

TECHNICAL DRAINAGE STUDY  
(RESPONSE TO CCRFCD COMMENTS)

**Skye Canyon  
Detention Basin 1**  
City of Las Vegas, Nevada

Job No.: OLY1401.004  
Date: October 2015

**Prepared By:**

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**Prepared For:**

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Steve Jones, P.E.  
NV Professional Engineer No. 19638

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL  
**DRAINAGE STUDY INFORMATION FORM**

Name of Development: Skye Canyon Detention Basin 1 (CCRFCD RTC) Date: October 2015  
Location of Development: a) Descriptive (Cross Streets): North/South: Puli Road  
East/West: Grand Teton Drive  
b) Section: 12 Township: 19 South Range: 59 East  
c) APN: 126-12-000-001

Name of Owner/Developer: Section 12, LLC / Ninety-Five Management, LLC  
Telephone No.: 702-220-6565 Fax No.: 702-220-6566 E-mail Address: mbolduc@olympiacompanies.com  
Address: 11411 Southern Highlands Parkway, Suite 300; Las Vegas, NV 89141

Contact Person – Name: Steve Jones, P.E. Telephone No.: 702-284-5300  
\*E-mail Address: sjones@shg-inc.com Fax No.: 702-284-5399  
Firm: Slater Hanifan Group  
Address: 5740 S. Arville Street, Suite 216; Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

|                                           |                                                   |                                                                  |
|-------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| <input type="checkbox"/> Rezoning         | <input type="checkbox"/> Subdivision Map          | <input type="checkbox"/> Clearing and grading Only               |
| <input type="checkbox"/> Parcel Map       | <input type="checkbox"/> Planned Unit Development | <input checked="" type="checkbox"/> Other (Please specify below) |
| <input type="checkbox"/> Large Parcel Map | <input type="checkbox"/> Building Permit          | <input type="checkbox"/> Roadway & Storm Drain Infrastructure    |

1. Total Owned Land Area: At Site: 668.9 Acres Being Developed/Disturbed: 16.7 Acres +/-

2. Is a portion or all of the subject property located in a FEMA Flood Hazard Area? ☐ Yes\*\* ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes\*\* ☐ No

4. Proposed type of development (Residential, Commercial, Etc.): Detention Basin

5. Approximate upstream land area which drains to the subject site: 0.9 sq. miles

6. Has the site drainage been evaluated in the past? ☒ Yes\*\* ☐ No If yes, please identify documentation: \_\_\_\_\_

Master Drainage Study Update for Skye Canyon (SHG, DS4420-1, 12/2014)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing Arroyo

8. Briefly describe your proposed schedule for the subject project: 1<sup>st</sup> of 2 planned detention basins per DS4420-1



Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over The subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

\*Newly Required Field

\*\*Review and concurrence of the Clark County Regional Flood Control District is required

| Revision | Date |
|----------|------|
|          |      |
|          |      |
|          |      |
|          |      |

Local Entity File No. \_\_\_\_\_

REFERENCE: SHG Job No. OLY1401.004

STANDARD FORM 1

Updated 05/01/2008

OLY1401.004

October 28, 2015

Abigail Mayrena, P.E., CFM  
Principal Civil Engineer  
Clark County Flood Control District  
600 S. Grand Central Pkwy, Suite 300  
Las Vegas, Nevada 89106

**Subject: Response to CCRFCD Comments on the Technical Drainage Study for  
Skye Canyon – Detention Basin 1 (CLV-DS4698, RFCN No. 15-9550)**

Dear Mrs. Mayrena:

The following are responses to Clark County Regional Flood Control District (CCRFCD) comments contained in the September 17, 2015 review memorandum, regarding the above referenced project. A copy of the CCRFCD comment letter has been provided in Appendix A of this submittal. The comments have been individually addressed as follows:

1. **Comment:** *The proposed Skye Canyon Detention Basin 1 (DB1) configuration differs from the flood control facilities presented with the "Kyle Canyon Master Plan Amendment (MPA) to the 2008 Master Plan Update (MPU)" approved by the District's Board of Directors on June 2013. Per NRS 543.597, a Master Plan Amendment must be processed to add the collector channel and revise the size and alignment of the detention basin.*

**Response:** It is acknowledged that the configuration of the facilities proposed is different than the MPA referenced above; however, the project is proposed to be constructed by a private developer and privately maintained. It is the developer's goal to eventually dedicate the proposed facilities as public to the City, and upon that time it is recognized that a Master Plan Amendment will be required to update the CCRFCD MPU accordingly.

In a March 18, 2015 coordination meeting between SHG, CLV, CCRFCD and the developer, it was agreed that the proposed improvements in nature were similar to the existing MPU. Therefore, an MPA requirement for approval to construct the project is not necessary. Summary notes from the meeting have been included in Appendix B.

2. **Comment:** *The "Kyle Canyon Master Plan Amendment (MPA) to the 2008 Master Plan Update (MPU)" identified District facilities LVMO 0000 and 0144 as part of the outfall facilities from the Skye Canyon development. Based on recent information regarding the Tule Springs Fossil Beds National Monument, construction of LVMO 0000 may not be possible in the alignment as shown on the current MPU. In the event that LVMO 0000 cannot be constructed, address the connectivity of the outfall from Skye Canyon DB1 to a Regional facility.*



**Response:** In continuation of the discussion presented in Response to Comment No. 1, further evaluation of the continuity of regional facilities for the DB1 outfall will be presented in the future MPA upon turnover of the facilities to the City.

Note that in the interim, the DB1 outfall is perpetuated in an existing wash that crosses through culvert crossings in US-95 at approximately Brent Lane. Demonstration of interim impacts to the east side of US-95 is discussed below in Response to Comment No. 3. However, the existing wash impacts US-95 where the existing capped Horse Interchange regional facilities CN95 0318 and 0333 are located. Therefore, if continuation of the DB1 outfall to LVMO 0000 and 0144 is no longer feasible, it is likely that continuation of the DB1 outfall beyond the Skye Canyon property may be in the alignment of CN95 0318 and 0333 after its facility is uncapped in the future upon completion of the downstream regional facilities CN95 0199, 0167, etc. The addition of the DB1 outfall flow to any new CCRFCD regional facility alignment, including CN95 0318, will require evaluation in the future MPA processing discussed in Response to Comment No. 1.

3. **Comment:** *Based on the aerial, the outflow from the proposed Skye Canyon DB1 crosses US95 through existing culverts and then conveyed along Brent Lane. Provide a discussion regarding the impacts of the prolonged discharge from Skye Canyon DB1 to existing downstream developments and streets. Identify who is responsible for maintenance of downstream streets in the event that the prolonged discharge impacts the downstream area.*

**Response:** The outflow from DB1 crosses offsite properties at the following locations from upstream to downstream:

- APN 125-07-601-006
- US-95
- Intersection of Brent Lane and Fort Apache Road, in proximity to Bilbray Elementary School.

As a result of the improvements being a detention basin designed to reduce the peak 100-year flow rate from 794 cfs to 71 cfs in the downstream watershed, the peak flow rate impacting these downstream properties/improvements is not an adverse impact. However, as the comment notes, the attenuated flow from the DB1 outfall is 70 cfs (determined by outflow hydrograph inspection in Appendix C) beyond the standard 6-hour storm event that downstream properties were designed upon. Therefore, evaluation of the downstream impacts from the attenuated flow is required and a summary of the downstream evaluation on the above locations is as follows:

- APN 125-07-601-006 is currently undeveloped; therefore, a Flowmaster cross section has been performed that shows the long term discharge of 70 cfs out of DB1 does not result in an adverse impact of erosion on the downstream property.
- The impacted culverts crossing US-95 are dual barrel 10-ft by 4-ft RCBs; therefore, have capacity for 70 cfs and no adverse impacts will occur to US-95 from the attenuated flow rate.
- In order to remove the long term discharge of 70 cfs from the DB1 outfall from the intersection, drop inlet and storm drain improvements are proposed by the developer on its property. A new plan set entitled "Brent & Fort Apache Storm Drain



Improvements" has been added to the project. After removal of the 70 cfs from the intersection, no adverse impacts occur downstream. Further discussion regarding the technical design of these improvements is provided below.

