS TO INSURE AGAINST DIFFERENTIAL SETTLEMENT OF THE STORM DRAIN.
(SEE UDACS SEC. 2.19.02C)
SEE SHEET SD32

## NOTE TO CONTRACTOR REGARDING FINISHED GRADES:

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ADJUST THE CONCRETE INLET APRON AND/OR GRATE TO THE FINISHED GROUND SURFACE OR TO THE FINISHED GRADE OF THE ROADWAY SURFACE (WHICHEVER IS APPLICABLE). IF THE APRON AND/OR GRATE IS CONSTRUCTED PRIOR TO FINALIZING THE FINISHED GRADE, AND THE APRON EDGES AND CORNERS AND/OR GRATE IS BEYOND 0.02' VERTICAL TOLERANCE TO THE FINISHED GRADE, THE CONTRACTOR SHALL REMOVE AND REPLACE THE APRONS AND/OR GRATE AT HIS OWN EXPENSE TO WITH IN THIS TOLERANCE IF THIS CONDITION OCCURS.

## NOTES:

1. FOR UTILITY ADJUSTMENT & RELOCATION SEE SHEET U1 THRU U13
2. FOR SANITARY SEWER INFORMATION SEE SHEET SS1 THRU SS8
3. FOR LANDSCAPING INFORMATION SEE LANDSCAPE PLANS

## NOTE:

(A) PROTECT IN PLACE

APPROVED

Joseph Morgan 7/24/08
LAS VEGAS VALLEY WATER DISTRICT DATE
LVVWD PROJECT # H80315

AVOID OVERHEAD POWER LINE CONTACT IT'S COSTLY
Call before you Overhead
1-702-227-2929
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600
OR
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

| REV | DATE | BY | REVISION |
|---|---|---|---|

PUBLIC WORKS DEPARTMENT
400 E. STEWART AVE.
LAS VEGAS, NV 89101
702-229-6272

CITY OF LAS VEGAS, NV

2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2567
nevada CONSULTING ENGINEERS ■ PLANNERS ■ LAND SURVEYORS

STORM DRAIN AND GRADING PLAN
"HD1" 128+22.39 TO "HD1" 134+26.60

HORSE DRIVE / US 95 INTERCHANGE

| | | | |
|---|---|---|---|
| DRAWN BY: JR | 06/30/2008 | | |
| DESIGNED BY: JLB | 06/30/2008 | | |
| CHECKED BY: LKL | 06/30/2008 | SCALE: 1"=50' | HORIZ. |
| PROJECT NO.: 6500 | | N/A | VERT. |

LANT K. LEAVITT
EXP. 12/31/09
CIVIL
No. 18287
STATE OF NEVADA
PROFESSIONAL ENGINEER
7/11/08

SHEET
SD5
115 OF 423 SHEETS
DRAWING NO.
107V3759

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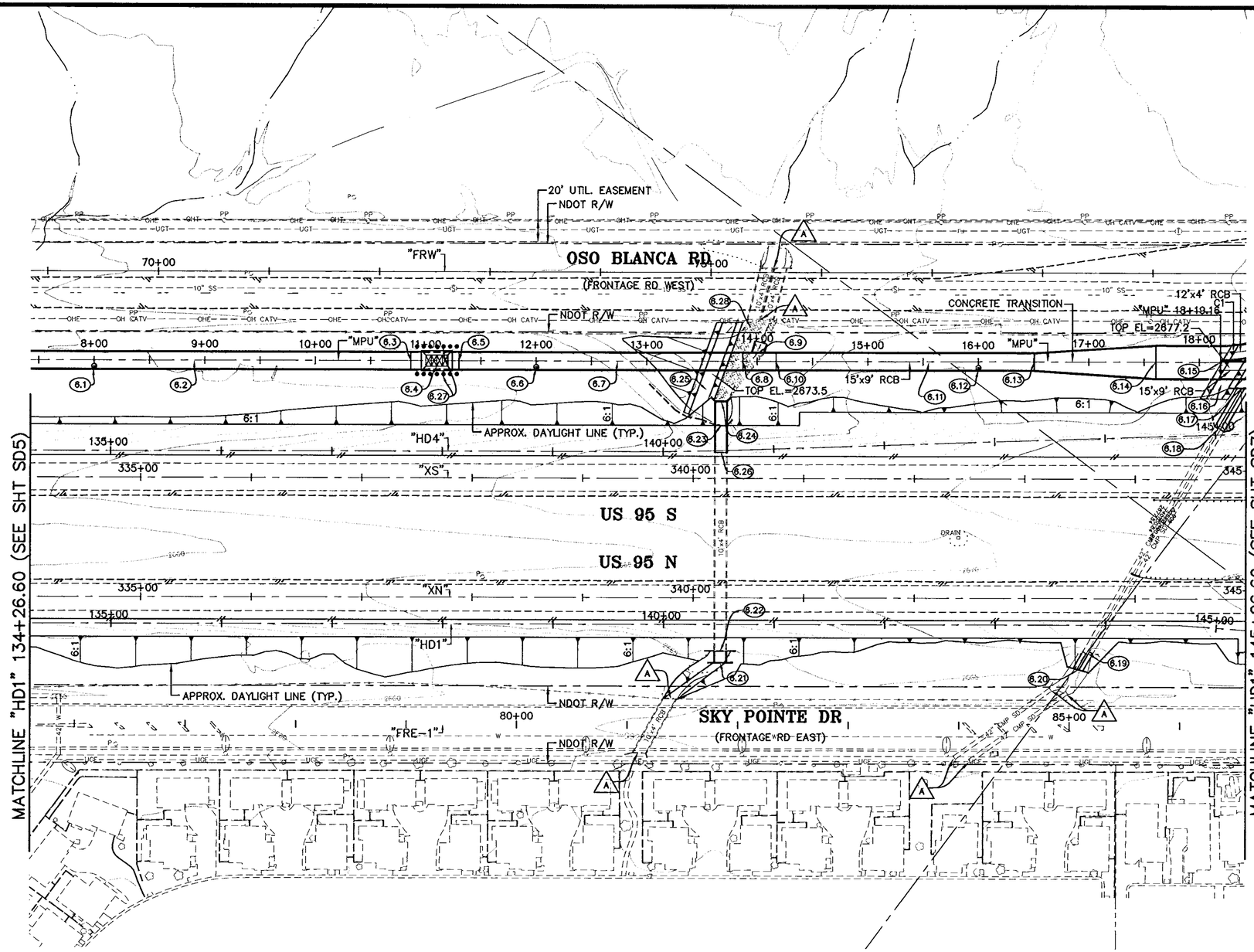
114286




GRAPHIC SCALE
50 0 25 50 100
( IN FEET )
1 inch = 50 ft.
(VERIFY SCALE – PLANS MAY HAVE BEEN REDUCED)

NORTH

## LEGEND:

- DENOTES PBS (PLANTMIX BITUMINOUS SURFACE)
- DENOTES CONCRETE PAVEMENT
- 16' WIDE NDOT MAINT. ACCESS SEE DETAIL ON SHEET SD1
- RIPRAP
- [#] GRADING KEYNOTE

| CURVE TABLE | | | | |
|---|---|---|---|---|
| CURVE | LENGTH | RADIUS | TANGENT | DELTA |
| C1 | 40.00' | 140' | 20.14' | 16°22'13" |

**NOTE:**
(A) PROTECT IN PLACE

**NOTE:**
FOR DRAINAGE & GRADING CONSTRUCTION NOTES SEE SHEET SD6A

FOR UTILITY ADJUSTMENT & RELOCATION SEE SHEET U1 THRU U15

FOR SANITARY SEWER INFORMATION SEE SHEET SS1 THRU SS8

FOR LANDSCAPING INFORMATION SEE LANDSCAPE PLANS

**NOTE TO CONTRACTOR REGARDING FINISHED GRADES:**

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ADJUST THE CONCRETE INLET APRON AND/OR GRATE TO THE FINISHED GROUND SURFACE OR TO THE FINISHED GRADE OF THE ROADWAY SURFACE (WHICHEVER IS APPLICABLE). IF THE APRON AND/OR GRATE IS CONSTRUCTED PRIOR TO FINALIZING THE FINISHED GRADE, AND THE APRON EDGES AND CORNERS AND/OR GRATE IS BEYOND 0.02' VERTICAL TOLERANCE TO THE FINISHED GRADE, THE CONTRACTOR SHALL REMOVE AND REPLACE THE APRONS AND/OR GRATE AT HIS OWN EXPENSE TO WITH IN THIS TOLERANCE IF THIS CONDITION OCCURS.

AVOID OVERHEAD POWER LINE CONTACT IT'S COSTLY
Call before you Overhead
1-702-227-2929
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT
Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR 1-800-227-2600
AND CLARK COUNTY SEWER AGENCIES 1-702-455-7544

| REVISION | BY | DATE | REV |
|---|---|---|---|

PUBLIC WORKS DEPARTMENT
400 E. STEWART AVE
LAS VEGAS, NV 89101
702-229-6272
CITY OF LAS VEGAS, NV
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5948
PH. (702) 873-7500 FAX (702) 362-2987
Nevada CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS

STORM DRAIN AND GRADING PLAN
"HD1" 134+26.60 TO "HD1" 145+26.60

HORSE DRIVE / US 95 INTERCHANGE

| DRAWN BY: | DESIGNED BY: | CHECKED BY: | PROJECT NO: | SCALE: |
|---|---|---|---|---|
| JR | AB | LKL | 6500 | 1"=50' N/A |
| 06/30/2008 | 06/30/2008 | 06/30/2008 | | HORIZ. VERT. |

PROFESSIONAL ENGINEER – STATE OF NEVADA
LANT K. LEAVITT
EXP. 12/31/09
CIVIL
No. 18287

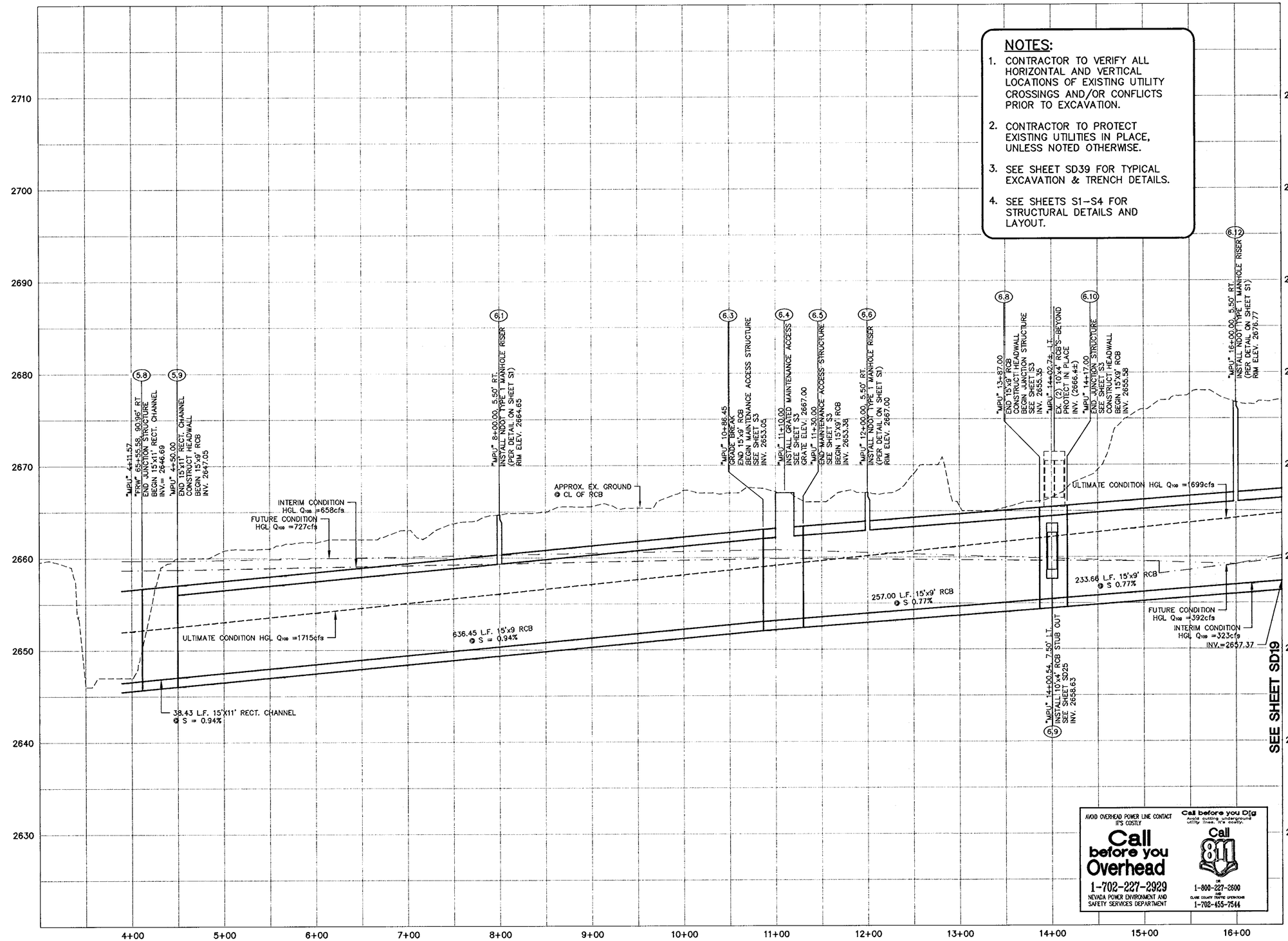
SHEET
SD6
116 OF 453 SHEETS
DRAWING NO.
107V3759

I:\6500\DWG\DESIGN\6500-SD-MAIN.dwg

114208

## NOTES:

1. CONTRACTOR TO VERIFY ALL HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING UTILITY CROSSINGS AND/OR CONFLICTS PRIOR TO EXCAVATION.
2. CONTRACTOR TO PROTECT EXISTING UTILITIES IN PLACE, UNLESS NOTED OTHERWISE.
3. SEE SHEET SD39 FOR TYPICAL EXCAVATION & TRENCH DETAILS.
4. SEE SHEETS S1–S4 FOR STRUCTURAL DETAILS AND LAYOUT.




AVOID OVERHEAD POWER LINE CONTACT IT'S COSTLY
Call before you Overhead
1-702-227-2929
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR 1-800-227-2600
AND CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-7544

**PUBLIC WORKS DEPARTMENT**
400 E. STEWART AVE.
LAS VEGAS, NV 89101
702-229-6272
CITY OF LAS VEGAS, NV

vtn nevada CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS
2727 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7500 FAX (702) 362-2847

| REV | DATE | BY | REVISION |
|---|---|---|---|

# STORM DRAIN PROFILE "MPU" 3+00 TO "MPU" 16+00
## HORSE DRIVE / US 95 INTERCHANGE

DRAWN BY: JS 6/30/2008
DESIGNED BY: JLB 6/30/2008
CHECKED BY: LKL 6/30/2008
PROJECT NO: 6500
SCALE: HORIZ. 1"=50' VERT. 1"=5'

PROFESSIONAL ENGINEER — STATE OF NEVADA — LANT K. LEAVITT EXP. 12/31/09 CIVIL No. 18287 — 6/30/08

SHEET SD18
132 OF 453 SHEETS
DRAWING NO. 107V3759

I:\6500\DWG\DESIGN\PRF MPU CHANNEL.dwg

11430H

# APPENDIX D - CENTENNIAL PARKWAY CHANNEL WEST 100% PRE-FINAL DESIGN PLANS

# DEPARTMENT OF PUBLIC WORKS

**Mayor:**
CAROLYN G. GOODMAN

**City Council:**
STEVEN D. ROSS (Mayor Pro-Tem)
LOIS TARKANIAN
RICKI Y. BARLOW
STAVROS S. ANTHONY
BOB COFFIN
BOB BEERS

**City Manager:**
ELIZABETH N. FRETWELL

**Director of Public Works:**
DAVID N. BOWERS, P.E., P.T.O.E.

**City Engineer:**
ALLEN E. PAVELKA, P.E.

## CENTENNIAL PARKWAY CHANNEL WEST
## DURANGO DRIVE TO GRAND TETON DRIVE

**Funded By:**
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

**Reviewed By:**

CLV CITY ENGINEER — DATE

CLV PROJECT MANAGER — DATE

CLV CITY TRAFFIC ENGINEER — DATE

CLV CONSTRUCTION MANAGER — DATE

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT — DATE

SOUTHWEST GAS CORPORATION — DATE

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK — DATE

THE AFFIXED CENTURYLINK 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 STANDARD REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

NV ENERGY – DISTRIBUTION — DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY 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.

NV ENERGY - TRANSMISSION — DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067
SHEETS: GCV-01, GGN-01, GSD-01 TO GSD-09, GLP-02 & GU-01 TO GU-03

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.

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN
DATE: 3/30/2017 | DRAWN BY: PME
SUBMITTAL STAGE: 100% PRE-FINAL | CHECKED BY: JSD

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
COVER SHEET

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBCV-01
01 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D02150951\2041569-CV01.DWG

## CITY OF LAS VEGAS GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST REVISED EDITION; THE "SUMMERLIN IMPROVEMENT STANDARDS" FOR WORK IN THE SUMMERLIN AREA; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE, EXCEPT AS NOTED ON THIS SHEET AS "DEVIATIONS FROM STANDARDS".

2. THE EXISTENCE AND LOCATION OF ANY OVERHEAD OR UNDERGROUND UTILITY LINES, PIPES, OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A RESEARCH OF THE AVAILABLE RECORDS. EXISTING UTILITIES AS SHOWN FROM CLV PLANS LIBRARY ARE APPROXIMATE AND FOR RECORD PURPOSES. EXISTING UTILITIES ARE LOCATED ON PLANS ONLY FOR THE CONVENIENCE OF THE CONTRACTOR. EXISTING UTILITY SERVICE LATERALS MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE ALL UNDERGROUND AND OVERHEAD INTERFERENCE WHICH MAY AFFECT HIS OPERATION DURING CONSTRUCTION AND SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD UTILITIES SO AS TO SAFELY PROTECT ALL PERSONNEL AND EQUIPMENT, AND SHALL BE RESPONSIBLE FOR ALL COST AND LIABILITY IN CONNECTION THEREWITH.

3. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING UTILITY LINES, STRUCTURES AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE, AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED SATISFACTORY TO THE CITY ENGINEER OR OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.

4. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE PLANS, ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE CITY ENGINEER.

5. TYPE V CEMENT SHALL BE USED IN ALL OFF-SITE CONCRETE WORK. CONCRETE TO BE 3000 P.S.I. MINIMUM @ 28 DAYS. MIX DESIGN TO BE APPROVED BY THE QUALITY CONTROL DIVISION, PRIOR TO THE USE ON THE PROJECT.

6. PERMITS ARE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SECURE ALL PERMITS AND INSPECTIONS REQUIRED FOR THIS CONSTRUCTION.

7. EXPANSION JOINTS REQUIRED, MAXIMUM EVERY 300' IN EXTRUDED-TYPE CURB.

8. AC PAVEMENT TO BE 1/2" ABOVE LIP OF ALL GUTTERS AFTER COMPACTION, EXCEPT AT SIDEWALK RAMPS.

9. CURB AND GUTTER WITH A GRADE OF LESS THAN FOUR-TENTHS OF ONE PERCENT SHALL BE WATER-TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION. ANY CURB AND GUTTER FOUND TO BE UNACCEPTABLE TO THE CITY SHALL BE REMOVED AND REPLACED PER USD 216.

10. SIDEWALK RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER USD 235, CASE I. EXACT LOCATION OF RAMPS MAY BE ADJUSTED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE.

11. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND FOR INGRESS AND EGRESS TO NEW CONSTRUCTION. THE EXTENT OF TRANSITIONS TO BE AS SHOWN ON PLANS, OR AS DESIGNATED IN THE FIELD BY CITY PROJECT REPRESENTATIVE.

12. EXACT LOCATION OF ALL SAWCUT LINES MAY BE DETERMINED IN THE FIELD BY A CITY PROJECT REPRESENTATIVE IF LOCATION ON PLANS IS NOT CLEARLY SHOWN, OR EXISTING PAVEMENT CONDITION REQUIRES RELOCATIONS.

13. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PROTECT EXISTING PERMANENT SURVEY MONUMENTS. ANY MONUMENTS DISTURBED SHALL BE REPLACED, AND SHALL BE DONE ONLY BY A NEVADA PROFESSIONAL LAND SURVEYOR IN ACCORDANCE WITH THE UNIFORM STANDARD DRAWINGS - CLARK COUNTY AREA. A RECORD-OF-SURVEY FOR REPLACEMENT OF PERMANENT SURVEY MONUMENTS SHALL BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL PRIOR TO RECORDING. THE RECORD-OF-SURVEY SHALL BE PREPARED IN ACCORDANCE WITH NEVADA REVISED STATUTES 625.350.

14. UTILITY COMPANY METER BOXES, MANHOLE LIDS, VALVE COVERS, ETC., SHALL BE LOCATED OUT OF DRIVEWAYS, DRIVEWAY APRONS, FLOWLINES, AND CROSS GUTTERS UNLESS WRITTEN APPROVAL IS GRANTED BY THE AFFECTED UTILITY COMPANY AND THE CITY ENGINEER.

15. ALL WALLS, NEW OR EXISTING, ARE ONLY SHOWN ON CIVIL PLANS FOR THE PURPOSE OF REVIEWING GRADING RELATIONSHIPS; FLOOD CONTROL AND SIGHT DISTANCE AT INTERSECTIONS. NEW WALLS REQUIRE A SEPARATE PERMIT AND INSPECTION BY THE CLV BUILDING DEPARTMENT.

16. ASPHALT MIX DESIGN MUST BE SUBMITTED AND APPROVED BY THE CITY ENGINEER PRIOR TO THE PLACEMENT OF ASPHALT WITHIN CITY RIGHTS OF WAY.

17. CONTRACTOR SHALL ADJUST ALL NEW AND EXISTING INLETS, VALVE BOXES, MANHOLE RIMS, SEWER CLEANOUTS, ETC. TO FINISH GRADE AS APPLICABLE WHETHER OR NOT THEY ARE SHOWN ON THE PLANS.

18. MATERIALS, HANDLING AND PLACEMENT OF PORTLAND CEMENT CONCRETE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF NDOT AND CLARK COUNTY AREA SPECIFICATIONS (AS APPLICABLE) AND THE PLANS AND DETAILS SHOWN HEREON.

19. WHEN INSTALLING UNDERGROUND FACILITIES THAT REQUIRE UNDERGROUND LOCATING DEVICES SUCH AS MARKER BALLS, LOCATING RIBBON, ETC, THE CONTRACTOR SHALL PROVIDE WRITTEN DOCUMENTATION TO THE ENGINEER CERTIFYING THAT ALL DEVICES HAVE BEEN PLACED AND VERIFIED TO BE IN GOOD WORKING CONDITION PRIOR TO THE CONSTRUCTION OF ANY ROAD BASE.

20. NEWLY INSTALLED AND EXISTING UTILITIES EXPOSED DURING CONSTRUCTION SHALL BE SURVEYED AND DOCUMENTED PER SECTION 622 OF THE SPECIAL PROVISIONS.

21. CCTV VIDEO INSPECTION IS REQUIRED FOR ALL SEWER AND STORM DRAINS. THE CCTV VIDEO INSPECTIONS NEED TO BE PERFORMED PER THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST ADDITION.

22. A SEPARATE BORING PERMIT IS REQUIRED FOR ALL BORING ACTIVITIES.

REVISED JULY 23, 2015 (CPM VERSION)

## CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.

2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.

3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.

4. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.

5. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.

6. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.

7. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT- OF-WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.

8. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, SUCH ITEM SHALL BE PROVIDED, AS DIRECTED BY THE CITY ENGINEER, AT NO EXPENSE TO THE CITY OF LAS VEGAS. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED APRIL 13, 2015 (CPM VERSION)

## CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.

2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.

3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.

4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D-3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.

5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.

6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.

7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.

8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.

9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.

10. INSTALLATION OF CURVED SEWERS REQUIRES THE USE OF C-900 PVC PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED JANUARY 13, 2015

## CITY OF LAS VEGAS STREET LIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.

2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS (ETC.) LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.

3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.

4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN No. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.

5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.

6. AS-BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE-FINAL INSPECTION. THE AS-BUILT DRAWING NEEDS TO BE STAMPED AS-BUILT AND SIGNED BY THE PREPARER.

7. SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICE POINTS SHALL BE SHOWN ON THE PLANS.

8. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS OR IN THE SPECIAL PROVISIONS.

9. ALL STREET LIGHTING AND TRAFFIC SIGNAL EQUIPMENT REMOVED AND / OR DESIGNATED TO BE SALVAGED SHALL BE DELIVERED BY THE CONTRACTOR TO THE APPROPRIATE CLV SERVICE YARD WITH A MEANS TO UNLOAD. A MINIMUM 24-HOUR NOTICE OF DELIVERY IS REQUIRED. CALL 229-6331 TO SET UP DELIVERY TIME AND LOCATION. REPAIR OF ANY DAMAGE TO EQUIPMENT DURING THIS PROCESS WILL BE THE CONTRACTOR'S RESPONSIBILITY, AT NO ADDITIONAL COST TO THE CITY.

REVISED JUNE 28, 2016 (CPM VERSION)

## CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.

2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.

3. BEFORE ANY WORK IS STARTED IN THE RIGHT-OF-WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCE WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.

4. WHEN A DESIGNATED "SUGGESTED ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.

5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. ALL NEW TRAFFIC SIGNS SHALL UTILIZE TYPE XI RETROREFLECTIVE SHEETING IN ACCORDANCE WITH CCAUSS 627 AND 716 AND SHALL HAVE AN ANTI-GRAFFITI PROTECTIVE OVERLAY FILM THAT IS A MATCHING COMPONENT TO, AND OF THE SAME MANUFACTURER AS THE RETROREFLECTIVE SHEETING TO WHICH IT IS APPLIED. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS; ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.

7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.

8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.

9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.

10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT OF WAY.

11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING RTC TRANSIT IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.

13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828-3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.

14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.

15. THE CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED JULY 3, 2013

## CITY OF LAS VEGAS TRAFFIC SIGNAL NOTES

1. ALL WORK PERFORMED ON ANY TRAFFIC SIGNAL COMPONENT MUST BE UNDER THE DIRECT ON-SITE SUPERVISION OF AN IMSA CERTIFIED TECHNICIAN. THE LEVEL OF CERTIFICATION REQUIRED SHALL BE LEVEL II.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO ALL EXISTING UTILITIES. THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES TO VERIFY IN THE FIELD THE LOCATIONS OF THEIR INSTALLATIONS 72 HOURS PRIOR TO CONSTRUCTION.

| | |
|---|---|
| CALL-BEFORE-YOU-OVERHEAD | 1-702-227-2929 |
| CALL-BEFORE-YOU-DIG | 1-800-227-2600 |
| STREETLIGHTS | 1-702-229-6331 |
| F.A.S.T. | 1-702-432-5300 |

3. ALL TRAFFIC SIGNAL INSTALLATIONS SHALL CONFORM TO THE UNIFORM STANDARD DRAWINGS SPECIFICATIONS AND SPECIAL PROVISIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, VOLUMES I AND II, ADOPTED BY THE REGIONAL TRANSPORTATION COMMISSION APRIL 8, 1992 WITH ALL SUBSEQUENT REVISIONS.

4. SERVICE SHALL HAVE 1-60 AMP SINGLE POLE BREAKER FOR SIGNAL, AND ONE 40 AMP SINGLE POLE BREAKERS FOR STREET LIGHTS. SERVICE SHALL BE 200 AMP PADMOUNT.

5. LINE SIDE OF METER TO BE WIRED WITH THREE #3/0 AWG THW. LOAD SIDE SHALL BE WIRED WITH FOUR #4 AWG THW (2 BLACK, 2 WHITE) AND ONE #8 AWG THW (GREEN).

6. LUMINAIRES ON ALL SIGNAL POLES SHALL BE 400 WATT HIGH PRESSURE SODIUM CUTOFF (G.E. M400A) WITH MC-111 DISTRIBUTION. EACH LUMINAIRE SHALL HAVE AN INDIVIDUAL 1000 WATT P.E. CONTROL FOR LUMINAIRES THERE SHALL BE 2(TWO)-#4 AWG THW CONDUCTORS FROM THE SERVICE TO THE CABINET. IN THE CABINET, THE #4 AWG THW CONDUCTORS SHALL BRANCH OFF INTO #10 AWG THW CONDUCTORS INDIVIDUALLY FUSED WITH 10 AMP FUSES. THERE SHALL BE NO SPLICES BETWEEN THE CABINET AND LUMINAIRE FIXTURES.

7. THE INTERNALLY ILLUMINATED STREET NAME SIGNS SHALL BE WIRED TO THE LUMINAIRES PHOTO CELL FOR CONTROL WITH #10 AWG THW COPPER STRANDED WIRE (TYPICAL). THE SIGN SHALL BE WIRED TO THE LUMINAIRE DIRECTLY ABOVE IT. IN THE EVENT THERE IS NO LUMINAIRE ON THE TRAFFIC SIGNAL POLE, THE 1000 WATT P.E. CONTROL SHALL BE MOUNTED ON THE POLE CAP. ALL NEW ILLUMINATED STREET NAME SIGNS SHALL HAVE LIGHT EMITTING DIODE (LED) LAMPS PER SECTION 623 T.02.16 OF THE SPECIAL PROVISIONS.

8. CHECK CONDUIT AND CABLE SCHEDULE FOR CONDUIT, CABLE, AND WIRE SIZE. VERIFY ALL EXISTING CONDUIT RUNS.

9. ALL PULLBOXES SHALL BE IN ACCORDANCE WITH UNIFORM STANDARD DRAWINGS NO. 705, NO. 706, AND NO. 707.

10. TRAFFIC SIGNAL CABLE SHALL BE 15 OR 25 CONDUCTOR #14 AWG SOLID (TYPICAL) CABLE AND SHALL CONFORM TO IMSA SPEC. NO. 20-1.

## CITY OF LAS VEGAS TRAFFIC SIGNAL NOTES (CONTINUED)

11. PEDESTRIAN PUSH BUTTONS SHALL BE AUDIBLE TACTILE "POLARA NAVIGATOR" TYPE (2 WIRE SYSTEM) OR CAMPBELL COMPANY ADVANCED ACCESSIBLE PEDESTRIAN SYSTEM BUTTONS WITH AAPS APC (CONTROLLER) IN ACCORDANCE WITH CITY OF LAS VEGAS SPECIAL PROVISIONS AND SECTION 623 OF THE CCA USS. PUSH BUTTON SIGNS SHALL BE R10-3e PER MUTCD, 2009 EDITION, WITH FULL MOUNTING BRACKETS, as modified by THE MANUFACTURER to fit on a 9"x12" sign, and shall be porcelain-enameled metal. ALL PUSH BUTTONS TO BE MOUNTED 42" ABOVE SIDEWALK. THE MAXIMUM HORIZONTAL REACH DISTANCE IS TO BE 10". SIDEWALK RAMPS WILL BE ACCORDING TO U.S.D. No. 235 (1-4) LATEST EDITION. WHEN AN EXISTING SIGNAL WITH EXISTING AUDIBLE-TACILE PUSH BUTTONS IS MODIFIED, THE CONTRACTOR SHALL VERIFY NEW PEDESTRIAN PUSH BUTTONS OR CABINET EQUIPMENT MATCHES THE MANUFACTURE AND MODEL OF ANY EXISTING EQUIPMENT SCHEDULED TO REMAIN, TO PROVIDE A FULLY FUNCTIONING SYSTEM. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL CABINET EQUIPMENT, INCLUDING THE PEDESTRIAN PUSH BUTTON CONTROL UNIT, INTERFACE PANEL AND ANY REQUIRED HARNESSES, TO PROVIDE A FULLY FUNCTIONING SYSTEM.

12. THE ROUTING AND TERMINATION OF CONDUITS AND THE PLACING OF POLES AND CABINETS SHALL BE AS INDICATED ON THE PLANS. ALL CHANGES SHALL BE APPROVED BY THE ENGINEER.

13. MAST ARM R10-12 SIGNS TO BE ADJACENT (NO GAP) TO THE M-5 SIGNAL HEAD. WHERE FLASHING YELLOW ARROW LEFT TURN SIGNALS ARE USED, A MAST ARM R10-26 "LEFT TURN YIELD ON FLASHING YELLOW ARROW" SIGN SHALL BE MOUNTED ADJACENT TO THE M2A SIGNAL HEAD.

14. TRAFFIC SIGNAL CABINET SHALL BE A TYPE VIII CABINET UNLESS OTHERWISE SPECIFIED IN THE PLANS. THIS IS COMMONLY REFERRED TO AS AN "R" CABINET. THE CABINET SHALL CONFORM TO THE CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS AND THE CITY OF LAS VEGAS SPECIAL PROVISIONS. INSTALL CABINET NEAR THE R.O.W. LINE OR AS SHOWN ON THE DRAWINGS. THE TRAFFIC SIGNAL CONTROLLER CABINET, SHALL BE EQUIPPED WITH 16 LOAD BAY POSITIONS,SHALL BE A 48 DETECTOR CHANNEL R CABINET AND SHALL INCLUDE TWO (2) RACK-MOUNTED, 12 SLOT, LOOP DETECTION RACKS, WITH 2 DETECTOR LOOP CHANNELS PER SLOT FULLY WIRED SO THAT ALL CHANNELS ARE USABLE AND 4 CHANNEL SLOTS THAT CAN ACCOMMODATE VIDEO DETECTION CARDS. THE CABINET SHALL CONTAIN A 764 OPTICOM PHASE SELECTOR IN A 760 RACK, WITH A 768 AUXILIARY INTERFACE PANEL MOUNTED IN THE CABINET AND FULLY WIRED FOR GREEN SENSE CAPABILITIES.

15. THE CONTRACTOR SHALL SUPPLY A MALFUNCTION MANAGEMENT UNIT (MMU) TO THE CITY OF LAS VEGAS TRAFFIC SIGNAL REPAIR SHOP A MINIMUM OF FOURTEEN DAYS PRIOR TO SIGNAL TURN-ON OR PRIOR TO CONVERTING TO A NEW PHASING SCHEME, FOR TESTING AND PROGRAMMING PURPOSES. THE MMU SHALL BE A MODEL MMU-1600GE AS MANUFACTURED BY RENO A&E OR MODEL MMU2-16LEip AS MANUFACTURED BY EBERLE DESIGN, INC., OR APPROVED EQUAL. THE CONTRACTOR SHALL DELIVER THE MMU TO AND PICKUP THE CONTROLLER AT 2824 E. CHARLESTON BOULEVARD. CONTRACTOR SHALL NOTIFY THE TRAFFIC SIGNAL REPAIR SHOP (229-6075) SEVEN DAYS PRIOR TO PICK UP. THE CITY, AT ITS DISCRETION, MAY PROVIDE A DIFFERENT MODEL MMU FOR INITIAL TURN-ON, IN WHICH CASE CITY PERSONNEL WILL SWAP THE MMU AFTER THE PROJECT IS ACCEPTED.

16. CONTRACTOR SHALL POTHOLE SIGNAL POLE LOCATIONS PRIOR TO ORDERING OF POLES.

17. ALL MAST ARMS TO BE HOT-DIP GALVANIZED BY THE MANUFACTURER THE MAST ARM IS TO BE FABRICATED WITH END TENON ONLY. THE END TENON SHALL BE FACTORY INSTALLED AND THE REMAINING TENONS SHALL BE FABRICATED IN THE FIELD AT THE LOCATION SHOWN ON THE PLANS OR AS DIRECTED BY THE TRAFFIC ENGINEER AND/OR HIS AUTHORIZED REPRESENTATIVE. FOR TENON FABRICATION DETAILS SEE CLARK COUNTY AREA U.S.D. NO. 808 SHEET 2. ALL WELDING SHALL CONFORM TO AWS D 2.0, "SPECIFICATION FOR WELDED HIGHWAYS AND RAILWAY BRIDGES," AND TO ANY ADDITIONAL REQUIREMENTS OF SECTION 623 OF THE SPECIFICATIONS. ALL EXPOSED WELDS, SHALL BE PAINTED AS PROVIDED FOR REPAIRING DAMAGED GALVANIZED SURFACES.

18. ALL VEHICLE AND PEDESTRIAN SIGNAL INDICATIONS SHALL HAVE LIGHT EMITTING DIODE (LED) TYPE INDICATIONS, IN CONFORMANCE TO CITY OF LAS VEGAS SPECIAL PROVISIONS AND TO SECTION 623 OF THE CCA USS. All pedestrian signal faces shall provide "Walking Person", "Hand", and "Countdown" messages as provided by Duralight model #JXM-400-VIEIL or Dialight model #430-6479-001X, or approved equal. THE "COUNTDOWN" MESSAGE SHALL NOT FLASH. WHERE EXISTING SIGNALS ARE MODIFIED, THE CONTRACTOR SHALL VERIFY THAT LED PEDESTRIAN INDICATIONS FOR A SPECIFIC PHASE ARE OF THE SAME MANUFACTURE SO THAT THEY FUNCTION CORRECTLY, OR SHALL REPLACE ALL COUNTDOWN PEDESTRIAN INDICATIONS FOR THAT PHASE.

19. VIDEO DETECTION SYSTEMS WILL BE EITHER ITERIS EDGE 2

## LVVWD STANDARD NOTES

LVVWD PROJECT # 120567

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT# IDENTIFIED ABOVE.
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2010 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL FACILITIES WILL INCLUDE THE PLACEMENT OF ANY APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

    ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF, ANY DECORATIVE PAVING SURFACE WITHIN THE STREET. THE LVVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.

| APPROVED FOR CONSTRUCTION | |
|---|---|
| LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER | |
| DATE: | PROJECT# 125067 |

## ABBREVIATIONS

| | |
|---|---|
| @ | AT |
| AB | ABANDONED |
| AC | ASPHALTIC CONCRETE |
| ACP | ASBESTOS CEMENT PIPE |
| AEP | AUTHORIZATION TO ENTER PROPERTY |
| APPROX | APPROXIMATE |
| AVAR | AIR VALVE ASSEMBLY |
| B/C, BC | BACK OF CURB |
| BCR | BACK OF CURB RADIUS |
| BM | BENCHMARK |
| BOT | BOTTOM |
| BR | BACK OF RAMP |
| C & G | CURB AND GUTTER |
| CALC'D | CALCULATED |
| CATV, TV | CABLE TELEVISION |
| CC | CLARK COUNTY |
| CCPW | CLARK COUNTY PUBLIC WORKS |
| CIPP | CURED-IN-PLACE PIPE |
| ℄, CL | CENTERLINE |
| CLSM | CONTROLLED LOW STRENGTH MATERIAL |
| CLV | CITY OF LAS VEGAS |
| CMP | CORRUGATED METAL PIPE |
| CONC | CONCRETE |
| COND | CONDUCTOR |
| CPM | CAPITAL PROJECT MANAGEMENT |
| D, DIA | DIAMETER |
| DCSWCS | DESIGN & CONSTRUCTION STDS FOR WASTEWATER COLLECTION SYSTEMS |
| DG | DECOMPOSED GRANITE |
| DIP | DUCTILE IRON PIPE |
| D/W | DRIVEWAY |
| DWG | DRAWING |
| ECR | END OF CURB RETURN (AT B/C) |
| ELEC | ELECTRIC |
| ELEV | ELEVATION |
| EOP, EP | EDGE OF PAVEMENT |
| EX. | EXISTING |
| FAST | FREEWAY & ARTERIAL SYSTEM OF TRANSPORTATION (INTERCONNECT) |
| FC | FACE OF CURB |
| FD | FOUND |
| FG | FINISHED GRADE |
| FH, HYD | FIRE HYDRANT |
| FT | FOOT, FEET |
| G | GAS |
| GM | GAS METER |
| GV | GAS VALVE |
| GW | GUY WIRE |
| HP | HIGH PRESSURE |
| INT | INTERSECTION |
| IRR | IRRIGATION |
| L | LENGTH |
| LF | LINEAL FOOT, LINEAR FEET |
| LT | LEFT |
| LVVWD | LAS VEGAS VALLEY WATER DISTRICT |
| MH | MANHOLE |
| MLCP | MULTI-LAYER COMPOSITE PIPE |
| MTR | METER |
| NDOT | NEVADA DEPT OF TRANSPORTATION |
| NTS | NOT TO SCALE |
| NVE | NV ENERGY |
| OHP | OVERHEAD POWER LINE |
| OHU | OVERHEAD UTILITIES |
| PB | PULL BOX |
| PC | POINT OF CURVATURE |
| P.I.P. | PROTECT IN PLACE |
| PP | POWER POLE |
| PRC | POINT OF REVERSE CURVE |
| PT | POINT OF TANGENCY |
| ℞, PL | PROPERTY LINE |
| R RADIUS | RT RIGHT |
| R/W, R.O.W. | RIGHT OF WAY |
| SCCP | STEEL CYLINDER CONCRETE PIPE |
| SD | STORM DRAIN |
| SF | SQUARE FOOT |
| SP | SPECIAL PROVISIONS |
| SS | SANITARY SEWER |
| STA. | STATION |
| STD | STANDARD |
| STL | STREET LIGHT |
| SV | SPRINKLER VALVE |
| S/W | SIDEWALK |
| SWG | SOUTHWEST GAS |
| SY | SQUARE YARD |
| T, TEL | TELEPHONE |
| TC | TOP OF CURB |
| TCE | TEMP. CONSTRUCTION EASEMENT |
| TEMP. | TEMPORARY |
| TRANS. | TRANSITION |
| TRC | TOP OF RAMP CURB |
| TS | TRAFFIC SIGNAL |
| TYP. | TYPICAL |
| UDACS | UNIFORM DESIGN & CONSTRUCTION STDS FOR POTABLE WATER DISTRIBUTION SYSTEMS |
| USD | UNIFORM STANDARD DRAWING |
| USS | UNIFORM STD SPECIFICATIONS |
| W | WATER LINE |
| WC | WHEEL CHAIR |
| WM | WATER METER |
| WV | WATER VALVE |
| W/ | WITH |
| Δ | INCLUDED DELTA ANGLE |

## RTC NOTES

1. THE CONTRACTOR SHALL NOT BE ALLOWED TO CLOSE MORE THAN ONE CONSECUTIVE BUS STOP ON THE SAME SIDE OF THE STREET. TEMPORARY CLOSURES SHALL BE PWD (PERSONS WITH DISABILITY) ACCESSIBLE BEFORE ANY BUS STOP CAN BE CLOSED. THE CONTRACTOR SHALL NOTIFY CARL SCARBROUGH AT (702) 676-1608 OR ERIC TRAASDAHL AT (702) 676-1633, AT LEAST SEVEN WORKING DAYS IN ADVANCE.
2. THE CONTRACTOR SHALL SUBMIT A BUS STOP CLOSURES SCHEDULE WITH THE TRAFFIC CONTROL PLAN. THE BUS STOP CLOSURE SCHEDULE SHALL IDENTIFY SPECIFIC DURATIONS AND TIMES OF THE DAY FOR ALL PROPOSED BUS STOP CLOSURES. BUS STOP CLOSURES ARE NOT TO EXCEED TWO CONSECUTIVE STOPS AT ONE TIME, OR MORE THAN 1,000 FEET AT A TIME. PERSONS WITH DISABILITIES SHALL HAVE ACCESS TO BUS STOPS. THE CONTRACTOR SHALL PROVIDE A 100 FOOT LONG BY 10 FEET WIDE GRAVELED TURN OUT AT TEMPORARY BUS STOPS.

REVISED FEBRUARY 14, 2013

## BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

DATUM (REFERENCE FRAME): NAD 1983 (2011) EPOCH 2010.0

ZONE: LAS VEGAS ZONE
STANDARD PARALLEL AND GRID ORIGIN: 36°15'00" N
CENTRAL MERIDIAN: 114°58'00" W
FALSE NORTHING: 200,000 METERS
FALSE EASTING: 100,000 METERS
STANDARD PARALLEL SCALE: 1.0001
LINEAR UNIT: US SURVEY FOOT (SFT)

## BENCHMARK

PROJECT DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
BENCHMARK: CITY OF LAS VEGAS 5LV9020NEE6
NAVD88 ELEVATION: 773.169 METERS (2536.64 FEET)
RIVET & PLATE IN HEAD WALL AT PARK ENTRANCE SW CORNER OF MOUNTAIN RIDGE PARK AND OSO BLANCA

## LEGEND

- CENTERLINE
- RIGHT OF WAY LINE
- PROPERTY LINE
- AUTHORIZATION TO ENTER PROPERTY (AEP)
- PATCH / SAWCUT LINE

- AREA LIGHT
- BENCHMARK
- ELEC. VAULT/CABINET
- ELECTRIC MANHOLE
- ELECTRIC METER
- FIRE HYDRANT
- FOUND MONUMENT
- GAS METER
- GAS VALVE
- IRR. CONTROLLER
- IRR. VALVE
- LOOP DETECTOR
- SANITARY SEWER MH
- SET MONUMENT
- SIDEWALK RAMP
- SIGN
- STORM DRAIN INLET
- STORM DRAIN MH
- STREET LIGHT
- STREET LIGHT PB
- TELEPHONE MH
- TELEPHONE PB
- TRAFFIC SIGNAL POLE
- TRAFFIC SIGNAL PB
- TV PULLBOX
- UTILITY POLE
- UTILITY POLE GUY WIRE
- UTILITY VAULT
- WATER VAULT/CABINET
- WATER MANHOLE
- WATER METER
- WATER VALVE

## ALIGNMENT ABBREVIATIONS

| | |
|---|---|
| "FR" | FARM ROAD STORM DRAIN |
| "GA" | GILCREASE AVENUE STORM DRAIN |
| "GT" | GRAND TETON DRIVE STORM DRAIN |
| "L1" | LATERAL CONNECTION (12'x4' RCB) |
| "L2" | LATERAL CONNECTION (6'x3' RCB) |
| "SD" | MAINLINE STORM DRAIN |

## SHEET INDEX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| 2 | LBGN-01 | GENERAL NOTES |
| 3 | LBGN-02 | NOTES, LEGEND & VICINITY MAP |
| 4 | 3 | SUMMARY OF SURFACE AND BASE QUANTITIES |
| 4 | 3A - 3B | SUMMARY OF EARTHWORK |
| 7-9 | LBHC-01 - LBHC-03 | HORIZONTAL CONTROL PLAN |
| 9-19 | LBSD-01 - LBSD-10 | STORM DRAIN PLAN AND PROFILE |
| 20-23 | LBLP-01 - LBLP-04 | LATERAL PROFILES |
| 24-26 | LBU-01 - LBU-03 | UTILITY PLAN |
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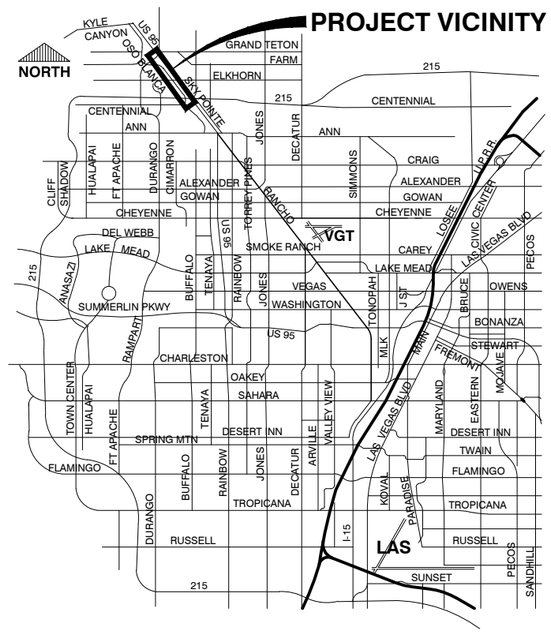
| 29-45 | LBDT-01 - LBDT-16 | TYPICAL DETAILS |
| 45-56 | LBS-01 - LBS-11 | HYDRAULIC STRUCTURE LIST |
| 56-59 | LBS-12 - LBS-14 | ROADWAY STRUCTURE LIST |


## 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 |

## PROJECT VICINITY




## VICINITY MAP

NOT TO SCALE

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
NOTES, LEGEND & VICINITY MAP

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBGN-02
02 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D02150951\2041569.GN01.DWG

# SUMMARY OF BASE AND SURFACE QUANTITIES

NOTE: QUANTITIES SHOWN IN THE SUMMARIES FOR BASE AND SURFACE MATERIALS ARE THEORETICAL AND - USED FOR ESTIMATING PURPOSES ONLY. ACTUAL SPREADS SHALL BE VARIED AS REQUIRED TO OBTAIN - THE DEPTHS OF VARIOUS COURSES SHOWN ON THE TYPICAL SECTIONS.