#### **"Brent Lane Storm Drain" – Drop Inlet Design**

Inspection of existing topography south of Brent Lane, on the developer's east property, shows that after completion of the 100-year 6-hour storm that the 70 cfs of long term discharge from DB1 is perpetuated in a flowline that discharges into Brent Lane approximately 200-ft west of the intersection with Fort Apache Road. As a result, a 6-ft by 5-ft NDOT Type 2 drop inlet in 2-ft sump has been proposed in this location to collect the 70 cfs prior to discharge onto Brent Lane and perpetuation toward downstream properties. A Flowmaster section of the existing topography and drop inlet capacity computation have been included in Appendix C.

Note that the drop inlet has been proposed with a concrete apron with maintenance access for potential sediment cleanout.

#### **"Brent Lane Storm Drain" – Storm Drain Design**

A proposed 30-inch RCP has been provided with an improved 42-inch RCP opening at the drop inlet box to meet headwater criteria. The 30-inch RCP extends from the proposed NDOT Type 2 drop inlet to an existing nuisance drop inlet at the southwest corner of the intersection of Brent and Fort Apache. A smaller storm drain lateral currently exists connecting the nuisance drop inlet into an existing 48-inch RCP within the east half of Fort Apache. The smaller storm drain is proposed to be removed and replaced with continuation of the 30-inch RCP to convey the design flow of 70 cfs. Note that impacts of connecting a proposed 30-inch RCP into the existing 48-inch RCP results in a slightly larger flow in the downstream storm drain than occurs during the existing condition by a quantity of 5 cfs (70 cfs compared to design flow of 65 cfs). A WSPG model extends from the proposed drop inlet to downstream where the increase is considered insignificant at the intersection of Fort Apache Road and Horse Drive. The resulting hydraulic model shows that the proposed and downstream storm drains meet CCRFCD storm drain criteria. Relevant reference material regarding the hydraulic impacts that the proposed 30-inch RCP causes on the downstream existing storm drain is included in Appendix C.

#### **"Brent Lane Storm Drain" – Improvement Plans**

A separate improvement plans set has been generated to propose design of these storm drain facilities detailed above. Although these improvements are required to mitigate for the Detention Basin 1 outfall impacts, they are anticipated to be constructed concurrently with the Detention Basin 1 (CLV No. 60604) project and are required to be complete prior to installation of the basin's outfall pipe that creates the long-term discharge subject of the CCRFCD comment. The additional improvement plan set has been included with this study.

4. **Comment:** *Based on the collector channel detail (Sheet D-2), the finished grade elevation may be lower than the water surface elevation in the channel. The Engineer should discuss how the FEMA levee criteria will be addressed to protect the future development downstream of the detention basin.*

**Response:** Note that there are 2 locations in the profile of the collector channel (P-1 and P-2) where the top of channel is above existing ground; however, levee criteria does not apply to these areas because of the following reasons:

- At approximately Station 13+79.61, the 100-year water surface elevation is below existing ground. Only the freeboard area in the channel and the proposed access road requires the tie-in to existing ground to be fill. Therefore, if there is any failure of fill in the future, the water surface will be contained by existing ground. Note in the future, it is likely that downstream development will fill the subject existing wash in this location also eliminating any potential failure impacts.
- At approximately Station 20+41.13, the grading proposed for access to the Maintenance Staging Area fills in the existing wash to an elevation that is above the top of channel.

Therefore, FEMA levee criteria do not apply to this project for protection of future downstream development projects.

5. **Comment:** *Provide detention basin identification and flood warning signs. The Engineer must coordinate with City of Las Vegas for sign templates and sign locations.*

**Response:** The requested signs have been added to the plans at all access points from Grand Teton Drive, the pertinent corners of the project and in proximity to the emergency spillway.

6. **Comment:** *Provide a copy of the approved Emergency Action Plan (EAP) to the District upon availability.*

**Response:** Acknowledged, the EAP will be forwarded upon completion and approval.

7. **Comment:** *Exhibits/Models/Calculations:*

- a) *Exhibits E & F: Offsite flow is perpendicular to the collector channel. Provide hydraulic calculations to account for energy and momentum of the offsite flow and demonstrate that the channel has the capacity to collect the flow.*
- b) *Update Exhibit H to be consistent with the current design as submitted with the Supplement. Update storage volume based on the current design. Provide HGL of outlet pipe(s) on Exhibit H.*
- c) *HEC-I, Line 93 (SA/SE cards): Provide surface area/elevation calculation for verification.*



- d) *The 24-inch orifice discharge curve calculation is annotated with consideration to a 2.5' depth in the 60" RCP. Clarify this calculation and update calculation accordingly based on the current design.*
- e) *Addendum #2: Update "DB1 - PMF 30" Orifice Outfall" rating table to reflect the 24" orifice.*
- f) *Addendum #1: Update "chnl.wsp" model to reflect current design grades. Provide station and finished grade on Sheet P-I at -18+75.*
- g) *TDS: Update debris tower orifice calculation to reflect current design.*

**Response:** See below for individual responses.

- a) There are two locations where significant flow is channelized as it approaches the collector channel based on offsite topography, and cross sections have been analyzed to determine inflow energy impacts to a perpendicular collector channel. Note that the receiving bank of the channel has been concrete lined up to minimum 5-ft depth measured from collector channel flowline. For computation purposes, the ultimate condition considers the higher flow conveyed to the collector channel and its flow rates have been utilized to determine the inflow energy impacts. The cross sections have been separated into North and South, with a summary of the inflow energy provided below, whose calculations and exhibit included depicting the cross section limits in Appendix D.
  - i. Due to positive slope from the southern limits of the collector channel to the natural wash approximately 400-ft north of Grand Teton, the Flowmaster calculation for the South section utilizes the entire 100-year flow rate of 468 cfs generated by Concentration Point CP2 plus Subbasin OFF2 in its analysis. This calculation determines the most conservative estimation of inflow energy at 2.25-ft which upon collection by the receiving channel will be contained. Note that this is the most upstream collected flow for the channel, therefore no splashing occurs in excess of the 100-year flow depth in the proposed channel.
  - ii. The Flowmaster calculation for the North section utilizes the 100-year flow rate of 38 cfs generated by Subbasin OFF3. This calculation determines an inflow energy of 0.95-ft which does not exceed the provided freeboard above the 100-year flow depth in the collector channel in the case that splashing occurs.

As a result, no revisions to the proposed design are necessary for accommodation of the offsite flow's energy impacts to the collector channel.

- b) Exhibit H has been updated to show that if necessitated in the future, basin expansion can occur and shows how the current design would be impacted. Additionally the proposed storage volume and potential future storage volume if the basin is excavated further at a 3:1 (H:V) slope has been detailed on the exhibit. It is also estimated that the proposed outflow from the basin will remain the same (no increase) in the future to minimize downstream impacts; therefore, the peak flow rate and HGL on the proposed and future outlet pipe designs remain the same.