**100% PRELIMINARY**
SUBJECT TO REVISION
APRIL 24, 2017

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | CLARK | 3 |

| LOCATION | LENGTH | BASE AGGREGATE (TYPE 1 CLASS B) INCLUDES SLOPE ALLOWANCE AND 1' WIDENING (includes 8% for moisture) | | | | PLANTMIX DENSE GRADE SURFACE TYPE 2C (WET) INCLUDES ANGLE OF REPOSE | | | | PLANTMIX OPEN GRADE SURFACE 1/2-INCH (WET) | | | | COLD MILLING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STATIONS | WIDTH FEET | DEPTH INCH | TONS PER STA. | UNIT TONS | WIDTH FEET | DEPTH INCH | TONS PER STA. | UNIT TONS | WIDTH FEET | DEPTH INCH | TONS PER STA. | UNIT TONS | UNIT SQYD |
| **OSO BLANCA AT GILCREASE** | | | | | | | | | | | | | | |
| "SD" 95+35.94 to "SD" 96+89.85 | 1.54 | 8.92 to 11.83 | 4.50 | 32.35 | 50 | 11.83 to 9.50 | 4.00 | 31.39 | 48 | | | | | 1,070 |
| **OSO BLANCA AT FARM** | | | | | | | | | | | | | | |
| "SD" 8+13.16 to "SD" 9+11.05 | 0.98 | 25.67 to 25.67 | 4.50 | 56.71 | 56 | 25.67 to 25.67 | 4.00 | 54.49 | 53 | | | | | 1,016 |
| **GILCREASE AVENUE** | | | | | | | | | | | | | | |
| "GA" 10+97.51 to "GA" 13+54.91 | 2.57 | 8.92 to 11.83 | 4.50 | 47.58 | 122 | 11.83 to 9.50 | 4.00 | 45.83 | 118 | | | | | 1,590 |
| **FARM ROAD** | | | | | | | | | | | | | | |
| "FR" 5+10.00 to "FR" 8+40.58 | 3.31 | 8.92 to 26.21 | 4.50 | 66.48 | 220 | 8.92 to 26.21 | 4.00 | 63.74 | 211 | | | | | 1,974 |
| **SB OFF RAMP AT "SD"** | | | | | | | | | | | | | | |
| "SD" 107+67.90 to "SD" 109+37.92 | 1.70 | 26.66 to 26.66 | 14.00 | 133.06 | 226 | 26.66 to 26.66 | 7.00 | 73.16 | 124 | 26.66 to 26.66 | 0.75 | 7.19 | 12 | 543 |
| **SB OFF RAMP AT "FR"** | | | | | | | | | | | | | | |
| "FR" 11+31.81 to "FR" 11+62.35 | 0.31 | 25.67 to 25.67 | 14.00 | 192.56 | 59 | 25.67 to 25.67 | 7.00 | 104.89 | 32 | 25.67 to 25.67 | 0.75 | 10.41 | 3 | 101 |
| **SB ON RAMP** | | | | | | | | | | | | | | |
| "SD" 113+64.81 to "SD" 114+33.75 | 0.69 | 38.06 to 34.54 | 14.00 | 199.52 | 138 | 38.06 to 34.54 | 7.00 | 108.60 | 75 | 38.06 to 34.54 | 0.75 | 10.78 | 7 | 337 |
| **Connection "L1"** | | | | | | | | | | | | | | |
| "L1" 50+39.81 to "L1" 50+66.64 | 0.27 | 15.00 to 15.00 | 4.50 | 13.63 | 4 | 15.00 to 15.00 | 4.00 | 13.64 | 4 | 15.00 to 15.00 | 0.75 | 2.29 | 1 | 37 |
| | | | | **Sub Total:** | **874** | | | **Sub Total:** | **665** | | | **Sub Total:** | **22.83** | **6,669** |

# SUMMARY OF EARTHWORK

**100% PRELIMINARY**
SUBJECT TO REVISION
APRIL 24, 2017

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | CLARK | 3A |

## ROADWAY EXCAVATION

**OSO BLANCA AT GILCREASE**

| | | | | |
|---|---|---|---|---|
| "SD" | 95+35.94 | to | "SD" 96+89.85 | 101 CUYD |

**OSO BLANCA AT FARM**

| | | | | |
|---|---|---|---|---|
| "SD" | 8+13.16 | to | "SD" 9+11.05 | 95 CUYD |

**GILCREASE AVENUE**

| | | | | |
|---|---|---|---|---|
| "GA" | 10+97.51 | to | "GA" 13+54.91 | 251 CUYD |

**FARM ROAD**

| | | | | |
|---|---|---|---|---|
| "FR" | 5+10.00 | to | "FR" 8+40.58 | 399 CUYD |

**SB OFF RAMP AT "SD"**

| | | | | |
|---|---|---|---|---|
| "SD" | 107+67.90 | to | "SD" 109+37.92 | 220 CUYD |

**SB OFF RAMP AT "FR"**

| | | | | |
|---|---|---|---|---|
| "FR" | 11+31.81 | to | "FR" 11+62.35 | 37 CUYD |

**SB ON RAMP**

| | | | | |
|---|---|---|---|---|
| "SD" | 113+64.81 | to | "SD" 114+33.75 | 153 CUYD |

**CONNECTION "L1"**

| | | | | |
|---|---|---|---|---|
| "L1" | 50+39.81 | to | "L1" 50+66.64 | 6 CUYD |

| | |
|---|---|
| TOTAL: | 1,263 CUYD |
| **USE TOTAL:** | **1,270 CUYD** |

## STRUCTURE EXCAVATION

| | |
|---|---|
| "SD" RCB | 42,290 CUYD |
| "FR" RCB | 10,485 CUYD |
| "L1" RCB | 653 CUYD |
| "L2" RCB | 8 CUYD |

| | |
|---|---|
| TOTAL: | 53,436 CUYD |
| **USE TOTAL:** | **53,440 CUYD** |

## GRANULAR BACKFILL

| | |
|---|---|
| "SD" RCB | 7,661.20 CUYD |
| "FR" RCB | 1,438.90 CUYD |
| "L1" RCB | 118.4 CUYD |
| "L2" RCB | 10.1 CUYD |

| | |
|---|---|
| TOTAL: | 9,229 CUYD |
| **USE TOTAL:** | **9,230 CUYD** |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | CLARK | 3B |

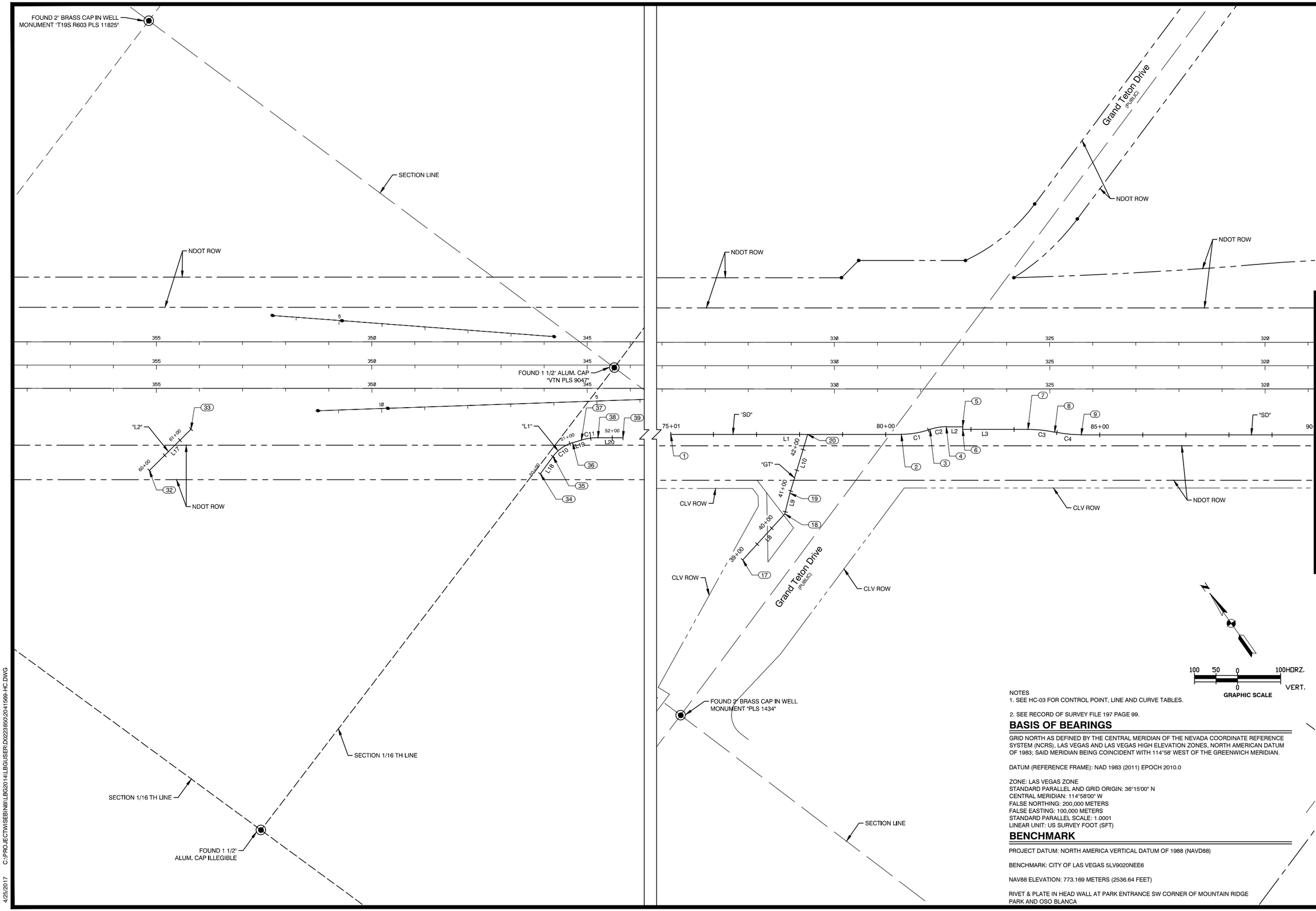
# 100% PRELIMINARY

**SUBJECT TO REVISION**
**APRIL 24, 2017**

| THEORETICAL APPLICATION OF SURFACE MATERIALS | | |
|---|---|---|
| **ASPHALT CEMENT GRADE PG76-22NV** | | |
| (1/2" SIZE) OPEN-GRADE | 5.5% | |
| (TYPE 2C) DENSE-GRADE | 4.5% | |
| **MINERAL FILLER** | 1.5% | |
| **SPECIFIC GRAVITY** | 2.70 | |
| **EMULSIFIED ASPHALT TYPE SS-1H (DILUTED)** | | |
| TACK COAT (BETWEEN PBS LIFTS) | 0.06 | $gal/yd^2$ |
| TACK COAT (OVER MILLED SURFACES) | 0.10 | $gal/yd^2$ |
| TACK COAT (UNDER OPEN GRADE) | 0.07 | $gal/yd^2$ |
| SEAL COAT (ISLAND AND APPROACH) | 0.12 | $gal/yd^2$ |
| **LIQUID ASPHALT TYPE MC-70NV** | | |
| PRIME COAT | 0.28 | $gal/yd^2$ |
| **AGGREGATE BASE UNIT WEIGHT (INCLUDES 8% MOISTURE)** | 141.00 | $lb/ft^3$ |
| **COLD MILLED MATERIAL TO BE USED AS SHOULDERING MATERIAL** | 1.69 | $ton/yd^3$ |
| **COLD MILLED UNIT WEIGHT** | 1.76 | $ton/yd^3$ |
| **PLANTMIX UNIT WEIGHT** | | |
| OPEN-GRADED | 1.92 | $ton/yd^3$ |
| DENSE-GRADED | 2.03 | $ton/yd^3$ |

GENERAL NOTES

1 Refer to Nevada Department of Transportation Standard Specifications for Road and Bridge Construction, 2001 Edition, for specifications except as modified by these plans and special provisions.
2 Traffic control devices shall conform to the requirements of the M.U.T.C.D. 2009 Edition.
3 Depth of base and surface is minimum compacted thickness.
4 Remove all existing guide posts and object markers at no direct payment.
5 Type 3 object markers to be placed as directed.
6 For curb and gutter sections place top of open grade flush with the gutter pan.
7 All highway signs, including overhead signs, including overhead signs, inappropriate to the traffic control are to be covered or removed and reset as directed by the engineer, no direct payment.
8 Construction signs shall be removed, laid down, or covered when the specified operation are not being performed.
9 The locations of approaches and signs are approximate only and shall be adjusted as necessary, as directed by the engineer.
10 Transverse ramps of 1:50 must be in place at the end of the paving shift, no direct payment.
11 Furnish and install all mileposts (posts only). The state shall furnish and install all milepost panels.
12 Profile grade line (PGL) is the top of dense grade.




NOTES
1. SEE HC-03 FOR CONTROL POINT, LINE AND CURVE TABLES.

2. SEE RECORD OF SURVEY FILE 197 PAGE 99.

## BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

DATUM (REFERENCE FRAME): NAD 1983 (2011) EPOCH 2010.0

ZONE: LAS VEGAS ZONE
STANDARD PARALLEL AND GRID ORIGIN: 36°15'00" N
CENTRAL MERIDIAN: 114°58'00" W
FALSE NORTHING: 200,000 METERS
FALSE EASTING: 100,000 METERS
STANDARD PARALLEL SCALE: 1.0001
LINEAR UNIT: US SURVEY FOOT (SFT)

## BENCHMARK

PROJECT DATUM: NORTH AMERICA VERTICAL DATUM OF 1988 (NAVD88)

BENCHMARK: CITY OF LAS VEGAS 5LV9020NEE6

NAV88 ELEVATION: 773.169 METERS (2536.64 FEET)

RIVET & PLATE IN HEAD WALL AT PARK ENTRANCE SW CORNER OF MOUNTAIN RIDGE PARK AND OSO BLANCA

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX
DATE: 3/30/2017 | DESIGNED BY: LDN
SUBMITTAL STAGE: 100% PRE-FINAL | DRAWN BY: FME
CHECKED BY: JSD

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
HORIZONTAL CONTROL PLAN

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBHC-01
07 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D0223850\2041569-HC.DWG

MATCHLINE "SD" 90+00 - SEE SHEET LBHC-01

SECTION LINE

NDOT ROW

NDOT ROW

Farm Road (PUBLIC)

Durango Drive (PUBLIC)

SECTION LINE

North US 95

South US 95

North US 95

South US 95

SEE CH2M PLAN FOR CONTINUATION

Oso Blanca Road (PUBLIC)

CLV ROW

CLV ROW

NDOT ROW

"SD"

"SD"

"GA"

"FR"

CLV ROW

Gilcrease Avenue (PUBLIC)

CLV ROW

CLV ROW

Farm Road (PUBLIC)

CLV ROW

NDOT ROW

Oso Blanca Road (PUBLIC)

CLV ROW

SECTION LINE

100 50 0 100HORZ.

0 VERT.

GRAPHIC SCALE

NOTES
1. SEE HC-03 FOR CONTROL POINT, LINE AND CURVE TABLES.

2. SEE RECORD OF SURVEY FILE 197 PAGE 99.

## BASIS OF BEARINGS

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

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FALSE EASTING: 100,000 METERS
STANDARD PARALLEL SCALE: 1.0001
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BENCHMARK: CITY OF LAS VEGAS 5LV9020NEE6

NAV88 ELEVATION: 773.169 METERS (2536.64 FEET)

RIVET & PLATE IN HEAD WALL AT PARK ENTRANCE SW CORNER OF MOUNTAIN RIDGE PARK AND OSO BLANCA

4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0223850\2041569-HC.DWG

| NO. | DATE | REVISIONS |
|---|---|---|

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Louis Berger
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Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE:
100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
HORIZONTAL CONTROL PLAN

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBHC-02
08 OF 59

DRAWING NO.
731-96

| | LINE TABLE | | |
|---|---|---|---|
| ALIGNMENT | LINE | DISTANCE | BEARING |
| "SD" | L1 | 535.07' | S36° 14' 24.55"E |
| | L2 | 37.94' | S36° 14' 24.55"E |
| | L3 | 151.93' | S36° 14' 24.55"E |
| | L4 | 1793.55' | S36° 14' 24.55"E |
| | L5 | 915.90' | S36° 18' 36.21"E |
| | L6 | 50.00' | S35° 39' 01.54"E |
| | L7 | 67.56' | S36° 19' 51.52"E |
| "GT" | L8 | 145.06' | S83° 51' 11.78"E |
| | L9 | 49.57' | N67° 43' 37.63"E |
| | L10 | 142.21' | N70° 28' 04.09"E |
| "GA" | L11 | 378.74' | S89° 20' 26.05"E |
| | L12 | 117.21' | N53° 45' 35.46"E |
| | L13 | 28.65' | S81° 14' 24.55"E |
| "FR" | L14 | 416.21' | S89° 32' 44.14"E |
| | L15 | 267.27' | S89° 32' 44.14"E |
| | L16 | 279.80' | S36° 18' 36.21"E |
| "L2" | L17 | 136.24' | S80° 59' 22.46"E |
| "L1" | L18 | 50.00' | N89° 46' 01.86"E |
| | L19 | 21.44' | S52° 36' 07.08"E |
| | L20 | 58.10' | S36° 22' 47.26"E |

| | CURVE TABLE | | | |
|---|---|---|---|---|
| ALIGNMENT | CURVE | RADIUS | LENGTH | DELTA (Δ) |
| "SD" | C1 | 200.00' | 67.64' | 19.38 |
| | C2 | 114.75' | 38.81' | 19.38 |
| | C3 | 300.00' | 62.22' | 11.88 |
| | C4 | 300.00' | 62.22' | 11.88 |
| | C5 | 1660.00' | 396.09' | 13.67 |
| | C6 | 500.00' | 119.91' | 13.74 |
| "FR" | C7 | 500.00' | 70.77' | 8.11 |
| | C8 | 500.00' | 70.77' | 8.11 |
| | C9 | 150.00' | 139.37' | 53.24 |
| "L1" | C10 | 86.00' | 56.48' | 37.63 |
| | C11 | 140.00' | 39.02' | 15.97 |

| | POINT TABLE | | | |
|---|---|---|---|---|
| ALIGNMENT | POINT # | NORTHING | EASTING | DESCRIPTION |
| "SD" | 1 | 677324.5639 | 231320.2713 | "SD" 75+01.14 BEGIN |
| | 2 | 676893.0085 | 231636.5867 | "SD" 80+36.21 PC |
| | 3 | 676846.1842 | 231684.9549 | "SD" 81+03.85 PRC |
| | 4 | 676819.3188 | 231712.7061 | "SD" 81+42.66 PT |
| | 5 | 676788.7194 | 231735.1345 | "SD" 81+80.60 END BACK = "SD" 81+80.60, 6.07' RT AHEAD |
| | 6 | 676785.1226 | 231730.2362 | "SD" 81+80.60 END AHEAD = "SD" 81+80.60, 6.07' LT BACK |
| | 7 | 676662.5808 | 231820.0552 | "SD" 83+32.53 PC |
| | 8 | 676608.9515 | 231851.3912 | "SD" 83+94.76 PRC |
| | 9 | 676555.3222 | 231882.7273 | "SD" 84+56.98 PT |
| | 10 | 675108.7386 | 232943.0240 | "SD" 102+50.53 PC |
| | 11 | 674764.4923 | 233137.0326 | "SD" 106+46.62 PRC |
| | 12 | 674660.3118 | 233195.8298 | "SD" 107+66.54 PT |
| | 13 | 673922.1681 | 233738.2498 | "SD" 116+82.44 END BACK = "SD" 116+82.44, 4.37' RT AHEAD |
| | 14 | 673919.6188 | 233734.6956 | "SD" 116+82.44 END AHEAD = "SD" 116+82.44, 4.37' LT BACK |
| | 15 | 673879.0756 | 233763.7757 | "SD" 117+32.44 PI |
| | 16 | 673824.6511 | 233803.7997 | "SD" 118+00.00 END |
| "GT" | 17 | 677017.6769 | 231183.8590 | "GT" 39+00.00 BEGIN |
| | 18 | 677002.1446 | 231328.0844 | "GT" 40+45.06 PI |
| | 19 | 677020.9312 | 231373.9526 | "GT" 40+94.63 PI |
| | 20 | 677068.4758 | 231507.9752 | "GT" 42+36.83 END = "SD" 78+18.66 |
| "GA" | 21 | 675566.1323 | 232061.8164 | "GA" 9+50.00 BEGIN |
| | 22 | 675563.5506 | 232442.9566 | "GA" 13+21.92 PI |
| | 23 | 675631.0626 | 232535.0647 | "GA" 14+39.12 PI |
| | 24 | 675626.7002 | 232563.3758 | "GA" 14+73.96 END = "SD" 96+08.34 |
| "FR" | 25 | 674216.8005 | 232616.6245 | "FR" 4+38.25 BEGIN |
| | 26 | 674213.4997 | 233032.8219 | "FR" 8+54.46 PC |
| | 27 | 674207.9404 | 233103.3137 | "FR" 9+25.23 PRC |
| | 28 | 674202.3812 | 233173.8055 | "FR" 9+96.00 PT |
| | 29 | 674200.2615 | 233441.0652 | "FR" 12+63.27 PC |
| | 30 | 674139.0895 | 233560.7492 | "FR" 14+02.64 PT |
| | 31 | 673913.5326 | 233726.4982 | "FR" 16+82.44 END |
| "L2" | 32 | 678997.6487 | 229988.6977 | "L2" 60+00.00 BEGIN |
| | 33 | 678976.3119 | 230123.2549 | "L2" 61+36.24 END |
| "L1" | 34 | 678261.0325 | 230518.7192 | "L1" 50+00.00 BEGIN |
| | 35 | 678261.2356 | 230568.7181 | "L1" 50+50.00 PC |
| | 36 | 678243.5578 | 230621.2995 | "L1" 51+06.48 PT |
| | 37 | 678230.5339 | 230638.3353 | "L1" 51+27.93 PC |
| | 38 | 678202.7285 | 230665.5305 | "L1" 51+66.95 PT |
| | 39 | 678155.9513 | 230699.9921 | "L1" 52+25.05 END |

NOTES
1. SEE RECORD OF SURVEY FILE 197 PAGE 99.

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE:
100% PRE-FINAL

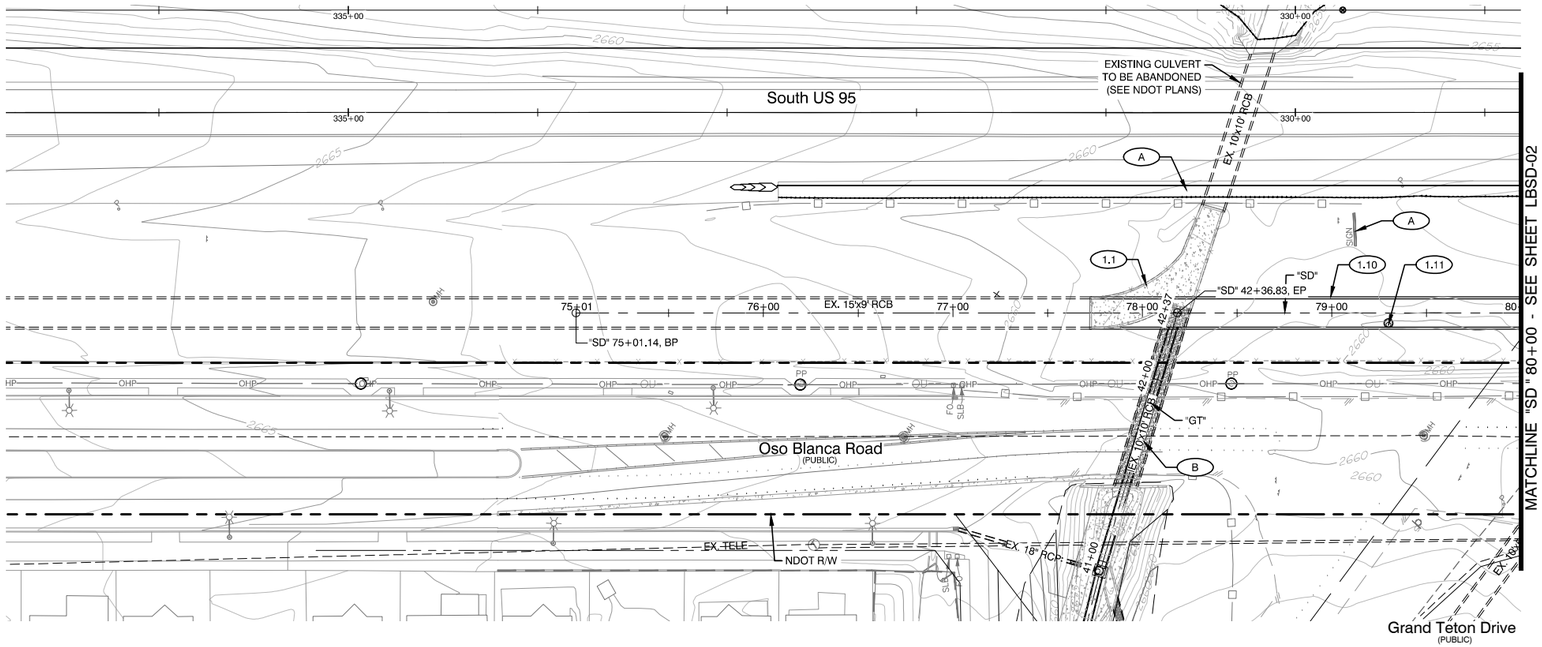
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

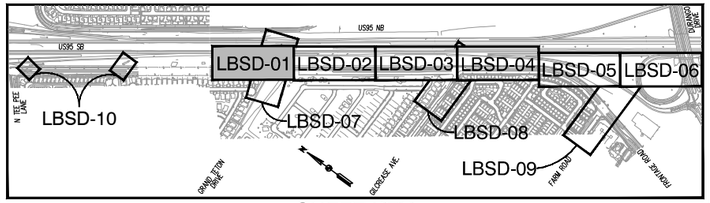
SHEET
HORIZONTAL CONTROL PLAN

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBHC-03
09 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0223850\2041569-HC.DWG



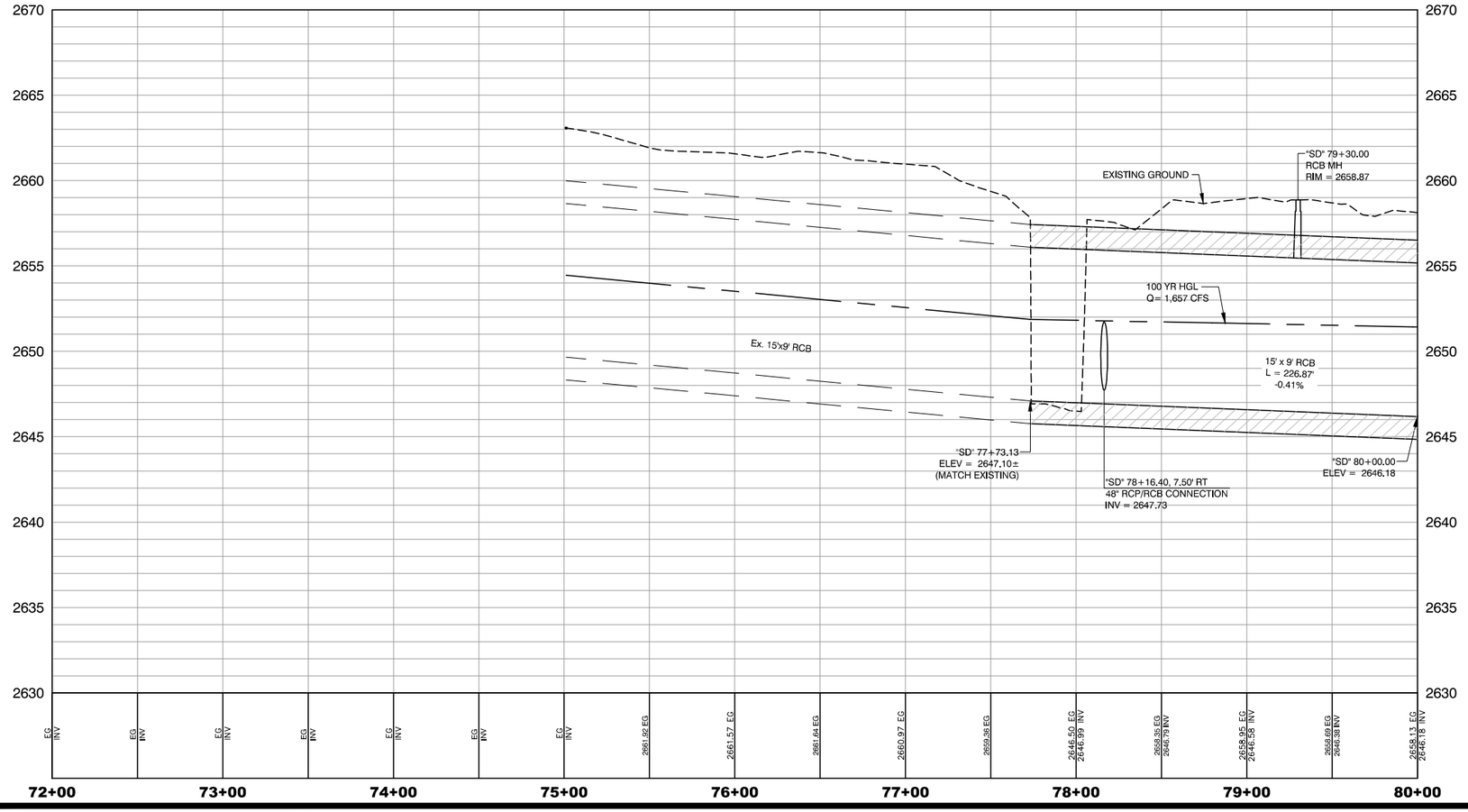




## SHEET KEY

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 1.1 | "SD" 77+73.13 TO "SD" 78+27.00 | REMOVE CONCRETE CHANNEL (SEE SHEET LBDT-13). |
| 1.10 | "SD" 77+73.13 TO "SD" 80+00.00 | CONSTRUCT 15' x 9' X 226.87' RCB. (SEE SHEET LBDT-10 ). |
| 1.11 | "SD" 79+30.00 | CONSTRUCT RCB MANHOLE, 5.50' RT (COVER ELEV= 2658.87', H = 2.16'). (SEE SHEET LBDT-08). |
| A | | SEE NDOT PLANS |
| B | | SEE SHEET LBSD-07 FOR GRAND TETON IMPROVEMENTS |




NOTE:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
**CITY OF LAS VEGAS**

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: **100% PRE-FINAL**

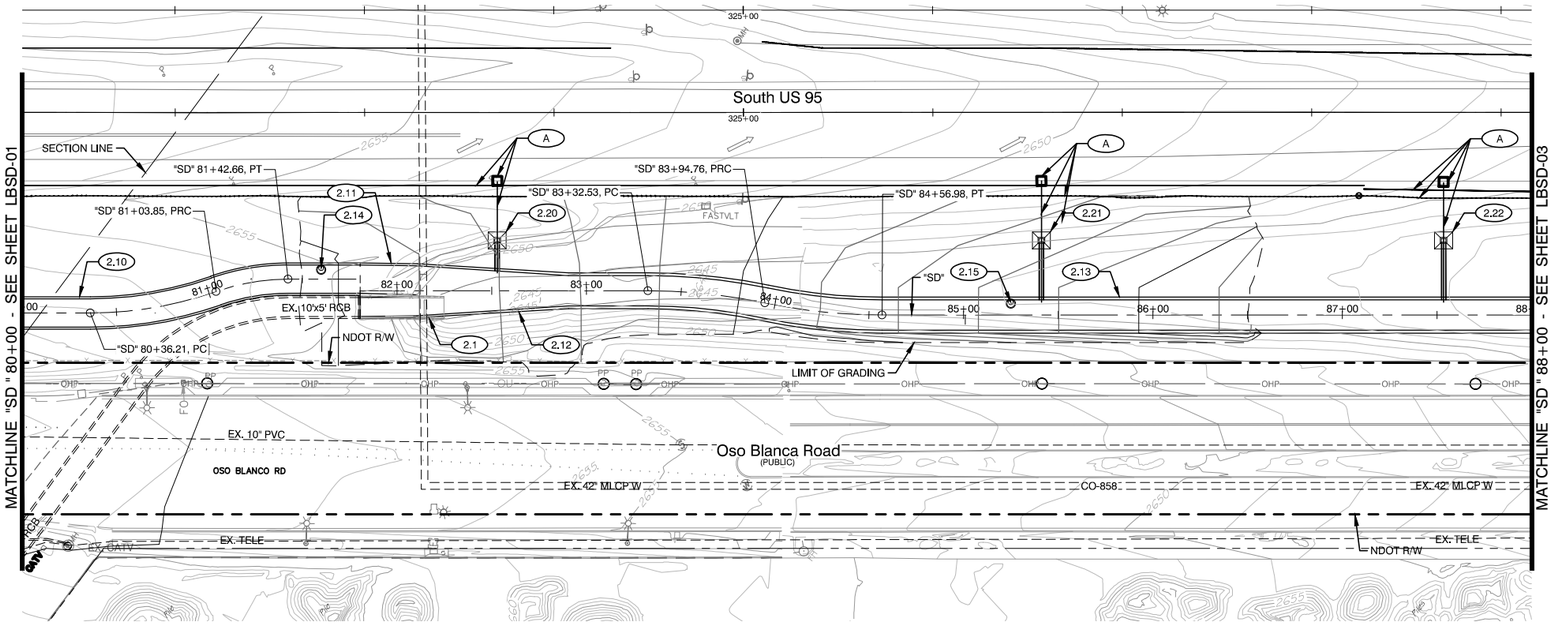
TITLE
**CENTENNIAL PARKWAY CHANNEL WEST**
**DURANGO DRIVE TO GRAND TETON DRIVE**

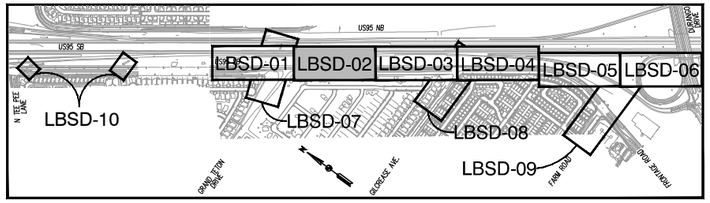
SHEET
**STORM DRAIN PLAN AND PROFILE**
**"SD" 72+00.00 TO "SD" 80+00.00**

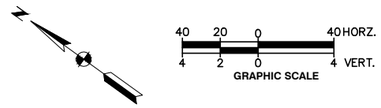
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
**LBSD-01**
10 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0180266\2041569-SD01.DWG

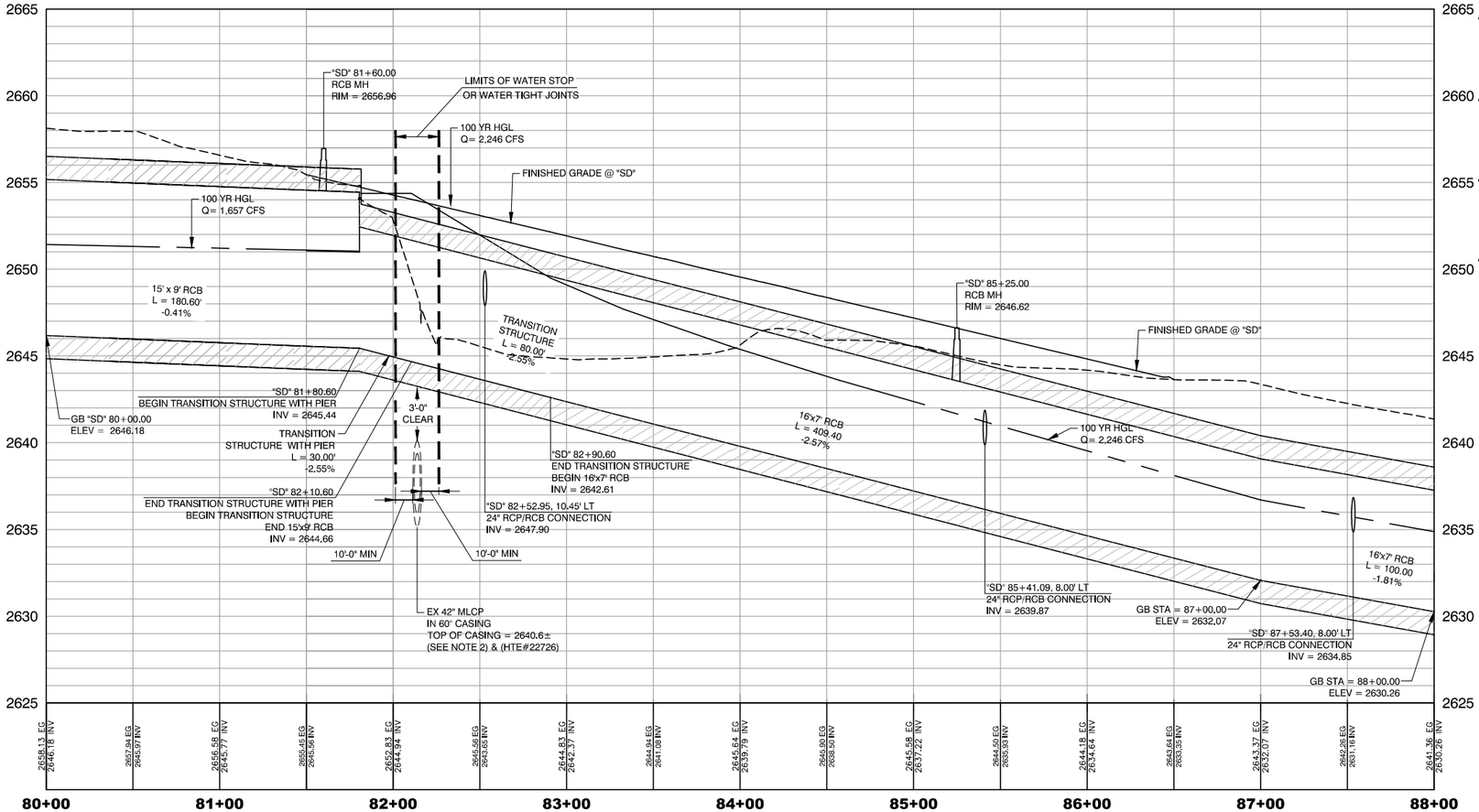



## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 2.1 | "SD" 81+80.60, 8.67' RT TO<br>"SD" 82+25.02, 8.67' RT | REMOVE CONCRETE CHANNEL<br>(SEE SHEET LBDT-05). |
| 2.10 | "SD" 80+00.00 TO<br>"SD" 81+80.60 | CONSTRUCT 15' x 9' x 180.60' RCB.<br>(SEE SHEETS LBDT-05 AND LBDT-10). |
| 2.11 | "SD" 81+80.60 TO<br>"SD" 82+10.60 | CONSTRUCT TRANSITION STRUCTURE WITH PIER<br>(SEE SHEETS LBDT-05). |
| 2.12 | "SD" 82+10.60 TO<br>"SD" 82+90.60 | CONSTRUCT TRANSITION STRUCTURE<br>(SEE SHEET LBDT-05) |
| 2.13 | "SD" 82+90.60 TO<br>"SD" 88+00.00 | CONSTRUCT 16' x 7' x 509.40' RCB<br>(SEE SHEET LBDT-10) |
| 2.14 | "SD" 81+60.00 TO | CONSTRUCT RCB MANHOLE, 5.00' LT<br>(COVER ELEV= 2656.96', H = 1.16').<br>(SEE SHEET LBDT-08). |
| 2.15 | "SD" 85+25.00 TO | CONSTRUCT RCB MANHOLE, 6.00' LT<br>(COVER ELEV= 2646.62', H = 1.75').<br>(SEE SHEET LBDT-08). |
| 2.20 | "SD" 82+52.94 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 26.43' LT<br>(GRATE ELEV= 2652.37', INV ELEV= 2648.20', H = 4.17').<br>INSTALL 24" X 16' RCP FROM "SD" 82+52.94, 26.43' LT<br>(UIE= 2648.20') TO "SD" 82+52.95, 10.45' LT (LIE= 2647.90').<br>CONSTRUCT 24" RCP CONNECTION, 10.45' LT.<br>(SEE SHEET LBLP-03 AND LBDT-09). |
| 2.21 | "SD" 85+41.09 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT<br>(GRATE ELEV= 2647.03', INV ELEV= 2642.53', H = 4.50').<br>INSTALL 24" X 32' RCP FROM "SD" 85+41.09, 39.40' LT<br>(UIE= 2642.53') TO "SD" 85+41.09, 8.00' LT (LIE= 2639.87').<br>CONSTRUCT 24" RCP CONNECTION, 8.00' LT.<br>(SEE SHEET LBLP-03 AND LBDT-09). |
| 2.22 | "SD" 87+53.40 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT<br>(GRATE ELEV= 2641.96', INV ELEV= 2637.46', H = 4.50').<br>INSTALL 24" X 32' RCP FROM "SD" 87+53.40, 39.40' LT<br>(UIE= 2637.46') TO "SD" 87+53.40, 8.00' LT (LIE= 2634.85').<br>CONSTRUCT 24" RCP CONNECTION, 8.00' LT.<br>(SEE SHEET LBLP-03 AND LBDT-09). |
| A | | SEE NDOT PLANS |




NOTE:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA
2. IN AREAS WHERE THE EXCAVATION IS LESS THAN THREE FEET (3 FT) FROM THE TOP ON THE LVVWD 42" TRANSMISSION WATER MAIN, NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELD EQUIPMENT, WILL BE ALLOWED WITHIN 10 FEET (10 FT) OF THE TRANSMISSION WATER MAIN. IN THESE AREAS, CONTRACTOR TO PLACE A CONCRETE BARRIER, I.E. JERSEY RAIL, TO IDENTIFY THE "NO EQUIPMENT ZONE"

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

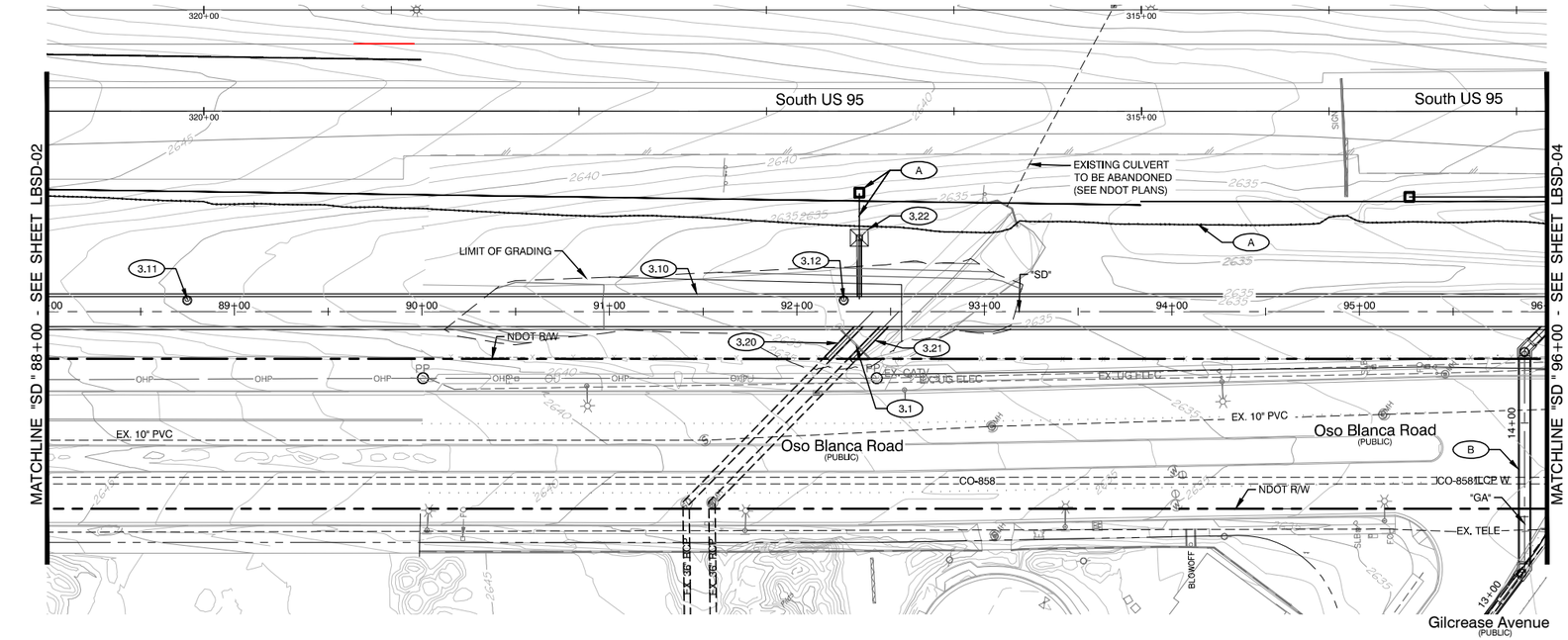
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

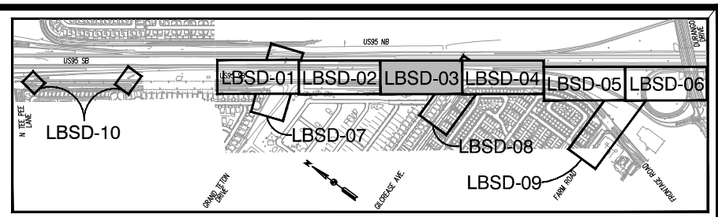
SHEET
STORM DRAIN PLAN AND PROFILE
"SD" 80+00.00 TO "SD" 88+00.00

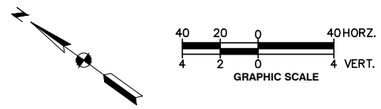
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBSD-02
11 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D0180266\2041569-SD01.DWG

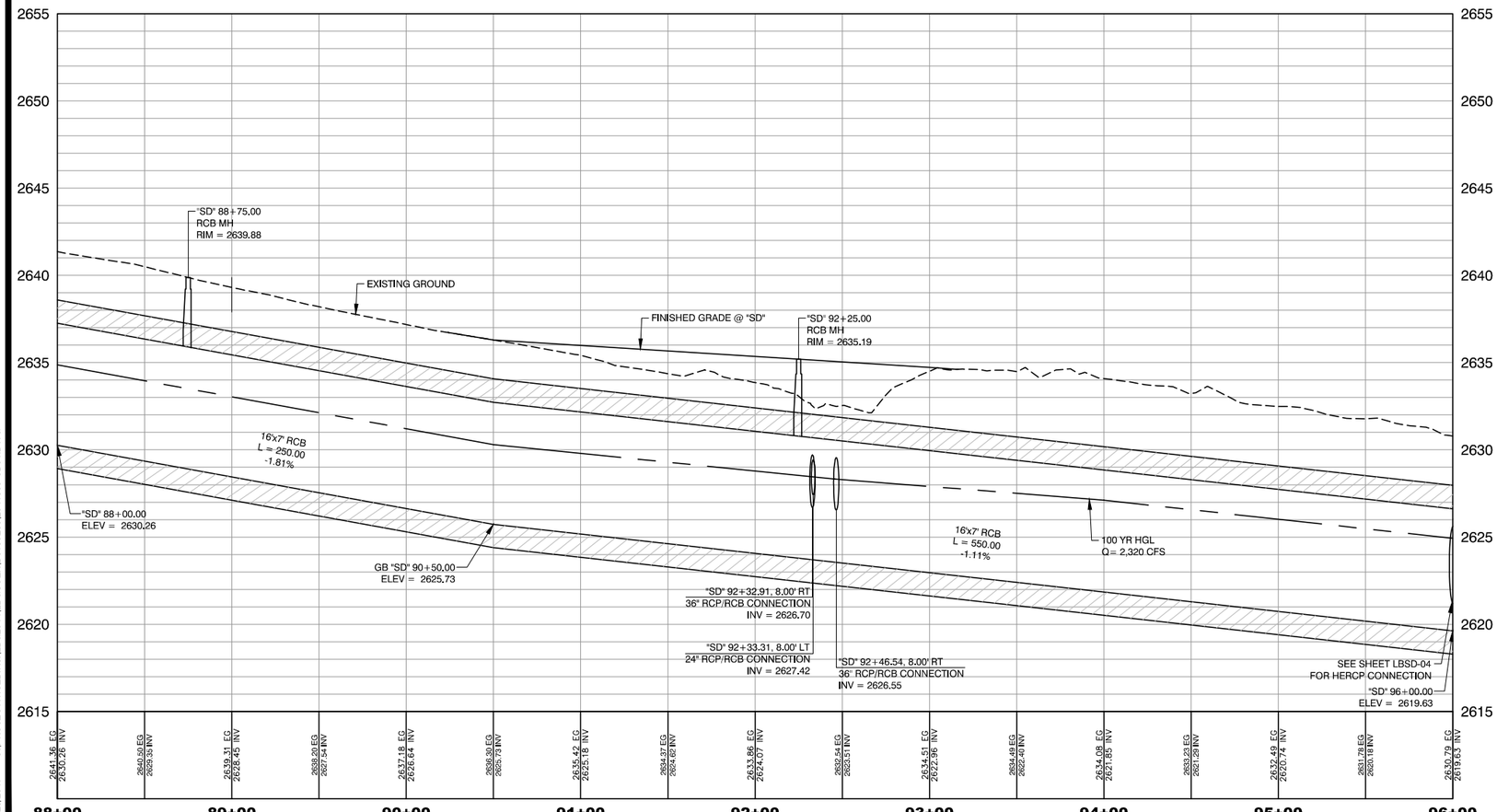



## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 3.1 | "SD" 92+30.80, 16.98' RT | REMOVE HEADWALL |
| 3.10 | "SD" 88+00.00 TO "SD" 96+00.00 | CONSTRUCT 16' x 7' x 800' RCB. (SEE SHEET LBDT-10). |
| 3.11 | "SD" 88+75.00 | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2639.88', H = 2.75'). (SEE SHEET LBDT-08). |
| 3.12 | "SD" 92+25.00 | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2635.19', H = 3.16'). (SEE SHEET LBDT-08). |
| 3.20 | "SD" 92+16.31 | INSTALL 36" X 24' RCP FROM "SD" 92+16.31, 25.00' RT (UIE= 2630.77') TO "SD" 92+32.91, 8.00' RT (LIE= 2626.70'). CONSTRUCT 36" RCP CONNECTION, 8.00' RT. (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). |
| 3.21 | "SD" 92+28.88 | INSTALL 36" X 26' RCP FROM "SD" 92+28.88, 26.09' RT (UIE= 2630.76') TO "SD" 92+46.54, 8.00' RT (LIE= 2626.55'). CONSTRUCT 36" RCP CONNECTION, 8.00' RT. (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). |
| 3.22 | "SD" 92+33.31 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT (GRATE ELEV= 2632.26', INV ELEV= 2628.03', H = 4.23'). INSTALL 24" X 32' RCP FROM "SD" 92+33.31, 39.40' LT (UIE= 2628.03') TO "SD" 92+33.31, 8.00' LT (LIE= 2627.42'). CONSTRUCT 24" RCP CONNECTION, 8.00' LT. (SEE SHEET LBLP-03 AND LBDT-09). |
| A | | SEE NDOT PLANS |
| B | | SEE SHEET LBSD-08 FOR GILCREASE AVENUE IMPROVEMENTS |




NOTE:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

| | | | |
|---|---|---|---|
| H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | |
| DATE: 3/30/2017 | | DRAWN BY: FME | |
| SUBMITTAL STAGE: 100% PRE-FINAL | | CHECKED BY: JSD | |

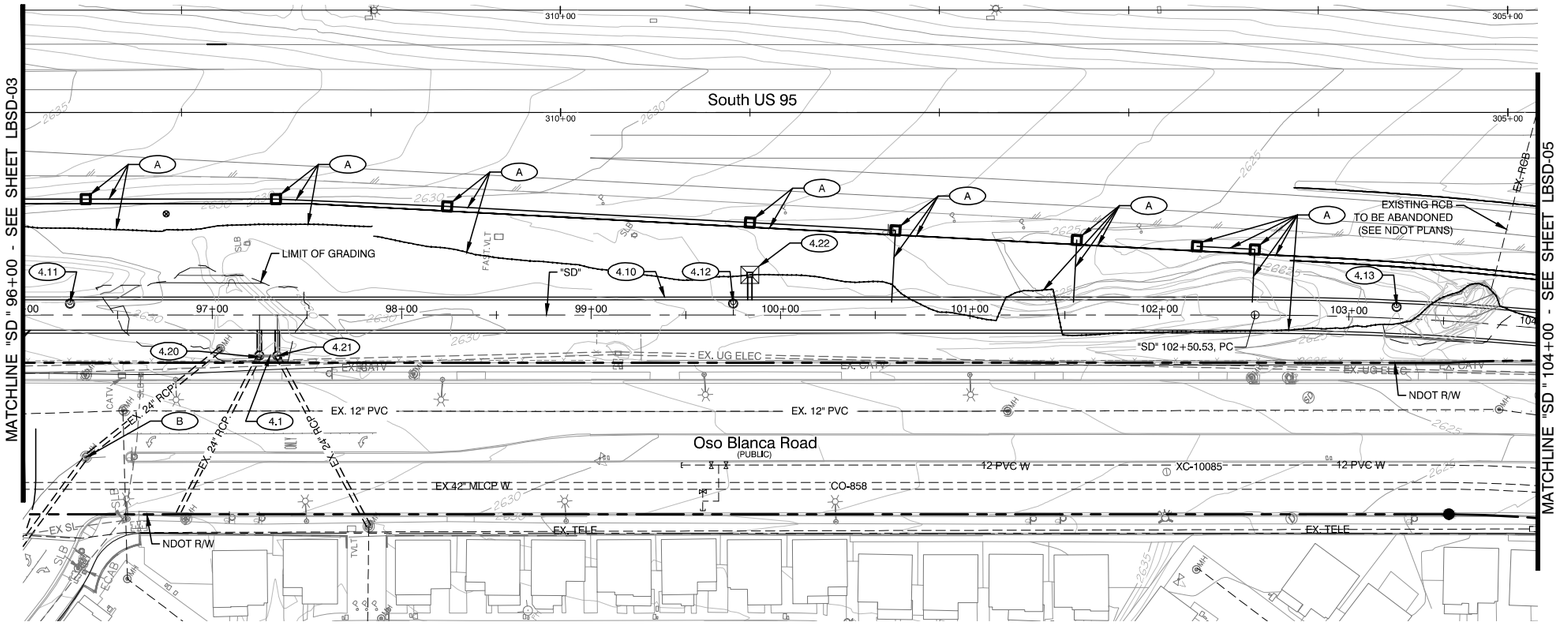
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

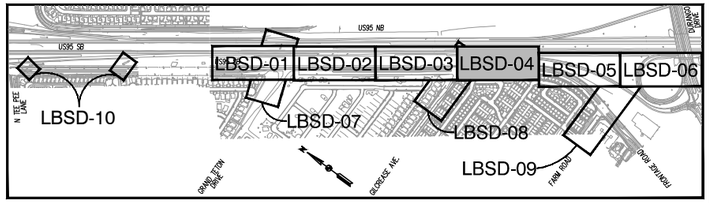
SHEET
STORM DRAIN PLAN AND PROFILE
"SD" 88+00.00 TO "SD" 96+00.00

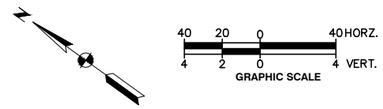
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBSD-03
12 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISE8I\N81\LBG2014\LBGUSER\D0180266\2041569-SD01.DWG

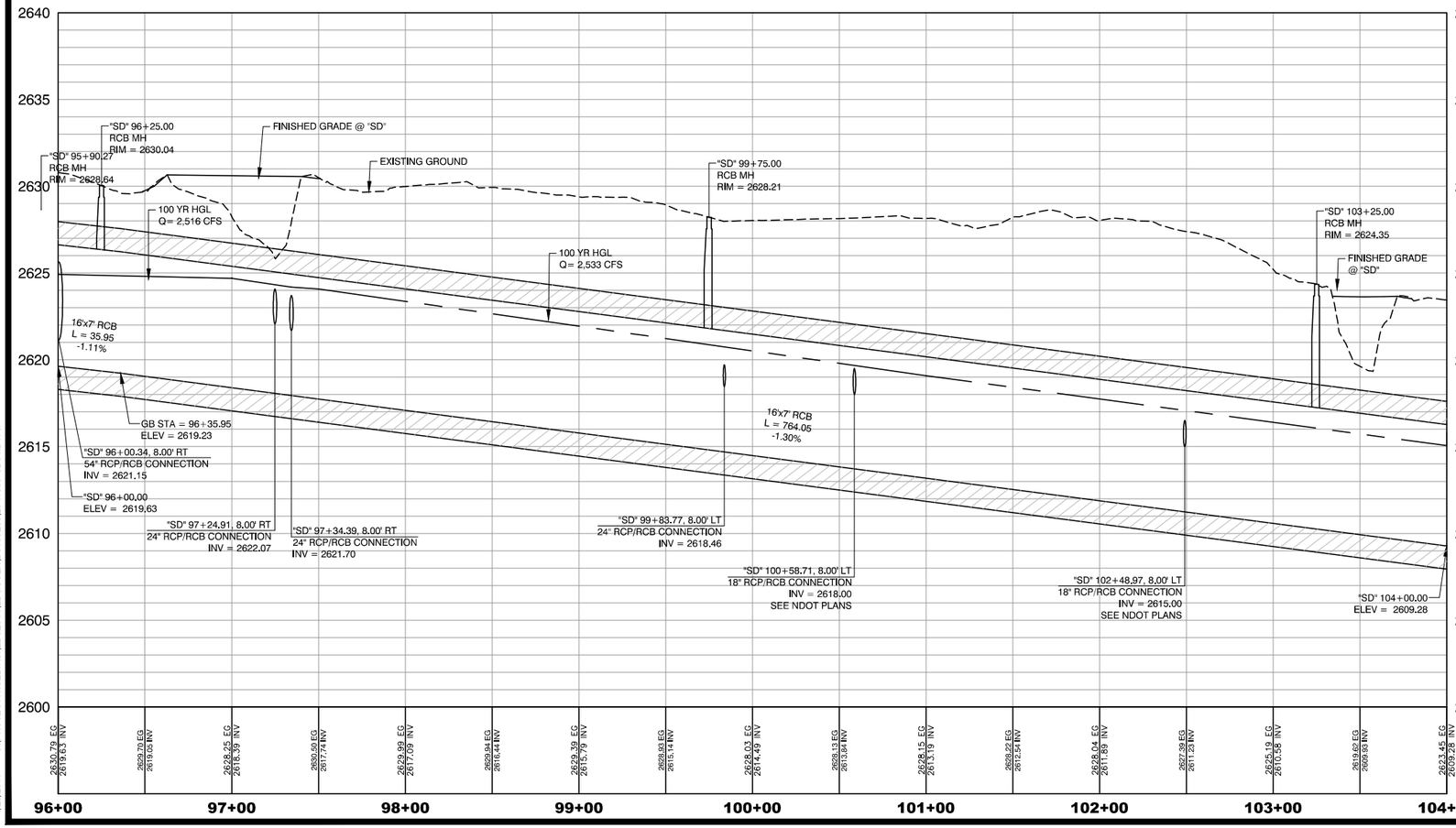



## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 4.1 | "SD" 97+29.54, 21.47' RT | REMOVE HEADWALL |
| 4.10 | "SD" 96+00.00 TO "SD" 104+00.00 | CONSTRUCT 16' x 7' x 800' RCB. (SEE SHEETS LBDT-10). |
| 4.11 | "SD" 96+25.00 TO | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2630.04', H = 2.41'). (SEE SHEET LBDT-08). |
| 4.12 | "SD" 99+75.00 TO | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2628.21', H = 5.16'). (SEE SHEET LBDT-08). |
| 4.13 | "SD" 103+25.00 TO | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2624.35', H = 5.83'). (SEE SHEET LBDT-08). |
| 4.20 | "SD" 97+24.91 | CONSTRUCT TYPE 1 MANHOLE MODIFIED , 21.46' RT (RIM ELEV= 2630.58', INV ELEV= 2625.81', H = 4.77'). INSTALL 24" X 14' RCP FROM "SD" 97+24.91, 21.46' RT (UIE= 2625.81') TO "SD" 97+24.91, 8.00' RT (LIE= 2622.07'). CONSTRUCT 24" RCP CONNECTION, 8.00' RT. (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). |
| 4.21 | "SD" 97+34.39 | CONSTRUCT TYPE 1 MANHOLE MODIFIED , 21.49' RT (RIM ELEV= 2630.43', INV ELEV= 2625.16', H = 5.27'). INSTALL 24" X 14' RCP FROM "SD" 97+34.39, 21.49' RT (UIE= 2625.16') TO "SD" 97+34.39, 8.00' RT (LIE= 2621.70'). CONSTRUCT 24" RCP CONNECTION, 8.00' RT. (SEE SHEETS LBLP-04, LBDT-08 AND LBDT-09). |
| 4.22 | "SD" 99+83.77 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 21.24' LT (GRATE ELEV= 2626.84', INV ELEV= 2651.52', H = -24.'). INSTALL 24" X 14' RCP FROM "SD" 99+83.77, 21.24' LT (UIE= 2651.52') TO "SD" 99+83.77, 8.00' LT (LIE= 2618.46'). CONSTRUCT 24" RCP CONNECTION, 8.00' LT. (SEE SHEET LBLP-03 AND LBDT-09). |
| A | | SEE NDOT PLANS |
| B | | SEE SHEET GSD-08 FOR GILCREASE AVENUE IMPROVEMENTS |




NOTE:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY

Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
**CITY OF LAS VEGAS**

H# 60223 | BID# XX.XXXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: **100% PRE-FINAL**

TITLE
**CENTENNIAL PARKWAY CHANNEL WEST**
**DURANGO DRIVE TO GRAND TETON DRIVE**

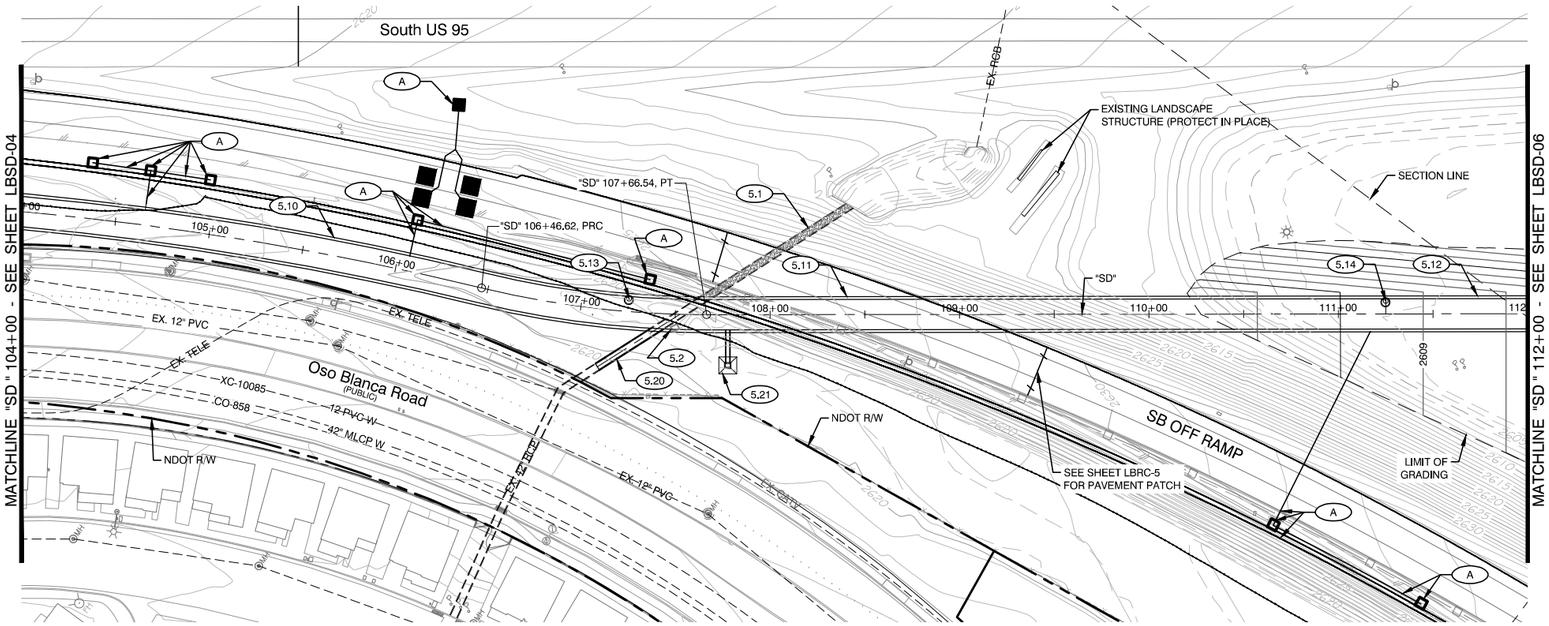
SHEET
**STORM DRAIN PLAN AND PROFILE**
**"SD" 96+00.00 TO "SD" 104+00.00**

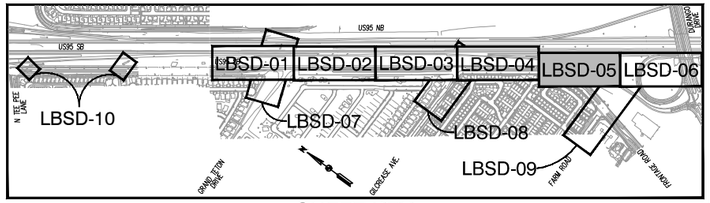
100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
**LBSD-04**
13 OF 59

DRAWING NO.
**731-96**

4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0160266\2041569-SD01.DWG



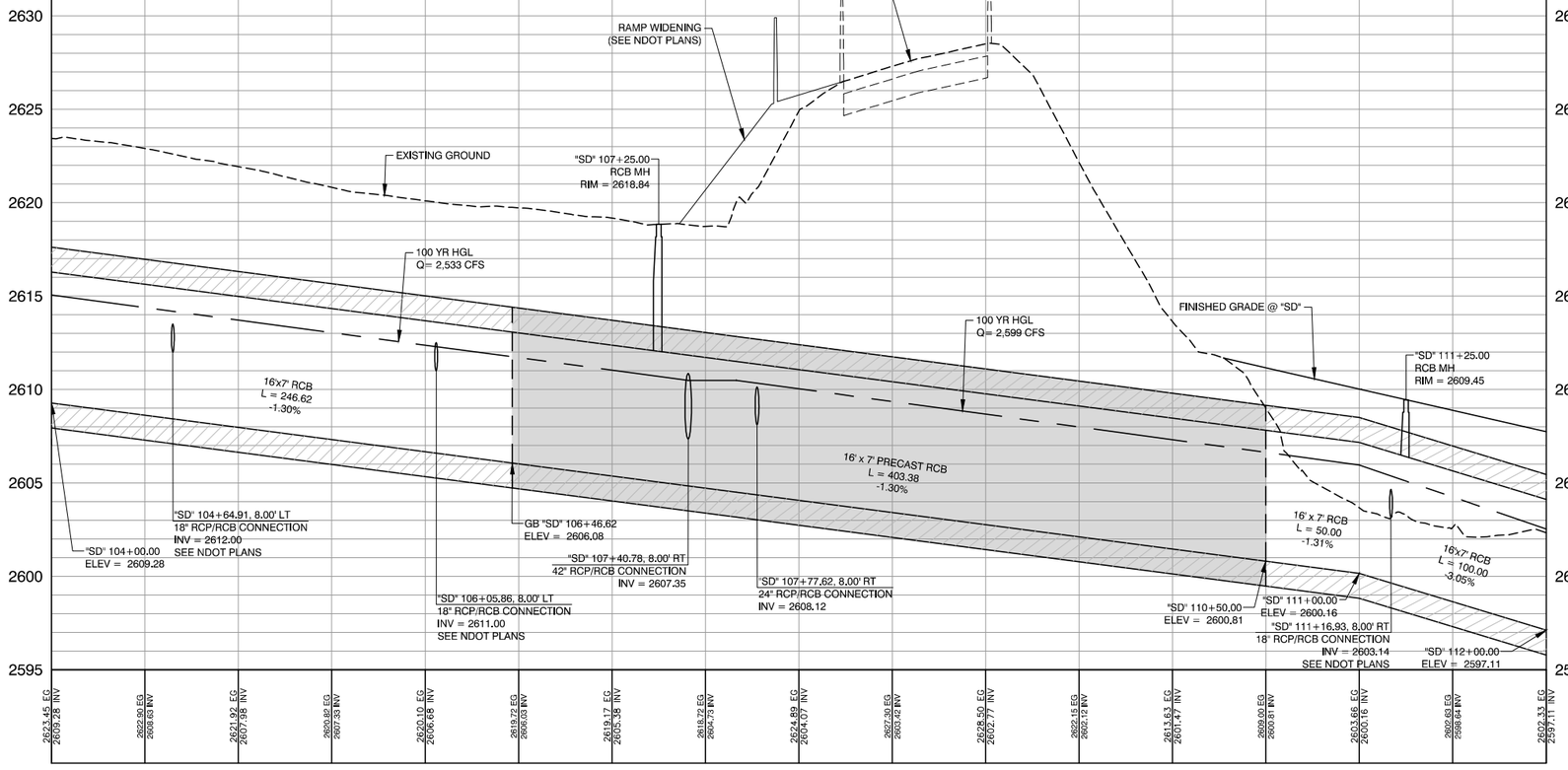




## SHEET KEY

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 5.1 | "SD" 107+71.44, 12.43' LT TO "SD" 108+42.51, 57.63' LT | ABANDON 42" x 84' RCP (SEE SHEET LBRC-05). |
| 5.2 | "SD" 107+12.03, 30.55' RT TO "SD" 107+68.00, 10.00' LT | REMOVE DROP INLET AND 42" x 75' RCP (SEE SHEET LBRC-05). |
| 5.10 | "SD" 104+00.00 TO "SD" 106+46.62 | CONSTRUCT 16' x 7' x 246.62' RCB. (SEE SHEETS LBDT-10 AND LBDT-12). |
| 5.11 | "SD" 106+46.62 TO "SD" 110+50.00 | INSTALL PRECAST 16' x 7' x 403.38' RCB. |
| 5.12 | "SD" 110+50.00 TO "SD" 112+00.00 | CONSTRUCT 16' x 7' x 150' RCB. (SEE SHEETS LBDT-10 AND LBDT-12). |
| 5.13 | "SD" 107+25.00 | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2618.84', H = 5.50'). (SEE SHEET LBDT-08). |
| 5.14 | "SD" 111+25.00 | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2609.45', H = 1.75'). (SEE SHEET LBDT-08). |
| 5.20 | "SD" 107+12.03 | INSTALL 42" X 38' RCP FROM "SD" 107+12.03, 30.55' RT (UIE= 2614.89') TO "SD" 107+40.78, 8.00' RT (LIE= 2607.35'). CONSTRUCT 42" RCP CONNECTION, 8.00' RT. (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). |
| 5.21 | "SD" 107+77.62 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 26.71' RT. (GRATE ELEV= 2618.38', INV ELEV= 2612.55', H = 5.83'). INSTALL 24" X 19' RCP FROM "SD" 107+77.62, 26.71' RT (UIE= 2612.55') TO "SD" 107+77.62, 8.00' RT (LIE= 2608.12'). CONSTRUCT 24" RCP CONNECTION, 8.00' RT. (SEE SHEET LBLP-03 AND LBDT-09). |
| A | | SEE NDOT PLANS |




NOTE:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

**CALL BEFORE CONSTRUCTION**

| | | |
|---|---|---|
| BEFORE YOU DIG | USA NORTH | 811 OR 800-227-2600 |
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| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223
BID# XX.XXXXX
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL
DESIGNED BY: LDN
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CHECKED BY: JSD

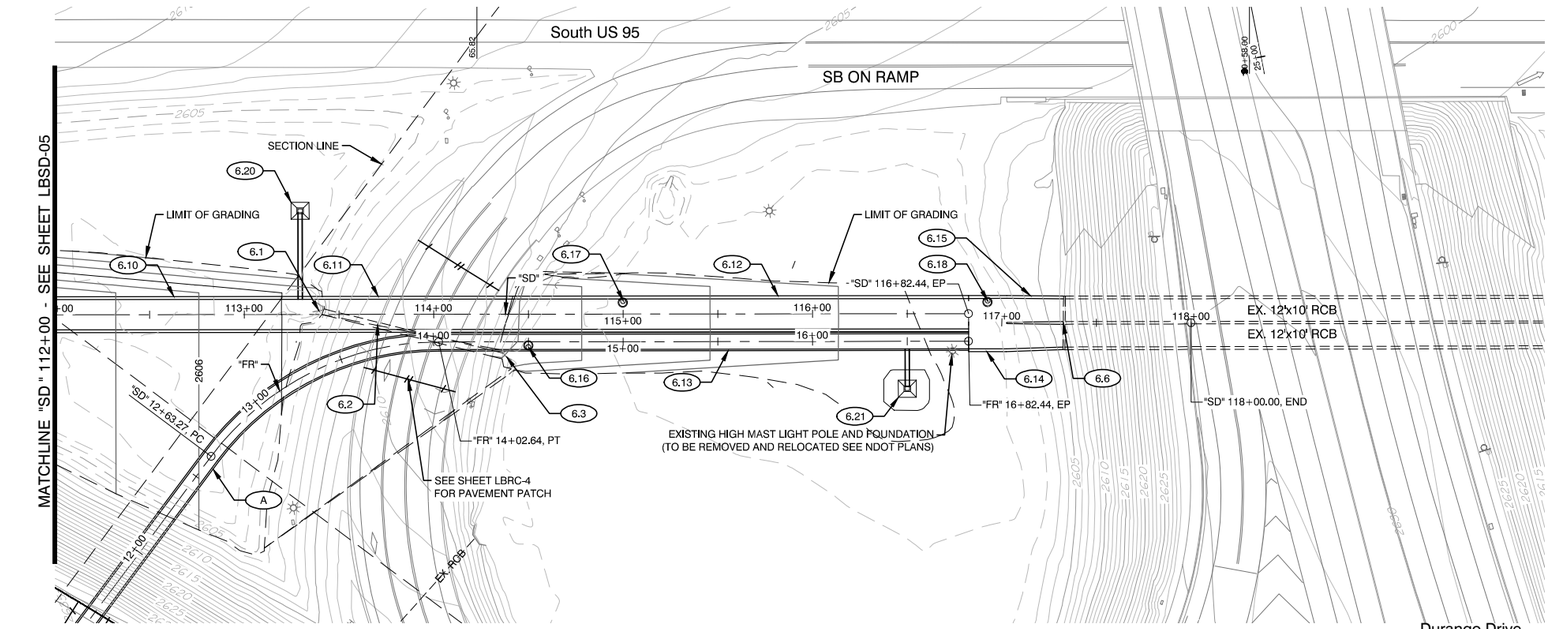
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

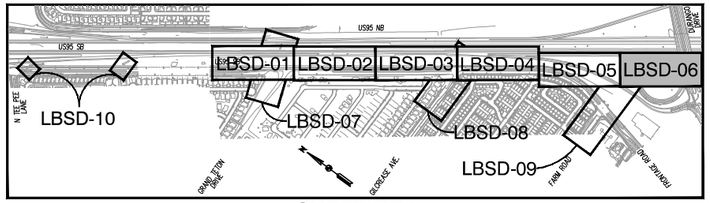
SHEET
STORM DRAIN PLAN AND PROFILE
"SD" 104+00.00 TO "SD" 112+00.00

100% PRE-FINAL SUBMITTAL 4/24/2017 NOT FOR CONSTRUCTION

SHEET
LBSD-05
14 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISE8I\I\LBG2014\LBGUSER\D01802662041569-SD01.DWG



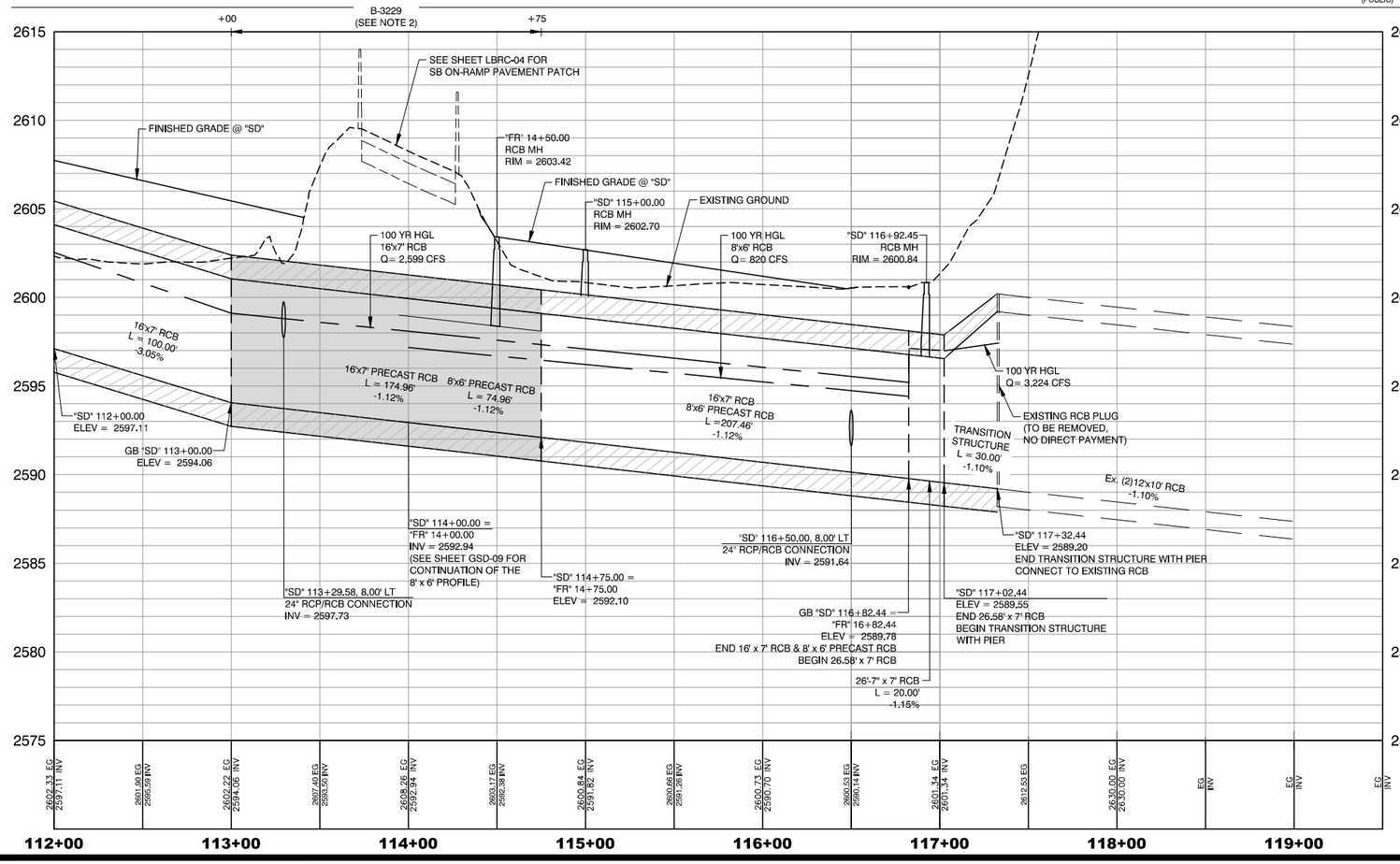




## SHEET KEY

GRAPHIC SCALE
40 20 0 40 HORZ.
4 2 0 4 VERT.

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 6.1 | "SD" 113+41.51, 3.00' LT | REMOVE END SECTION (SEE SHEET LBRC-04). |
| 6.2 | "SD" 113+41.51, 3.00' LT TO "SD" 114+37.01, 20.56' RT | REMOVE 98' STORM DRAIN PIPE (SEE SHEET LBRC-04). |
| 6.3 | "SD" 114+37.01, 20.56' RT | REMOVE END SECTION (SEE SHEET LBRC-04). |
| 6.10 | "SD" 112+00.00 TO "SD" 113+00.00 | CONSTRUCT 16' x 7' x 100' RCB. (SEE SHEETS LBDT-10 AND LBDT-12). |
| 6.11 | "SD" 113+00.00 TO "SD" 114+75.00 | INSTALL PRECAST 16' x 7' x 175' RCB. |
| 6.12 | "SD" 114+75.00 TO "SD" 116+82.44 | CONSTRUCT 16' x 7' x 207.46' RCB. (SEE SHEETS LBDT-10 AND LBDT-12). |
| 6.13 | "FR" 14+00.00 TO "FR" 16+82.44 | CONSTRUCT PRECAST 8' x 6' 282.44' RCB. |
| 6.14 | "SD" 116+82.44 TO "SD" 117+02.44 | CONSTRUCT 26.58' x 7' x 20' RCB. (SEE SHEET LBDT-06. |
| 6.15 | "SD" 117+02.44 TO "SD" 117+32.44 | CONSTRUCT TRANSITION STRUCTURE WITH PIER (SEE SHEET LBDT-06). |
| 6.16 | "FR" 14+50.00 | CONSTRUCT RCB MANHOLE, 2.00' RT (COVER ELEV= 2603.42', H = 4.00'). (SEE SHEET LBDT-08). |
| 6.17 | "SD" 115+00.00 | CONSTRUCT RCB MANHOLE, 6.00' LT (COVER ELEV= 2602.70', H = 2.16'). (SEE SHEET LBDT-08). |
| 6.18 | "SD" 116+92.45 | CONSTRUCT RCB MANHOLE, 11.29' LT (COVER ELEV= 2600.84', H = 2.91'). (SEE SHEET LBDT-08). |
| 6.20 | "SD" 113+29.58 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 54.70' LT (GRATE ELEV= 2602.39', INV ELEV= 2598.64', H = 3.75'). INSTALL 24" X 47' RCP FROM "SD" 113+29.58, 54.70' LT (UIE= 2598.64') TO "SD" 113+29.58, 8.00' LT (LIE= 2597.73'). CONSTRUCT 24" RCP CONNECTION, 8.00' LT. (SEE SHEET LBLP-01 AND LBDT-09). |
| 6.21 | "FR" 16+50.00 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 49.00' LT (GRATE ELEV= 2600.36', INV ELEV= 2596.45', H = 3.91'). INSTALL 24" X 41' RCP FROM "FR" 16+50.00, 49.00' LT (UIE= 2596.45') TO "SD" 16+50.00, 8.00' LT (LIE= 2595.90'). CONSTRUCT 24" RCP CONNECTION, 8.00' LT. (SEE SHEET LBLP-04 AND LBDT-09). |
| A | | SEE SHEET GSD-09 FOR FARM ROAD IMPROVEMENTS |




NOTES:

1. SEE SHEETS LBHC-01 THROUGH LBHC-03 FOR LINE AND CURVE DATA.
2. PRECAST RCB MANUFACTURER SHALL PROVIDE A LRFD LOAD RATING MEETING NDOT REQUIREMENTS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223
BID# XX.XXXXX
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD

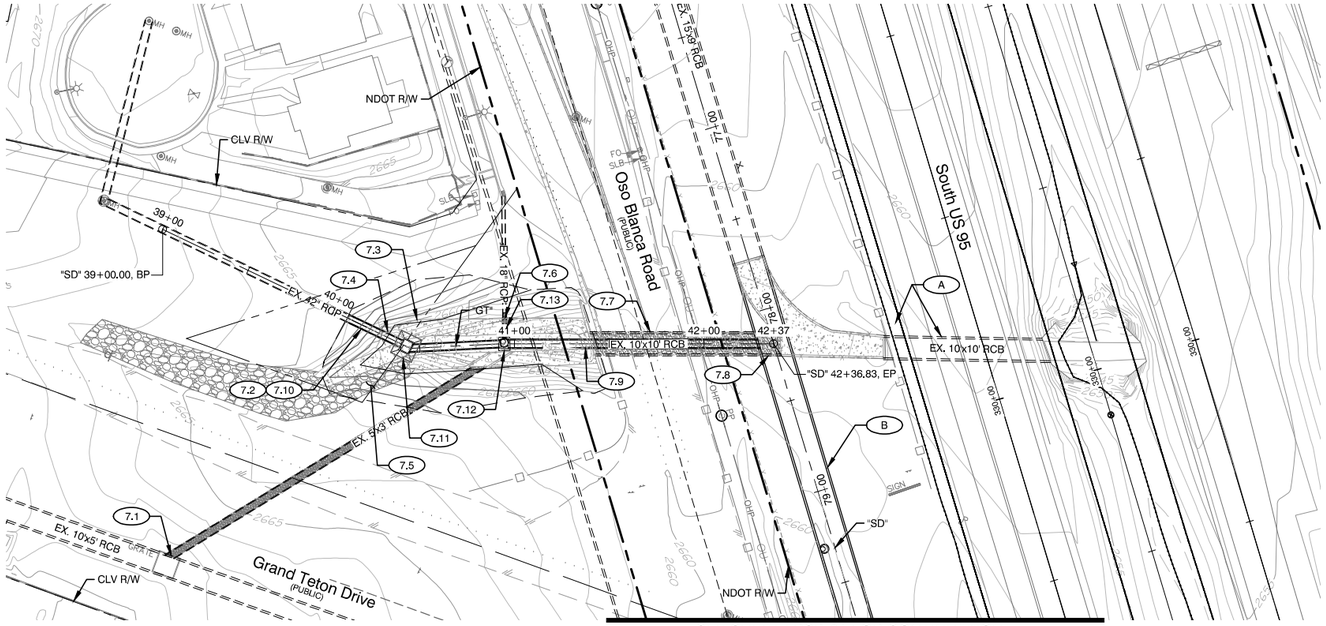
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
STORM DRAIN PLAN AND PROFILE
"SD" 112+00.00 TO "SD" 119+50.00

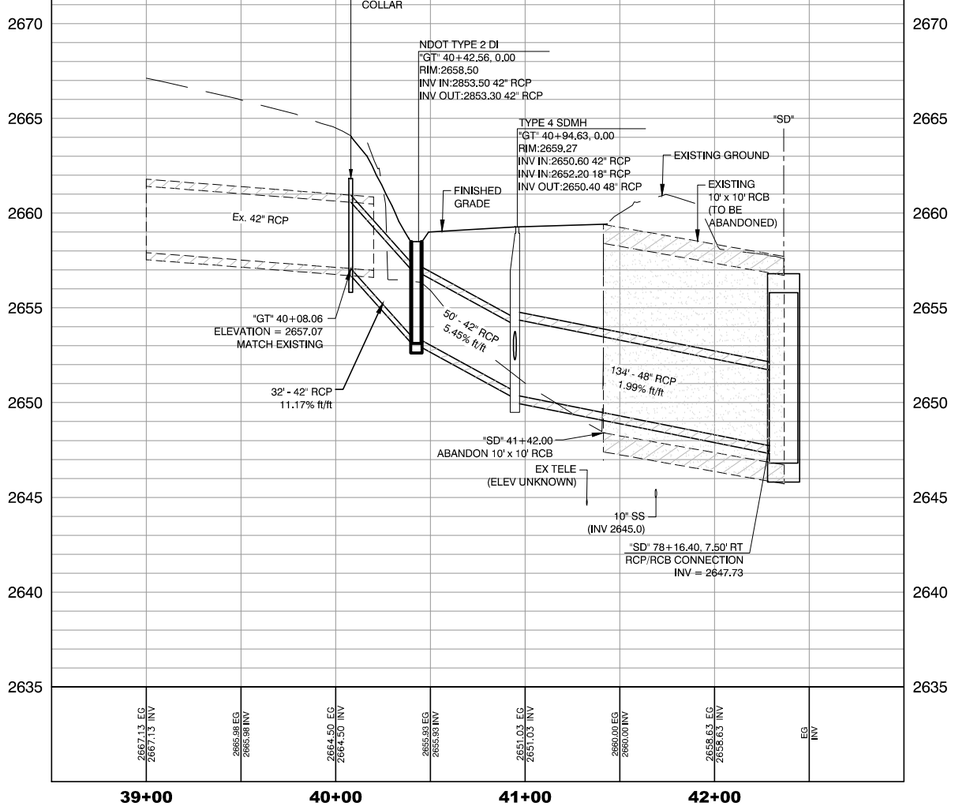
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

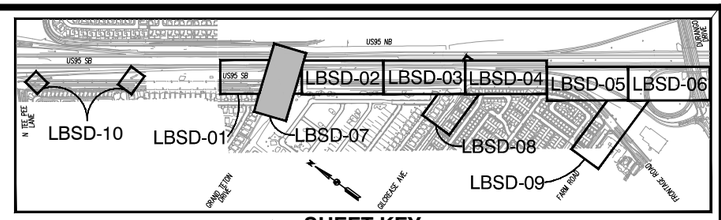
SHEET
LBSD-06
15 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN8\LBG32014\LBGUSER\D01802660\2041569-SD01.DWG




SEE SHEET LBSD-01 FOR CONTINUATION




## SHEET KEY

GRAPHIC SCALE
40 20 0 40 HORZ.
4 2 0 4 VERT.