- c) A print-out from Civil-3D AutoCAD software detailing the stage-storage curve parameters corresponding with the HEC-1 output has been provided in Appendix D. Note there are minor differences in the corresponding with the surface area and elevations due to the Response to Comment No. 8b; however, the variance is minor and considered insignificant to modify the HEC-1 model at this point in the review process.
- d) With the design outflow of 71 cfs in the proposed 60-inch outlet pipe, a free-flow  $\frac{1}{2}$  full condition occurs based on previously submitted Flowmaster calculation. Therefore, a tailwater condition of 2.5-ft depth in the receiving pipe is considered in calculation of the discharge thru the 24-inch orifice plate proposed on the 60-inch pipe. A tailwater depth of 2.5-ft corresponds to a tailwater elevation of 3016.3-ft based on 60-inch pipe invert of 3013.8-ft, and no revision to calculation is necessary. These calculations have been re-included in Appendix D for reference.
- e) Supplement #1 dated 8/3/2015 had updated the stage-discharge curve to reflect the current design of a 24-inch orifice outlet on the detention basin outlet pipe. The stage-discharge curve from that submittal has been re-included in Appendix D for reference.
- f) The WSPG model for the collector channel has been updated to reflect the current design. The corrected flow depths, HGL, and required channel depth results in no revision necessary to the current design. Note the following details regarding the revised model, performed in a similar manner to the previous approved model:
  - i. The starting water surface elevation guess in the input is assumed as the resulting conjugate depth (4.4-ft) after impact with the chutes and baffles in order to estimate the highest velocities for design purposes in the chute to the stilling basin. The approach velocity to the stilling basin in the revised model (27.6 ft/s) is approximately equal to previous submittals (27.5 ft/s); therefore, no adjustment to the stilling basin design is necessary.
  - ii. The transition from trapezoidal to rectangular geometry does not account for the access ramp tie-in to the channel. The total depth in the channel meets the CCRFCD Manual requirement at this location and inclusion of the access ramp will only allow for flow to spread wider and return to the trapezoidal geometry of flow in a short distance after it extends up the slope.
  - iii. The model terminates at the most upstream end of the channel that functions for flow conveyance. South of Station 12+31.55, the channel design is intended to provide a ramp for maintenance vehicles to access the facility. This is considered acceptable because the tributary flow designed to be received by the channel inflows downstream of 12+31.55, as shown in Response to Comment No. 8a.
- g) An updated debris tower based on the current design shown on Sheet S-8 shows the dewatering time for the bottom of the basin below the outlet structure as 28 hours which is considered acceptable, considering the CCRFCD Manual maximum is 7 hours for the basin to dewater.



**8. Comment: Sheet G-1:**

- a) *The 1-foot thick soil cement embankment is shown to be constructed at a 3H:1V slope. Based on District's experience, it is difficult to compact soil cement at this slope. Address slope constructability and revise as necessary.*
- b) *Detail 8/D-2: The inflow structures should be structurally engineered to control and confine the offsite inflow. The velocity is at the threshold (14.98 feet per second) for the low strength lining and therefore a more substantial design is recommended to prevent erosion and additional maintenance of the inflow structures. Revise accordingly.*
- c) *Detail 5/D-2: Provide cut-off wall depth on the plan for the OFF6 inflow. Provide appropriate cut-off depth for OFF4 inflow. Verify all cut-off wall depths and revise accordingly.*
- d) *Update "Summary of Detention Basin Performance Parameters" table. Provide parameters on the grading plan.*
- e) *Provide Detail 17 on Sheet D-2.*
- f) *Provide block and cable fencing limits along west boundary. Remove fencing line work where block and cable fencing is not proposed.*

**Response:** See below for individual responses.

- a) It is anticipated that the soil cement placement on a 3:1 (H:V) slope is constructible. It is noted another major project in the Clark County area has been constructed with soil cement on the same steepness of slope: Northeast C-1 Detention Basin. The constructability of the soil cement has been specified clearly within the project's special provisions that will be provided to the contractor during construction.
- b) The inflow channels for offsite flow conveyed down the soil cement slope from Subbasins OFF4 and OFF5 have been adjusted from the previous 3:1 (H:V) slope that carried velocity at the maximum CCRFCD Manual threshold to a lesser 4:1 (H:V) slope to better control the velocity. As a result, maintenance and erosion concerns are within the normal range of acceptability. The revised calculations showing the new velocities down the lesser slope have been included in Appendix E.
- c) A concrete cut-off wall has been proposed at the top of slope for the transition from an average sloped riprap lined wash to steep soil cement lined detention basin slope for the inflow from Subbasins OFF4, OFF5 and OFF6. These concrete cut-off walls have been proposed as the typical 3-ft deep because the proposed riprap lining in the approach washes controls the velocity within the CCRFCD Manual range of acceptability.
- d) A current table that summarizes the performance parameters for the detention basin has been added to Sheet C-3.

- e) Detail 17/D-2 has been provided on the plans. This detail represents the concrete pad at the toe of slope intended to protect against the energy change as the flow transitions to the flat bottom of the basin.
- f) Block and cable fencing is provided around the entire perimeter of the basin, located at the line of 10-ft buffer from BLM property on the west. The only exception where the fencing isn't located is across the deep un-navigable wash where the emergency spillway and outlet pipe are located.

9. **Comment:** *Sheet G-2:*

- a) *Revise leader line to point to the flood threat station conduit.*
- b) *Extend Section 2/D-4 past property to match detail. Show block and cable fencing location and provide dimension from buffer on the detail.*

**Response:** See below for individual responses.

- a) The leader line has been corrected.
- b) Section 2/D-4 has been extended in plan view and all aspects including the block and cable fencing have been shown accurately in the detail.

10. **Comment:** *Sheet G-3:*

- a. *Extend the plan view to show that proposed channel between -Sta. 11+00 and -Sta. 14+00 is within the existing BLM Grant N-7772.*
- b. *Provide a detail to include location of block and cable fencing east of the channel in relation to the finished grade.*

**Response:** See below for individual responses.

- a) An additional leader showing the channel is within the existing BLM grant has been provided to the right viewport on Sheet G-3. Note the existing grant is extensive and extends off the page; however, after discussion with the reviewer this is considered acceptable.
- b) The block and cable fencing is proposed at existing ground, and all applicable details have been updated accordingly to show accurately.

11. **Comment:** *Sheet G-4:*

- a. *Provide inlet structure ramp finished grades.*
- b. *Detail 4 on Sheets D-3 and D-4: Address access road elevation discrepancy (3,036 feet).*



**Response:** See below for individual responses.

- a) Ramp grades have been added to the plan on G-4.
- b) The access road to maintain the spillway has been adjusted on Detail 4/D-4 to show a 3037-ft finished grade to match plan and meet access requirements.

12. **Comment:** *Sheet G-5/Detail 5/D-4: Provide fall protection above 60-inch RCP headwall.*

**Response:** Post and cable fencing with plate and bolt connection to the top of headwall has been proposed for fall protection.

13. **Comment:** *Sheet D-3:*

- a. *Details 1 & 2: Clarify type and thickness of fill. Verify constructability of structural fill and the top thickened RCC section (fill between RCC and finished grade).*
- b. *Section 5: Provide Note 2 and provide specification/requirements for structural fill.*

**Response:** See below for individual responses.

- a) The RCC stepped spillway has been cleaned up for clarity. The relationship between fill, finished ground and RCC is now clearly shown.
- b) Note 2 has been removed and refer to Section 207 of the standard specifications and special provisions for the requirements of the structural fill that the RCC is proposed on top.

14. **Comment:** *Sheet D-4:*

- a. *Detail 1: Show ramp location on detail.*
- b. *Detail 4: Consider a cut-off wall at end of the RCC apron.*

**Response:** See below for individual responses.

- a) The detail has been shown to show the maintenance access ramp.
- b) A 4-ft deep concrete cut-off wall has been proposed at the top of slope between the 3:1 (H:V) soil cement plated slope and the high strength soil cement that designates the stepped spillway.

15. **Comment:** *Sheet D-6, Detail 1: Revise details such that the dimensions are legible.*

**Response:** The detail has been adjusted for legibility.

16. **Comment:** *Sheet S-1, Note 2: Add to include the "Special Provisions".*

**Response:** The additional Special Provisions has been added to Note 2.

17. **Comment:** *Sheet S-3: Per Sheet S-2, the maximum expansion joint spacing is 180 feet. Per the HCDDM, for channels with expansion joints greater than 100 feet on center, the ratio of longitudinal steel area to concrete cross-sectional area shall be greater than 0.005. Verify reinforcement requirements and revise accordingly.*

**Response:** Longitudinal reinforcing as shown meets design criteria. Plans call out #5 bar @ 10" O.C. in a 6" slab which is 0.37 square inches per foot. (Required =  $0.005 \times 6"$  thick  $\times 12"$  wide = 0.36 square inches per foot).