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 7.1 | "GT" 39+75.00, 160.00' RT TO "GT" 40+80.00, 12.00' RT | REMOVE FLOW CONTROL WEIR AND ABANDON 5' x 3' x 190' RCB (SEE SHEETS LBDT-13 AND LBDT-14) |
| 7.2 | "GT" 40+08.06 TO "GT" 40+28.10 | REMOVE 42"x 20' RCP (SEE SHEET LBDT-14) |
| 7.3 | "GT" 40+11.08, 34.92' RT TO "GT" 41+43.24 | REMOVE CONCRETE CHANNEL (SEE SHEET LBDT-14) |
| 7.4 | "GT" 40+28.10 | REMOVE END SECTION (SEE SHEET LBDT-14) |
| 7.5 | "GT" 40+13.98, 37.57' RT TO "GT" 40+45.60, 3.96' LT | REMOVE GROUTED RIPRAP (SEE SHEET LBDT-14) |
| 7.6 | "GT" 40+94.74, 13.86' LT | REMOVE END SECTION (SEE SHEET LBDT-14) |
| 7.7 | "GT" 41+43.24 TO "SD" 74+14.00, 15.50' RT | ABANDON 10' x 10' x 80' RCB (SEE SHEET LBDT-13 AND LBDT-14) |
| 7.8 | "SD" 74+14.00, 15.50' RT TO "SD" 78+20.00, 3.60' LT | REMOVE 10' x 10' x 20' RCB (SEE SHEET LBDT-13 AND LBDT-14) |
| 7.9 | "GT" 41+35.56 | REMOVE METAL GATE (SEE SHEET LBDT-14) |
| 7.10 | "GT" 40+08.06 | INSTALL 42" X 32' RCP FROM "GT" 40+08.06 (UIE= 2657.07') TO "GT" 40+42.56 (LIE= 2653.50'). CONNECT TO TYPE 2 DROP INLET. (SEE SHEET LBDT-08). |
| 7.11 | "GT" 40+42.56 | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 0.00' LT (GRATE ELEV= 2658.50', INV ELEV= 2653.30', H = 5.20'). INSTALL 42" X 50' RCP FROM "GT" 40+42.56 (UIE= 2653.30') TO "GT" 40+94.63 (LIE= 2650.60'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEET LBDT-09). |
| 7.12 | "GT" 40+94.63 | CONSTRUCT TYPE 4 MANHOLE (COVER ELEV= 2659.27', INV ELEV= 2650.40', H = 8.87'). INSTALL 48" X 134' RCP FROM "GT" 40+94.63 (UIE= 2650.40') TO "SD" 78+16.40 (LIE= 2647.73'). CONSTRUCT 48" RCP CONNECTION, 7.50' LT. (SEE SHEET LBDT-09). |
| 7.13 | "GT" 40+94.74 | INSTALL 18" X 17' RCP FROM "GT" 40+94.74, 16.39' LT (UIE= 2655.19') TO "GT" 40+94.63 (LIE= 2652.20'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-02 AND LBDT-08). |
| A | | SEE NDOT PLANS |
| B | | SEE SHEETS GSD-01 – GSD-06 FOR MAINLINE PLAN AND PROFILE |

NOTE:

1. SEE SHEETS GHC-01 THROUGH GHC-03 FOR LINE AND CURVE DATA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

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| BEFORE YOU OVERHEAD | NV ENERGY | 702-227-2929 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXXX | DESIGNED BY: LDN
DATE: 3/30/2017 | DRAWN BY: FME
SUBMITTAL STAGE: 100% PRE-FINAL | CHECKED BY: JSD

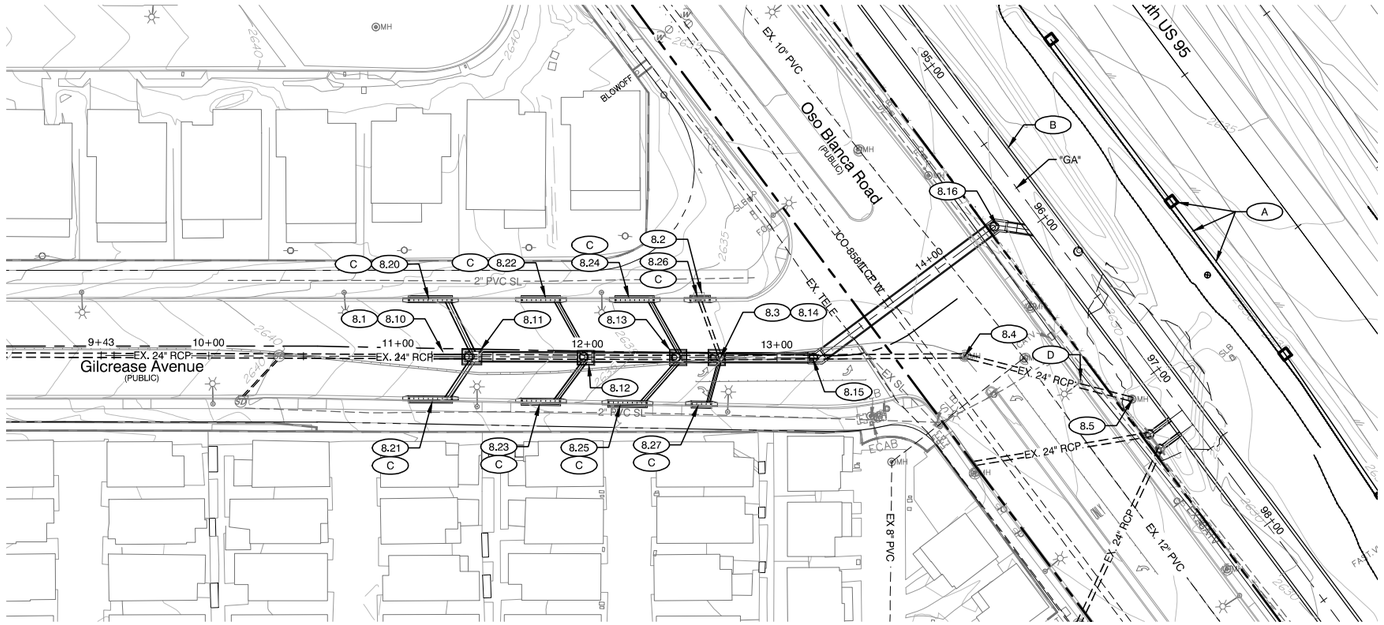
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

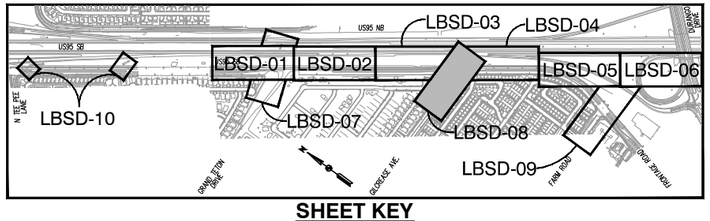
SHEET
STORM DRAIN PLAN AND PROFILE
GRAND TETON DRIVE

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBSD-07
16 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISE8IN8\LBG2014\LBGUSER\D01802066\2041569-SD01.DWG




## SHEET KEY

GRAPHIC SCALE 40 20 0 40 HORZ. / 4 2 0 4 VERT.

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 8.1 | "GA" 11+08.44 TO "GA" 12+70.18 | REMOVE 24" X 162' RCP |
| 8.2 | "GA" 12+58.69, 30.10' LT | REMOVE DROP INLET |
| 8.3 | "GA" 12+70.18 | REMOVE MANHOLE AND 24" X 129' RCP. |
| 8.4 | "GA" 13+84.34, 45.37' RT | REMOVE MANHOLE AND 24" X 62' RCP. |
| 8.5 | "SD" 97+04.62, 17.68' RT TO "SD" 96+81.77, 36.01' RT | REMOVE MANHOLE AND ABANDON 24" X 30' RCP. |

8.10 "GA" 11+08.44 INSTALL 24" X 32' RCP FROM "GA" 11+08.44 (UIE= 2633.12') TO "GA" 11+40.44 (LIE= 2629.60'). CONNECT TO EXISTING 24" RCP (SEE SHEET LBDT-08)

8.11 "GA" 11+40.44 CONSTRUCT TYPE 4 MANHOLE (COVER ELEV= 2636.81', INV ELEV= 2629.40', H = 7.41'). INSTALL 48" X 60' RCP FROM "GA" 11+40.44 (UIE= 2629.40') TO "GA" 12+00.20 (LIE= 2628.21'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEET LBDT-07).

8.12 "GA" 12+00.20 CONSTRUCT TYPE 4 MANHOLE (COVER ELEV= 2635.41', INV ELEV= 2628.01', H = 7.40'). INSTALL 54" X 50' RCP FROM "GA" 12+00.20 (UIE= 2628.01') TO "GA" 12+49.78 (LIE= 2627.02'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEET LBDT-07).

8.13 "GA" 12+49.78 CONSTRUCT TYPE 4 MANHOLE (COVER ELEV= 2634.33', INV ELEV= 2626.82', H = 7.51'). INSTALL 54" X 21' RCP FROM "GA" 12+49.78 (UIE= 2626.82') TO "GA" 12+70.18 (LIE= 2626.41'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEET LBDT-07).

8.14 "GA" 12+70.18 CONSTRUCT TYPE 4 MANHOLE (COVER ELEV= 2633.91', INV ELEV= 2626.21', H = 7.70'). INSTALL 54" X 52' RCP FROM "GA" 12+70.18 (UIE= 2626.21') TO "GA" 13+21.92 (LIE= 2625.17'). CONNECT TO TYPE III MANHOLE. (SEE SHEET LBDT-07).

8.15 "GA" 13+21.92 CONSTRUCT TYPE III MANHOLE (COVER ELEV= 2632.93', INV ELEV= 2624.97', H = 7.96'). INSTALL 68" X 43" X 117' HERCP FROM "GA" 13+21.92 (UIE= 2624.97') TO "GA" 14+39.12 (LIE= 2623.12'). CONNECT TO TYPE III MANHOLE. (SEE SHEET LBDT-07).

8.16 "GA" 14+39.12 CONSTRUCT TYPE III MANHOLE (COVER ELEV= 2631.83', INV ELEV= 2622.92', H = 8.91'). INSTALL 54" X 18' RCP FROM "GA" 14+39.12 (UIE= 2622.92') TO "SD" 96+00.34 (LIE= 2621.15'). CONSTRUCT 54" RCP CONNECTION, 8.00' RT. (SEE SHEETS LBDT-07 AND LBDT-09).

8.20 "GA" 11+16.98 CONSTRUCT "DM" DROP INLET (L= 22.5') , 29.71' LT (GRATE ELEV= 2636.88', INV ELEV= 2630.88', H = 6.00'). INSTALL 30" X 33' RCP FROM "GA" 11+16.98, 29.71' LT (UIE= 2630.88') TO "GA" 11+40.44 (LIE= 2629.60'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.21 "GA" 11+17.18 CONSTRUCT "DM" DROP INLET (L= 22.5') , 22.11' RT (GRATE ELEV= 2637.01', INV ELEV= 2630.88', H = 6.00'). INSTALL 30" X 26' RCP FROM "GA" 11+17.18, 22.11' RT (UIE= 2631.01') TO "GA" 11+40.44 (LIE= 2629.60'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.22 "GA" 11+75.29 CONSTRUCT "DM" DROP INLET (L= 20') , 30.02' LT (GRATE ELEV= 2635.42', INV ELEV= 2630.42', H = 5.00'). INSTALL 24" X 34' RCP FROM "GA" 11+75.29, 30.02' LT (UIE= 2630.42') TO "GA" 12+00.20 (LIE= 2628.21'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.23 "GA" 11+75.49 CONSTRUCT "DM" DROP INLET (L= 20') , 23.15' RT (GRATE ELEV= 2635.42', INV ELEV= 2630.42', H = 5.00'). INSTALL 24" X 28' RCP FROM "GA" 11+75.49, 23.15' RT (UIE= 2630.42') TO "GA" 12+00.20 (LIE= 2628.21'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.24 "GA" 12+24.77 CONSTRUCT "DM" DROP INLET (L= 20') , 30.18' LT (GRATE ELEV= 2634.15', INV ELEV= 2630.15', H = 4.00'). INSTALL 18" X 34' RCP FROM "GA" 12+24.77, 30.18' LT (UIE= 2630.15') TO "GA" 12+49.78 (LIE= 2627.02'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.25 "GA" 12+21.19 CONSTRUCT "DM" DROP INLET (L= 20') , 24.08' RT (GRATE ELEV= 2634.23', INV ELEV= 2630.23', H = 4.00'). INSTALL 18" X 32' RCP FROM "GA" 12+21.19, 24.08' RT (UIE= 2630.23') TO "GA" 12+49.78 (LIE= 2627.02'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

8.26 "GA" 12+59.45 CONSTRUCT "DM" DROP INLET (L= 10') , 30.88' LT (GRATE ELEV= 2633.14', INV ELEV= 2629.56', H = 3.58'). CONNECT TO EXISTING 18" RCP (SEE SHEETS LBLP-01 AND LBDT-11).

8.27 "GA" 12+60.23 CONSTRUCT "DM" DROP INLET (L= 10') , 24.38' RT (GRATE ELEV= 2633.46', INV ELEV= 2630.46', H = 3.00'). INSTALL 18" X 25' RCP FROM "GA" 12+60.23, 24.38' RT (UIE= 2630.46') TO "GA" 12+70.18 (LIE= 2626.21'). CONNECT TO TYPE 4 MANHOLE. (SEE SHEETS LBLP-01 AND LBDT-11).

A SEE NDOT PLANS

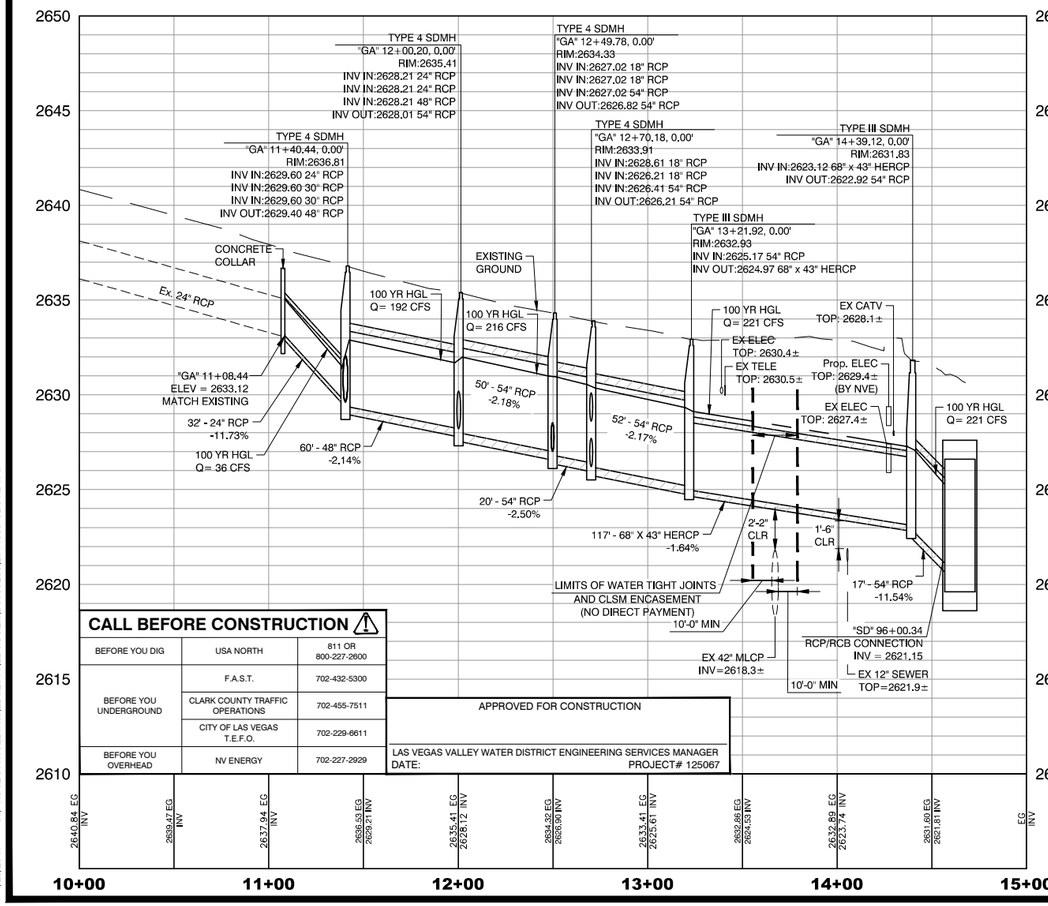
B SEE SHEETS GSD-01 – GSD-06 FOR MAINLINE PLAN AND PROFILE.

C EXISTING IRRIGATION SHALL BE PROTECTED IN PLACE. EXISTING LANDSCAPING SHALL BE REMOVED AND REPLACED (SEE NDOT PLANS).

D EXISTING STREETLIGHT (PROTECT IN PLACE)

NOTES:

1. SEE SHEETS GHC-01 THROUGH GHC-03 FOR LINE AND CURVE DATA
2. IN AREAS WHERE THE EXCAVATION IS LESS THAN THREE FEET (3 FT) FROM THE TOP ON THE LVVWD 42" TRANSMISSION WATER MAIN, NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELD EQUIPMENT, WILL BE ALLOWED WITHIN 10 FEET (10 FT) OF THE TRANSMISSION WATER MAIN. IN THESE AREAS, CONTRACTOR TO PLACE A CONCRETE BARRIER, I.E. JERSEY RAIL, TO IDENTIFY THE "NO EQUIPMENT ZONE"




CALL BEFORE CONSTRUCTION

| | | |
|---|---|---|
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| BEFORE YOU UNDERGROUND | F.A.S.T. | 702-432-5300 |
| | CLARK COUNTY TRAFFIC OPERATIONS | 702-455-7511 |
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

4/25/2017 C:\PROJECTWISE8I\INI\LBG2014\LBGUSER\D01802662041569-SD01.DWG

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

BID# XX.XXXXX
H# 60223
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL
DESIGNED BY: LDN
DRAWN BY: FME
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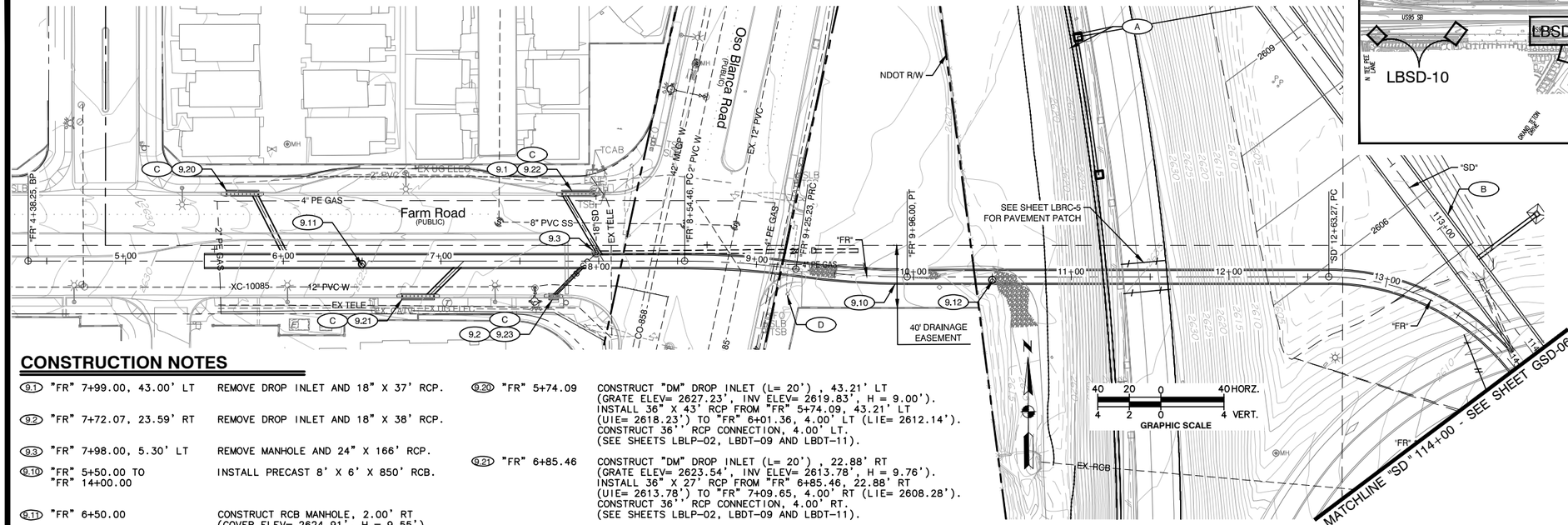
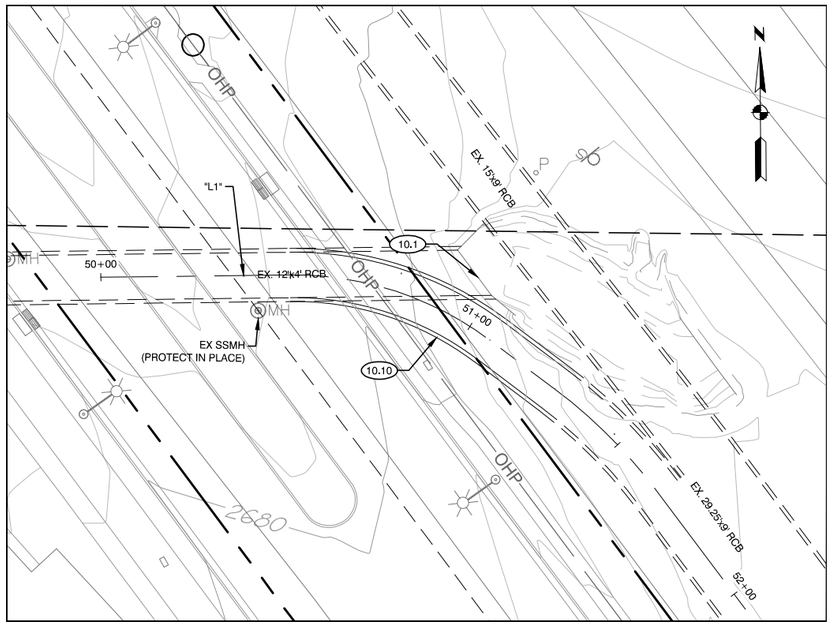
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

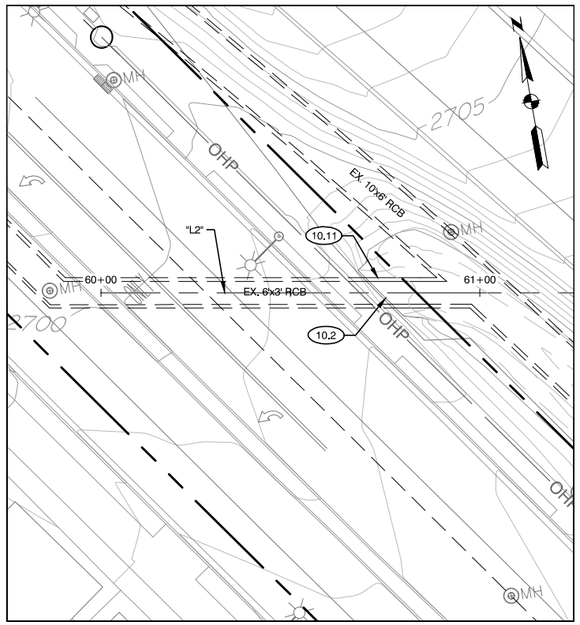
SHEET
STORM DRAIN PLAN AND PROFILE
"GA" 9+00.00 TO "GA" 15+00.00

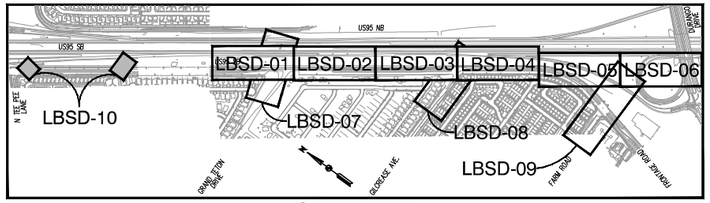
100% PRE-FINAL SUBMITTAL 4/24/2017 NOT FOR CONSTRUCTION

SHEET
LBSD-08
17 OF 59
DRAWING NO.
731-96


Farm Road
(PUBLIC)
Oso Blanca Road
NDOT R/W
SEE SHEET LBRC-5
FOR PAVEMENT PATCH
40' DRAINAGE
EASEMENT
EX-RCB
MATCHLINE "SD" 114+00 - SEE SHEET GSD-06
GRAPHIC SCALE
40 20 0 40 HORZ.
4 2 0 4 VERT.
4" PE GAS
8" PVC SS
12" PVC W
EX TELE
EX 12" PVC
EX 42" MLCP W
2" PVC W
EX 4" PE GAS
EX 8" PVC SS
EX 12" PVC SS
EX 8" SD
EX 18" SD
EX 24" SD
EX 30" SD
EX 36" SD
EX 48" SD
EX 54" SD
EX 60" SD
EX 72" SD
EX 84" SD
EX 96" SD
EX 108" SD
EX 120" SD
EX 132" SD
EX 144" SD
EX 156" SD
EX 168" SD
EX 180" SD
EX 192" SD
EX 204" SD
EX



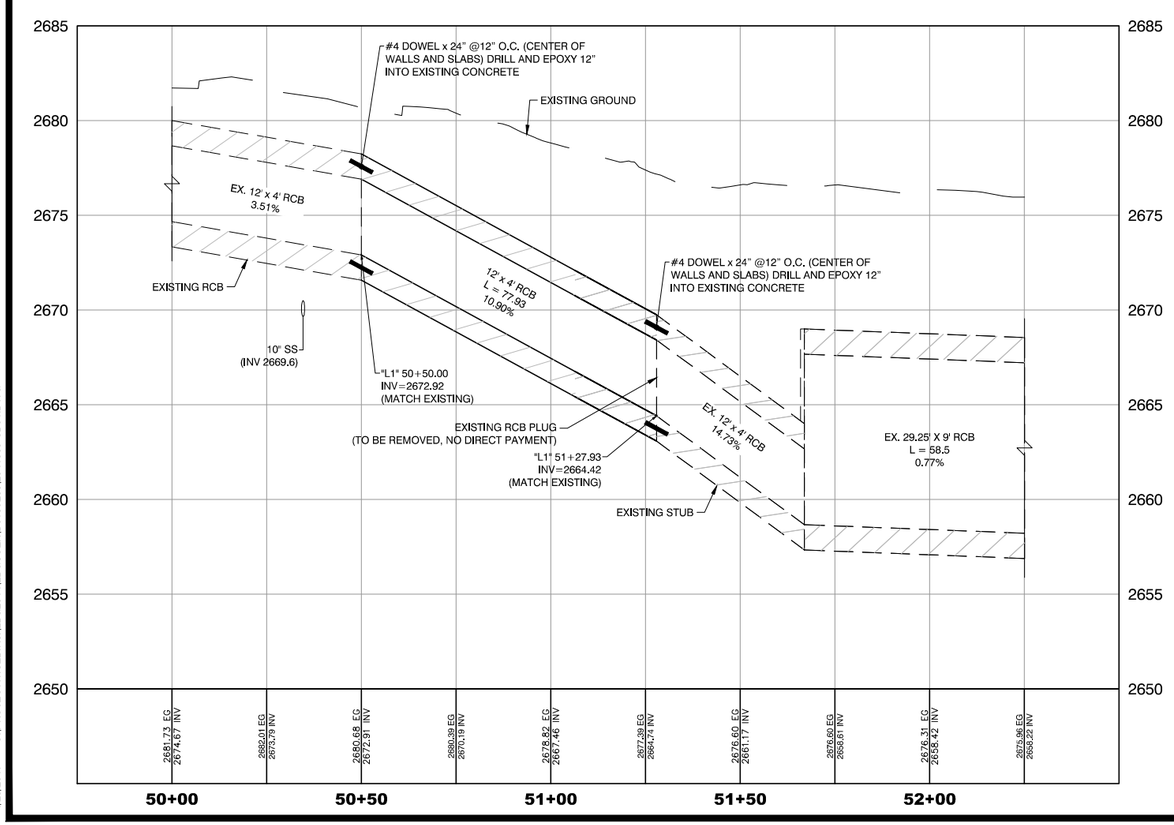



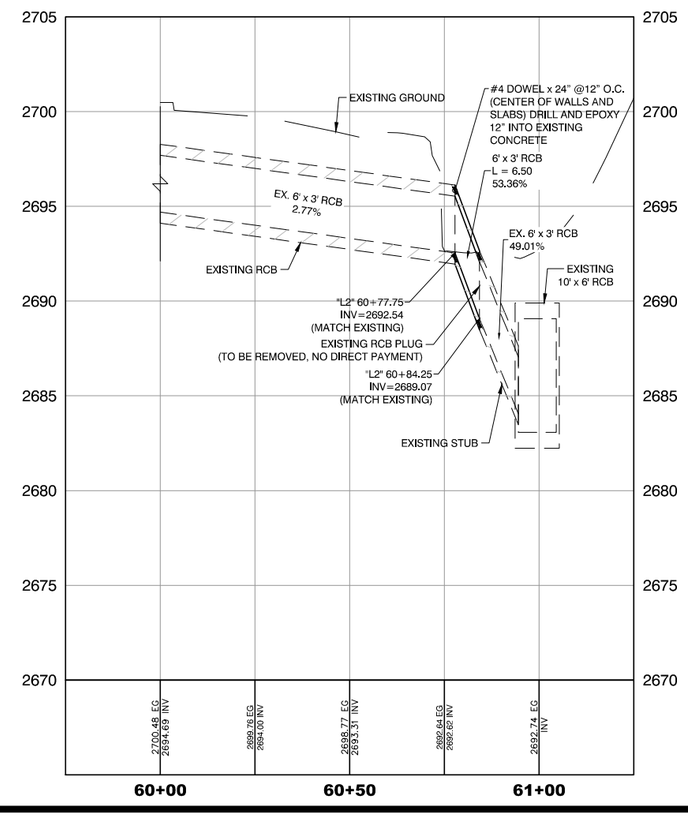

## SHEET KEY

20 10 0 20 HORZ.
2 1 0 2 VERT.
GRAPHIC SCALE

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 10.1 | "L1" 50+50.00 TO "L1" 50+95.01, 13.29' LT | REMOVE HEADWALL AND 12' x 4' x 50' RCB. |
| 10.2 | "L2" 60+73.77 | REMOVE HEADWALL. |
| 10.10 | "L1" 50+50.00 TO "L1" 51+27.93 | REMOVE RCB PLUG AND CONSTRUCT 12' x 4' X 77.93' RCB. (SEE SHEET LBDT-10). |
| 10.11 | "L2" 60+77.75 TO "L2" 60+84.25 | REMOVE RCB PLUG AND CONSTRUCT 6' x 3' X 6.5'RCB. (SEE SHEET LBDT-10). |




NOTE:

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| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

| | |
|---|---|
| H# 60223 | BID# XX.XXXX |
| DATE: 3/30/2017 | DESIGNED BY: LDN |
| SUBMITTAL STAGE: 100% PRE-FINAL | DRAWN BY: FME |
| | CHECKED BY: JSD |

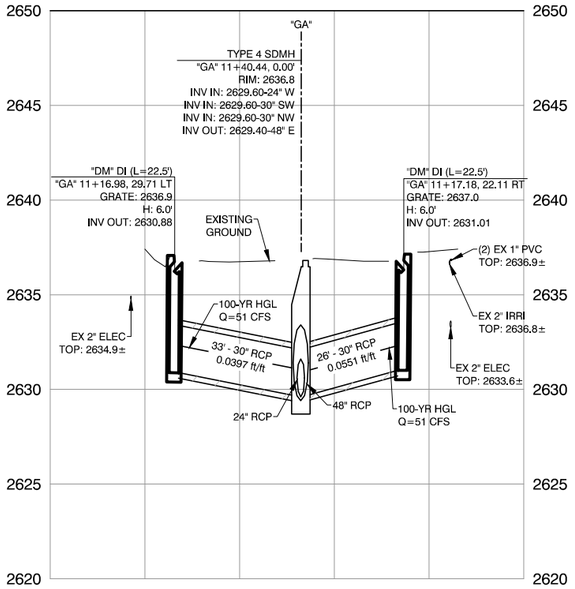
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
STORM DRAIN PLAN AND PROFILE
RCB CONNECTION DETAILS

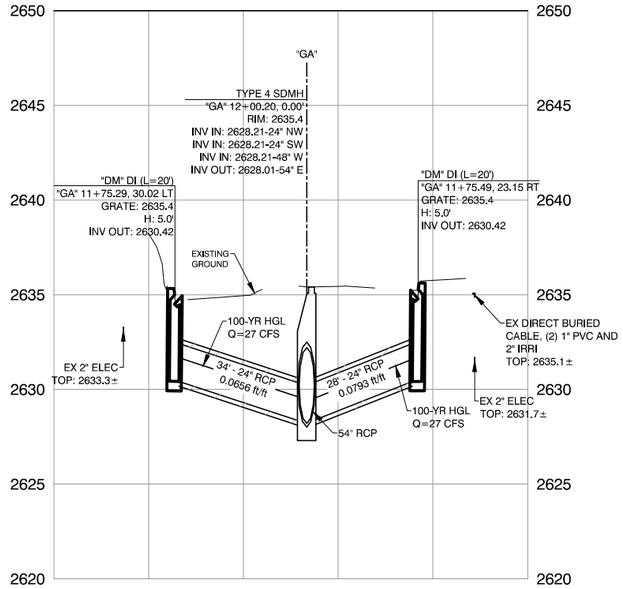
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBSD-10
19 OF 59
DRAWING NO.
731-96

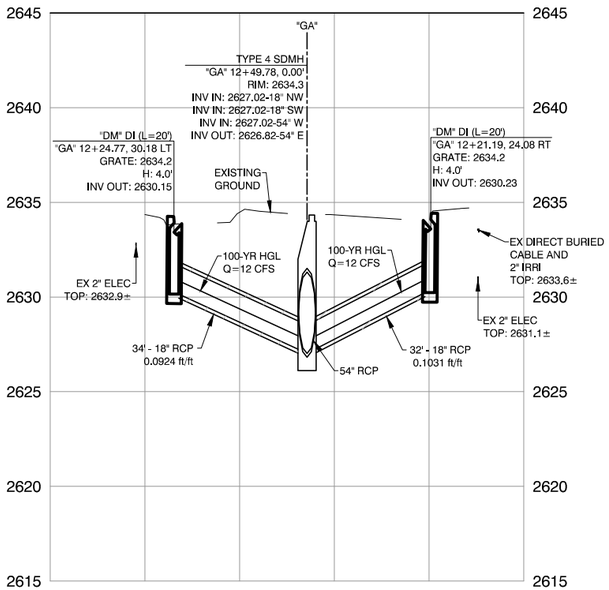
4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D01802666\2041569-SD01.DWG



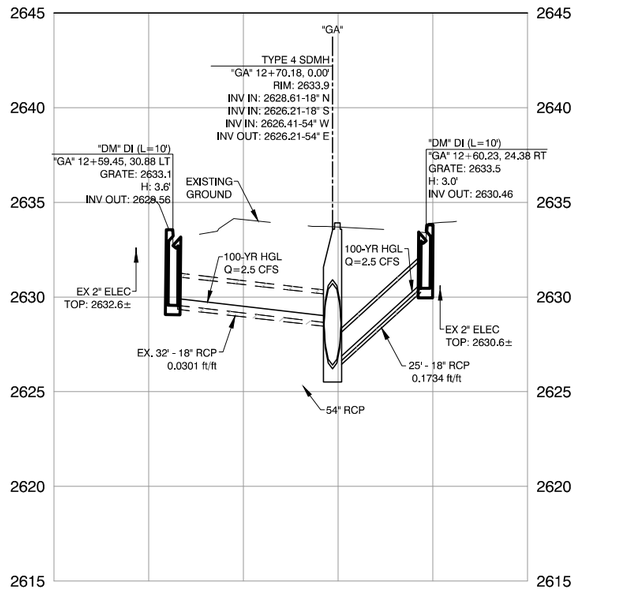

LBLP-01 "GA" 11+40.44
1 NOTES 8.20 & 8.21



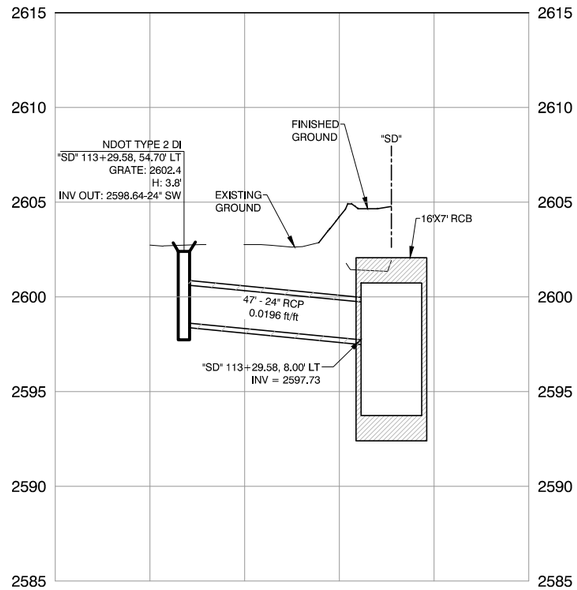

LBLP-01 "GA" 12+00.20
2 NOTES 8.22 & 8.23




LBLP-01 "GA" 12+49.78
3 NOTES 8.24 & 8.25




LBLP-01 "GA" 12+70.18
4 NOTES 8.26 & 8.27




LBLP-01 "SD" 113+29.58
5 NOTE 6.20

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## 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 |

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223
BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

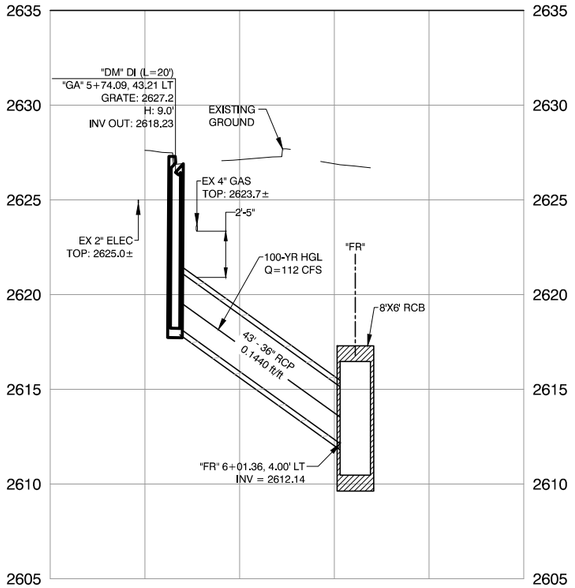
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
LATERAL PROFILE
GILCREASE AVENUE

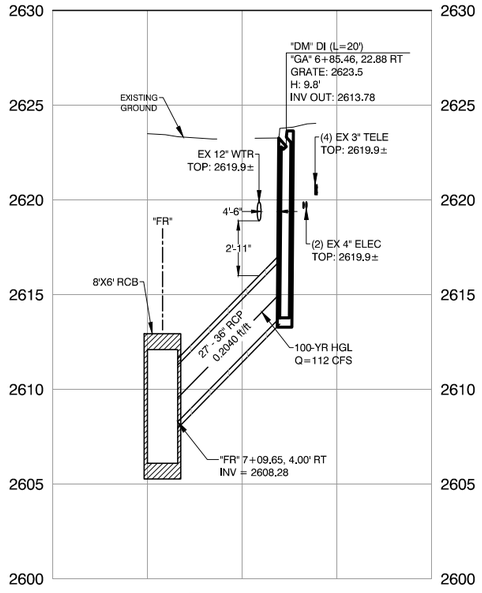
100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBLP-01
20 OF 59
DRAWING NO.
731-96

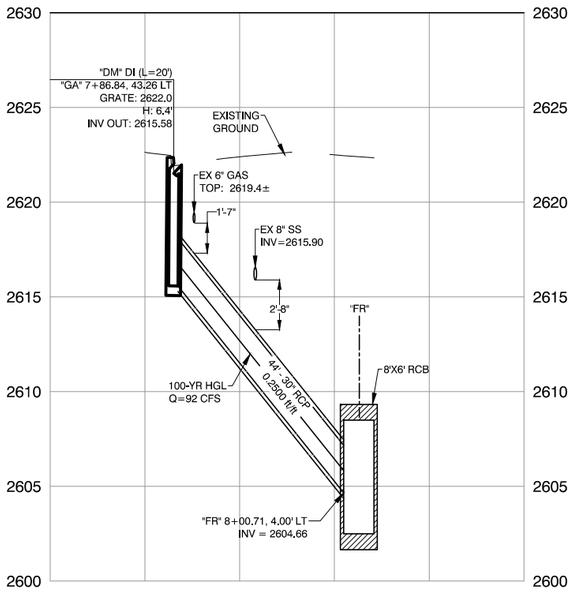
4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D01802266\2041569-LP01.DWG



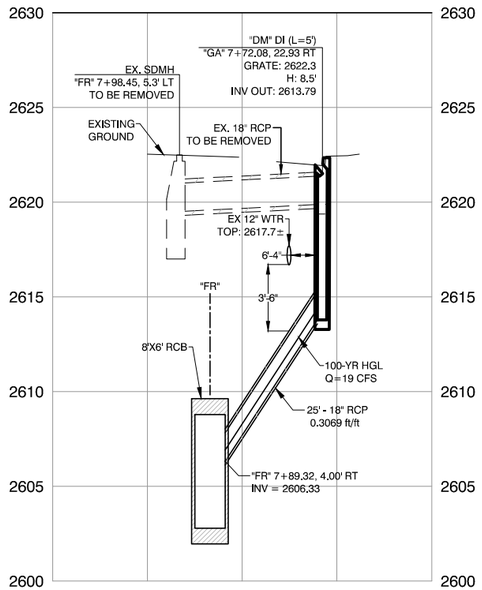

LBLP-02 / 1 — "FR" 6+03.39 NOTE 9.20



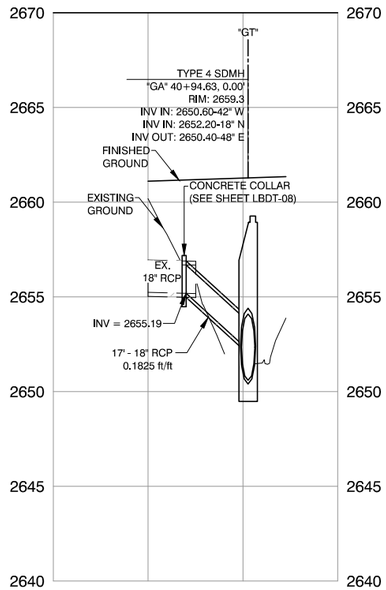

LBLP-02 / 2 — "FR" 7+14.49 NOTE 9.21




LBLP-02 / 3 — "FR" 8+03.06 NOTE 9.22




LBLP-02 / 4 — "FR" 7+93.33 NOTE 9.23




LBLP-02 / 8 — "GT" 40+94.63 NOTE 7.13

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

**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 |

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION FROM WATER LINES IS NOT PRACTICABLE:

CAST-IN PLACE MONOLITHIC POUR WITH WATER STOP BETWEEN SLAB AND WALLS, BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATER STOPS, CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD
DATE: 3/30/2017 | SUBMITTAL STAGE: 100% PRE-FINAL

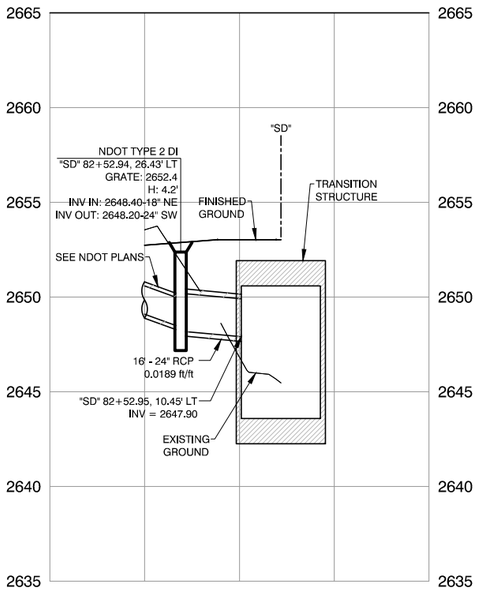
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
LATERAL PROFILE
FARM ROAD/GRAND TETON DRIVE

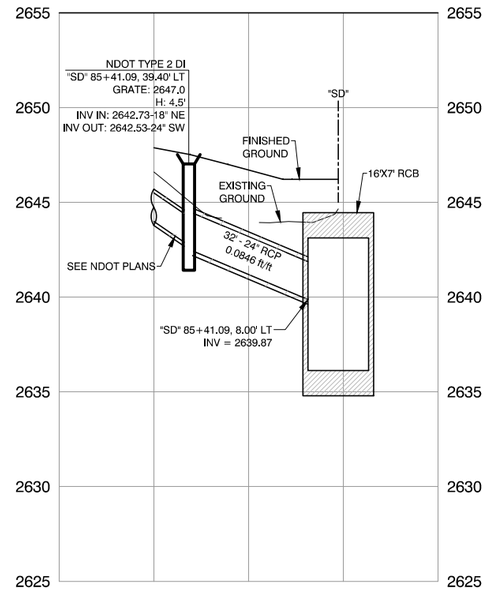
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET LBLP-02
21 OF 59
DRAWING NO. 731-96

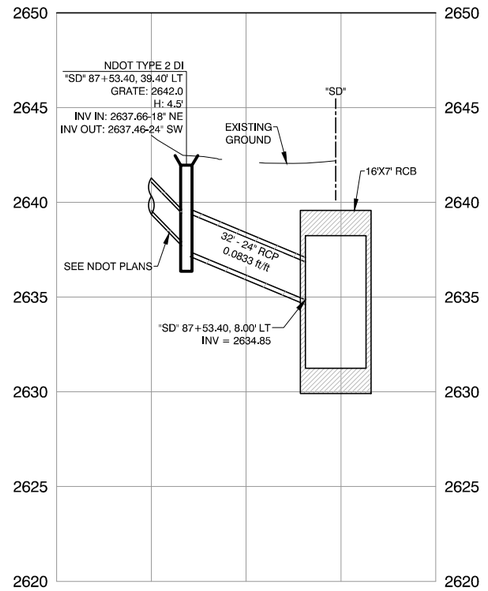
4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D01802662041569-LP01.DWG