18. **Comment:** *Sheet S-7: Provide a manhole for District personnel to access the outlet structure sensor. Provide appropriate structural details.*

**Response:** A manhole for personnel access has been added to access the outlet sensor.

19. **Comment:** *Sheet S-8:*

- a. *The current design of the trash rack includes the top of the rack being secured by three hinges. Debris impacting the trash rack during a major storm event may damage the hinges and cause the rack to fail. Revise the trash rack to be hinged at the top of the back wall. Provide appropriate structural details.*
- b. *Provide transverse bar(s) to minimize debris that can pass thru the trash rack.*
- c. *It appears that the bottom of the rack is directly on the ramp slab. Consider a pedestal design for the racks. Provide bearing pad for the trash rack base column to absorb shocks during opening/closing the trash rack.*
- d. *Provide trash rack capacity calculation. Verify that the grate opening is adequate assuming a maximum velocity of 5 feet per second thru the grate. Account for 50% clogging factor. Address as necessary.*

**Response:** See below for individual responses.

- a) Trash rack hinge details have been revised. Revised hinge details are more stout and less susceptible to failure.
- b) The gap between bars in the grate is considered small enough to not require additional debris catching protection with extra transverse bars than proposed. After discussion with the reviewer, the proposed design's debris catchment is considered acceptable.
- c) Pedestals have been added with an elastomeric bearing pad, as requested.
- d) Including a 50% clogging factor on the grate's open area, the maximum flow to pass through the grate at a rate not exceeding 5 ft/s is 88.5 cfs. The design outflow from the detention basin is 71 cfs, or less than the maximum allowable flow; therefore, the grate design is considered acceptable.



20. **Comment:** *Special Provisions:*

- a. *Update Section 104 to reflect current detention basin design and parameters.*
- b. *Section 310: District recommends a minimum of 2,000 psi compressive strength for the RCC spillway (high strength soil cement).*

**Response:** See below for individual responses.

- a) The outlet structure has been adjusted to reflect the current design with one (1) 60-inch RCP outlet pipe.
- b) The specification for the strength of the high-strength soil cement has been adjusted to 2,000 psi. An updated geotechnical report, mix design and associated special provisions have been provided.

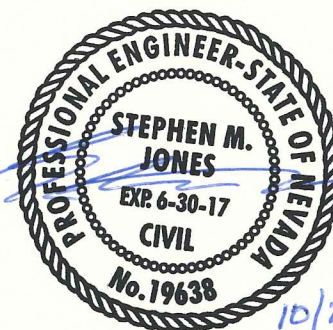
Revised "Detention Basin 1" improvement plans and the new additional "Brent & Fort Apache Storm Drain Improvements" improvement plans have been included with this submittal for review. If you have any questions or require additional information, please do not hesitate to contact us at 284-5300.

Respectfully Submitted,

SLATER HANIFAN GROUP

Steve Jones, P.E.  
Project Manager - Flood Control Division

cc: Marc Bolduc – Olympia Companies  
Bobby Williamson – Olympia Companies  
Jerry Slater, P.E. – SHG  
Mark Failla, P.E., CFM – SHG  
Rhonda Miller – SHG



10/28/2015

## **APPENDIX CONTENTS**

### **Appendix A: CCRFCD Comment Letter**

### **Appendix B: Response to Comment No. 1 (MPU Amendment)**

- 3/18/2015 Meeting Notes

### **Appendix C: Response to Comment No. 3 (Long-Term Discharge Impacts)**

- HEC-1 Output
- APN 125-07-601-006
- US-95
- "Brent Lane Storm Drain Improvements" Calculations

### **Appendix D: Response to Comment No. 7 (Exhibits/Models/Calculations Revisions)**

- Inflow Energy Calculations
- Exhibit H – Future Outlet Pipe Concept
- AutoCAD Printout – Stage-Storage Design Parameters
- Outlet Pipe Hydraulics
- Stage-Discharge Curve
- Updated WSPG Model
- Debris Tower Dewatering Calculation

### **Appendix E: Response to Comment No. 8 (Inflow Velocity)**

- Adjusted 4:1 (H:V) Slope Hydraulics

### **Appendix F: Response to Comment No. 19 (Trash Rack Capacity)**

- 50% Clogging Factor Flow Calculation



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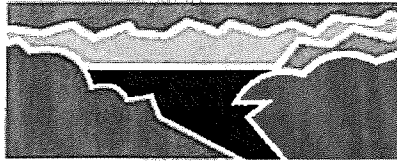
## APPENDIX

# APPENDIX A

## CCRFCD Comment Letter



## REGIONAL FLOOD CONTROL DISTRICT



Steven C. Parrish, P.E.  
General Manager/Chief  
Engineer

### BOARD OF DIRECTORS

Lawrence L. Brown, III  
Chairman  
Clark County

Debra March  
Vice-Chairman  
City of Henderson

Chris Giunchigliani  
Clark County

Mayor Carolyn Goodman  
City of Las Vegas

Mayor John J. Lee  
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Mayor Allan Litman  
City of Mesquite

Dr. Lois Tarkanian  
City of Las Vegas

Mayor Rodney Woodbury  
City of Boulder City

September 17, 2015

Mr. Oh Sang Kwon, P.E.  
City of Las Vegas  
333 North Rancho Drive  
Las Vegas, NV 89106

**DISTRICT COMMENT(S): SKYE CANYON - DETENTION BASIN 1  
(DS4698C) (RFCD No. 15-9550)**

Dear Mr. Kwon:

Clark County Regional Flood Control District (District) reviewed Technical Drainage Study dated September 10, 2014, Addendum No. 1 dated December 24, 2014, Addendum No. 2 dated May 7, 2015 and Supplement No. 1 dated August 3, 2015 for above-mentioned project as submitted by SLATER HANIFAN GROUP. In addition, District is in receipt of the Conditional Letter of Acceptance from City of Las Vegas dated June 25, 2015.

District has the following comment(s):

1. The proposed Skye Canyon Detention Basin 1 (DB1) configuration differs from the flood control facilities presented with the "Kyle Canyon Master Plan Amendment (MPA) to the 2008 Master Plan Update (MPU)" approved by the District's Board of Directors on June 2013. Per NRS 543.597, a Master Plan Amendment must be processed to add the collector channel and revise the size and alignment of the detention basin.
2. The "Kyle Canyon Master Plan Amendment (MPA) to the 2008 Master Plan Update (MPU)" identified District facilities LVMO 0000 and 0144 as part of the outfall facilities from the Skye Canyon development. Based on recent information regarding the Tule Springs Fossil Beds National Monument, construction of LVMO 0000 may not be possible in the alignment as shown on the current MPU. In the event that LVMO 0000 cannot be constructed, address the connectivity of the outfall from Skye Canyon DB1 to a Regional facility.
3. Based on the aerial, the outflow from the proposed Skye Canyon DB 1 crosses US-95 through existing culverts and then conveyed along Brent Lane. Provide a discussion regarding the impacts of the prolonged discharge from Skye Canyon DB 1 to existing downstream developments and streets. Identify who is responsible for maintenance of downstream streets in the event that the prolonged discharge impacts the downstream area.
4. Based on the collector channel detail (Sheet D-2), the finished grade elevation may be lower than the water surface elevation in the channel. The Engineer should



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discuss how the FEMA levee criteria will be addressed to protect the future development downstream of the detention basin.

5. Provide detention basin identification and flood warning signs. The Engineer must coordinate with City of Las Vegas for sign templates and sign locations.
6. Provide a copy of the approved Emergency Action Plan (EAP) to the District upon availability.
7. Exhibits/Models/Calculations:
  - a. Exhibits E & F: Offsite flow is perpendicular to the collector channel. Provide hydraulic calculations to account for energy and momentum of the offsite flow and demonstrate that the channel has the capacity to collect the flow.
  - b. Update Exhibit H to be consistent with the current design as submitted with the Supplement. Update storage volume based on the current design. Provide HGL of outlet pipe(s) on Exhibit H.
  - c. HEC-1, Line 93 (SA/SE cards): Provide surface area/elevation calculation for verification.
  - d. The 24-inch orifice discharge curve calculation is annotated with consideration to a 2.5' depth in the 60" RCP. Clarify this calculation and update calculation accordingly based on the current design.
  - e. Addendum #2: Update "DB1 – PMF 30" Orifice Outfall" rating table to reflect the 24" orifice.
  - f. Addendum #1: Update "chnl.wsp" model to reflect current design grades. Provide station and finished grade on Sheet P-1 at ~18+75.
  - g. TDS: Update debris tower orifice calculation to reflect current design.
8. Sheet G-1:
  - a. The 1-foot thick soil cement embankment is shown to be constructed at a 3H:1V slope. Based on District's experience, it is difficult to compact soil cement at this slope. Address slope constructability and revise as necessary.
  - b. Detail 8/D-2: The inflow structures should be structurally engineered to control and confine the offsite inflow. The velocity is at the threshold (14.98 feet per second) for the low strength lining and therefore a more substantial





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design is recommended to prevent erosion and additional maintenance of the inflow structures. Revise accordingly.

- c. Detail 5/D-2: Provide cut-off wall depth on the plan for the OFF6 inflow. Provide appropriate cut-off depth for OFF4 inflow. Verify all cut-off wall depths and revise accordingly.
  - d. Update "Summary of Detention Basin Performance Parameters" table. Provide parameters on the grading plan.
  - e. Provide Detail 17 on Sheet D-2.
  - f. Provide block and cable fencing limits along west boundary. Remove fencing line work where block and cable fencing is not proposed.
9. Sheet G-2:
- a. Revise leader line to point to the flood threat station conduit.
  - b. Extend Section 2/D-4 past property to match detail. Show block and cable fencing location and provide dimension from buffer on the detail.
10. Sheet G-3:
- a. Extend the plan view to show that proposed channel between ~Sta. 11+00 and ~Sta. 14+00 is within the existing BLM Grant N-7772.
  - b. Provide a detail to include location of block and cable fencing east of the channel in relation to the finished grad.
11. Sheet G-4:
- a. Provide inlet structure ramp finished grades.
  - b. Detail 4 on Sheets D-3 and D-4: Address access road elevation discrepancy (3,036 feet).
12. Sheet G-5/Detail 5/D-4: Provide fall protection above 60-inch RCP headwall.
13. Sheet D-3:
- a. Details 1 & 2: Clarify type and thickness of fill. Verify constructability of structural fill and the top thickened RCC section (fill between RCC and finished grade).
  - b. Section 5: Provide Note 2 and provide specification/requirements for structural fill.



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14. Sheet D-4:
  - a. Detail 1: Show ramp location on detail.
  - b. Detail 4: Consider a cut-off wall at end of the RCC apron.
15. Sheet D-6, Detail 1: Revise details such that the dimensions are legible.
16. Sheet S-1, Note 2: Add to include the "Special Provisions".
17. Sheet S-3: Per Sheet S-2, the maximum expansion joint spacing is 180 feet. Per the HCDDM, for channels with expansion joints greater than 100 feet on center, the ratio of longitudinal steel area to concrete cross-sectional area shall be greater than 0.005. Verify reinforcement requirements and revise accordingly.
18. Sheet S-7: Provide a manhole for District personnel to access the outlet structure sensor. Provide appropriate structural details.
19. Sheet S-8:
  - a. The current design of the trash rack includes the top of the rack being secured by three hinges. Debris impacting the trash rack during a major storm event may damage the hinges and cause the rack to fail. Revise the trash rack to be hinged at the top of the back wall. Provide appropriate structural details.
  - b. Provide transverse bar(s) to minimize debris that can pass thru the trash rack.
  - c. It appears that the bottom of the rack is directly on the ramp slab. Consider a pedestal design for the racks. Provide bearing pad for the trash rack base column to absorb shocks during opening/closing the trash rack.
  - d. Provide trash rack capacity calculation. Verify that the grate opening is adequate assuming a maximum velocity of 5 feet per second thru the grate. Account for 50% clogging factor. Address as necessary.
20. Special Provisions:
  - a. Update Section 104 to reflect current detention basin design and parameters.
  - b. Section 310: District recommends a minimum of 2,000 psi compressive strength for the RCC spillway (high strength soil cement).

District's review of this project was limited to issues of Regional Flood Control Significance as defined in *Uniform Regulations for the Control of Drainage*.

REGIONAL FLOOD  
CONTROL DISTRICT



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The consultant must be advised to submit any revisions to the Technical Drainage Study and Improvement Plans to City of Las Vegas for review/re-approval. District review of any such revisions will commence upon City of Las Vegas's acceptance.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, information submitted by SLATER HANIFAN GROUP may be superseded. Compliance with regulatory elements and design standards specified in *Uniform Regulations for the Control of Drainage* does not imply a guarantee that properties will be free from flooding or flood damage.

The District, its officials, or employees assume no liability for information, data, or conclusions presented by consulting engineers. We, therefore, make no warranties, either expressed or implied, in conducting this review.

STEVEN C. PARRISH, P.E.

General Manager/Chief Engineer

BY:

A handwritten signature in black ink, appearing to read 'Abigail Mayrena', is written over a horizontal line.

Abigail Mayrena, P.E., CFM  
Principal Civil Engineer

AM:eb

c: STEVE JONES, P.E. Slater Hanifan Group

P:\Letters and Memos\Local Drainage\Land Development & Drainage\2015\L-15-9550comment.doc



## APPENDIX B

### Response to Comment No. 1- MPU Amendment

(3/18/2015 Meeting Notes)

**MEETING NOTES**

**Project Number:** OLY1401.004

**Project Name:** Skye Canyon

**Meeting Date:** 3/18/2015

**Meeting Location:** CLV Public Works – Turquoise Room

**Meeting Topic:** MPU Amendment & Outstanding Detention Basin Issues

| <b>Attendees:</b> | <b>Company Name:</b> |
|-------------------|----------------------|
| Oh Sang Kwon      | CLV                  |
| Peter Jackson     | CLV                  |
| Allen Pavelka     | CLV                  |
| Andrew Trelease   | CCRFCD               |
| Abigail Mayrena   | CCRFCD               |
| Jerry Slater      | SHG                  |
| Steve Jones       | SHG                  |
| Marc Bolduc       | Olympia              |
| Bobby Williamson  | Olympia              |