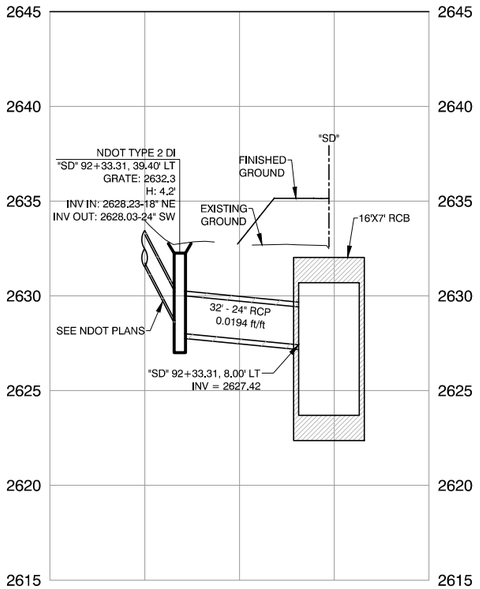

LBLP-03 / 1 "SD" 82+52.94, 26.54' LT
NOTE 2.20



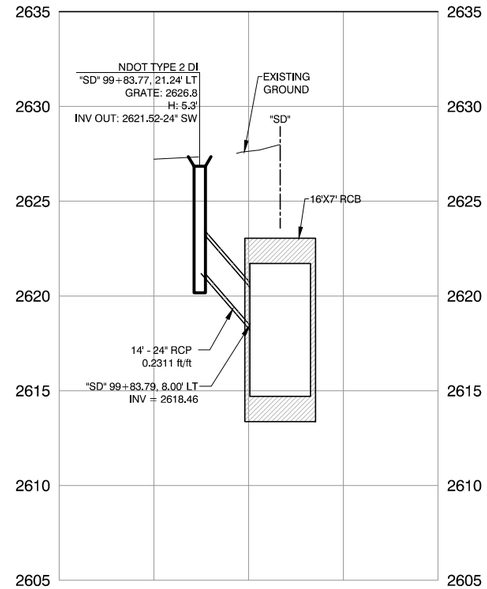

LBLP-03 / 2 "SD" 85+41.09, 39.40' LT
NOTE 2.21



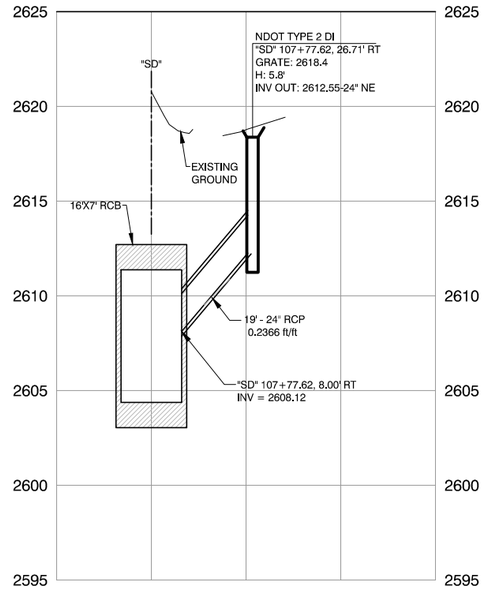

LBLP-03 / 3 "SD" 87+53.40, 39.40' LT
NOTE 2.22




LBLP-03 / 4 "SD" 92+33.31, 39.40' LT
NOTE 3.22




LBLP-03 / 5 "SD" 99+83.79, 21.24' LT
NOTE 4.22




LBLP-03 / 6 "SD" 107+77.62, 26.71' RT
NOTE 5.21

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY:
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223
BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

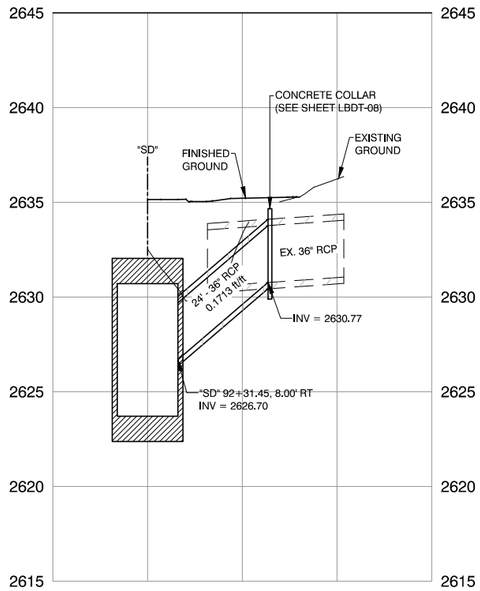
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
LATERAL PROFILES
MAINLINE FIELD INLETS

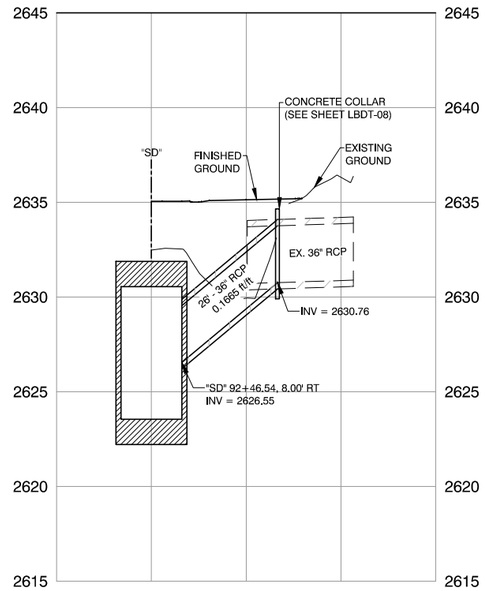
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBLP-03
22 OF 59
DRAWING NO.
731-96

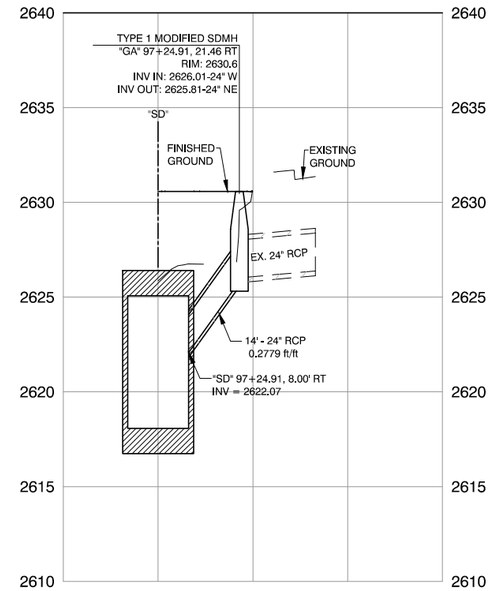
4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D01802662041569-LP01.DWG



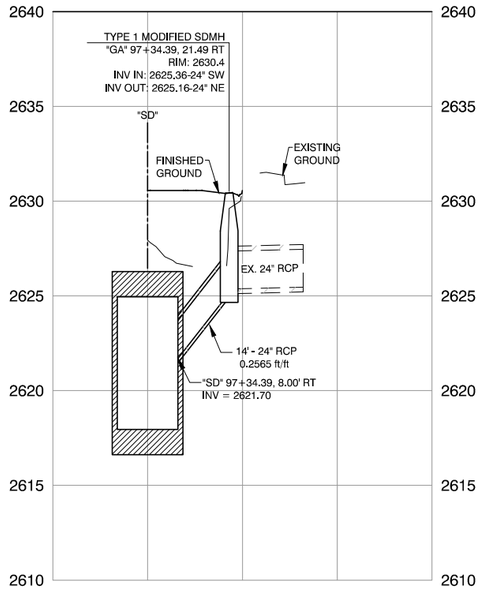

LBLP-04 / 1 — "SD" 92+16.31 NOTE 3.20



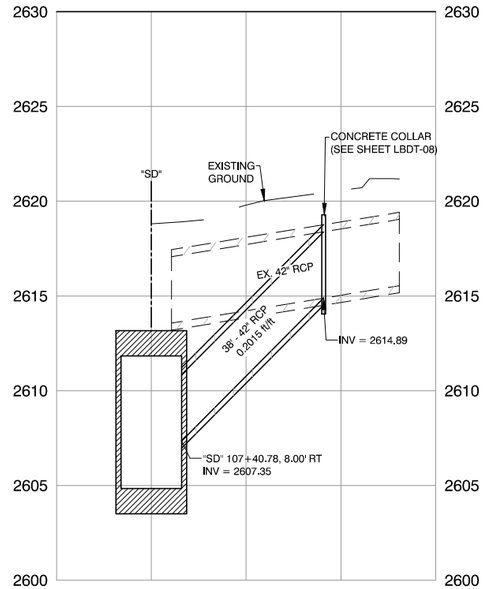

LBLP-04 / 2 — "SD" 92+28.88 NOTE 3.21



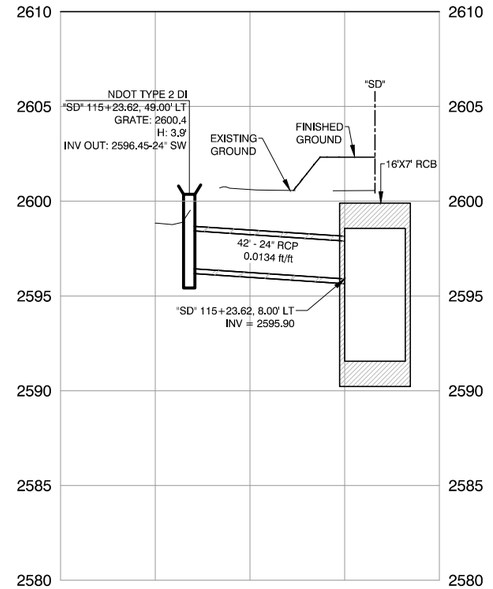

LBLP-04 / 3 — "SD" 97+24.91 NOTE 4.20




LBLP-04 / 4 — "SD"97+34.39 NOTE 4.21




LBLP-04 / 5 — "SD" 107+12.03 NOTE 5.20




LBLP-04 / 6 — "SD" 115+23.62, 49.00' LT NOTE 6.21

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223
BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

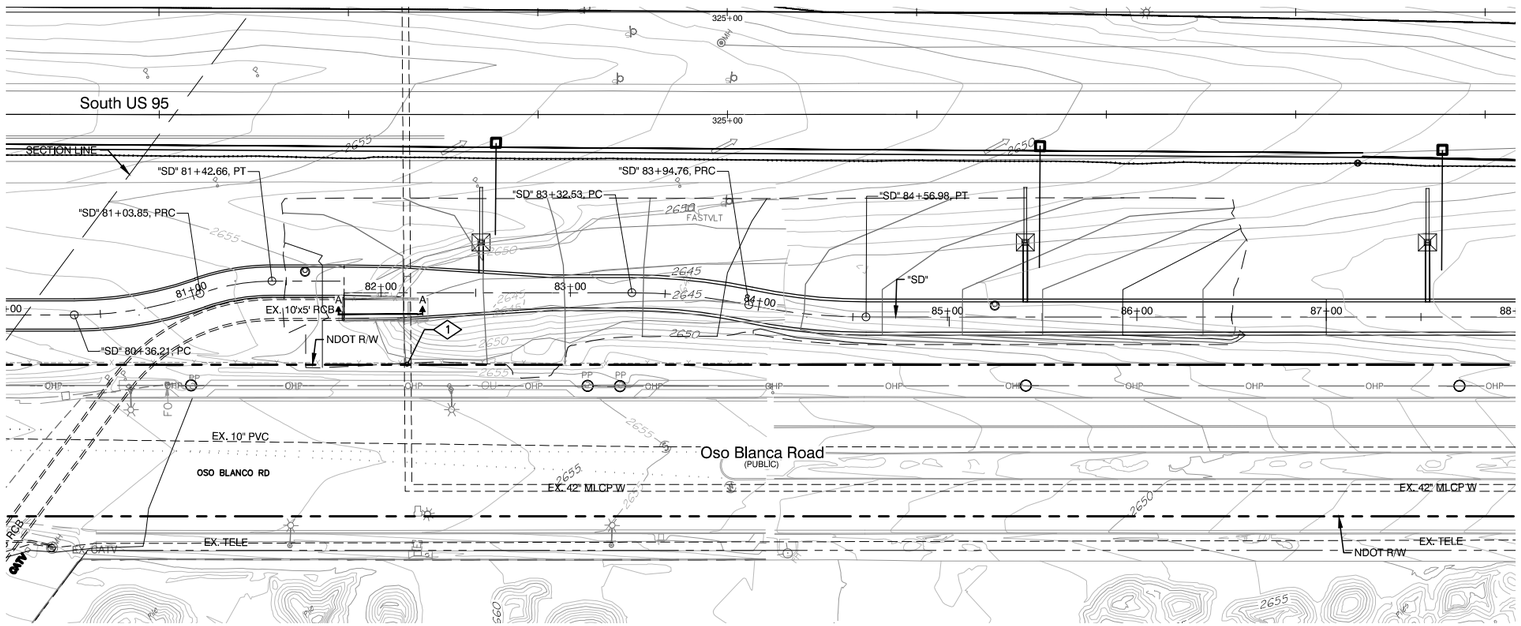
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

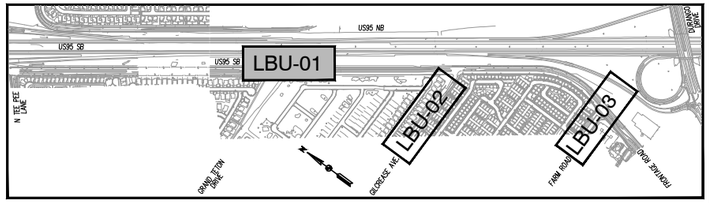
SHEET
LATERAL PROFILES
MAIN LINE PIPE CONNECTIONS

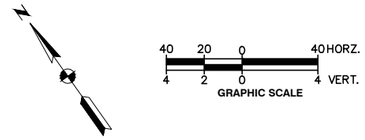
100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBLP-04
23 OF 59
DRAWING NO.
731-96

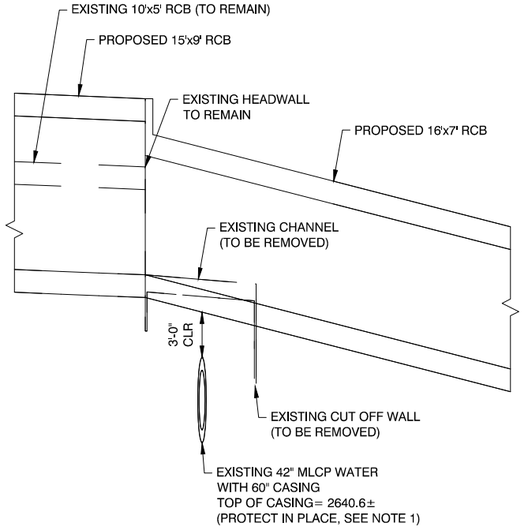
4/25/2017 C:\PROJECTWISEBINB\LBG2014\LBGUSER\D01802066\2041569-LP01.DWG




| PH No. | Utility | | | Depth to Top | Top Elev |
|---|---|---|---|---|---|
| | Type | Size (inches) | Width (inches) | (ft) | |
| 1 | Water | 42 | 42 | | 2640.6 |




SECTION A-A
NTS

NOTE:

1. IN AREAS WHERE THE EXCAVATION IS LESS THAN THREE FEET (3 FT) FROM THE TOP ON THE LVVWD 42" TRANSMISSION WATER MAIN, NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELD EQUIPMENT, WILL BE ALLOWED WITHIN 10 FEET (10 FT) OF THE TRANSMISSION WATER MAIN. IN THESE AREAS, CONTRACTOR TO PLACE A CONCRETE BARRIER, I.E. JERSEY RAIL, TO IDENTIFY THE "NO EQUIPMENT ZONE"

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY:
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

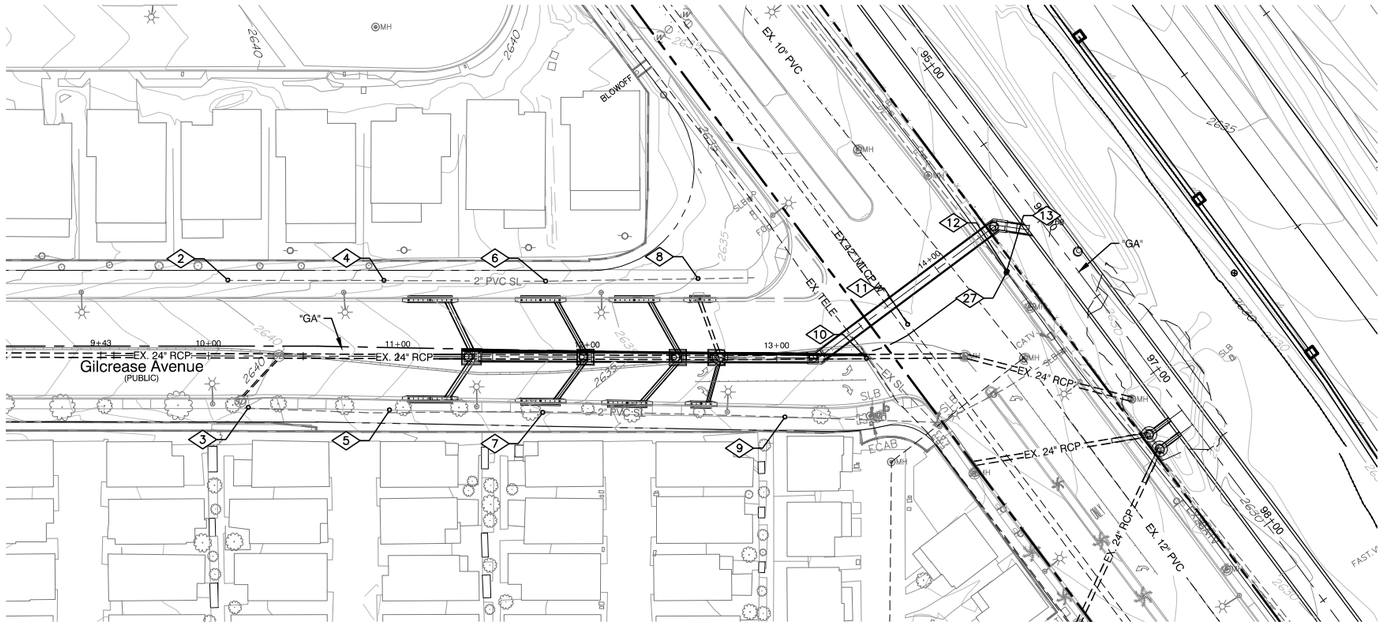
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

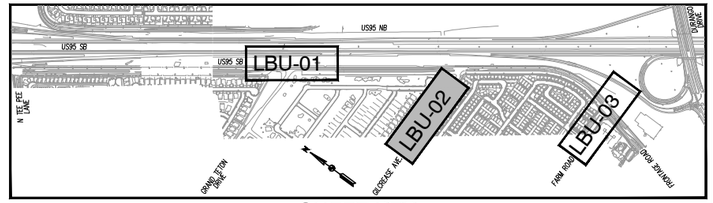
SHEET
UTILITY PLAN

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBU-01
24 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBN8\\LBG\20141\LBGUSER\D01802281\20411569-U01.DWG




**SHEET KEY**

GRAPHIC SCALE
40 20 0 40 HORZ.
4 2 0 4 VERT.

| PH No. | Utility | | | Depth to Top | Top Elev |
|---|---|---|---|---|---|
| | Type | Size (inches) | Width (inches) | (ft) | |
| 2 | Electric | 2 | 2 | 4.01 | 2637.8 |
| 3a | Irrigation | 2 | 2 | 0.33 | 2640.0 |
| 3b | (2) Plastic | 1 | 1 | 0.25 | 2640.1 |
| 3c | Electric | 2 | 2 | 3.84 | 2636.5 |
| 4 | Electric | 2 | 2 | 3.68 | 2635.8 |
| 5a | Direct Buried Cable | 1 | 1 | <.58 | 2637.7 |
| 5b | Irrigation | 2 | 2 | 0.58 | 2637.7 |
| 5c | Electric | 2 | 2 | 3.83 | 2634.5 |
| 6 | Electric | 2 | 2 | 3.95 | 2633.3 |
| 7a | Direct Buried Cable | .5 | .5 | <1 | 2635.1 |
| 7b | Irrigation | 2 | 2 | <1 | 2635.1 |
| 7c | Electric | 2 | 2 | 4.37 | 2631.7 |
| 8 | Electric | 2 | 2 | 2.37 | 2632.6 |
| 9 | Electric | 2 | 2 | 3.40 | 2630.0 |
| 10 | (3) Fiber Optic | 2 | 4 | 2.14 | 2630.5 |
| 10 | (4) Electric | 3,4 | 16 | 2.16 | 2630.4 |
| 11 | Water | 42 | 42 | 11.17 | TBD |
| 12 | (2) Electric | 3 | 3 | 4.56 | 2628.1 |
| 13 | Electric | 0 | 29 | 5.25 | 2627.4 |

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER

DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY

Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
**CITY OF LAS VEGAS**

H# 60223 | BID# XX.XXXXX

DATE: 3/30/2017 | DESIGNED BY: LDN

SUBMITTAL STAGE: **100% PRE-FINAL** | DRAWN BY: FME | CHECKED BY: JSD

TITLE
**CENTENNIAL PARKWAY CHANNEL WEST**
**DURANGO DRIVE TO GRAND TETON DRIVE**

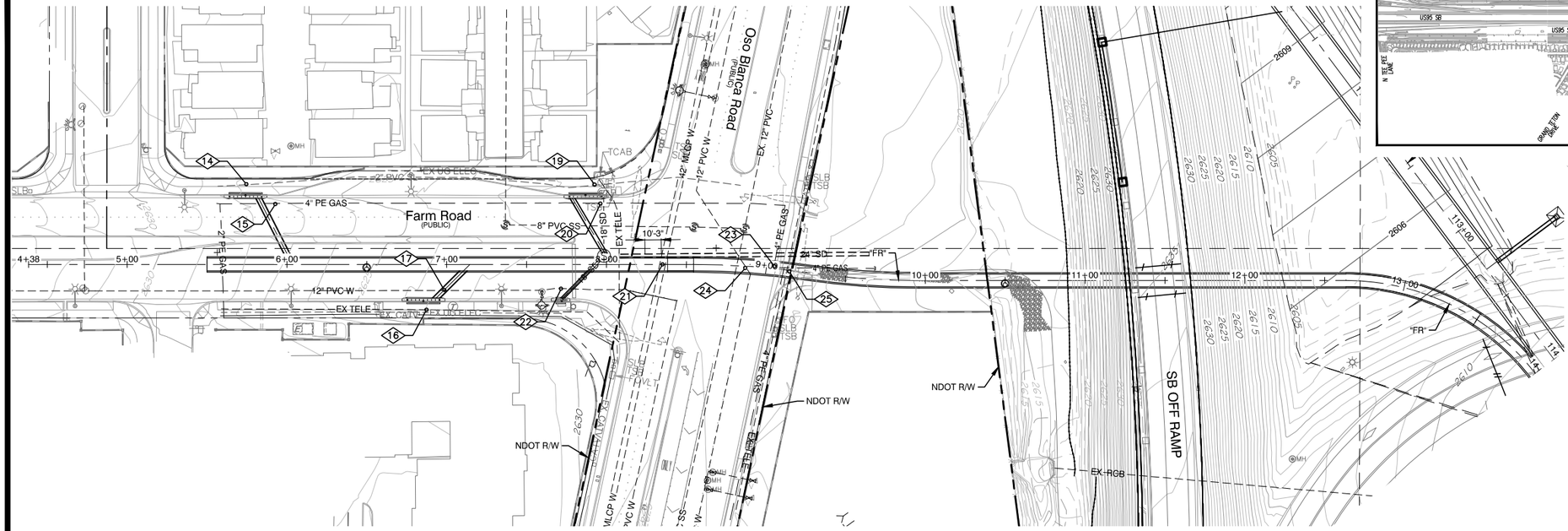
SHEET
**UTILITY PLAN**

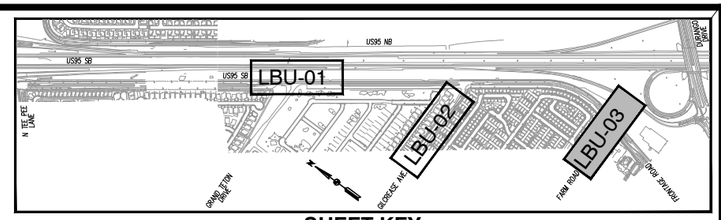
100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
**LBU-02**
25 OF 59

DRAWING NO.
**731-96**

4/25/2017 C:\PROJECTWISE8N8\LBG2014\LBGUSER\D0180281\2041569-U01.DWG




**SHEET KEY**

GRAPHIC SCALE
40 20 0 40 HORZ.
4 2 0 4 VERT.

| PH No. | Utility | | | Depth to Top | Top Elev |
|---|---|---|---|---|---|
| | Type | Size (inches) | Width (inches) | (ft) | |
| 14 | Electric | 2 | 2 | 2.89 | 2625.0 |
| 15 | Gas | 4 | 4 | 3.45 | 2623.5 |
| 16 | (2) Electric | 4 | 13 | 3.93 | 2619.9 |
| 16 | (4) Telephone | 3 | 6 | 3.10 | 2620.8 |
| 17 | Water | 12 | 12 | 3.54 | 2619.9 |
| 18 | 0 | 0 | 0 | 0.00 | 0.0 |
| 19 | Electric | 2 | 2 | 1.92 | 2620.7 |
| 20 | Gas | 6 | 6 | 3.21 | 2619.1 |
| 22 | Water | 12 | 12 | 4.38 | 2617.9 |
| 23 | Gas | 4 | 4 | 2.78 | 2620.3 |
| 24 | Water | 12 | 12 | 6.75 | 2616.7 |
| 25a | Fiber Optic/Elec | 2 | 2 | 4.99 | 2618.0 |
| 25b | (2) Fiber Optic/Elec | 3 | 3 | 4.99 | 2618.0 |
| 25c | (3) Fiber Optic/Elec | 4 | 4 | 4.99 | 2618.0 |
| 25d | (2) Fiber Optic/Elec | 6 | 6 | 5.86 | 2617.1 |
| 27 | Electric | 2 | 2 | 2.24 | 2630.5 |

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT# 125067

**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 |

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

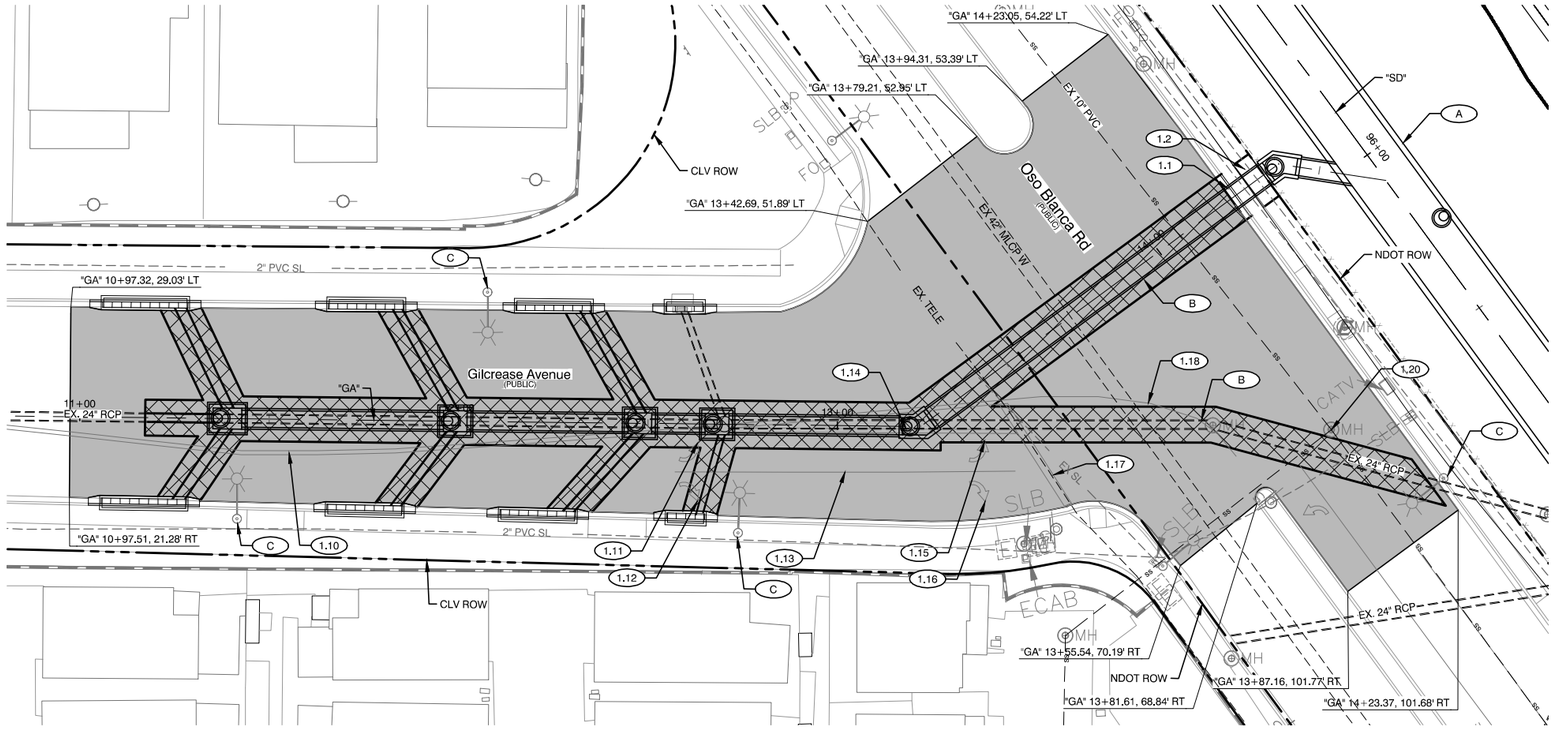
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

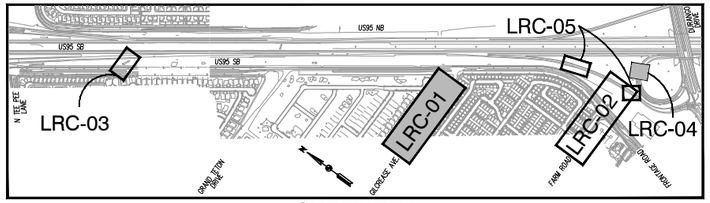
SHEET
UTILITY PLAN
"FR" 5+50.00 TO "FR" 14+00.00

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBU-03
26 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISE8N8i\LBG20141\LBGUSER\D0180281\20415691-U01.DWG




## SHEET KEY

N

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## LEGEND

LIMITS OF TRENCH

LIMITS OF 2" MILL AND OVERLAY

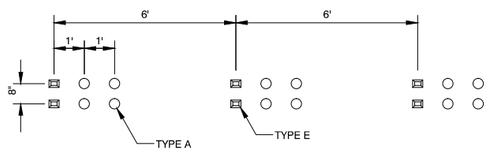
## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 1.1 | "GA" 14+25.40, 6.83' LT TO "GA" 14+25.40, 6.83' RT | REMOVE AND RECONSTRUCT "L" TYPE CURB AND GUTTER PER USDCCA DWG No 216. |
| 1.2 | "GA" 14+34.26, 6.83' LT TO "GA" 14+34.26, 6.83' RT | REMOVE AND RECONSTRUCT SIDEWALK PER USDCCA DWG No 234. |
| 1.10 | "GA" 10+97.45, 5.08' RT TO "GA" 13+44.02, 8.68' RT | REMOVE AND REPLACE TYPE 1 CENTERLINE PER USDCCA DWG No. 244. |
| 1.11 | "GA" 12+63.11, 5.02' RT | REMOVE AND REPLACE LEFT ARROW SYMBOL PER USDCCA DWG No. 246. |
| 1.12 | "GA" 12+63.26, 20.31' RT | REMOVE AND REPLACE RIGHT ARROW SYMBOL PER USDCCA DWG No. 246. |
| 1.13 | "GA" 12+57.24, 12.72' RT TO "GA" 13+35.10, 24.25' RT | REMOVE AND REPLACE STORAGE LANE LINE PER USDCCA DWG No. 246. |
| 1.14 | "GA" 12+72.64, 0.94' RT TO "GA" 13+44.02, 8.68' RT | REMOVE AND REPLACE TYPE 1 CENTERLINE PER USDCCA DWG No. 244. |
| 1.15 | "GA" 13+33.29, 13.14' RT | REMOVE AND REPLACE LEFT ARROW SYMBOL USDCCA DWG No. 246. |
| 1.16 | "GA" 13+23.99, 26.08' RT | REMOVE AND REPLACE RIGHT ARROW SYMBOL USDCCA DWG No. 246. |
| 1.17 | "GA" 13+44.02, 8.68' RT TO "GA" 13+42.05, 39.79' RT | REMOVE AND REPLACE STOP BAR. |
| 1.18 | "GA" 13+44.31, 7.62' RT TO "GA" 13+84.52, 55.58' RT | REMOVE AND REPLACE CAT TRACK PER DETAIL 1/LBRC-1. |
| 1.20 | "GA" 14+08.87, 64.82' RT | ADJUST MANHOLE TO GRADE. |

(A) SEE SHEETS LBSD-01 THROUGH LBSD-06 FOR STORM DRAIN PLAN AND PROFILE

(B) SEE SHEET LBSD-08 FOR GILCREASE LATERAL PLAN AND PROFILE.

(C) EXISTING STREETLIGHT (PROTECT IN PLACE)




1 LBRC-01 CAT TRACK NTS

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

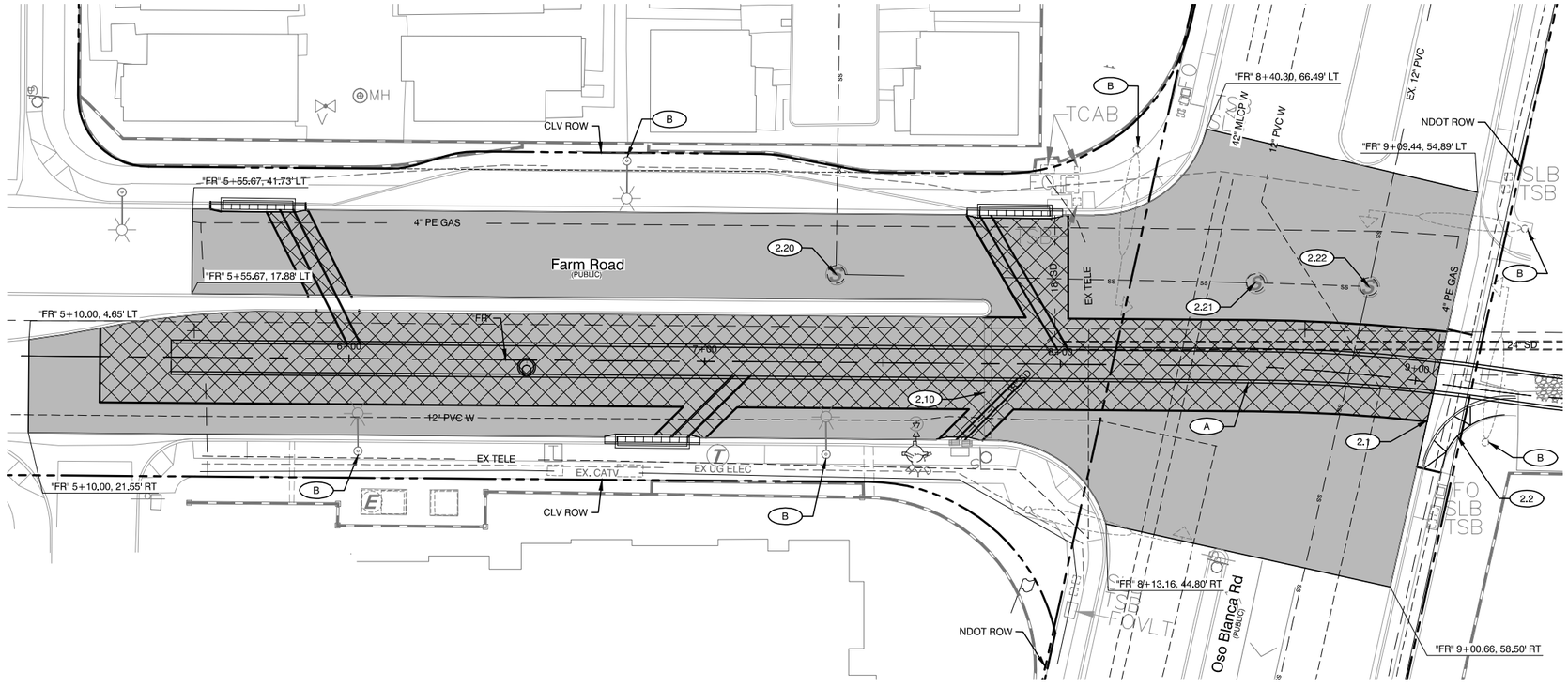
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

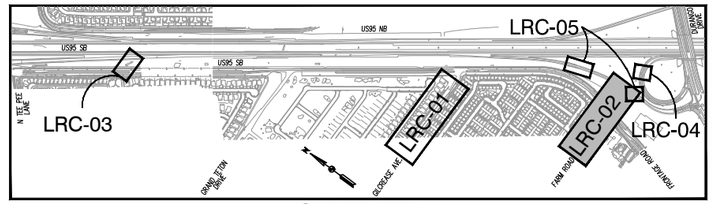
SHEET
ROADWAY PLAN
"GA" 9+00.00 TO "GA" 15+00.00

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBRC-01
27 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\ILBG2014\LBGUSER\D01802268\2041569_RC1.DWG




## SHEET KEY

N

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## LEGEND

LIMITS OF TRENCH

LIMITS OF 2" MILL AND OVERLAY

## CONSTRUCTION NOTES

2.1 "FR" 9+03.78, 24.06' RT TO REMOVE AND RECONSTRUCT CROSS GUTTER PER USDCCA
"FR" 9+06.85, 15.50' LT DWG No. 228.

2.2 "FR" 9+10.77, 24.57' RT TO REMOVE AND RECONSTRUCT SIDEWALK RAMP PER USDCCA
"FR" 9+29.29, 6.07' RT DWG No. 235.

2.10 "FR" 7+79.50, 12.61' LT TO REMOVE AND REPLACE STOP BAR.
"FR" 7+79.77, 20.91' RT

2.20 "FR" 7+36.78, 24.75' LT ADJUST MANHOLE TO GRADE.

2.21 "FR" 8+53.92, 23.62' LT ADJUST MANHOLE TO GRADE.

2.22 "FR" 8+84.33, 24.75' LT ADJUST MANHOLE TO GRADE.

(A) SEE SHEET LBSD-09 FOR FARM LATERAL PLAN AND PROFILE

(B) EXISTING STREETLIGHT AND/OR TRAFFIC SIGNAL ARM (PROTECT IN PLACE)

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN
DATE: 3/30/2017 | DRAWN BY: FME
SUBMITTAL STAGE: 100% PRE-FINAL | CHECKED BY: JSD

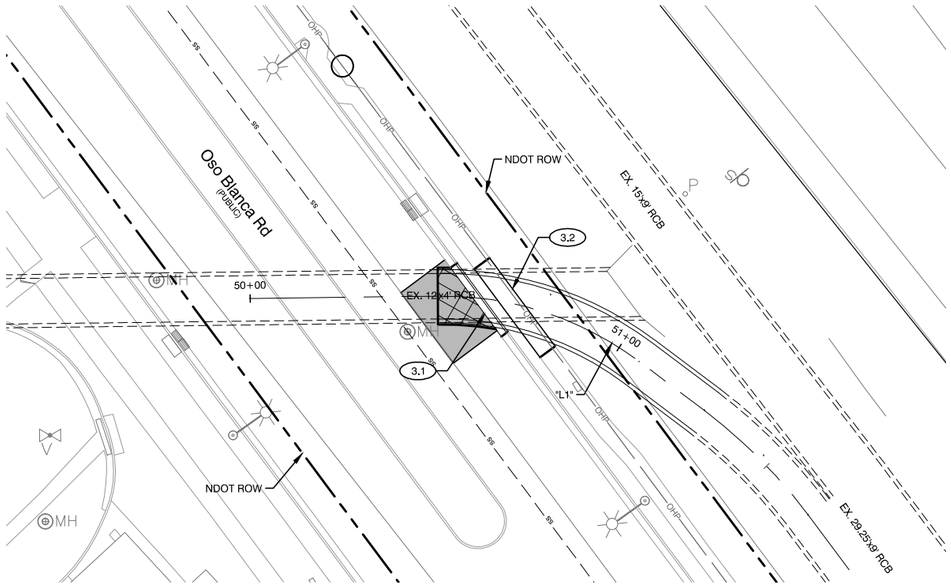
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

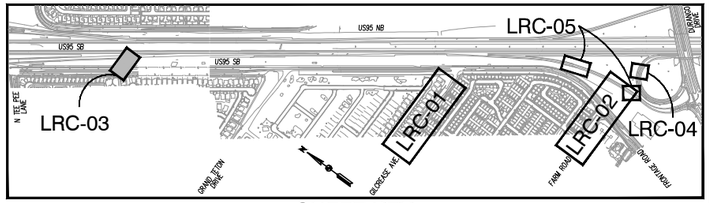
SHEET
ROADWAY PLAN
"FR" 5+50.00 TO "FR" 14+00.00

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBRC-02
28 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D01802682041569_RC1.DWG




## SHEET KEY

N

40 20 0 40 HORZ.
4 2 0 4 VERT.
GRAPHIC SCALE

## LEGEND

LIMITS OF TRENCH

LIMITS OF 2" MILL AND OVERLAY

## CONSTRUCTION NOTES

(3.1) "L1" 50+54.33, 8.86' LT TOREMOVE AND RECONSTRUCT "L" TYPE CURB AND GUTTER
"L1" 50+69.82, 7.50' RT PER USDCCA DWG No 216.

(3.2) "L1" 50+58.54, 7.50' LT TOREMOVE AND RECONSTRUCT SIDEWALK PER USDCCA DWG
"L1" 50+84.10, 7.50' RT No. 234.

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

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PREPARED FOR
CITY OF LAS VEGAS
H# 60223

BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
ROADWAY PLAN
"L1" 50+00.00 - "L1" 52+00.00

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBRC-03
29 OF 59
DRAWING NO.
731-96

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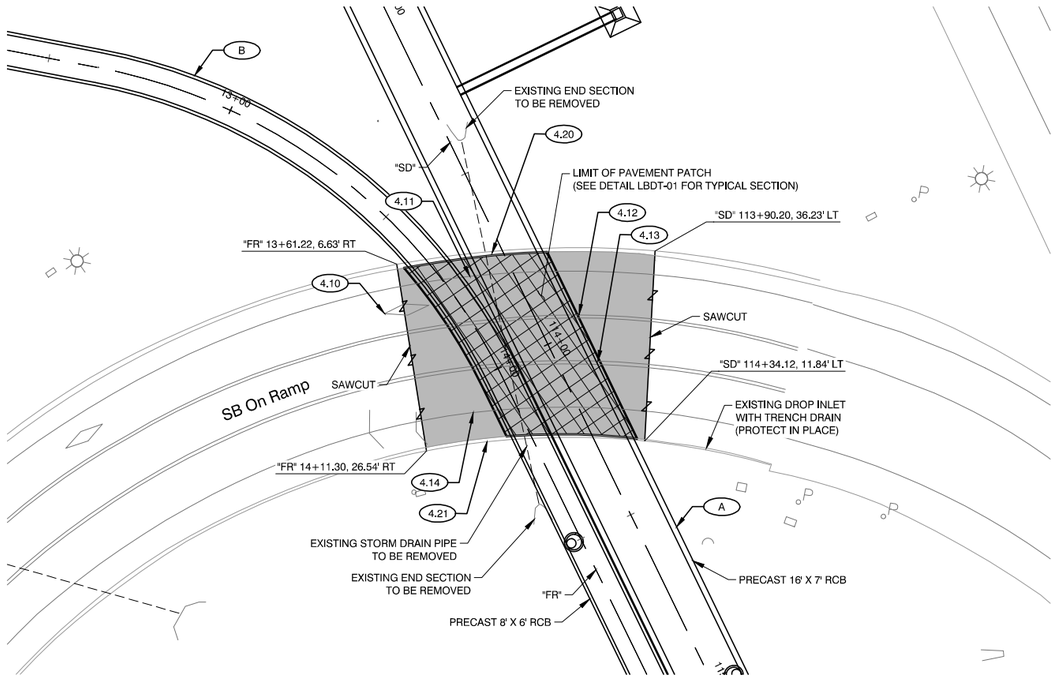


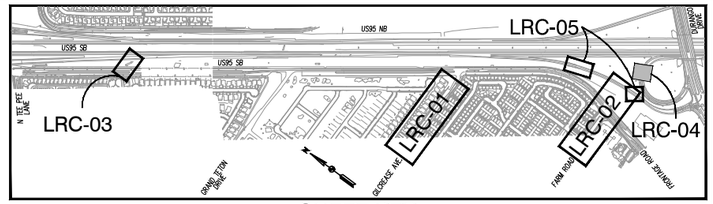


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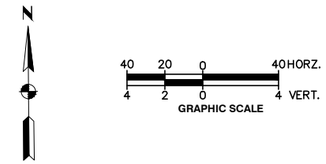



## LEGEND

LIMITS OF TRENCH

LIMITS OF 2" MILL AND OVERLAY

## CONSTRUCTION NOTES

| | | |
|---|---|---|
| 4.10 | "FR" 13+69.79, 17.47' RT | REMOVE AND REPLACE HOV LANE SYMBOL PER NDOT STANDARD PLAN T-38.1.13 |
| 4.11 | "FR" 13+66.61, 9.78' RT TO "SD" 113+95.70, 33.18' LT | REMOVE AND REPLACE 8" SOLID YELLOW LINE |
| 4.12 | "FR" 13+78.36, 15.59' RT TO "SD" 114+06.18, 27.36' LT | REMOVE AND REPLACE 8" SOLID WHITE LINE PER NDOT STANDARD PLAN T-37.1.1 |
| 4.13 | "FR" 13+90.72, 20.39' RT TO "SD" 114+16.81, 21.45' LT | REMOVE AND REPLACE 8" SOLID WHITE LINE PER NDOT STANDARD PLAN T-37.1.1 |
| 4.14 | "FR" 14+03.55, 24.19' RT TO "SD" 114+27.25, 15.65' RT | REMOVE AND REPLACE 8" SOLID WHITE LINE |
| 4.20 | "FR" 13+61.22, 6.63' RT TO "SD" 113+90.20, 36.23' LT | REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) |
| 4.21 | "FR" 14+11.30, 26.54' RT TO "SD" 114+34.12, 11.84' LT | REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) |

(A) SEE SHEETS LBSD-01 THROUGH LBSD-06 FOR STORM DRAIN PLAN AND PROFILE

(B) SEE SHEET LBSD-09 FOR FARM LATERAL PLAN AND PROFILE.

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY

Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR
**CITY OF LAS VEGAS**

H# 60223 | BID# XX.XXXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: **100% PRE-FINAL**

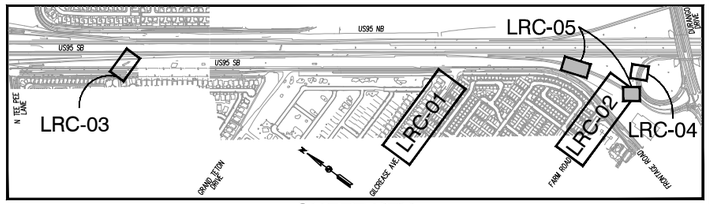
TITLE
**CENTENNIAL PARKWAY CHANNEL WEST**
**DURANGO DRIVE TO GRAND TETON DRIVE**

SHEET
**"FR"/"SD" RCB SOUTHBOUND ON RAMP PAVEMENT PATCH**

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
**LBRC-04**
29 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\ILBG2014\LBGUSER\D01802682041569_RC1.DWG

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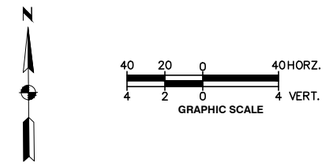
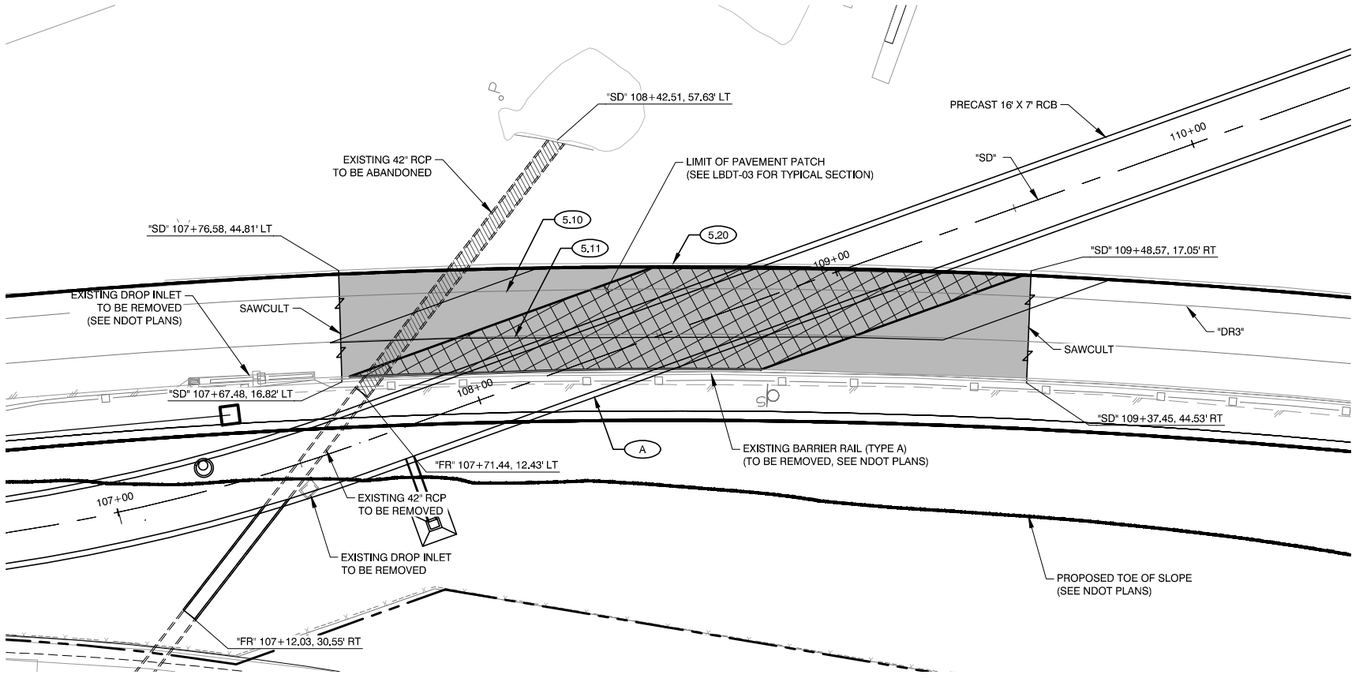
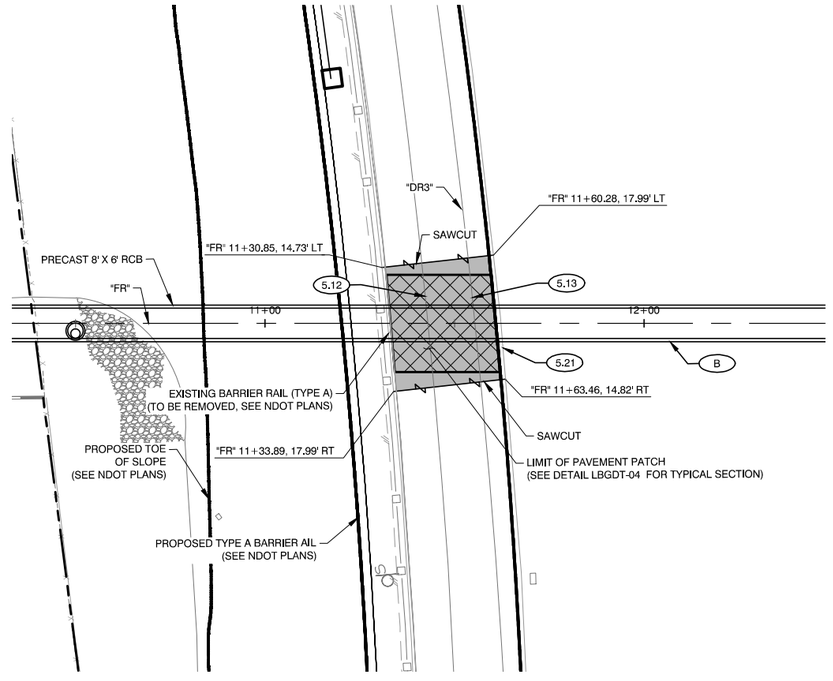



## LEGEND

- LIMITS OF TRENCH
- LIMITS OF 2" MILL AND OVERLAY

## CONSTRUCTION NOTES

5.10 "SD" 107+74.46, 38.31' LT TO "SD" 109+46.00, 23.83' RT — REMOVE AND REPLACE 8" SOLID YELLOW LINE

5.11 "SD" 107+70.77, 26.93' LT TO "SD" 109+41.57, 34.34' RT — REMOVE AND REPLACE 8" SOLID WHITE LINE

5.12 "FR" 11+41.37, 15.89' LT TO "FR" 11+44.58, 16.81' RT — REMOVE AND REPLACE 8" SOLID WHITE LINE

5.13 "FR" 11+53.58, 17.25' LT TO "FR" 11+56.93, 15.33' RT — REMOVE AND REPLACE 8" SOLID YELLOW LINE

5.20 "SD" 107+76.58, 44.81' LT TO "SD" 109+48.57, 17.05' RT — REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A)

5.21 "FR" 11+60.28, 17.99' LT TO "FR" 11+63.46, 14.82' RT — REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A)

A SEE SHEETS LBSD-01 THROUGH LBSD-06 FOR STORM DRAIN PLAN AND PROFILE

B SEE SHEET LBSD-09 FOR FARM LATERAL PLAN AND PROFILE.

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY:
Louis Berger
444 East Warm Springs Road, Suite 118
Las Vegas, NV 89119

PREPARED FOR: CITY OF LAS VEGAS

BID# XX.XXXXX | DESIGNED BY: LDN
H# 60223 | DRAWN BY: FME
DATE: 3/30/2017 | CHECKED BY: JSD
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE: CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET: "FR"/"SD" RCB SOUTHBOUND
OFF RAMP PAVEMENT PATCH

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBRC-05
29 OF 59
DRAWING NO.
731-96

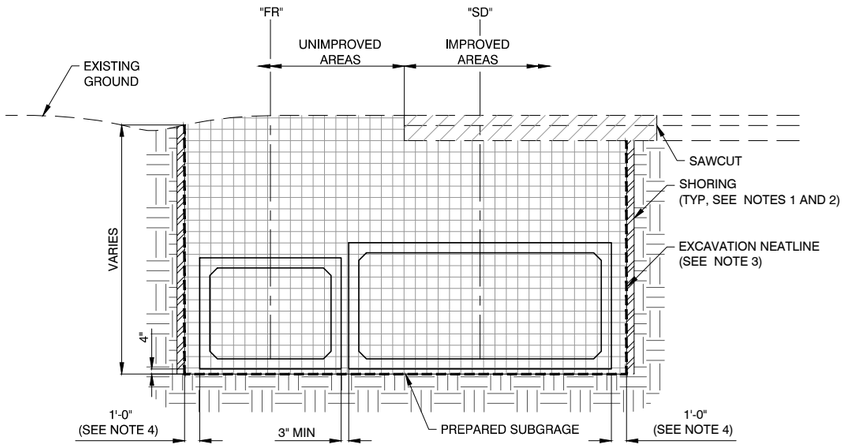
4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0180268\2041569_RC1.DWG

LEGEND

- BACKFILL
- NATIVE MATERIAL
- STRUCTURE EXCAVATION
- ROADWAY EXCAVATION
- SLURRY CEMENT BACKFILL

NOTES:

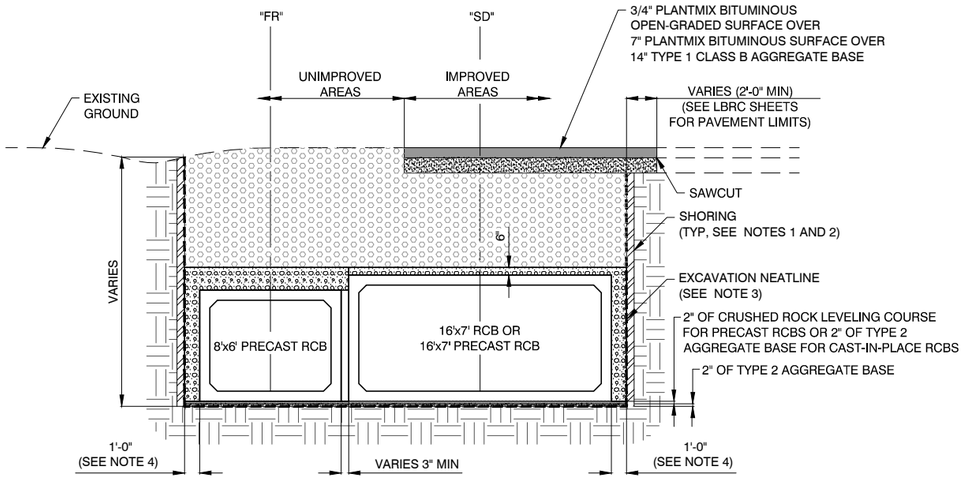
1. TRENCH WALLS SHALL BE APPROPRIATELY SHORED PER OSHA REQUIREMENTS.
2. NO ADDITIONAL PAYMENT SHALL BE MADE FOR EXCAVATION MADE BEYOND THE INSIDE FACE OF SHORING SHOWN ABOVE.
3. EXCAVATION NEATLINE FOR PAYMENT OF STRUCTURE EXCAVATION IS INSIDE FACE OF SHORING AND SUBGRADE.
4. 6" MINIMUM IS ALLOWABLE FOR PRECAST RCB.




## 1 DUAL RCB AS CONSTRUCTED SECTION

LBDT-01 NTS

"SD" 113+50.00 TO "SD" 116+82.44
"FR" 13+50.00 TO "FR" 16+82.44




## 2 DUAL RCB TYPICAL SECTION OF IMPROVEMENT

LBDT-01 NTS

"SD" 113+50.00 TO "SD" 116+82.44
"FR" 13+50.00 TO "FR" 16+82.44

NOTES:

1. DESIGN SPECIFICATIONS; "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" 7TH EDITION 2014 WITH REVISIONS TO DATE.
2. CONTRACT SPECIFICATIONS: STATE OF NEVADA, DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2014". EXCEPT AS NOTED BELOW AND IN THE SPECIAL PROVISIONS FOR THIS CONTRACT.
3. ALL CONCRETE FOR REINFORCED CONCRETE BOX CULVERTS (PRECAST AND CAST-IN-PLACE), CONFLUENCE STRUCTURES AND TRANSITION STRUCTURES, SHALL HAVE A 28 DAY MINIMUM COMPRESSIVE STRENGTH OF 6,000 PSI. ALL OTHER CONCRETE SHALL HAVE A 28 DAY MINIMUM COMPRESSIVE STRENGTH OF 4,500 PSI. ALL CONCRETE SHALL HAVE TYPE v CEMENT. ALL CONSTRUCTION JOINTS SHALL BE INTENTIONALLY ROUGHENED TO 1/4" AMPLITUDE. UNLESS OTHERWISE NOTED ALL REINFORCING BARS SHALL HAVE 2" CLEAR CONCRETE COVER. CHAMFER ALL EDGES OF CONCRETE 3/4" UNLESS OTHERWISE NOTED.
4. THE INVERT SLAB FOR ALL REINFORCED CONCRETE BOX CULVERTS, CONFLUENCE STRUCTURES, AND TRANSITION STRUCTURES SHALL BE CLASS A CONCRETE. CLASS A CONCRETE FOR THE WALLS, PIERS AND TOP SLAB MAY BE SUBSTITUTED WITH CLASS D CONCRETE AT NO ADDITIONAL COST.
5. CONCRETE CONSTRUCTION JOINTS DESIGNATED AS A "PERMISSIBLE JOINT" OR AS AN "OPTIONAL CONSTRUCTION JOINT" MAY BE INCORPORATED INTO THE CONSTRUCTION AT THE CONTRACTORS OPTION. JOINTS DESIGNATED AS A "CONSTRUCTION JOINT" ARE CONSIDERED MANDATORY AND SHALL BE INCORPORATED INTO THE CONSTRUCTION UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.
6. REINFORCING STEEL: ALL REINFORCING STEEL SHALL BE ASTM A615, GRADE 60, DEFORMED. (WHEN CONSIDERED AS BARS TO CONTROL TEMPERATURE, SHRINKAGE AND DISTRIBUTION STRESSES BY THE ENGINEER, MAY BE ADJUSTED BY THE CONTRACTOR UPON CONCURRENCE AND APPROVAL OF THE ENGINEER.) DIMENSIONS RELATING TO BAR SPACING ARE CENTER TO CENTER OF BAR.
7. UNLESS OTHERWISE NOTED, THE FOLLOWING TABLE APPLIES TO ALL REINFORCED CONCRETE DRAINAGE STRUCTURES.

| BAR SIZE | LAP DISTANCE |
|---|---|
| #4 | 2'-0" |
| #5 | 2'-4" |
| #6 | 2'-9" |
| #7 | 3'-6" |
| #8 | 4'-7" |
| #9 | 5'-10" |
| #10 | 7'-4" |

8. DEAD LOAD: MAXIMUM COVER WITH EARTH LOAD MODIFICATION FACTOR.
9. ALL STRUCTURES AND THEIR COMPONENTS SUPPORTING TRAFFIC LOADS SHALL BE DESIGNED FOR AASHTO HL-93 LOADING+IMPACT.
10. UNLESS OTHERWISE NOTED ALL STRUCTURAL STEEL PLATES AND SHAPES SHALL BE ASTM A36. GRADE 50 STEEL MAY BE SUBSTITUTED FOR GRADE 36 AT NO ADDITIONAL COST.
11. GEOTECHNICAL DESIGN PARAMETERS PER GEOTECHNICAL INVESTIGATION "CENTENNIAL PARKWAY CHANNEL WEST US95 FROM DURANGO DRIVE TO GRAND TETON DRIVE" PROJECT # 20153750F1 BY GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC DATED DECEMBER 9, 2016.
    a. ALLOWABLE SOIL BEARING PRESSURE: 2,600 PSF FOR EMBEDMENT DEPTH 12" MINIMUM BELOW ADJACENT FINISH GRADE FOR A WIDTH OF 12" MINIMUM.
    b. ULTIMATE SOIL BEARING CAPACITY:
    $q_{ULT}$ (ksf)=2.47B' + 3.53$D_f$
    WHERE:
    B'=EFFECTIVE WIDTH OF FOOTING
    $D_f$=DEPTH OF EMBEDMENT TO BOTTOM OF FOOTING
    c. UNIT WEIGHT OF RETAINED SOIL: 145pcf (RCBs)

RESTRAINED

| ACTIVE PCF | EARTHQUAKE Peq TOP | EARTHQUAKE Peq BOTTOM | SURCHARGE |
|---|---|---|---|
| 60 | 32H | 8H | 0.44q |

12. PRECAST RCB MANUFACTURER SHALL PROVIDE A LRFR LOAD RATING MEETING NDOT REQUIREMENTS FOR THE 16'x7' BOX LOCATED AT "SD"113+00 TO "SD"114+75

## 3 GENERAL DRAINAGE STRUCTURE NOTES

LBDT-01 NTS

| NO. | DATE | REVISIONS |
|---|---|---|


PREPARED BY
Louis Berger
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Las Vegas, NV 89119


PREPARED FOR
CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-01
32 OF 59
DRAWING NO.
731-96

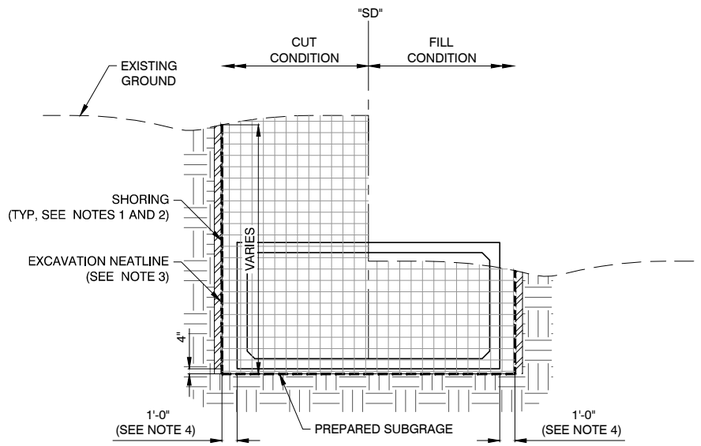

4/25/2017 C:\PROJECTWISEBIN\BILBG2014\LBGUSER\D01802662041569-SDXX.DWG

LEGEND

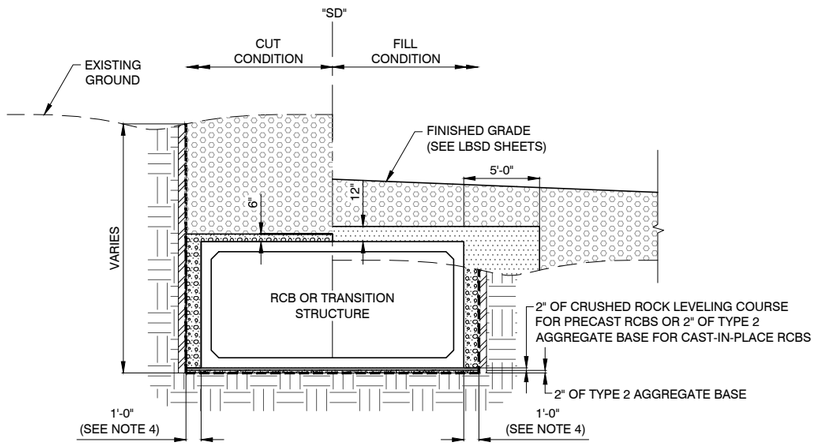
- BACKFILL
- GRANULAR BACKFILL
- NATIVE MATERIAL
- STRUCTURE EXCAVATION
- SLURRY CEMENT BACKFILL

NOTES:

1. TRENCH WALLS SHALL BE APPROPRIATELY SHORED PER OSHA REQUIREMENTS.
2. NO ADDITIONAL PAYMENT SHALL BE MADE FOR EXCAVATION MADE BEYOND THE INSIDE FACE OF SHORING SHOWN ABOVE.
3. EXCAVATION NEATLINE FOR PAYMENT OF STRUCTURE EXCAVATION IS INSIDE FACE OF SHORING AND SUBGRADE.
4. 6" MINIMUM IS ALLOWABLE FOR PRECAST RCB.




1 LBDT-02 RCB AND TRANSITIONS AS CONSTRUCTED SECTION NTS




2 LBDT-02 RCB AND TRANSITIONS TYPICAL SECTION OF IMPROVEMENT NTS

"SD" 110+50.00 TO "SD" 113+50.00
"SD" 77+75.13 TO "SD" 107+50.00

LEGEND

- BACKFILL
- GRANULAR BACKFILL
- NATIVE MATERIAL
- STRUCTURE EXCAVATION
- ROADWAY EXCAVATION
- SLURRY CEMENT BACKFILL

NOTES:

1. TRENCH WALLS SHALL BE APPROPRIATELY SHORED PER OSHA REQUIREMENTS.
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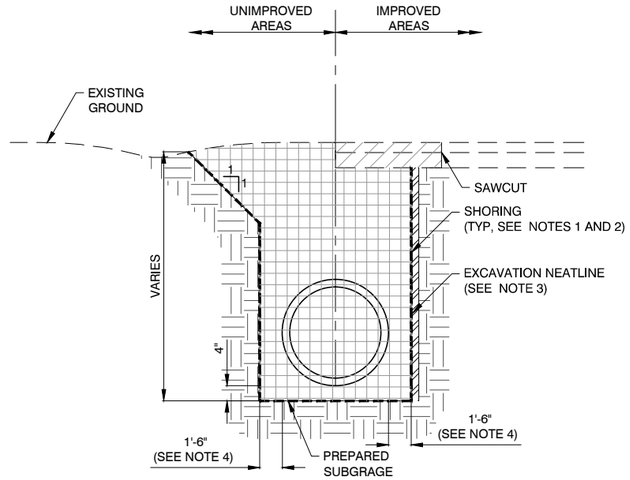
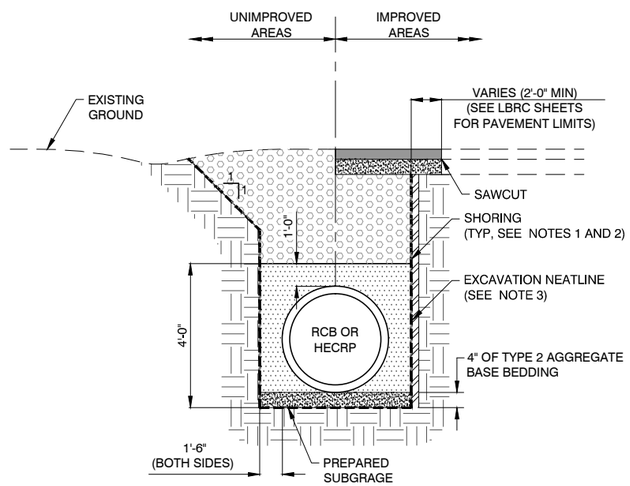



3 LBDT-02 RCP AND HERCP AS CONSTRUCTED SECTION NTS




4 LBDT-02 RCP AND HERCP TYPICAL SECTION OF IMPROVEMENT NTS

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY
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CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN
DATE: 3/30/2017 | DRAWN BY: FME
SUBMITTAL STAGE: 100% PRE-FINAL | CHECKED BY: JSD

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-02
33 OF 59
DRAWING NO.
731-96

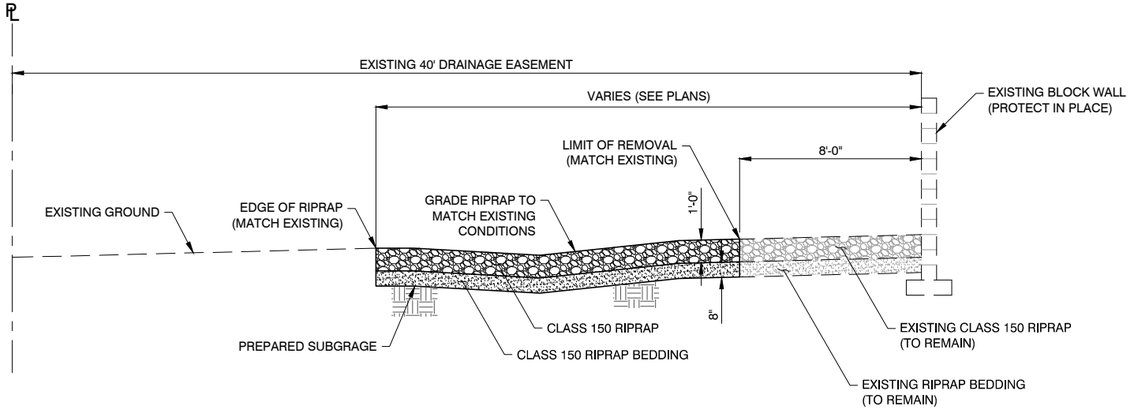
4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D01802662041569-SDXX.DWG

LEGEND

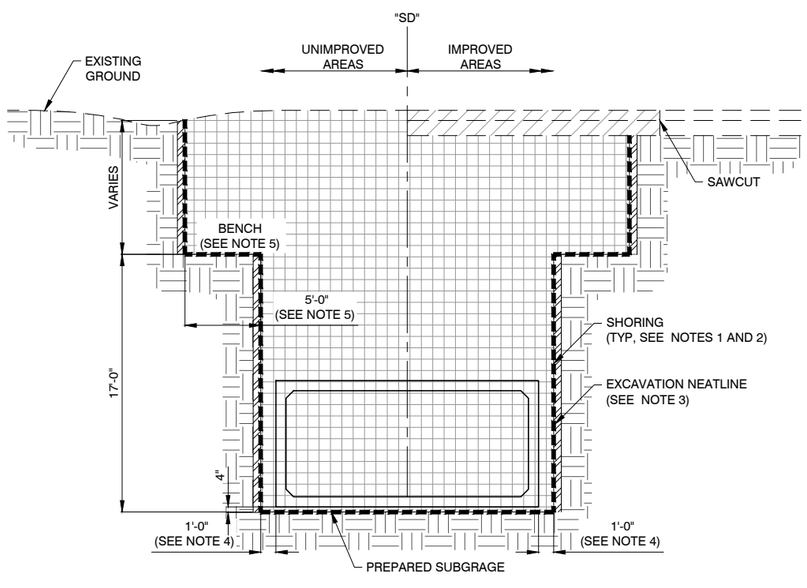
- BACKFILL
- NATIVE MATERIAL
- STRUCTURE EXCAVATION
- ROADWAY EXCAVATION
- SLURRY CEMENT BACKFILL

NOTES:

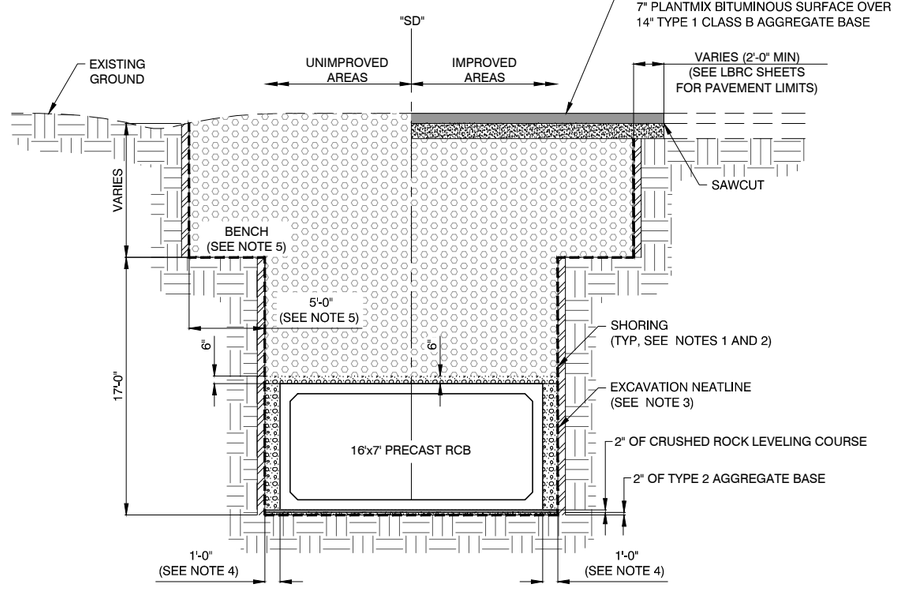
1. TRENCH WALLS SHALL BE APPROPRIATELY SHORED PER OSHA REQUIREMENTS.
2. NO ADDITIONAL PAYMENT SHALL BE MADE FOR EXCAVATION MADE BEYOND THE INSIDE FACE OF SHORING SHOWN ABOVE.
3. EXCAVATION NEATLINE FOR PAYMENT OF STRUCTURE EXCAVATION IS INSIDE FACE OF SHORING AND SUBGRADE.
4. 6" MINIMUM IS ALLOWABLE FOR PRECAST RCB.
5. BENCH WITH AND HEIGTH ARE FOR QUANTITY CALCULATION PURPOSES ONLY. NO ADDITIONAL PAYMENT WILL BE MADE FOR WIDER AND/OR ADDITIONAL BENCHES.




3 LBDT-03 RIPRAP SECTION NTS




1 LBDT-03 "SD" RCB AS CONSTRUCTED SB OFF RAMP SECTION NTS
"SD" 107+50.00 TO "SD" 110+50.00




2 LBDT-03 "SD" RCB TYPICAL SB OFF RAMP SECTION OF IMPROVEMENT NTS
"SD" 107+50.00 TO "SD" 110+50.00

| NO. | DATE | REVISIONS |
|---|---|---|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BID# XX.XXXX
H# 60223
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE:
100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBDT-03
34 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN64\LBG2014\LBGUSER\D0180286\2041569-SDXX.DWG

LEGEND

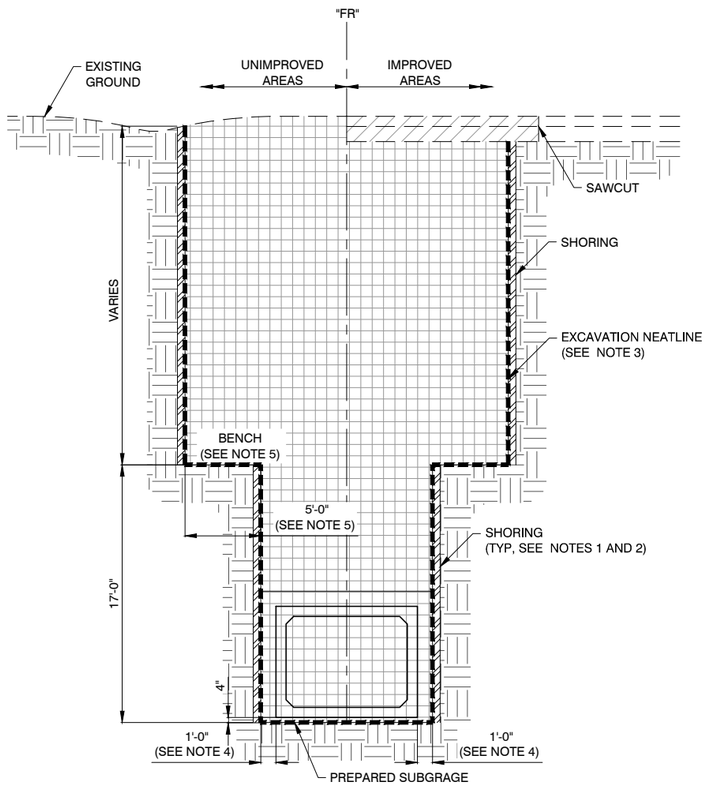
- BACKFILL
- NATIVE MATERIAL
- STRUCTURE EXCAVATION
- ROADWAY EXCAVATION
- SLURRY CEMENT BACKFILL

NOTES:

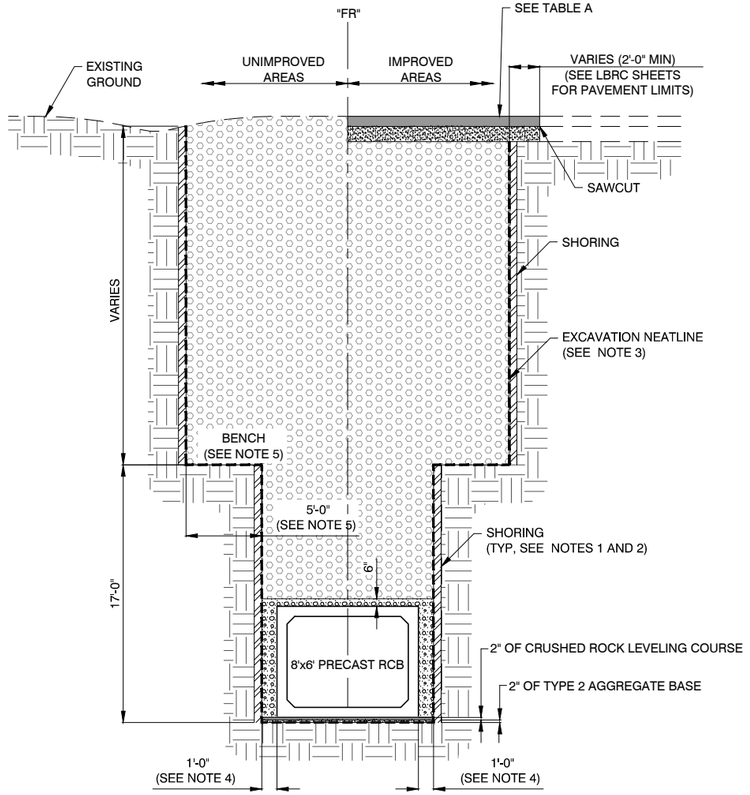
1. TRENCH WALLS SHALL BE APPROPRIATELY SHORED PER OSHA REQUIREMENTS.
2. NO ADDITIONAL PAYMENT SHALL BE MADE FOR EXCAVATION MADE BEYOND THE INSIDE FACE OF SHORING SHOWN ABOVE.
3. EXCAVATION NEATLINE FOR PAYMENT OF STRUCTURE EXCAVATION IS INSIDE FACE OF SHORING AND SUBGRADE.
4. 6" MINIMUM IS ALLOWABLE FOR PRECAST RCB.
5. BENCH WITH AND HEIGTH ARE FOR QUANTITY CALCULATION PURPOSES ONLY. NO ADDITIONAL PAYMENT WILL BE MADE FOR WIDER AND/OR ADDITIONAL BENCHES.

TABLE A

| STREET | OPEN GRADE THICKNESS | AC PAVEMENT THICKNESS | TYPE 1 CLASS B AGGREGATE THICKNESS |
|---|---|---|---|
| FARM ROAD | - | 4" | 4 1/2" |
| OSO BLANCA ROAD | - | 4" | 4 1/2" |
| SB OFF RAMP | 3/4" | 7" | 14" |




1 LBDT-04 NTS "FR" RCB AS CONSTRUCTED SECTION
"FR" 5+50.00 TO "FR" 13+50.00




2 LBDT-04 NTS "FR" RCB TYPICAL SECTION OF IMPROVEMENT
"FR" 5+50.00 TO "FR" 13+50.00

REVISIONS

| NO. | DATE |
|---|---|

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H# 60223

BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-04
35 OF 59
DRAWING NO.
731-96

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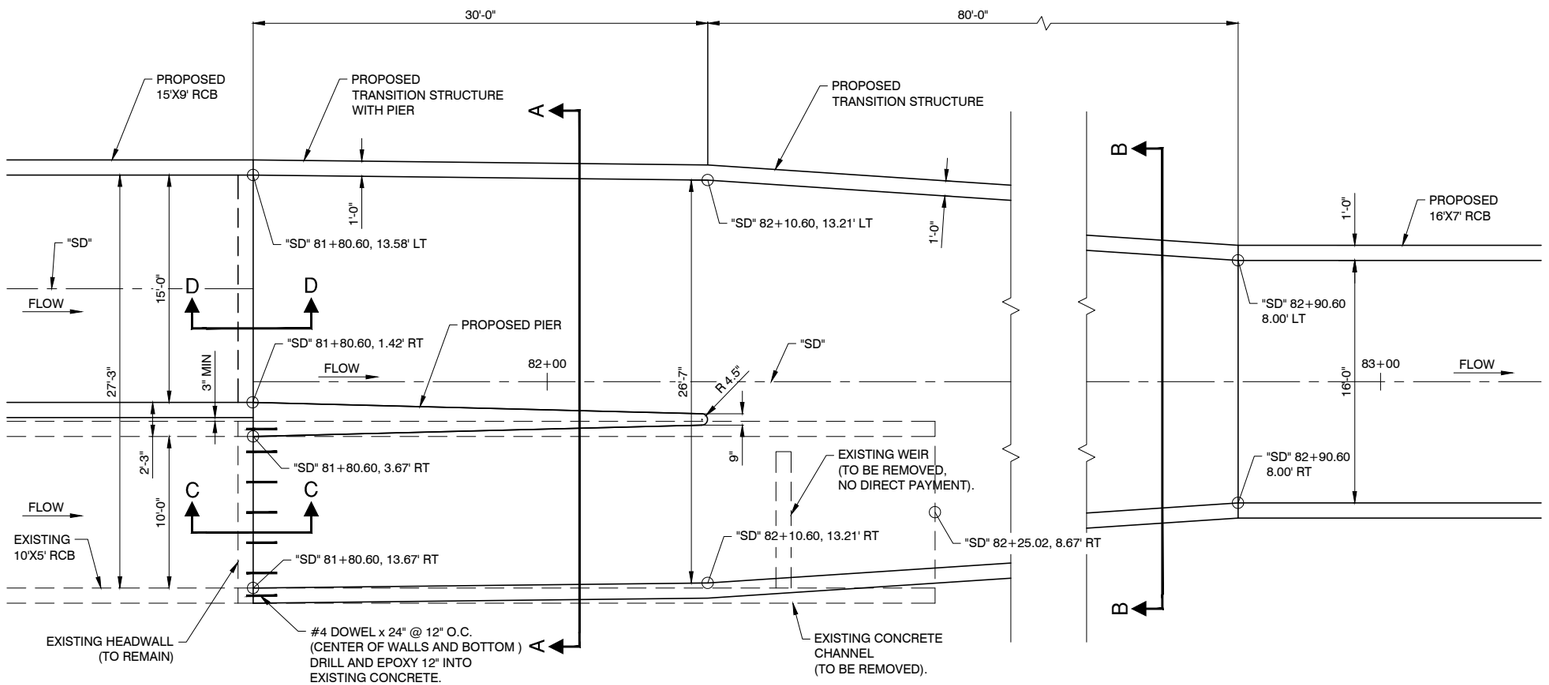
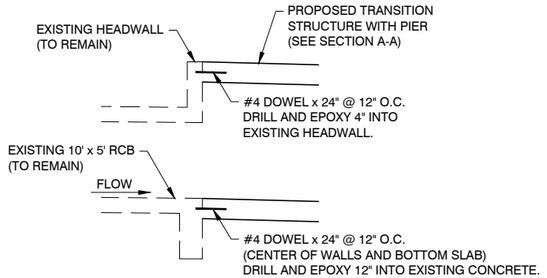
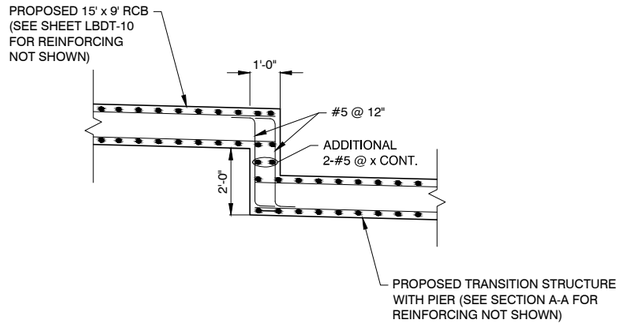



## PLAN VIEW
NTS




## SECTION C-C
NTS




## SECTION D-D
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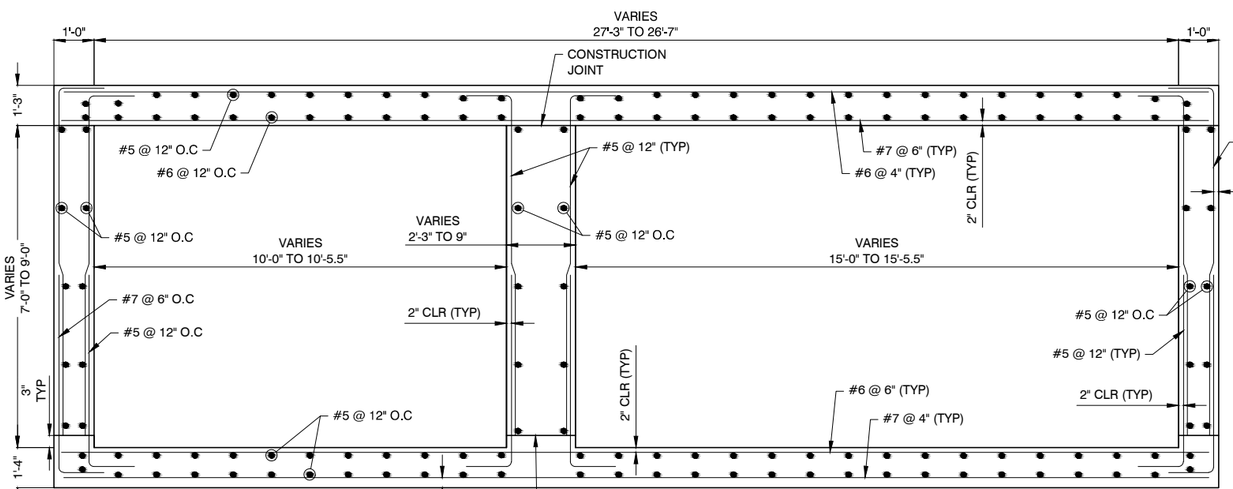
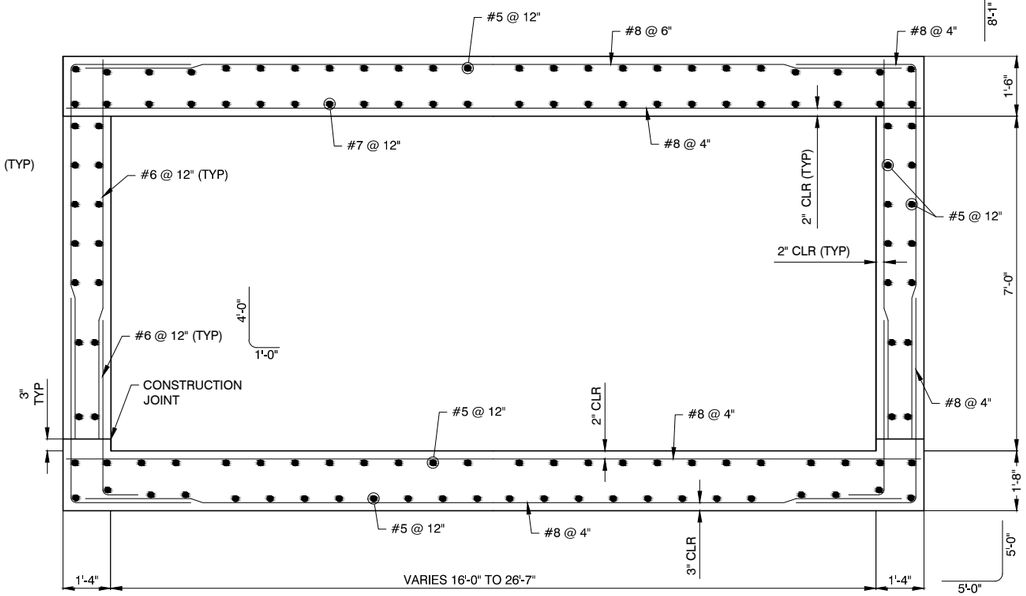



## SECTION A-A
(0'-10' DESIGN COVER)
NTS




## SECTION B-B
(0'-10' DESIGN COVER)
NTS

1 LBDT-05 TRANSITION STRUCTURE AT "SD" 81+80.60
NTS

REVISIONS

| NO. | DATE |
|---|---|

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CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-05
36 OF 59
DRAWING NO.
731-96

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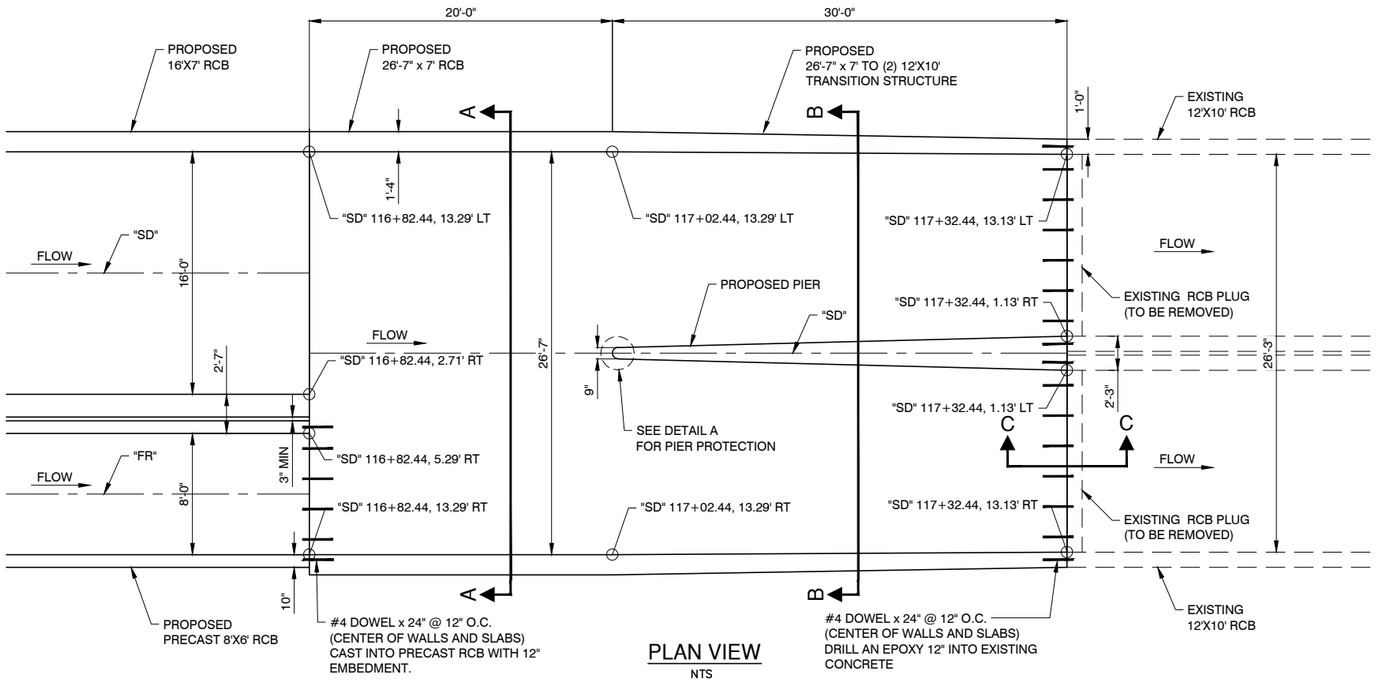
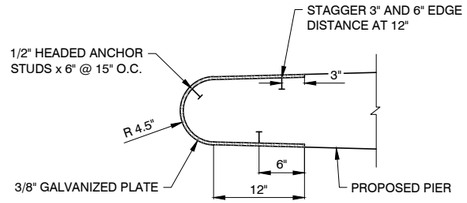
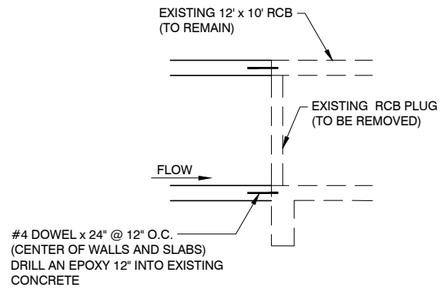