**Meeting Notes:**

| <b>Item:</b> | <b>Discussion:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | <b>MPU Amendment (MPA)</b> – SHG discussed that in a previous meeting with the City, it was communicated that for development to further continue at Skye Canyon and construct the Detention Basin 1 (DB1) as planned, the regional master plan needs to be updated. Since DB1 is planned to be adopted as a regional facility and it's outfall is in a regional alignment that is different from the current MPU, the City wants assurances that the ultimate plan for the routing of the DB1 outfall needs to be adopted. SHG showed the MPA exhibit that was approved through the CCRFCD Boards for the previous representative of the property and the new concept schematic of regional facility routing for Olympia and discussed its similarities with the exception of the number of detention basins has been reduced from 3 to 2. CCRFCD discussed that the new regional facility routing is so close to the previous MPA that it believes the previous MPA would remain valid, but ultimately it is the City's choice of whether they want to adopt the previous MPA thru City Council or update the MPA to reflect the 2 detention basin schematic more accurately. The City discussed that it will need to decide internally which is the process they prefer, but agreed that they would allow SHG and Olympia to move forward with processing an MPA. Olympia voiced its concerns regarding the schedule impacts if the MPA had to be revised from the currently CCRFCD approved MPA due to conditions placed on the property which includes prohibiting approval of DB1 and processing design plans for the Phase 2 area of the property. SHG also noted that building the DB1 requires 404 permits to be in place and that it is preferred to utilize CCRFCD credits but the DB1 can't be considered for the CCRFCD credits until the DB1 is adopted as a CCRFCD regional facility. Due to these concerns, CLV decided that allowing the previous CCRFCD approved MPA to City Council agenda would likely be the best option to keep the project moving forward. CLV requested that CCRFCD verify if the previous CCRFCD approval of the current MPA remains acceptable with their bylaws before it adds the MPA to City Council agenda. |
| 2            | <b>Detention Basin Staging Area</b> – CLV identified with its maintenance staff that the easement/right-of-way area needs to be large enough to stockpile the sediment volume anticipated to be received by the detention basin. All parties identified that the areas near the outfall would be ideal for accessibility and that SHG discussed it would determine the area of expansion by computation of stockpiling sediment volume in these locations. It was also identified and agreed that an additional access ramp be provided near the outfall for accessibility to these additional staging areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3            | <b>4:1 Slopes Requirement</b> – CLV identified after discussion internally with its maintenance staff that the necessity of 4:1 slopes, as opposed to 3:1, reduces future maintenance costs by large amounts; therefore, the 4:1 slopes requirement is still imposed on the project. Olympia discussed that changing the slopes to 4:1 is likely a large design change due to its impacts on all other aspects of the basin design, including possibly the footprint area. Olympia also noted that making a large change to the design in the 2 <sup>nd</sup> review comment period for a new unwritten policy is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Prepared By:** Steve Jones, SHG

*Please notify the preparer if you have any questions, concerns or additions to these minutes within 2 days. After 2 days the content of this document will be considered accurate and accepted as the final recordation.*

| <b>Item:</b> | <b>Discussion:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | placing a large burden on this project. CLV noted that although this is a new policy, it is being utilized universally with its newer basins. However, in effort to not place such a burden on the project, CLV offered to Olympia that they could line the current proposed 3:1 slopes with soil cement instead of revising the design to 4:1. Olympia and SHG acknowledges the CLV concerns and agreed to investigate which is the more advantageous design to proceed with. |
| 4            | <b>Sheep Mountain Parkway Channel Alignment</b> – After discussion, CLV is going to allow Olympia to maintain its current design of a collector channel that bisects the alignment for Sheep Mountain Parkway and not require it to be revised to parallel with the alignment.                                                                                                                                                                                                 |

#### **Action Items:**

| <b>Item:</b> | <b>Discussion:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | <b>MPU Amendment (MPA)</b> – CLV to discuss which of two options to continue: <ul style="list-style-type: none"> <li>Although the current approved CCRFCD approved MPA shows 3 detention basins instead of the now currently planned 2 basins, add this MPA to City Council agenda for official adoption. Process a separate MPA/MPC at a later date to show the approved Master Drainage Study regional facility schematic. CLV needs CCRFCD to verify if the previous CCRFCD approvals remain valid.</li> <li>Revise the previous MPA to reflect the current plan of having 2 detention basins instead of 3, and re-process thru the appropriate CCRFCD Boards and City Council. CLV &amp; CCRFCD agreed to expedite the process to its furthest extent, including re-wording the condition on the Master Drainage Study approval that restricts Olympia from submitting its Phase 2 technical plans and studies until the MPA is approved.</li> </ul> |
| 2            | <b>Detention Basin Staging Area</b> – Plans will be updated accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3            | <b>4:1 Slopes requirement</b> – Investigation into which option (4:1 slopes or Soil Cement 3:1 slopes) is more advantageous and then update plans accordingly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 4            | <b>Sheep Mountain Parkway Channel Alignment</b> – No action item, current design/plans remain valid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**Prepared By: Steve Jones, SHG**

*Please notify the preparer if you have any questions, concerns or additions to these minutes within 2 days. After 2 days the content of this document will be considered accurate and accepted as the final recordation.*



## APPENDIX C

### Response to Comment No. 3- Long-Term Discharge Impacts

*HEC-1*

*Output*

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*   JUN 1998
*   VERSION 4.1
* RUN DATE 22JUL15 TIME 14:21:58
*****

                                ULT1.OUT

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

```

```

X X XXXXXX XXXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X XXXXXX 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 -AMSK- 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
1 ID SLATER HANIFAN GROUP
2 ID NINETY-FIVE MANAGEMENT, LLC.
3 ID SKYE CANYON - DETENTION BASIN #1
4 ID TECHNICAL DRAINAGE STUDY - CLV SUPPLEMENT
5 ID ULTIMATE DRAINAGE CONDITION
6 ID
7 ID RETURN PERIOD ----- 100-YEAR
8 ID DISTRIBUTION ----- 6-HOUR SDN3
9 ID PROJECT NO. ----- OLY1401.004
10 ID FILENAME ----- ULT1.H1
11 ID DATE ----- 7/16/2015
12 ID MODELED BY ----- SMJ
13 ID
14 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
15 ID DRAINAGE AREA (MI^2) RATIO
16 ID 0.0-0.49 1.00
17 ID 0.5-0.99 0.98
18 ID
19 IT 5 0 0 500
20 TO 5 0 0
21 IN 5 0 0
22 JR PREC 1.00 0.98
*
23 KK OFF1
24 KM EXISTING OFFSITE DRAINAGE BASIN
25 KM DISCHARGES INTO DETENTION BASIN "DB1"
26 PB 3.00
27 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
28 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
29 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
30 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
31 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
32 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
33 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
34 PC 0.998 0.999 1
35 BA .4073
36 LS 0 86.4
37 UD 0.356
*
38 KK OFF7
39 KM FUTURE DEVELOPED OFFSITE DRAINAGE BASIN
40 KM DISCHARGES INTO DETENTION BASIN "DB1"
41 BA .0281
42 LS 0 96.0
43 UD 0.118
*

```

1 HEC-1 INPUT PAGE 2

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*
44 KK CP2
45 KM COMBINE OFF1, OFF7
46 HC 2
*
47 KK OFF2
48 KM EXISTING OFFSITE DRAINAGE BASIN
49 KM DISCHARGES INTO DETENTION BASIN "DB1"
50 BA .0355
51 LS 0 85.0
52 UD 0.148
*
53 KK OFF3
54 KM EXISTING OFFSITE DRAINAGE BASIN
55 KM DISCHARGES INTO DETENTION BASIN "DB1"
56 BA .0259
57 LS 0 86.2
58 UD 0.112
*
59 KK CP1
60 KM COMBINE CP2, OFF2, AND OFF3
61 HC 3
*
62 KK OFF4
63 KM EXISTING OFFSITE DRAINAGE BASIN
64 KM DISCHARGES INTO DETENTION BASIN "DB1"
65 BA .0581
66 LS 0 86.2
67 UD 0.136
*
68 KK OFF5
69 KM EXISTING OFFSITE DRAINAGE BASIN
70 KM DISCHARGES INTO DETENTION BASIN "DB1"

```

ULT1.OUT

```

71      BA .2569
72      LS 0      86.5
73      UD 0.419
*
74      KK OFF6
75      KM EXISTING OFFSITE DRAINAGE BASIN
76      KM DISCHARGES INTO DETENTION BASIN "DB1"
77      BA .0399
78      LS 0      86.2
79      UD 0.121
*
```