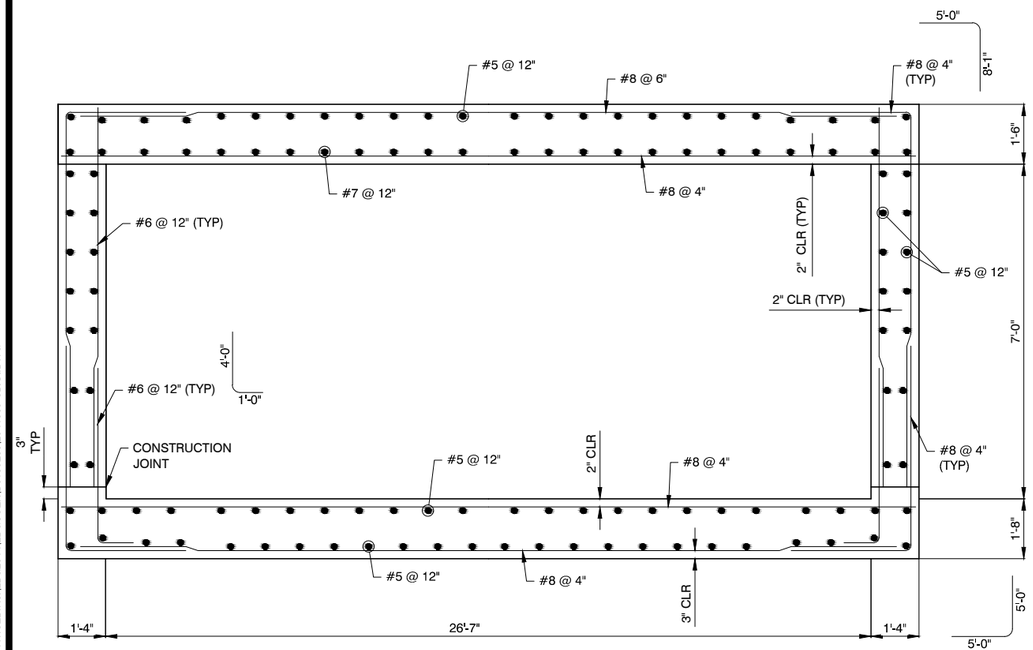

PLAN VIEW
NTS



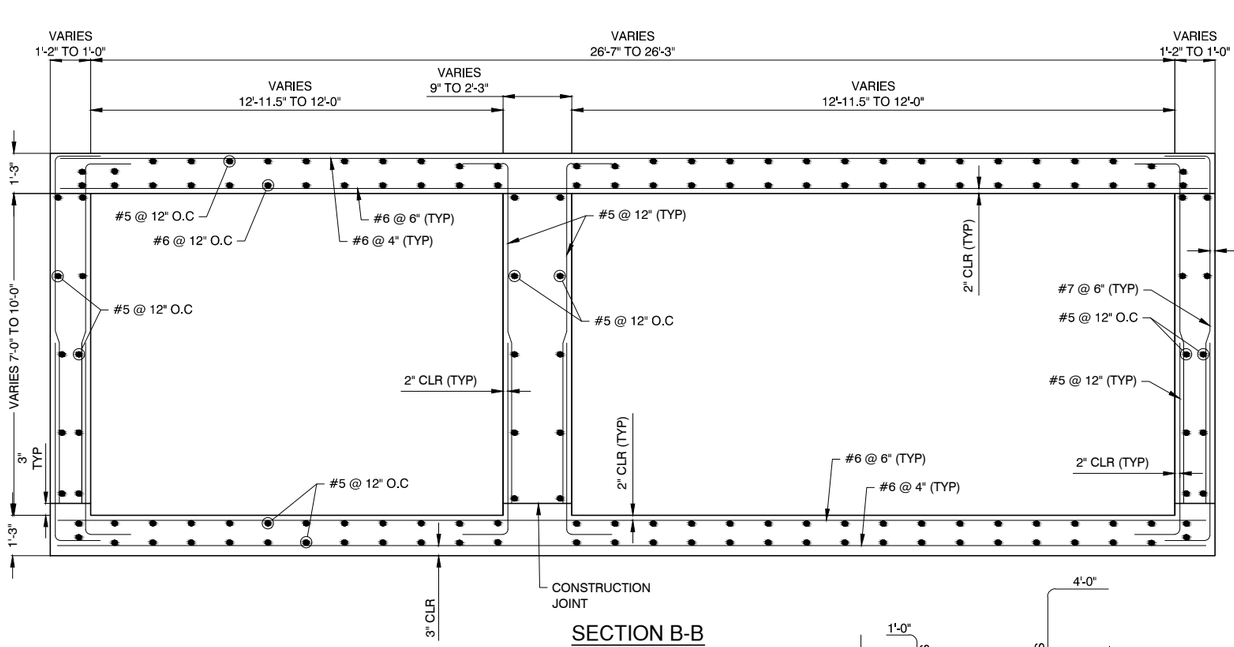

DETAIL A
NTS



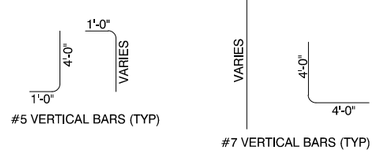

SECTION C-C
NTS




SECTION A-A
(0'-10' DESIGN COVER)
NTS




SECTION B-B
(0'-10' DESIGN COVER)
NTS




1 LBDT-06 TRANSITION STRUCTURE AT "SD" 116+82.44
NTS

| NO. | DATE | REVISIONS |
|---|---|---|
| | | |

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H# 60223

BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-06
37 OF 59
DRAWING NO.
731-96

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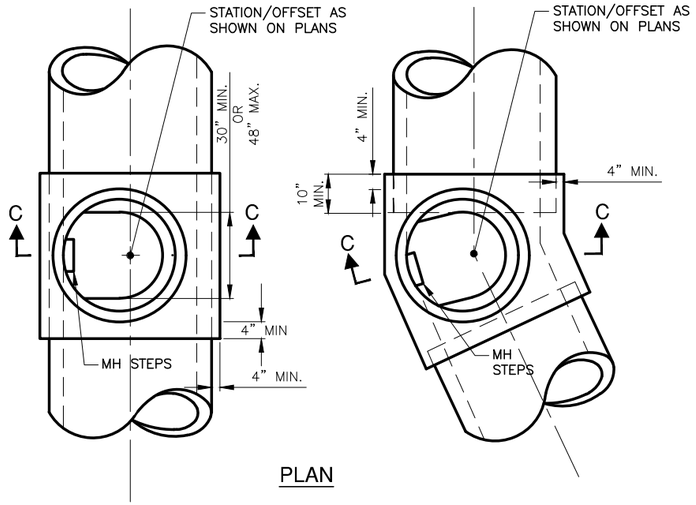
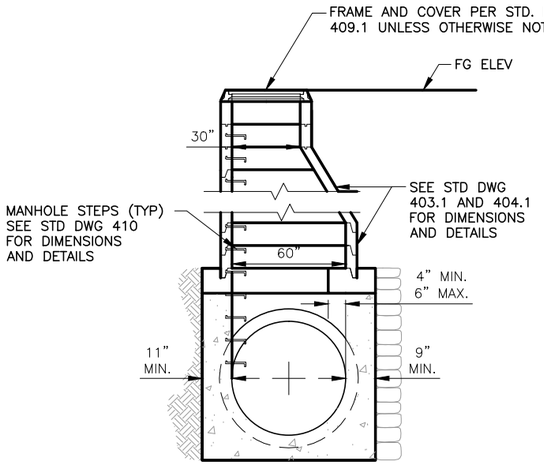



PLAN

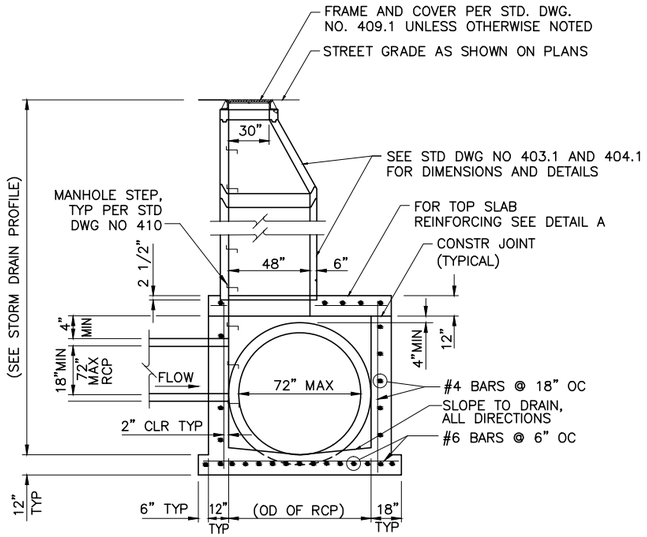



SECTION C-C
TANGENT AND ANGLE POINT

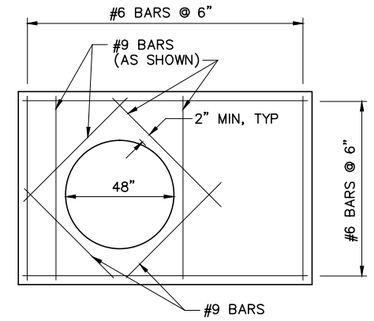
NOTES:

1. SEE STD DWG NO 406.1 FOR ADDITIONAL DETAILS NOT SHOWN.
2. MANHOLE STEPS SHALL BE SPACED FROM 12" TO 16". VERTICAL DISTANCE BETWEEN THE TOP OF MANHOLE AND FIRST STEP SHALL BE A MAXIMUM OF 16". VERTICAL DISTANCE BETWEEN THE RCP CENTERLINE AND LAST STEP SHALL BE A MAXIMUM OF 16".

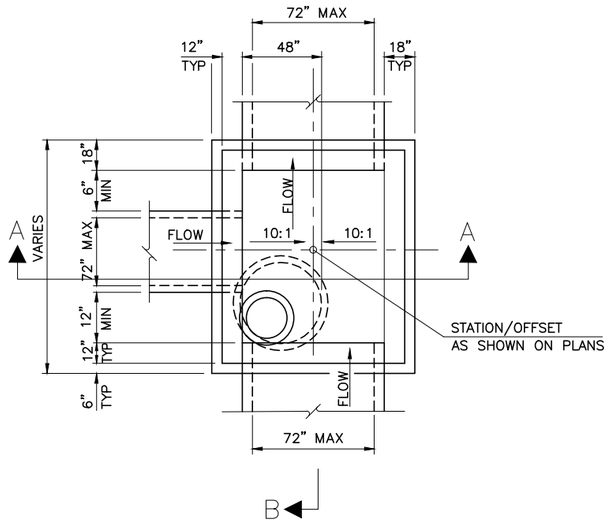
1 LBDT-07 60-INCH TYPE III MANHOLE
NTS



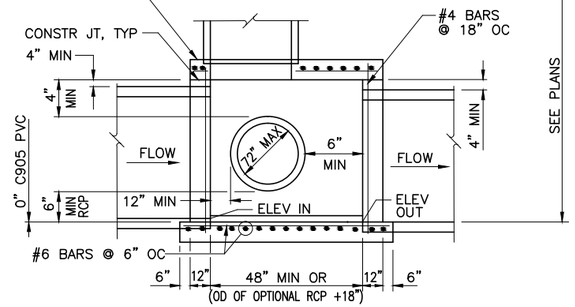

SECTION A-A
NTS




DETAIL A
NTS
(TOP SLAB REINFORCING)




PLAN VIEW




SECTION B-B
NTS

NOTES:

1. SHAPE FLOW LINE IN MANHOLE TO OUTLET PIPE AND PROVIDE A MINIMUM 10H:1V SLOPE IN ALL DIRECTIONS TOWARDS FLOW LINE.
2. USE FLAT SLAB PER CCAUSD NO. 404.1 WHERE REQUIRED FOR LOW COVER SITUATIONS.

1 LBDT-07 NDOT TYPE 4 MANHOLE
NTS

| NO. | DATE | REVISIONS |
|---|---|---|

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CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN
DATE: 3/30/2017 | DRAWN BY: FME
SUBMITTAL STAGE: 100% PRE-FINAL | CHECKED BY: JSD

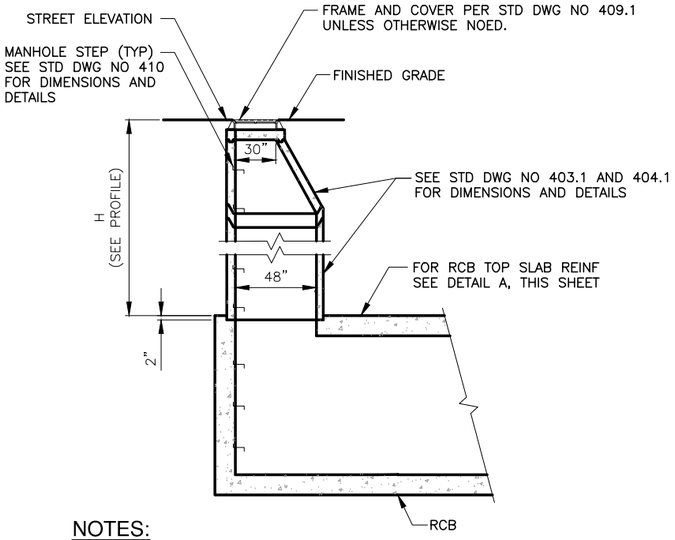
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-07
38 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN\LBG2014\LBGUSER\D01802662041569.SDXX.DWG

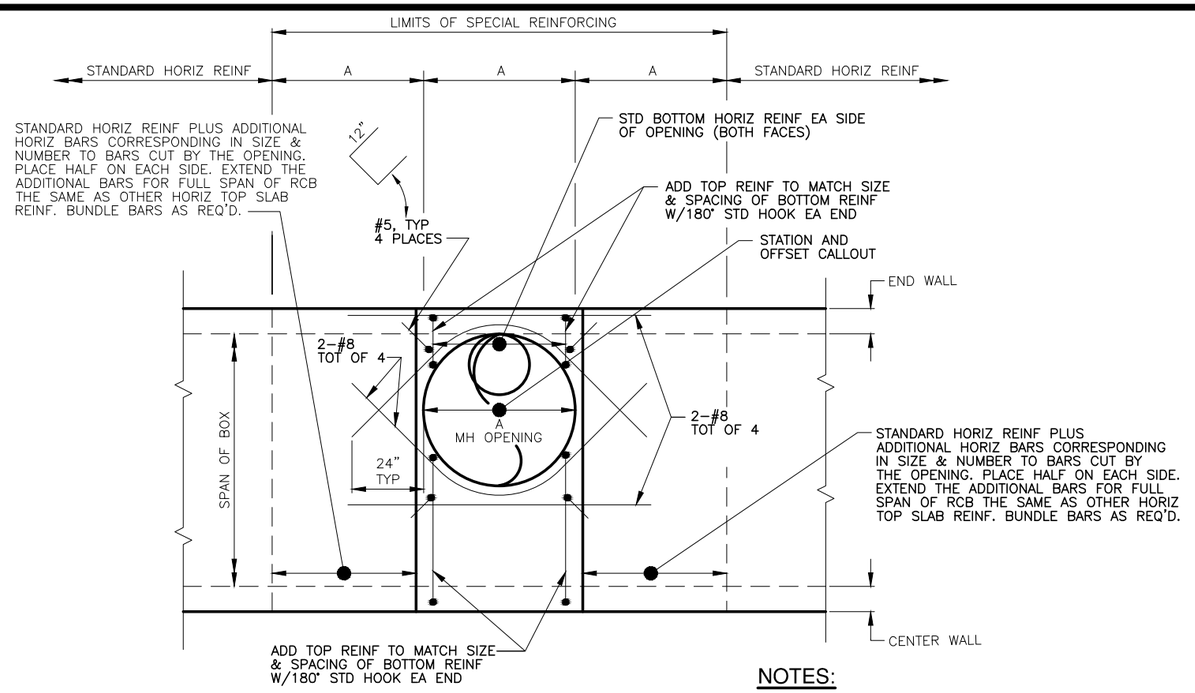



NOTES:

1. USE LOW COVER SITUATION STD DWG NO 404.1 WHERE TAPERED SECTION WILL NOT FIT.
2. STEPS SHALL BE EVENLY SPACED FROM 12" TO 16". VERTICAL DISTANCE BETWEEN THE TOP OF MANHOLE AND FIRST STEP SHALL BE A MAXIMUM OF 16". VERTICAL DISTANCE BETWEEN THE INVERT OF MANHOLE AND LAST STEP SHALL BE A MAXIMUM OF 16"

ELEVATION

1 RCB MANHOLE
LBDT-08 NTS



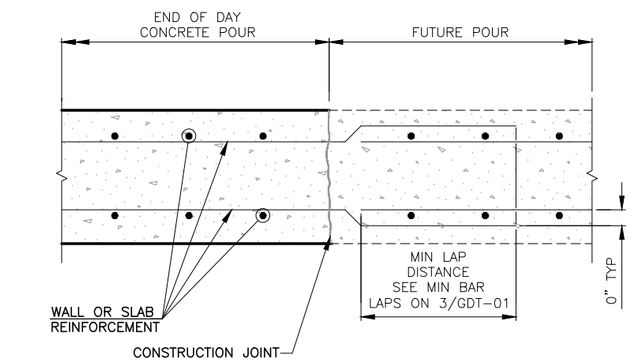

DETAIL A

RCB MANHOLE - TOP SLAB REINFORCING

MAX SIZE OF OPENING "A" = 4'-0"

NOTES:

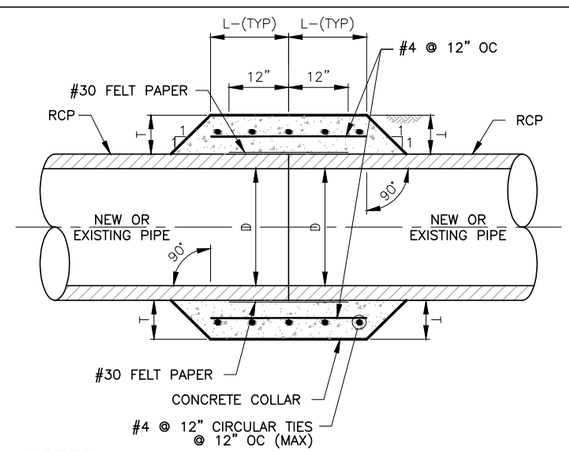
1. ALL REINFORCING TO CLEAR OPENING BY 2" MINIMUM.




NOTES:

1. SEE RCB DETAIL FOR ADDITIONAL REINFORCING AND DIMENSIONS NOT SHOWN.
2. STAGGER ALL SPLICES SO THAT NO MORE THAN 50% OF BARS ARE SPLICED ON ANY PLANE.
3. NO LONGITUDINAL CONSTRUCTION JOINTS MAY BE USED UNLESS SHOWN ON THE PLANS.

2 CONSTRUCTION JOINT AT END OF DAY POUR
LBDT-08 NTS




TABLE

| D (IN) | L (FT) | T (IN) |
|---|---|---|
| < 24 | 1.0 | 6 |
| 24-60 | 1.75 | 12 |

NOTES:

1. FIELD CLOSURES OF PIPE OF THE SAME DIAMETER AND WITHOUT CHANGE IN GRADE OR ALIGNMENT SHALL BE MADE WITH A CONCRETE COLLAR.
2. BACKFILL MATERIAL ALL AROUND COLLAR FOR A DISTANCE OF 12" MIN TO 90% OF MAX DRY DENSITY.
3. TROWEL INVERT TO A SMOOTH FINISH BETWEEN PIPES.
4. OMIT REINFORCING ON PIPE 24" IN DIAMETER OR LESS.
5. USE #30 FELT PAPER TO PREVENT CONCRETE FROM SEEPING INTO JOINT.

3 CONCRETE COLLAR
LBDT-08 NTS

| NO. | DATE | REVISIONS |
|---|---|---|

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CITY OF LAS VEGAS
H# 60223
BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

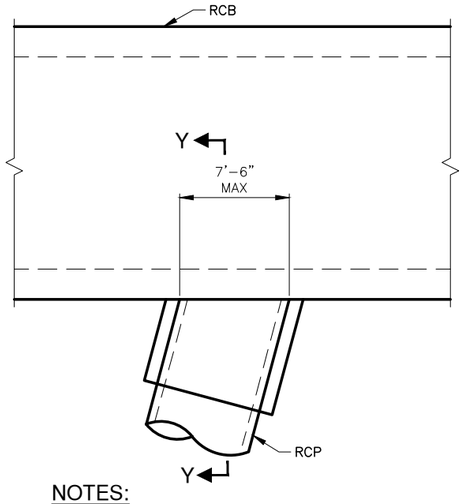
TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE
TYPICAL DETAILS

SHEET

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-08
39 OF 59
DRAWING NO.
731-96

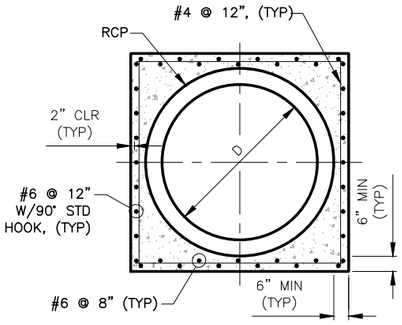
4/25/2017 C:\PROJECTWISEBIN8\LBG2014\LBGUSER\D0180266\2041569-SDXX.DWG



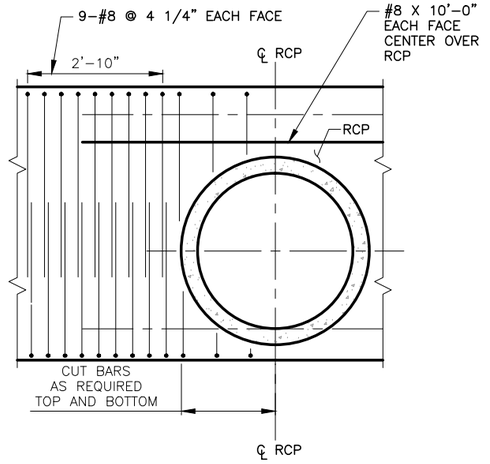

NOTES:

1. WALL & SLAB REINFORCEMENT OF RCB AND RCP NOT SHOWN FOR CLARITY.
2. OUTER RCP SURFACE TO BE ROUGHENED ALONG LENGTH OF COLLAR.

PLAN VIEW
NTS




SECTION X-X
NTS

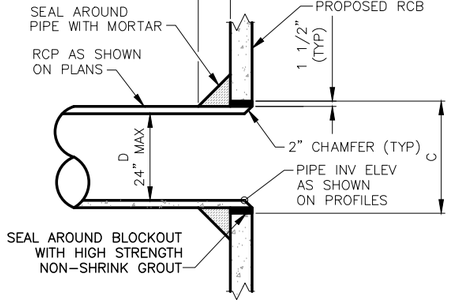



NOTES:

1. RCP COLLAR NOT SHOWN

   HORIZONTAL BARS NOT SHOWN. CUT AS REQUIRED
2. TO CLEAR RCP.

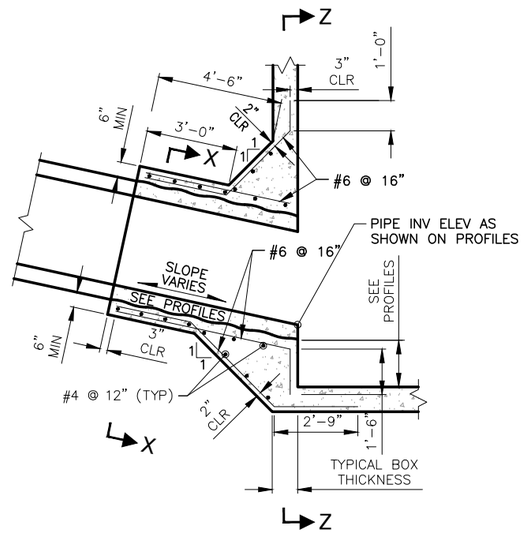
SECTION Z-Z
NTS




NOTES:

1. DIMENSION C = PIPE O.D. + 3" FOR PERPENDICULAR PIPE CONNECTION. ADJUST BLOCKOUT DIMENSION TO ACCOUNT FOR PIPE SKEW.
2. FORM PIPE BLOCKOUT AS PART OF WALL.
3. SEE RCB PROFILE FOR CONNECTION LOCATIONS.
4. ADD REINFORCEMENT BARS EQUIVALENT TO BARS CUT BY OPENING, VERTICAL BARS SHALL EXTEND FULL HEIGHT OF WALL. HORIZONTAL BARS SHALL EXTEND 24" PAST THE OPENING. SEE NOTE 5 FOR BAR SPACING.
5. ADD ADDITIONAL VERTICAL WALL REINFORCEMENT AT 3" OC EACH SIDE OF RCP OPENING IN ADDITION TO TYPICAL VERTICAL REINFORCEMENT.

METHOD A, D ≤ 24"




METHOD B, D > 24"

SECTION Y-Y
NTS

1 LBDT-09 RCP/RCB CONNECTION NTS

| NO. | DATE | REVISIONS |
|---|---|---|

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H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD

DATE: 3/30/2017

SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL SUBMITTAL
4/24/2017
NOT FOR CONSTRUCTION

SHEET
LBDT-09
40 OF 59
DRAWING NO.
731-96

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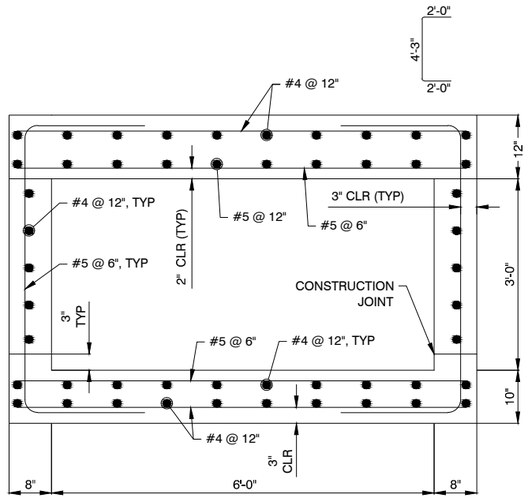
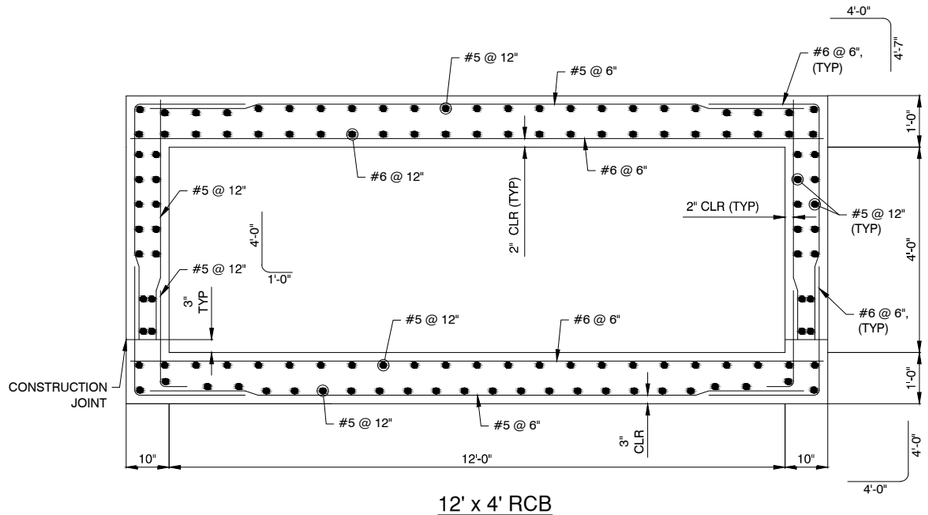
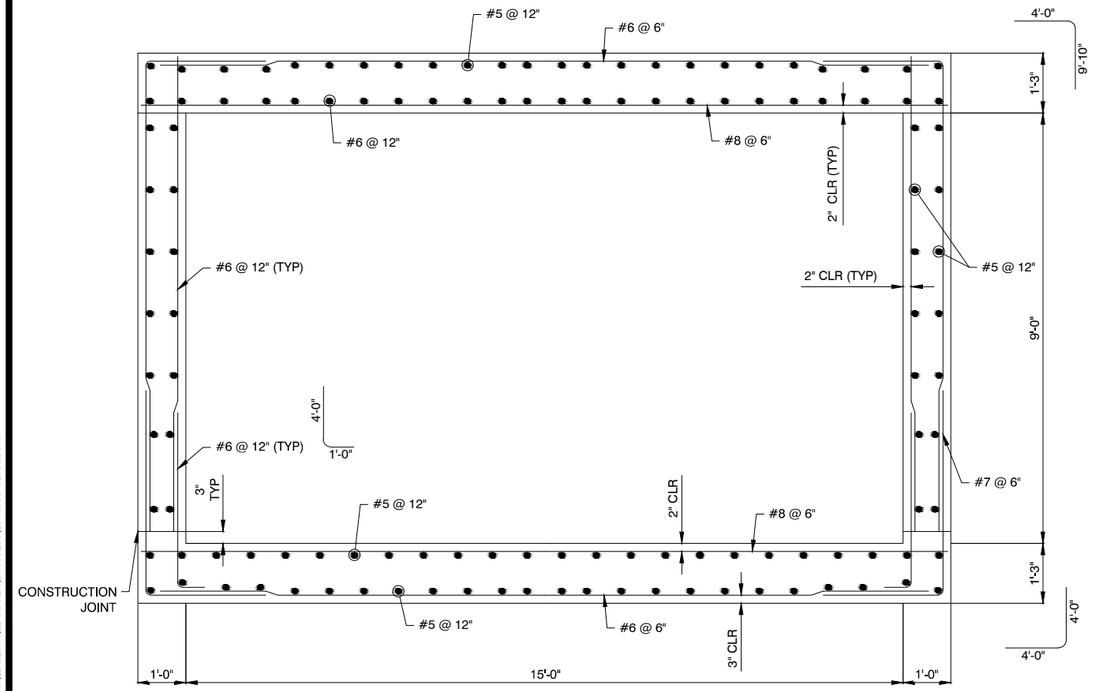


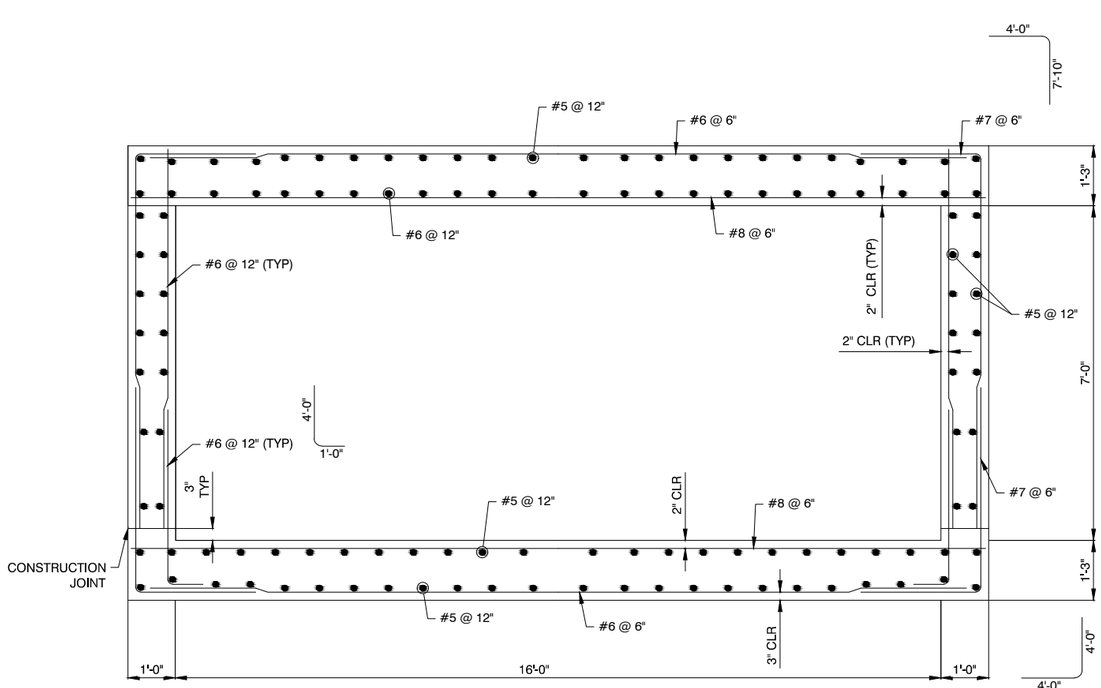

6' x 3' RCB
(0'-10' DESIGN COVER)
NTS




12' x 4' RCB
(0'-10' DESIGN COVER)
NTS




15' x 9' RCB
(0'-10' DESIGN COVER)
NTS




16' x 7' RCB
(0'-10' DESIGN COVER)
NTS

1 LBDT-10 RCB CULVERT
NTS

NOTES:

1. SEE SHEET LBDT-01 FOR GENERAL STRUCTURAL NOTES.
2. SEE SHEET LBDT-08 FOR CONSTRUCTION JOINT DETAILS.
3. SEE SHEET LBDT-12 FOR PRECAST/CAST-IN-PLACE TRANSITION DETAILS.

| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED BY

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CITY OF LAS VEGAS

H# 60223 | BID# XX.XXXXX
DATE: 3/30/2017 | DESIGNED BY: LDN
SUBMITTAL STAGE: 100% PRE-FINAL | DRAWN BY: FME
CHECKED BY: JSD

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBDT-10
41 OF 59
DRAWING NO.
731-96

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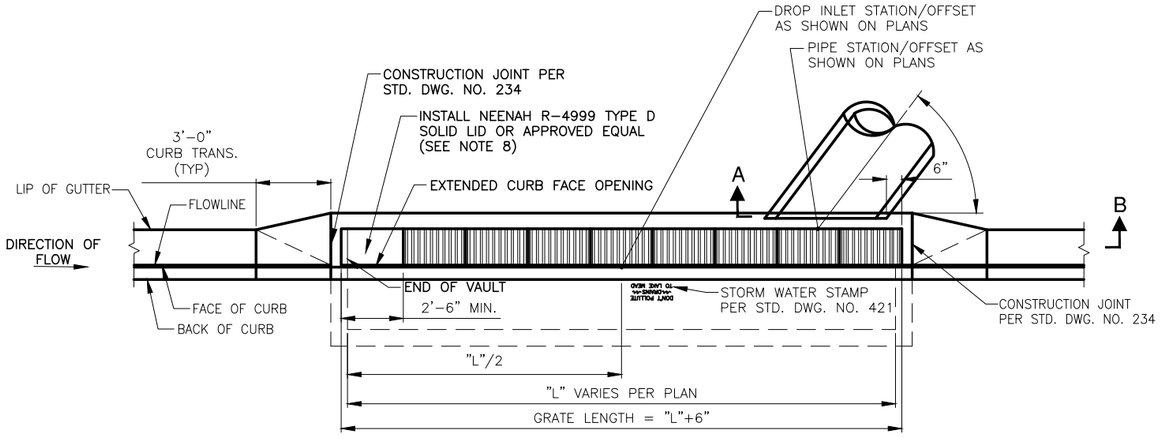
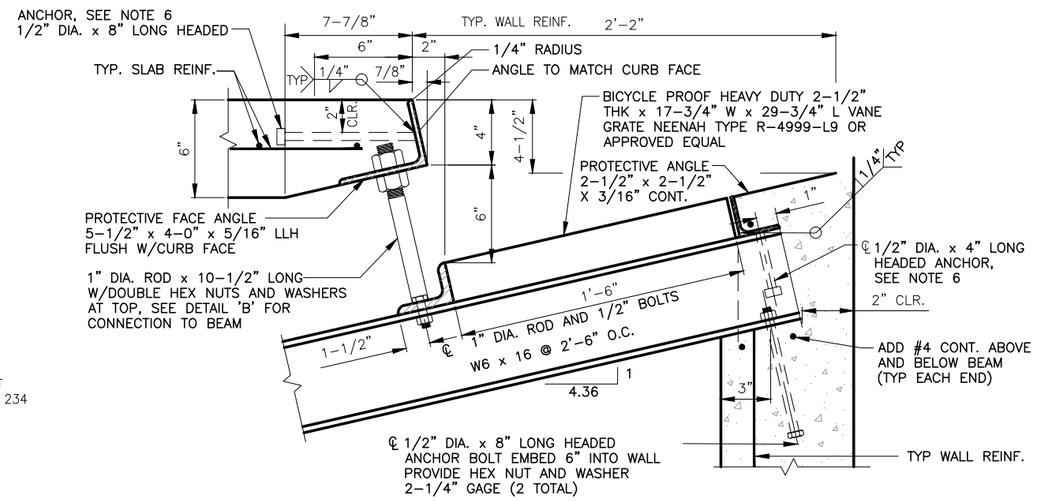
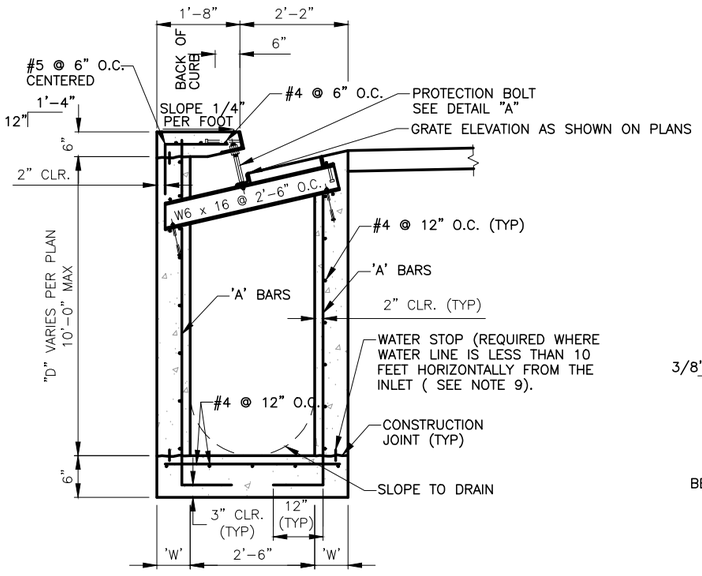



DROP INLET LAYOUT PLAN

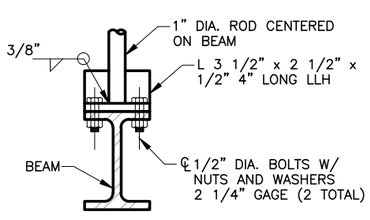



PROTECTIVE FACE & ROD - DETAIL "A"

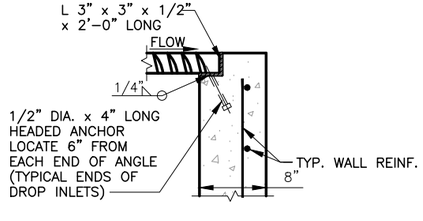



TYPE "DM" DROP INLET SECTION

| D (MAX) | DIM. 'W' | (A) BARS |
|---|---|---|
| 4'-0" | 6" | #4 @ 12" O.C. |
| 6'-0" | 6" | #4 @ 12" O.C. |
| 8'-0" | 8" | #5 @ 12" O.C. |
| 10'-0" | 8" | #5 @ 6" O.C. |




DETAIL "B"




SECTION "B"

1 LBDT-11 TYPE "DM" MODIFIED DROP INLET
NTS




SECTION "A"

## NOTES:

1. ALL EXPOSED METALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
2. PROVIDE 1/2" (MIN.) CLEARANCE ALL AROUND THE STEEL BEAM, DRY PACK AFTER INSTALLATION.
3. WHEN REQUIRED BY LENGTH OF OPENING, PLATE ANGLE MAY BE DELIVERED IN SECTIONS AND BUTT WELDED IN PLACE.
4. ALL GALVANIZED DAMAGED BY WELDING SHALL RECEIVE TWO COATS OF GALVALLOY OR EQUAL.
5. CONCRETE SHALL BE MODIFIED CLASS DA 4000 PSI, SEE SPECIAL PROVISIONS SECTION 501.
6. ANGLE ANCHORS SHALL BE EMBEDDED MIDPOINT IN EACH ENDWALL AND EVENLY SPACED, (MAXIMUM SPACING OF 2").
7. THE MAXIMUM ALLOWABLE SPACING BETWEEN GRATES SHALL BE 1/2".
8. IF L ≤ 5' THEN SUBSTITUTE VANE TYPE GRATE FOR SOLID GRATE.
9. BASE WALLS AND TOP SLAB SHALL BE CONSTRUCTED WITH MECHANICAL WATER STOPS, CENTER BULB OR FLAT STRIP (VINYLEX, GREESTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

| NO. | DATE | REVISIONS |
|---|---|---|

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H# 60223

DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD

DATE: 3/30/2017
SUBMITTAL STAGE:
100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBDT-11
42 OF 59
DRAWING NO.
731-96

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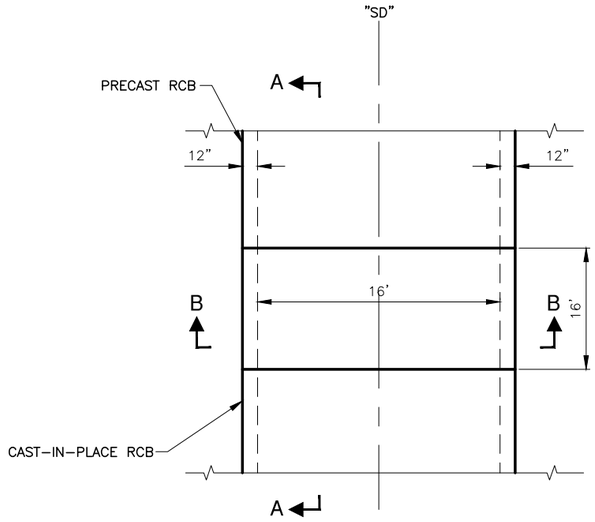
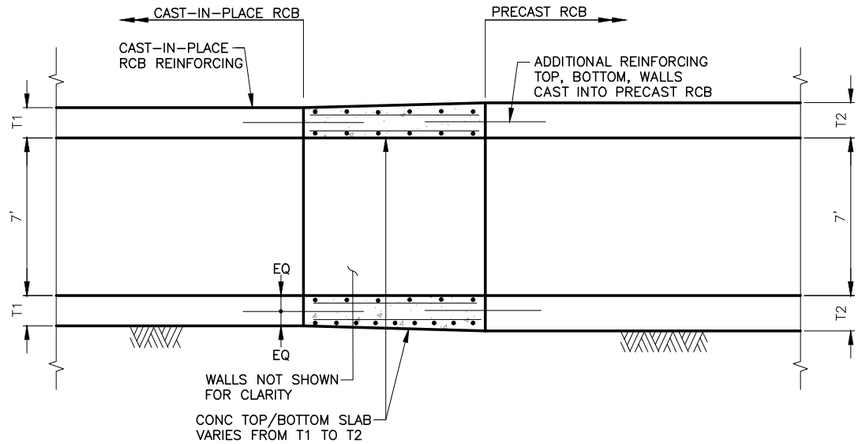
## NOTES:

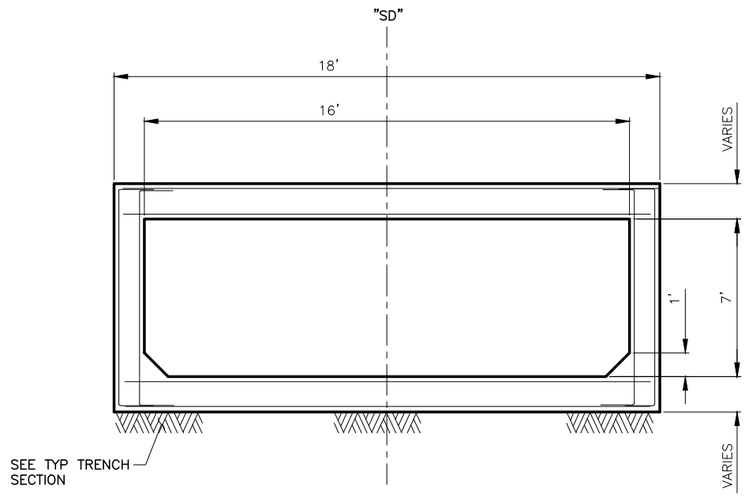
1. SEE SHEETS LBDT–06 OR LBDT–10 FOR ADDITIONAL RCB REINFORCING AND DETAILS NOT SHOWN.
2. PRECAST PRE–ENGINEERED RCB MANUFACTURER/SUPPLIER SHALL PROVIDE STRUCTURAL DESIGN CALCULATIONS AND SHOP DRAWINGS WET STAMPED BY A LICENSED CIVIL ENGINEER IN THE STATE OF NEVADA FOR ENGINEERS REVIEW AND APPROVAL
3. TRANSITION SHALL NOT BE CONSTRUCTED WITHIN 10' EITHER SIDE OF A RCP/RCB CONNECTION, OR RCB MANHOLE.