1 HEC-1 INPUT PAGE 3

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
80      KK ON1
81      KM PROPOSED ONSITE DRAINAGE BASIN
82      BA .0261
83      LS 0      92.8
84      UD 0.116
*
85      KK DB1
86      KM COMBINE CP1, OFF4, OFF5, OFF6 AND ON1
87      KO 1
88      HC 5
*
89      KK RDB1
90      KM OUTLET = 24" ORIFICE @ INVERT ELEVATION = 3013.8-FT
91      KO 1
92      RS 1      ELEV 3025.5      5.92      6.10      7.01      7.46      8.36      9.32      10.68
93      SA 4.68      3.56      3.74      3029      3030      3035      3037      3040      3043      3046
94      SE 3025.5      3027      3028      3029      3030      3035      3037      3040      3043      3046
95      SQ 49.7      60.6      70.8      74.5      1436.0      3920.5      7136.3
96      SE 3025.5      3030      3035      3037      3040      3043      3046
*
97      ZZ
```

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
23      OFF1
.
.
38      OFF7
.
.
44      CP2.....
.
.
47      OFF2
.
.
53      OFF3
.
.
59      CP1.....
.
.
62      OFF4
.
.
68      OFF5
.
.
74      OFF6
.
.
80      ON1
.
.
85      DB1.....
V
89      RDB1
```

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 22JUL15 TIME 14:21:58 *
*****
```

```

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

SLATER HANIFAN GROUP  
NINETY-FIVE MANAGEMENT, LLC.  
SKYE CANYON - DETENTION BASIN #1  
TECHNICAL DRAINAGE STUDY - CLV SUPPLEMENT  
ULTIMATE DRAINAGE CONDITION

RETURN PERIOD ----- 100-YEAR  
DISTRIBUTION ----- 6-HOUR SDN3  
PROJECT NO. ----- OLY1401.004  
FILENAME ----- ULT1.H1  
DATE ----- 7/16/2015  
MODELED BY ----- SMJ

SIX HOUR DEPTH-AREA REDUCTION FACTORS  
DRAINAGE AREA (MI^2) RATIO  
0.0-0.49 1.00  
0.5-0.99 0.98

```

20 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 500 NUMBER OF HYDROGRAPH ORDINATES
      NDDATE 2 0 ENDING DATE
      NDTIME 1735 ENDING TIME
      ICENT 19 CENTURY MARK
```