PLAN VIEW




SECTION A-A




SECTION B-B

1 LBDT-12 PRECAST/CAST-IN-PLACE TRANSITION
NTS


PREPARED BY
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| NO. | DATE | REVISIONS |
|---|---|---|

PREPARED FOR
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H# 60223
BID# XX.XXXX
DESIGNED BY: LDN
DRAWN BY: FME
CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE
SHEET
TYPICAL DETAILS

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBDT-12
43 OF 59
DRAWING NO.
731-96

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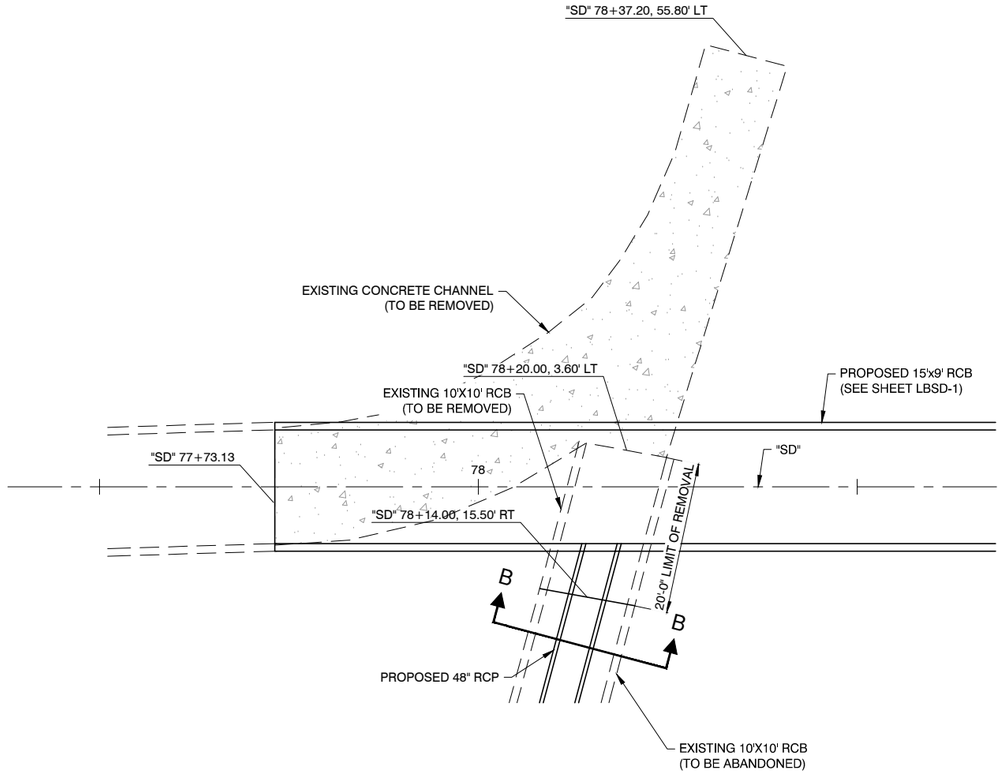
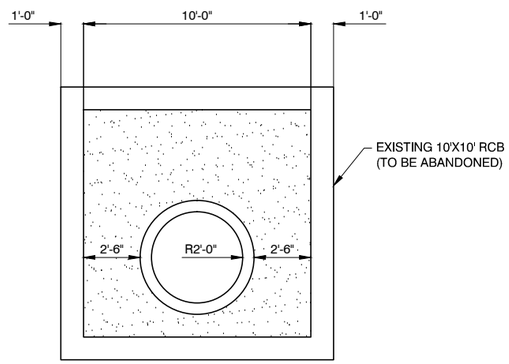
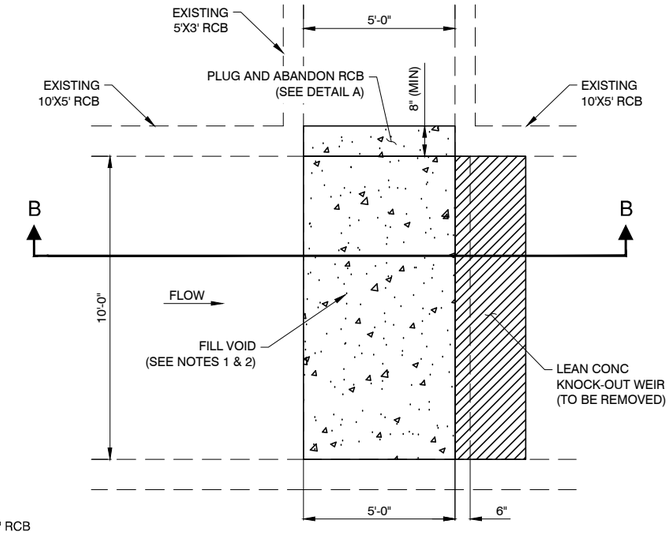
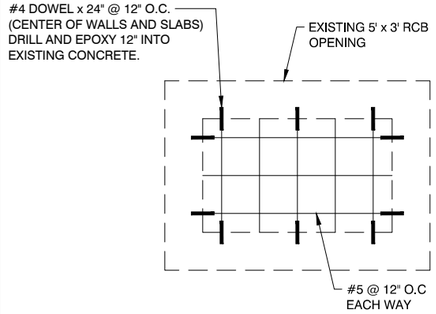


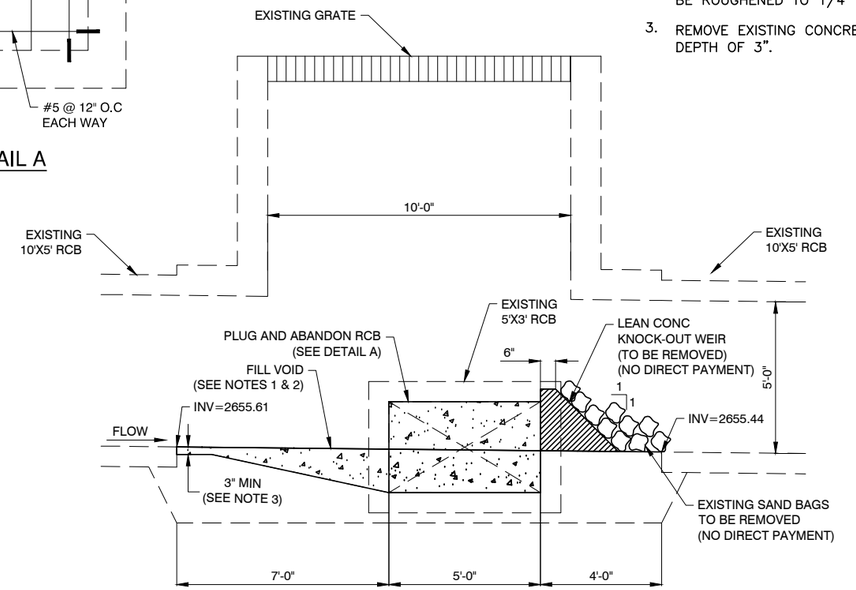

SECTION B-B

1 CHANNEL REMOVAL
LBDT-13 NTS




DETAIL A




SECTION B-B

2 WEIR REMOVAL
LBDT-13 NTS

## NOTES:

1. VOID SHALL BE FILLED WITH CLASS A CONCRETE, MODIFIED (MINOR).
2. EXISTING CONCRETE SURFACE SHALL BE ROUGHENED TO 1/4" AMPLITUDE.
3. REMOVE EXISTING CONCRETE TO A DEPTH OF 3".

| NO. | DATE | REVISIONS |
|---|---|---|

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H# 60223 | BID# XX.XXXX | DESIGNED BY: LDN | DRAWN BY: FME | CHECKED BY: JSD
DATE: 3/30/2017
SUBMITTAL STAGE: 100% PRE-FINAL

TITLE
CENTENNIAL PARKWAY CHANNEL WEST
DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

100% PRE-FINAL
SUBMITTAL
4/24/2017
NOT FOR
CONSTRUCTION

SHEET
LBDT-13
44 OF 59
DRAWING NO.
731-96

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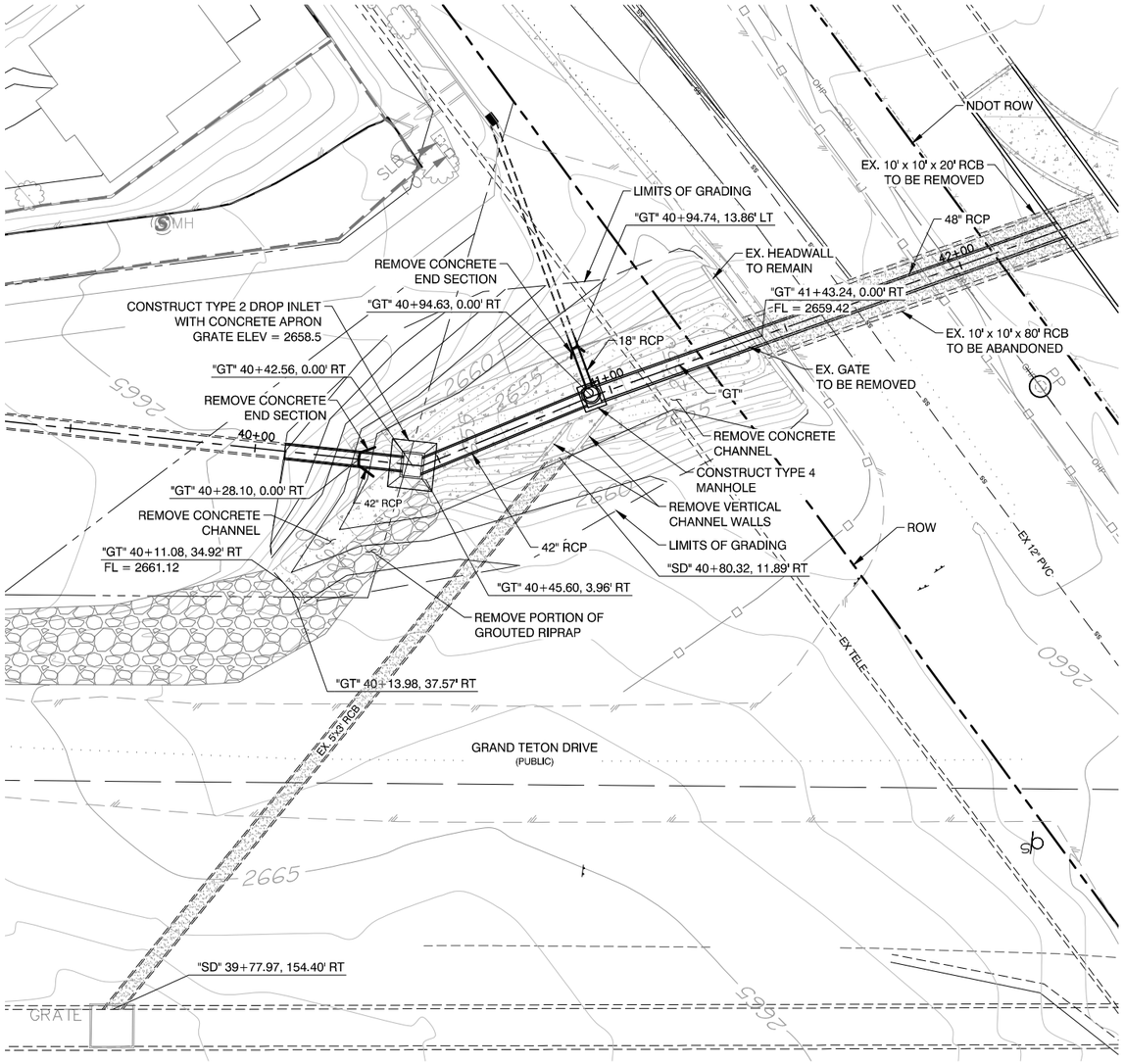


1 GDT-XX "GT" CHANNEL REMOVAL AND GRADING
SCALE: 1" = 20'

N

20 10 0 20 HORZ.
0 VERT.
GRAPHIC SCALE

| NO. | DATE | REVISIONS |
|---|---|---|

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DESIGNED BY: LDN
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DURANGO DRIVE TO GRAND TETON DRIVE

SHEET
TYPICAL DETAILS

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SUBMITTAL
4/24/2017
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CONSTRUCTION

SHEET
LBDT-14
45 OF 59
DRAWING NO.
731-96

4/25/2017 C:\PROJECTWISEBIN8\\LBG2014\LBGUSER\D0180266\20415699-SDXX2.DWG

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS1 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **NOTE: ALL LOCATIONS ARE APPROXIMATE AND MAY BE ADJUSTED BY THE ENGINEER** | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE CONCRETE CHANNEL | LBSD 1.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-13). | "SD" 77+73.13 TO |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 78+27.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 15' x 9' X 226.87' RCB. | LBSD 1.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-10 ). | "SD" 77+73.13 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 80+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 5.50' RT | LBSD 1.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2658.87', H = 2.16'). | "SD" 79+30.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE CONCRETE CHANNEL | LBSD 2.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-05). | "SD" 81+80.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 82+25.02 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 15' x 9' x 180.60' RCB. | LBSD 2.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-05 AND LBDT-10). | "SD" 80+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 81+80.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT TRANSITION STRUCTURE WITH PIER | LBSD 2.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-05). | "SD" 81+80.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 82+10.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT TRANSITION STRUCTURE | LBSD 2.12 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-05) | "SD" 82+10.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 82+90.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 16' x 7' x 509.40' RCB | LBSD 2.13 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-10) | "SD" 82+90.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 88+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 5.00' LT | LBSD 2.14 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2656.96', H = 1.16'). | "SD" 81+60.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 2.15 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2646.62', H = 1.75'). | "SD" 85+25.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| STATE | PROJECT NO. | COUNTY | SHEET NO. |
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| NEVADA | | | LBS2 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| DESCRIPTION | STATION TO STATION | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 |
| | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT |
| CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 26.43' LT | LBSD 2.20 | | | | | | | 349 | | | | | | | | | | | 16 | | 67 | | | 2.92 | 0.00 | | 12.3 | 17.0 | | | | | | | | | | | | |
| (GRATE ELEV= 2652.37', INV ELEV= 2648.20', H = 4.17'). | "SD" 82+52.94 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSTALL 24" X 16' RCP FROM "SD" 82+52.94, 26.43' LT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (UIE= 2648.20') TO "SD" 82+52.95, 10.45' LT (LIE= 2647.90'). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT 24" RCP CONNECTION, 10.45' LT. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBLP-03 AND LBDT-09). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT | LBSD 2.21 | | | | | | | 349 | | | | | | | | | | | 32 | | 70 | | | 2.99 | | | 20.7 | 28.4 | | | | | | | | | | | | |
| (GRATE ELEV= 2647.03', INV ELEV= 2642.53', H = 4.50'). | "SD" 85+41.09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSTALL 24" X 32' RCP FROM "SD" 85+41.09, 39.40' LT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (UIE= 2642.53') TO "SD" 85+41.09, 8.00' LT (LIE= 2639.87'). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBLP-03 AND LBDT-09). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT | LBSD 2.22 | | | | | | | 349 | | | | | | | | | | | 32 | | 70 | | | 2.99 | | | 20.7 | 28.4 | | | | | | | | | | | | |
| (GRATE ELEV= 2641.96', INV ELEV= 2637.46', H = 4.50'). | "SD" 87+53.40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSTALL 24" X 32' RCP FROM "SD" 87+53.40, 39.40' LT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (UIE= 2637.46') TO "SD" 87+53.40, 8.00' LT (LIE= 2634.85'). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBLP-03 AND LBDT-09). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REMOVE HEADWALL | LBSD 3.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | |
| | "SD" 92+30.80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT 16' x 7' x 800' RCB. | LBSD 3.10 | | | | | | | | | | | | | | | | | | | | 497600 | | | | 1748.20 | 859.3 | 1376.0 | 8396.5 | | | | | | | | | | | | |
| (SEE SHEET LBDT-10). | "SD" 88+00.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | "SD" 96+00.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 3.11 | | | | | | | | 270 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (COVER ELEV= 2639.88', H = 2.75'). | "SD" 88+75.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBDT-08). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 3.12 | | | | | | | | 270 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (COVER ELEV= 2635.19', H = 3.16'). | "SD" 92+25.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBDT-08). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSTALL 36" X 24' RCP FROM "SD" 92+16.31, 25.00' RT | LBSD 3.20 | | | | | | | | | | | | | | | | | 24 | | | | | | | | | 17.5 | 26.9 | | | | | | | | | | | | |
| CONSTRUCT 36" RCP CONNECTION, 8.00' RT. | "SD" 92+16.31 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INSTALL 36" X 26' RCP FROM "SD" 92+28.88, 26.09' RT | LBSD 3.21 | | | | | | | | | | | | | | | | | 26 | | | | | | | | | 15.4 | 25.6 | | | | | | | | | | | | |
| (UIE= 2630.76') TO "SD" 92+46.54, 8.00' RT (LIE= 2626.55'). | "SD" 92+28.88 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSTRUCT 36" RCP CONNECTION, 8.00' RT. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| STATE | PROJECT NO. | COUNTY | SHEET NO. |
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| NEVADA | | | LBS3 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | 349 | | | | | | | | | | | 32 | | 67 | | | 2.94 | | | 20.4 | 28.0 | | | | | | | | | | | | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 39.40' LT | LBSD 3.22 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2632.26', INV ELEV= 2628.03', H = 4.23'). | "SD" 92+33.31 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 32' RCP FROM "SD" 92+33.31, 39.40' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2628.03') TO "SD" 92+33.31, 8.00' LT (LIE= 2627.42'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBLP-03 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE HEADWALL | LBSD 4.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 97+29.54 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 16' x 7' x 800' RCB. | LBSD 4.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-10). | "SD" 96+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 104+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 4.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2630.04', H = 2.41'). | "SD" 96+25.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 4.12 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2628.21', H = 5.16'). | "SD" 99+75.00 TO |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 4.13 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2624.35', H = 5.83'). | "SD" 103+25.00 TO |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT TYPE 1 MANHOLE MODIFIED , 21.46' RT | LBSD 4.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (RIM ELEV= 2630.58', INV ELEV= 2625.81', H = 4.77'). | "SD" 97+24.91 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 14' RCP FROM "SD" 97+24.91, 21.46' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2625.81') TO "SD" 97+24.91, 8.00' RT (LIE= 2622.07'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' RT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBLP-04, LBDT-08 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT TYPE 1 MANHOLE MODIFIED , 21.49' RT | LBSD 4.21 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (RIM ELEV= 2630.43', INV ELEV= 2625.16', H = 5.27'). | "SD" 97+34.39 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 14' RCP FROM "SD" 97+34.39, 21.49' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2625.16') TO "SD" 97+34.39, 8.00' RT (LIE= 2621.70'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' RT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-04, LBDT-08 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 21.24' LT | LBSD 4.22 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2626.84', INV ELEV= 2651.52', H = -24.'). | "SD" 99+83.77 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 14' RCP FROM "SD" 99+83.77, 21.24' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2651.52') TO "SD" 99+83.77, 8.00' LT (LIE= 2618.46'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBLP-03 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS4 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS5 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 62200 | | | | 218.60 | 107.5 | 172.0 | 676.8 | | | | | | | | 1 | | | | | REMOVE END SECTION | LBSD 6.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBRC-04). | "SD" 114+37.01 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 62200 | | | | 218.60 | 107.5 | 172.0 | 676.8 | | | | | | | | | | | | | CONSTRUCT 16' x 7' x 100' RCB. | LBSD 6.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-10 AND LBDT-12). | "SD" 112+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 113+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 175 | | | | | 188 | 301.0 | 1916.8 | 107 | | | | | | | | | | | | | INSTALL PRECAST 16' x 7' x 175' RCB. | LBSD 6.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 113+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 114+75.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 129097 | | | | 835.80 | 222.9 | 356.8 | 1836.3 | | | | | | | | | | | | | CONSTRUCT 16' x 7' x 207.46' RCB. | LBSD 6.12 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-10 AND LBDT-12). | "SD" 114+75.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 116+82.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT PRECAST 8' x 6' 282.44' RCB. | LBSD 6.13 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 14+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 16+82.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 29755 | | | | 65.10 | 25.6 | 43.7 | 263.1 | | | | | | | | | | | | | CONSTRUCT 26.58' x 7' x 20' RCB. | LBSD 6.14 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-06. | "SD" 116+82.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 117+02.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 27754 | | | | 122.10 | 42 | 75.1 | 601.8 | | | | | | | | | | | | 2 | CONSTRUCT TRANSITION STRUCTURE WITH PIER | LBSD 6.15 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-06). | "SD" 117+02.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 117+32.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 270 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 2.00' RT | LBSD 6.16 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2603.42', H = 4.00'). | "FR" 14+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 270 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 6.00' LT | LBSD 6.17 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2602.70', H = 2.16'). | "SD" 115+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 270 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 11.29' LT | LBSD 6.18 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2600.84', H = 2.91'). | "SD" 116+92.45 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS6 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | 349 | | | | | | | | | | | 47 | | 61 | | | 2.83 | | | 24.1 | 34.3 | | | | | | | | | | | | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 54.70' LT | LBSD 6.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2602.39', INV ELEV= 2598.64', H = 3.75'). | "SD" 113+29.58 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 47' RCP FROM "SD" 113+29.58, 54.70' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2598.64') TO "SD" 113+29.58, 8.00' LT (LIE= 2597.73'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBLP-01 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 349 | | | | | | | | | | | 41 | | 63 | | | 2.87 | | | 23.1 | 32.2 | | | | | | | | | | | | CONSTRUCT TYPE 2 DROP INLET WITH CONCRETE APRON, 49.00' LT | LBSD 6.21 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2600.36', INV ELEV= 2596.45', H = 3.91'). | "FR" 16+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 41' RCP FROM "FR" 16+50.00, 49.00' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2596.45') TO "SD" 16+50.00, 8.00' LT (LIE= 2595.90'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 24" RCP CONNECTION, 8.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBLP-04 AND LBDT-09). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE FLOW CONTROL WEIR AND ABANDON 5' x 3' x 190' RCB | LBSD 7.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBDT-13 AND LBDT-14) | "GT" 39+75.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "GT" 40+80.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE 42"x 20' RCP | LBSD 7.2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-14) | "GT" 40+08.06 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "GT" 40+28.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE CONCRETE CHANNEL | LBSD 7.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-14) | "GT" 40+11.08 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "GT" 41+43.24 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE END SECTION | LBSD 7.4 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-14) | "GT" 40+28.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE GROUTED RIPRAP | LBSD 7.5 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-14) | "GT" 40+13.98 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "GT" 40+45.60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE END SECTION | LBSD 7.6 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-14) | "GT" 40+94.74 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ABANDON 10' x 10' x 80' RCB | LBSD 7.7 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-13 AND LBDT-14) | "GT" 41+43.24 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 74+14.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE 10' x 10' x 20' RCB | LBSD 7.8 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-13 AND LBDT-14) | "SD" 74+14.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "SD" 78+20.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE METAL GATE | LBSD 7.9 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "GT" 41+35.56 |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS7 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

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| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS8 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS9 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | **DESCRIPTION** | **STATION TO STATION** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | CUYD | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | 1124 | 3270 | | | | | | | | | 33 | | | 378 | | | 8.59 | | | 38.7 | 49.3 | 14 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 22.5') , 29.71' LT | LBSD 8.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2636.88', INV ELEV= 2630.88', H = 6.00'). | "GA" 11+16.98 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 30" X 33' RCP FROM "GA" 11+16.98, 29.71' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.88') TO "GA" 11+40.44 (LIE= 2629.60'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 1124 | 3270 | | | | | | | | | 26 | | | 378 | | | 8.59 | | | 34.5 | 47.0 | 10 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 22.5') , 22.11' RT | LBSD 8.21 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2637.01', INV ELEV= 2631.01', H = 6.00'). | "GA" 11+17.18 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 30" X 26' RCP FROM "GA" 11+17.18, 22.11' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2631.01') TO "GA" 11+40.44 (LIE= 2629.60'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 997 | 2910 | | | | | | | | | 34 | | | 336 | | | 7.02 | | | 31.1 | 35.2 | 13 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 30.02' LT | LBSD 8.22 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2635.42', INV ELEV= 2630.42', H = 5.00'). | "GA" 11+75.29 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 34' RCP FROM "GA" 11+75.29, 30.02' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.42') TO "GA" 12+00.20 (LIE= 2628.21'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 997 | 2910 | | | | | | | | | 28 | | | 336 | | | 7.02 | | | 28.1 | 34.4 | 10 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 23.15' RT | LBSD 8.23 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2635.42', INV ELEV= 2630.42', H = 5.00'). | "GA" 11+75.49 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 24" X 28' RCP FROM "GA" 11+75.49, 23.15' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.42') TO "GA" 12+00.20 (LIE= 2628.21'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 997 | 2910 | | | | | | | | | 34 | | | 336 | | | 6.28 | | | 24.8 | 24.0 | 13 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 30.18' LT | LBSD 8.24 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2634.15', INV ELEV= 2630.15', H = 4.00'). | "GA" 12+24.77 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 18" X 34' RCP FROM "GA" 12+24.77, 30.18' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.15') TO "GA" 12+49.78 (LIE= 2627.02'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 997 | 2910 | | | | | | | | | 32 | | | 336 | | | 6.28 | | | 24.0 | 25.0 | 11 | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 24.08' RT | LBSD 8.25 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2634.23', INV ELEV= 2630.23', H = 4.00'). | "GA" 12+21.19 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 18" X 32' RCP FROM "GA" 12+21.19, 24.08' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.23') TO "GA" 12+49.78 (LIE= 2627.02'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 489 | 1470 | | | | | | | | | | | | 168 | | | 3.53 | | | 6.6 | 10.7 | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 10') , 30.88' LT | LBSD 8.26 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2633.14', INV ELEV= 2629.56', H = 3.58'). | "GA" 12+59.45 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO EXISTING 18" RCP | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS10 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| | | | | | | | | | | | | | DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | | |
| | | | | | | | | | | | | | LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | EACH | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | | | | | | | | | | | | | | 489 | 1470 | | | | | | | | | | | 25 | 168 | | | 3.31 | | | 15.0 | 12.5 | 9 | | | | | | | | | | | | | DESCRIPTION | STATION TO STATION |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | 489 | 1470 | | | | | | | | | | | 25 | 168 | | | 3.31 | | | 15.0 | 12.5 | 9 | | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 10') , 24.38' RT | LBSD 8.27 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2633.46', INV ELEV= 2630.46', H = 3.00'). | "GA" 12+60.23 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 18" X 25' RCP FROM "GA" 12+60.23, 24.38' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2630.46') TO "GA" 12+70.18 (LIE= 2626.21'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONNECT TO TYPE 4 MANHOLE. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-01 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE DROP INLET AND 18" X 37' RCP. | LBSD 9.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE DROP INLET AND 18" X 38' RCP. | LBSD 9.2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 7+72.07 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REMOVE MANHOLE AND 24" X 166' RCP. | LBSD 9.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 7+98.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL PRECAST 8' X 6' X 850' RCB. | LBSD 9.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 5+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "FR" 14+00.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 2.00' RT | LBSD 9.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2624.91', H = 9.55'). | "FR" 6+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT RCB MANHOLE, 2.00' RT | LBSD 9.12 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (COVER ELEV= 2617.08', H = 11.37'). | "FR" 10+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-08). |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 43.21' LT | LBSD 9.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2627.23', INV ELEV= 2618.23', H = 9.00'). | "FR" 5+74.09 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 36" X 43' RCP FROM "FR" 5+74.09, 43.21' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2618.23') TO "FR" 6+01.36, 4.00' LT (LIE= 2612.14'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 36" RCP CONNECTION, 4.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-02, LBDT-09 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 22.88' RT | LBSD 9.21 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2623.54', INV ELEV= 2613.78', H = 9.76'). | "FR" 6+85.46 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 36" X 27' RCP FROM "FR" 6+85.46, 22.88' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2613.78') TO "FR" 7+09.65, 4.00' RT (LIE= 2608.28'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 36" RCP CONNECTION, 4.00' RT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-02, LBDT-09 AND LBDT-11). | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS11 |

# HYDRAULIC STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| 637 0190 | 637 0130 | 628 0120 | 610 0460 | 610 0170 | 609 1410 | 609 1040 | 609 1030 | 609 0400 | 609 0380 | 609 0360 | 603 0900 | 603 0490 | 603 0440 | 603 0410 | 603 0350 | 603 0290 | 603 0230 | 603 0170 | 505 0100 | 502 1518 | 502 1280 | 502 0930 | 502 0920 | 207 0150 | 207 0110 | 206 0110 | 203 0140 | 202 1230 | 202 1040 | 202 1035 | 202 0655 | 202 0640 | 202 0600 | 202 0530 | 202 0450 | 202 0385 | 202 0260 | 202 0256 | DESCRIPTION | STATION TO STATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DUST CONTROL | WATER POLLUTION CONTROL PLAN | MOBILIZATION | RIPRAP BEDDING,(CLASS 150) | RIPRAP (CLASS 150) | ABANDON PIPE | STRUCTURAL STEEL GRATES | CASTINGS | TYPE 4 MANHOLE | TYPE 1 MANHOLE (MODIFIED) | SPECIAL MANHOLE (RCB) | 68-INCH X 43-INCH OVAL REINFORCED CONCRETE PIPE, CLASS HE III | 54-INCH REINFORCED CONCRETE PIPE, CLASS III | 48-INCH REINFORCED CONCRETE PIPE, CLASS III | 42-INCH REINFORCED CONCRETE PIPE, CLASS III | 36-INCH REINFORCED CONCRETE PIPE, CLASS III | 30-INCH REINFORCED CONCRETE PIPE, CLASS III | 24-INCH REINFORCED CONCRETE PIPE, CLASS III | 18-INCH REINFORCED CONCRETE PIPE, CLASS III | REINFORCING STEEL | 16-FOOT X 7-FOOT PRECAST CONCRETE BOX CULVERT | 8-FOOT X 6-FOOT PRECAST CONCRETE BOX CULVERT | CLASS A CONCRETE, MODIFIED (MINOR) | CLASS A CONCRETE, MODIFIED (MAJOR) | SLURRY CEMENT BACKFILL | GRANULAR BACKFILL | STRUCTURE EXCAVATION | ROADWAY EXCAVATION | REMOVAL OF STORM DRAIN PIPE | REMOVAL OF DROP INLET | REMOVAL OF MANHOLE | REMOVAL OF GROUTED RIPRAP | REMOVE RIPRAP | REMOVAL OF GATE | REMOVAL OF HEADWALL | REMOVE END SECTION | REMOVE CONCRETE CHANNEL | REMOVAL OF PORTION OF REINFORCED CONCRETE BOX CULVERT | REMOVAL OF REINFORCED CONCRETE BOX CULVERT | | |
| LS | LS | LS | CUYD | CUYD | LINFT | POUND | POUND | EACH | EACH | EACH | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | LINFT | POUND | LINFT | LINFT | CUYD | CUYD | CUYD | CUYD | CUYD | CUYD | LINFT | EACH | EACH | EACH | LS | LINFT | EACH | EACH | SQFT | EACH | LINFT | | |
| | | | | | | 997 | 2910 | | | | | | | | | 44 | | | 336 | | | 8.04 | | | 44.8 | 45.1 | 26 | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 20') , 43.26' LT | LBSD 9.22 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2621.96', INV ELEV= 2615.58', H = 6.38'). | "FR" 7+86.84 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 30" X 44' RCP FROM "FR" 7+86.84, 43.26' LT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2615.58') TO "FR" 8+00.71, 4.00' LT (LIE= 2604.66'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 30" RCP CONNECTION, 4.00' LT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-02, LBDT-09 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | 235 | 750 | | | | | | | | | | | | 84 | | | 3.25 | | | 20.4 | 23.4 | 5 | | | | | | | | | | | | CONSTRUCT "DM" DROP INLET (L= 5') , 22.93' RT | LBSD 9.23 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (GRATE ELEV= 2622.33', INV ELEV= 2613.79', H = 8.54'). | "FR" 7+72.08 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL 18" X 25' RCP FROM "FR" 7+72.08, 22.93' RT | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (UIE= 2613.79') TO "FR" 7+89.32, 4.00' RT (LIE= 2606.33'). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONSTRUCT 18" RCP CONNECTION, 4.00' RT. | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEETS LBLP-02, LBDT-09 AND LBDT-11). | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 62 | 93 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LS | | | | | | REMOVE EXISTING RIPRAP. | LBSD 9.30 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INSTALL RIPRAP CLASS (150). | "FR" 9+29.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-03). | "FR" 10+76.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | 50 | REMOVE HEADWALL AND 12' x 4' x 50' RCB. | LBSD 10.1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "L1" 50+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "L1" 50+95.01 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | REMOVE HEADWALL. | LBSD 10.2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "L2" 60+73.77 |
| | | | | | | | | | | | | | | | | | | | 27588 | | | 107.80 | 68.8 | 118.4 | -6.4 | 6 | | | | | | | | | | 1 | | REMOVE RCB PLUG AND CONSTRUCT 12' x 4' X 77.93' RCB. | LBSD 10.10 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-10). | "L1" 50+50.00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "L1" 51+27.93 |
| | | | | | | | | | | | | | | | | | | | 1227 | | | 6.80 | 5.6 | 10.1 | 0.0 | | | | | | | | | | 1 | | REMOVE RCB PLUG AND CONSTRUCT 6' x 3' X 6.5'RCB. | LBSD 10.11 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (SEE SHEET LBDT-10). | "L2" 60+77.75 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | "L2" 60+84.25 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LS | LS | LS | 62 | 93 | 114 | 13807 | 37080 | 5 | 2 | 15 | 117 | 141 | 194 | 70 | 120 | 103 | 355 | 108 | 2202322 | 578 | 1633 | 120.36 | 8946.10 | 5916.6 | 10423.8 | 45101.5 | 1265 | 787 | 4 | 4 | 40 | LS | 1 | 4 | 4 | 4980 | 4 | 70 | Total | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS12 |

# ROADWAY STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| DESCRIPTION | STATION TO STATION | 634 0350 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID YELLOW) LINFT | 634 0250 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID WHITE) LINFT | 634 0100 PERMANENT PAVEMENT MARKING FILM (VARIES) SQFT | 633 0180 PERMANENT PAVEMENT MARKERS SPECIAL EACH | 633 0110 REFLECTIVE PAVEMENT MARKERS EACH | 633 0100 NON-REFLECTIVE PAVEMENT MARKERS EACH | 623 2835 REMOVE AND REPLACE CONCRETE SIDEWALK SQFT | 613 1420 CLASS A CONCRETE RAMP (4-INCH) SQYD | 613 1200 CLASS A DRIVEWAYS CUYD | 613 0690 CLASS A CONCRETE CURB AND GUTTER (TYPE 5) LINFT | 613 0130 DETECTABLE WARNINGS SQYD | 609 0220 ADJUST MANHOLE EACH | 502 0160 CONCRETE BARRIER RAIL (TYPE A) LINFT | 202 1295 REMOVE PAVEMENT MARKINGS SQYD | 202 1290 REMOVE PAVEMENT MARKINGS LINFT | 202 1070 REMOVAL OF CURB AND GUTTER LINFT | 202 1065 REMOVAL OF VALLEY GUTTER SQYD | 202 0525 REMOVE PAVEMENT MARKINGS EACH | 202 0515 REMOVAL OF RAISED PAVEMENT MARKER EACH | 202 0400 REMOVAL OF CONCRETE BARRIER RAIL LINFT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NOTE: ALL LOCATIONS ARE APPROXIMATE AND MAY BE ADJUSTED BY THE ENGINEER** | | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT "L" TYPE CURB AND GUTTER | LBRC 1.1 | | | | | | | | | | 14 | | | | | | 14 | | | | |
| PER USDCCA DWG No 216 | "GA" 14+25.40 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 14+25.40 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT SIDEWALK | LBRC 1.2 | | | | | | | 67 | | | | | | | | | | | | | |
| PER USDCCA DWG No 234 | "GA" 14+34.26 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 14+34.26 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE TYPE 1 CENTERLINE | LBRC 1.10 | | | | | 6 | 26 | | | | | | | | | | | | | 32 | |
| PER USDCCA DWG No 244 | "GA" 10+97.45 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 13+44.02 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE LEFT ARROW SYMBOL | LBRC 1.11 | | | | 1 | | | | | | | | | | | | | | 1 | | |
| PER USDCCA DWG No 246 | "GA" 12+63.11 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE RIGHT ARROW SYMBOL | LBRC 1.12 | | | | 1 | | | | | | | | | | | | | | 1 | | |
| PER USDCCA DWG No 246 | "GA" 12+63.26 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE STORAGE LANE LINE | LBRC 1.13 | | | | | 8 | 12 | | | | | | | | | | | | 20 | | |
| PER USDCCA DWG No 246 | "GA" 12+57.24 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 13+35.10 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE TYPE 1 CENTERLINE | LBRC 1.14 | | | | | 10 | 30 | | | | | | | | | | | | 40 | | |
| PER USDCCA DWG No 244 | "GA" 12+72.64 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 13+44.02 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE LEFT ARROW SYMBOL | LBRC 1.15 | | | | 1 | | | | | | | | | | | | | | 1 | | |
| PER USDCCA DWG No 246 | "GA" 13+33.29 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE RIGHT ARROW SYMBOL | LBRC 1.16 | | | | 1 | | | | | | | | | | | | | | 1 | | |
| PER USDCCA DWG No 246 | "GA" 13+23.99 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE STOP BAR | LBRC 1.17 | | | 63 | | | | | | | | | | | 7 | | | | | | |
| | "GA" 13+44.02 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 13+42.05 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE CAT TRACK | LBRC 1.18 | | | | | 22 | 44 | | | | | | | | | | | | 66 | | |
| PER DETAIL 1/LBRC-1 | "GA" 13+44.31 TO | | | | | | | | | | | | | | | | | | | | |
| | "GA" 13+84.52 | | | | | | | | | | | | | | | | | | | | |
| ADJUST MANHOLE TO GRADE | LBRC 1.20 | | | | | | | | | | | | 1 | | | | | | | | |
| | "GA" 14+08.87 | | | | | | | | | | | | | | | | | | | | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS13 |

# ROADWAY STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| DESCRIPTION | STATION TO STATION | 634 0350 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID YELLOW) LINFT | 634 0250 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID WHITE) LINFT | 634 0100 PERMANENT PAVEMENT MARKING FILM (VARIES) SQFT | 633 0180 PERMANENT PAVEMENT MARKERS SPECIAL EACH | 633 0110 REFLECTIVE PAVEMENT MARKERS EACH | 633 0100 NON-REFLECTIVE PAVEMENT MARKERS EACH | 623 2835 REMOVE AND REPLACE CONCRETE SIDEWALK SQFT | 613 1420 CLASS A CONCRETE RAMP (4-INCH) SQYD | 613 1200 CLASS A DRIVEWAYS CUYD | 613 0690 CLASS A CONCRETE CURB AND GUTTER (TYPE 5) LINFT | 613 0130 DETECTABLE WARNINGS SQYD | 609 0220 ADJUST MANHOLE EACH | 502 0160 CONCRETE BARRIER RAIL (TYPE A) LINFT | 202 1295 REMOVE PAVEMENT MARKINGS SQYD | 202 1290 REMOVE PAVEMENT MARKINGS LINFT | 202 1070 REMOVAL OF CURB AND GUTTER LINFT | 202 1065 REMOVAL OF VALLEY GUTTER SQYD | 202 0525 REMOVE PAVEMENT MARKINGS EACH | 202 0515 REMOVAL OF RAISED PAVEMENT MARKER EACH | 202 0400 REMOVAL OF CONCRETE BARRIER RAIL LINFT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REMOVE AND RECONSTRUCT CROSS GUTTER | LBRC 2.1 | | | | | | | | | 33 | | | | | | | | | | | |
| PER USDCCA DWG No 228 | "FR" 9+03.78 O | | | | | | | | | | | | | | | | | | | | |
| | "FR" 9+06.85 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT SIDEWALK RAMP | LBRC 2.2 | | | | | | | | 173 | | | 1 | | | | | | | | | |
| PER USDCCA DWG No 235 | "FR" 9+40.77 TO | | | | | | | | | | | | | | | | | | | | |
| | "FR" 9+29.29 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE STOP BAR | LBRC 2.10 | | | 67 | | | | | | | | | | | 8 | | | | | | |
| | "FR" 7+79.50 TO | | | | | | | | | | | | | | | | | | | | |
| | "FR" 7+97.77 | | | | | | | | | | | | | | | | | | | | |
| ADJUST MANHOLE TO GRADE | LBRC 2.20 | | | | | | | | | | | | 1 | | | | | | | | |
| | "FR" 7+36.78 | | | | | | | | | | | | | | | | | | | | |
| ADJUST MANHOLE TO GRADE | LBRC 2.21 | | | | | | | | | | | | 1 | | | | | | | | |
| | "FR" 8+53.92 | | | | | | | | | | | | | | | | | | | | |
| ADJUST MANHOLE TO GRADE | LBRC 2.22 | | | | | | | | | | | | 1 | | | | | | | | |
| | "FR" 8+84.33 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT "L" TYPE CURB AND GUTTER | LBRC 3.1 | | | | | | | | | | 23 | | | | | | 23 | | | | |
| PER USDCCA DWG No 216 | "L1" 50+54.33 TO | | | | | | | | | | | | | | | | | | | | |
| | "L1" 50+69.82 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT SIDEWALK | LBRC 3.2 | | | | | | | 144 | | | | | | | | | | | | | |
| PER USDCCA DWG No 234 | "L1" 50+58.54 TO | | | | | | | | | | | | | | | | | | | | |
| | "L1" 50+84.10 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE HOV LANE SYMBOL | LBRC 4.10 | | | | 1 | | | | | | | | | | | | | | 1 | | |
| PER NDOT STANDARD PLAN T-38.1.13 | "FR" 13+69.79 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID YELLOW LINE | LBRC 4.11 | 68 | | | | | | | | | | | | | | 68 | | | | | |
| | "FR" 13+66.61 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 113+95.70 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID WHITE LINE | LBRC 4.12 | | | | 6 | 8 | | | | | | | | | | | | | | 14 | |
| PER NDOT STANDARD PLAN T-37.1.1 | "FR" 13+78.36 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 114+06.18 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID WHITE LINE | LBRC 4.13 | | | | 6 | 8 | | | | | | | | | | | | | | 14 | |
| PER NDOT STANDARD PLAN T-37.1.1 | "FR" 3+90.72 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 114+16.81 | | | | | | | | | | | | | | | | | | | | |

| STATE | PROJECT NO. | COUNTY | SHEET NO. |
|---|---|---|---|
| NEVADA | | | LBS14 |

# ROADWAY STRUCTURE LIST

# PRELIMINARY

**SUBJECT TO REVISION**

**24-Apr-2017**

| DESCRIPTION | STATION TO STATION | 634 0350 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID YELLOW) LINFT | 634 0250 PERMANENT PAVEMENT MARKING FILM (TYPE 1) (8-INCH SOLID WHITE) LINFT | 634 0100 PERMANENT PAVEMENT MARKING FILM (VARIES) SQFT | 633 0180 PERMANENT PAVEMENT MARKERS SPECIAL EACH | 633 0110 REFLECTIVE PAVEMENT MARKERS EACH | 633 0100 NON-REFLECTIVE PAVEMENT MARKERS EACH | 623 2835 REMOVE AND REPLACE CONCRETE SIDEWALK SQFT | 613 1420 CLASS A CONCRETE RAMP (4-INCH) SQYD | 613 1200 CLASS A DRIVEWAYS CUYD | 613 0690 CLASS A CONCRETE CURB AND GUTTER (TYPE 5) LINFT | 613 0130 DETECTABLE WARNINGS SQYD | 609 0220 ADJUST MANHOLE EACH | 502 0160 CONCRETE BARRIER RAIL (TYPE A) LINFT | 202 1295 REMOVE PAVEMENT MARKINGS SQYD | 202 1290 REMOVE PAVEMENT MARKINGS LINFT | 202 1070 REMOVAL OF CURB AND GUTTER LINFT | 202 1065 REMOVAL OF VALLEY GUTTER SQYD | 202 0525 REMOVE PAVEMENT MARKINGS EACH | 202 0515 REMOVAL OF RAISED PAVEMENT MARKER EACH | 202 0400 REMOVAL OF CONCRETE BARRIER RAIL LINFT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REMOVE AND REPLACE 8" SOLID WHITE LINE | LBRC 4.14 | | 60 | | | | | | | | | | | | | 60 | | | | | |
| | "FR" 14+03.55 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 114+27.25 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) | LBRC 4.20 | | | | | | | | | | | | | 69 | | | | | | | 69 |
| | "FR" 13+61.22 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 113+90.20 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) | LBRC 4.21 | | | | | | | | | | | | | 58 | | | | | | | 58 |
| | "FR" 14+11.30 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 114+34.12 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID YELLOW LINE | LBRC 5.10 | 183 | | | | | | | | | | | | | | 183 | | | | | |
| | "SD" 107+74.46 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 109+46.00 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID WHITE LINE | LBRC 5.11 | | 182 | | | | | | | | | | | | | 182 | | | | | |
| | "SD" 107+70.77 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 109+41.57 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID WHITE LINE | LBRC 5.12 | | 33 | | | | | | | | | | | | | 33 | | | | | |
| | "FR" 11+41.37 TO | | | | | | | | | | | | | | | | | | | | |
| | "FR" 11+44.58 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND REPLACE 8" SOLID YELLOW LINE | LBRC 5.13 | 33 | | | | | | | | | | | | | | 33 | | | | | |
| | "FR" 11+53.58 TO | | | | | | | | | | | | | | | | | | | | |
| | "FR" 11+56.93 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) | LBRC 5.20 | | | | | | | | | | | | | 183 | | | | | | | 183 |
| | "SD" 107+76.58 TO | | | | | | | | | | | | | | | | | | | | |
| | "SD" 109+48.57 | | | | | | | | | | | | | | | | | | | | |
| REMOVE AND RECONSTRUCT CONCRETE BARRIER RAIL (TYPE A) | LBRC 5.21 | | | | | | | | | | | | | 33 | | | | | | | 33 |
| | "FR" 11+60.28 TO | | | | | | | | | | | | | | | | | | | | |
| | "FR" 11+63.45 | | | | | | | | | | | | | | | | | | | | |
| TOTAL | | 284 | 275 | 130 | 5 | 58 | 128 | 211 | 173 | 33 | 37 | 1 | 4 | 343 | 15 | 559 | 37 | 33 | 131 | 60 | 343 |

# APPENDIX E - DATA CD