ULT1.OUT

COMPUTATION INTERVAL .08 HOURS  
TOTAL TIME BASE 41.58 HOURS

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

JP MULTI-PLAN OPTION  
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION  
RATIOS OF PRECIPITATION  
1.00 .98

\*\*\* \*\*

\*\*\*\*\*  
\*  
85 KK \* DB1 \*  
\*  
\*\*\*\*\*

87 KO OUTPUT CONTROL VARIABLES  
IPRNT 1 PRINT CONTROL  
IPLOT 0 PLOT CONTROL  
QSCAL 0. HYDROGRAPH PLOT SCALE

88 HC HYDROGRAPH COMBINATION  
ICOMP 5 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\*\*\*

HYDROGRAPH AT STATION DB1  
SUM OF 5 HYDROGRAPHS  
PLAN 1, RATIO = 1.00

\*\*\*\*\*

| DA | MON  | HRMN | ORD  | FLOW | DA | MON  | HRMN | ORD | FLOW | DA | MON  | HRMN | ORD | FLOW | DA | MON  | HRMN | ORD | FLOW |
|----|------|------|------|------|----|------|------|-----|------|----|------|------|-----|------|----|------|------|-----|------|
| 1  | 0000 | 1    | 0.   | *    | 1  | 1025 | 126  | 0.  | *    | 1  | 2050 | 251  | 0.  | *    | 2  | 0715 | 376  | 0.  | *    |
| 1  | 0005 | 2    | 0.   | *    | 1  | 1030 | 127  | 0.  | *    | 1  | 2055 | 252  | 0.  | *    | 2  | 0720 | 377  | 0.  | *    |
| 1  | 0010 | 3    | 1.   | *    | 1  | 1035 | 128  | 0.  | *    | 1  | 2100 | 253  | 0.  | *    | 2  | 0725 | 378  | 0.  | *    |
| 1  | 0015 | 4    | 2.   | *    | 1  | 1040 | 129  | 0.  | *    | 1  | 2105 | 254  | 0.  | *    | 2  | 0730 | 379  | 0.  | *    |
| 1  | 0020 | 5    | 4.   | *    | 1  | 1045 | 130  | 0.  | *    | 1  | 2110 | 255  | 0.  | *    | 2  | 0735 | 380  | 0.  | *    |
| 1  | 0025 | 6    | 6.   | *    | 1  | 1050 | 131  | 0.  | *    | 1  | 2115 | 256  | 0.  | *    | 2  | 0740 | 381  | 0.  | *    |
| 1  | 0030 | 7    | 9.   | *    | 1  | 1055 | 132  | 0.  | *    | 1  | 2120 | 257  | 0.  | *    | 2  | 0745 | 382  | 0.  | *    |
| 1  | 0035 | 8    | 10.  | *    | 1  | 1100 | 133  | 0.  | *    | 1  | 2125 | 258  | 0.  | *    | 2  | 0750 | 383  | 0.  | *    |
| 1  | 0040 | 9    | 8.   | *    | 1  | 1105 | 134  | 0.  | *    | 1  | 2130 | 259  | 0.  | *    | 2  | 0755 | 384  | 0.  | *    |
| 1  | 0045 | 10   | 5.   | *    | 1  | 1110 | 135  | 0.  | *    | 1  | 2135 | 260  | 0.  | *    | 2  | 0800 | 385  | 0.  | *    |
| 1  | 0050 | 11   | 4.   | *    | 1  | 1115 | 136  | 0.  | *    | 1  | 2140 | 261  | 0.  | *    | 2  | 0805 | 386  | 0.  | *    |
| 1  | 0055 | 12   | 3.   | *    | 1  | 1120 | 137  | 0.  | *    | 1  | 2145 | 262  | 0.  | *    | 2  | 0810 | 387  | 0.  | *    |
| 1  | 0100 | 13   | 2.   | *    | 1  | 1125 | 138  | 0.  | *    | 1  | 2150 | 263  | 0.  | *    | 2  | 0815 | 388  | 0.  | *    |
| 1  | 0105 | 14   | 3.   | *    | 1  | 1130 | 139  | 0.  | *    | 1  | 2155 | 264  | 0.  | *    | 2  | 0820 | 389  | 0.  | *    |
| 1  | 0110 | 15   | 4.   | *    | 1  | 1135 | 140  | 0.  | *    | 1  | 2200 | 265  | 0.  | *    | 2  | 0825 | 390  | 0.  | *    |
| 1  | 0115 | 16   | 6.   | *    | 1  | 1140 | 141  | 0.  | *    | 1  | 2205 | 266  | 0.  | *    | 2  | 0830 | 391  | 0.  | *    |
| 1  | 0120 | 17   | 7.   | *    | 1  | 1145 | 142  | 0.  | *    | 1  | 2210 | 267  | 0.  | *    | 2  | 0835 | 392  | 0.  | *    |
| 1  | 0125 | 18   | 11.  | *    | 1  | 1150 | 143  | 0.  | *    | 1  | 2215 | 268  | 0.  | *    | 2  | 0840 | 393  | 0.  | *    |
| 1  | 0130 | 19   | 17.  | *    | 1  | 1155 | 144  | 0.  | *    | 1  | 2220 | 269  | 0.  | *    | 2  | 0845 | 394  | 0.  | *    |
| 1  | 0135 | 20   | 24.  | *    | 1  | 1200 | 145  | 0.  | *    | 1  | 2225 | 270  | 0.  | *    | 2  | 0850 | 395  | 0.  | *    |
| 1  | 0140 | 21   | 29.  | *    | 1  | 1205 | 146  | 0.  | *    | 1  | 2230 | 271  | 0.  | *    | 2  | 0855 | 396  | 0.  | *    |
| 1  | 0145 | 22   | 33.  | *    | 1  | 1210 | 147  | 0.  | *    | 1  | 2235 | 272  | 0.  | *    | 2  | 0900 | 397  | 0.  | *    |
| 1  | 0150 | 23   | 34.  | *    | 1  | 1215 | 148  | 0.  | *    | 1  | 2240 | 273  | 0.  | *    | 2  | 0905 | 398  | 0.  | *    |
| 1  | 0155 | 24   | 31.  | *    | 1  | 1220 | 149  | 0.  | *    | 1  | 2245 | 274  | 0.  | *    | 2  | 0910 | 399  | 0.  | *    |
| 1  | 0200 | 25   | 28.  | *    | 1  | 1225 | 150  | 0.  | *    | 1  | 2250 | 275  | 0.  | *    | 2  | 0915 | 400  | 0.  | *    |
| 1  | 0205 | 26   | 25.  | *    | 1  | 1230 | 151  | 0.  | *    | 1  | 2255 | 276  | 0.  | *    | 2  | 0920 | 401  | 0.  | *    |
| 1  | 0210 | 27   | 26.  | *    | 1  | 1235 | 152  | 0.  | *    | 1  | 2300 | 277  | 0.  | *    | 2  | 0925 | 402  | 0.  | *    |
| 1  | 0215 | 28   | 34.  | *    | 1  | 1240 | 153  | 0.  | *    | 1  | 2305 | 278  | 0.  | *    | 2  | 0930 | 403  | 0.  | *    |
| 1  | 0220 | 29   | 44.  | *    | 1  | 1245 | 154  | 0.  | *    | 1  | 2310 | 279  | 0.  | *    | 2  | 0935 | 404  | 0.  | *    |
| 1  | 0225 | 30   | 51.  | *    | 1  | 1250 | 155  | 0.  | *    | 1  | 2315 | 280  | 0.  | *    | 2  | 0940 | 405  | 0.  | *    |
| 1  | 0230 | 31   | 53.  | *    | 1  | 1255 | 156  | 0.  | *    | 1  | 2320 | 281  | 0.  | *    | 2  | 0945 | 406  | 0.  | *    |
| 1  | 0235 | 32   | 51.  | *    | 1  | 1300 | 157  | 0.  | *    | 1  | 2325 | 282  | 0.  | *    | 2  | 0950 | 407  | 0.  | *    |
| 1  | 0240 | 33   | 56.  | *    | 1  | 1305 | 158  | 0.  | *    | 1  | 2330 | 283  | 0.  | *    | 2  | 0955 | 408  | 0.  | *    |
| 1  | 0245 | 34   | 63.  | *    | 1  | 1310 | 159  | 0.  | *    | 1  | 2335 | 284  | 0.  | *    | 2  | 1000 | 409  | 0.  | *    |
| 1  | 0250 | 35   | 63.  | *    | 1  | 1315 | 160  | 0.  | *    | 1  | 2340 | 285  | 0.  | *    | 2  | 1005 | 410  | 0.  | *    |
| 1  | 0255 | 36   | 57.  | *    | 1  | 1320 | 161  | 0.  | *    | 1  | 2345 | 286  | 0.  | *    | 2  | 1010 | 411  | 0.  | *    |
| 1  | 0300 | 37   | 58.  | *    | 1  | 1325 | 162  | 0.  | *    | 1  | 2350 | 287  | 0.  | *    | 2  | 1015 | 412  | 0.  | *    |
| 1  | 0305 | 38   | 75.  | *    | 1  | 1330 | 163  | 0.  | *    | 1  | 2355 | 288  | 0.  | *    | 2  | 1020 | 413  | 0.  | *    |
| 1  | 0310 | 39   | 107. | *    | 1  | 1335 | 164  | 0.  | *    | 2  | 0000 | 289  | 0.  | *    | 2  | 1025 | 414  | 0.  | *    |
| 1  | 0315 | 40   | 163. | *    | 1  | 1340 | 165  | 0.  | *    | 2  | 0005 | 290  | 0.  | *    | 2  | 1030 | 415  | 0.  | *    |
| 1  | 0320 | 41   | 273. | *    | 1  | 1345 | 166  | 0.  | *    | 2  | 0010 | 291  | 0.  | *    | 2  | 1035 | 416  | 0.  | *    |
| 1  | 0325 | 42   | 428. | *    | 1  | 1350 | 167  | 0.  | *    | 2  | 0015 | 292  | 0.  | *    | 2  | 1040 | 417  | 0.  | *    |
| 1  | 0330 | 43   | 618. | *    | 1  | 1355 | 168  | 0.  | *    | 2  | 0020 | 293  | 0.  | *    | 2  | 1045 | 418  | 0.  | *    |
| 1  | 0335 | 44   | 764. | *    | 1  | 1400 | 169  | 0.  | *    | 2  | 0025 | 294  | 0.  | *    | 2  | 1050 | 419  | 0.  | *    |
| 1  | 0340 | 45   | 807. | *    | 1  | 1405 | 170  | 0.  | *    | 2  | 0030 | 295  | 0.  | *    | 2  | 1055 | 420  | 0.  | *    |
| 1  | 0345 | 46   | 817. | *    | 1  | 1410 | 171  | 0.  | *    | 2  | 0035 | 296  | 0.  | *    | 2  | 1100 | 421  | 0.  | *    |
| 1  | 0350 | 47   | 780. | *    | 1  | 1415 | 172  | 0.  | *    | 2  | 0040 | 297  | 0.  | *    | 2  | 1105 | 422  | 0.  | *    |
| 1  | 0355 | 48   | 698. | *    | 1  | 1420 | 173  | 0.  | *    | 2  | 0045 | 298  | 0.  | *    | 2  | 1110 | 423  | 0.  | *    |
| 1  | 0400 | 49   | 612. | *    | 1  | 1425 | 174  | 0.  | *    | 2  | 0050 | 299  | 0.  | *    | 2  | 1115 | 424  | 0.  | *    |
| 1  | 0405 | 50   | 519. | *    | 1  | 1430 | 175  | 0.  | *    | 2  | 0055 | 300  | 0.  | *    | 2  | 1120 | 425  | 0.  | *    |
| 1  | 0410 | 51   | 425. | *    | 1  | 1435 | 176  | 0.  | *    | 2  | 0100 | 301  | 0.  | *    | 2  | 1125 | 426  | 0.  | *    |
| 1  | 0415 | 52   | 349. | *    | 1  | 1440 | 177  | 0.  | *    | 2  | 0105 | 302  | 0.  | *    | 2  | 1130 | 427  | 0.  | *    |
| 1  | 0420 | 53   | 292. | *    | 1  | 1445 | 178  | 0.  | *    | 2  | 0110 | 303  | 0.  | *    | 2  | 1135 | 428  | 0.  | *    |
| 1  | 0425 | 54   | 254. | *    | 1  | 1450 | 179  | 0.  | *    | 2  | 0115 | 304  | 0.  | *    | 2  | 1140 | 429  | 0.  | *    |
| 1  | 0430 | 55   | 240. | *    | 1  | 1455 | 180  | 0.  | *    | 2  | 0120 | 305  | 0.  | *    | 2  | 1145 | 430  | 0.  | *    |
| 1  | 0435 | 56   | 242. | *    | 1  | 1500 | 181  | 0.  | *    | 2  | 0125 | 306  | 0.  | *    | 2  | 1150 | 431  | 0.  | *    |
| 1  | 0440 | 57   | 240. | *    | 1  | 1505 | 182  | 0.  | *    | 2  | 0130 | 307  | 0.  | *    | 2  | 1155 | 432  | 0.  | *    |
| 1  | 0445 | 58   | 237. | *    | 1  | 1510 | 183  | 0.  | *    | 2  | 0135 | 308  | 0.  | *    | 2  | 1200 | 433  | 0.  | *    |
| 1  | 0450 | 59   | 245. | *    | 1  | 1515 | 184  | 0.  | *    | 2  | 0140 | 309  | 0.  | *    | 2  | 1205 | 434  | 0.  | *    |
| 1  | 0455 | 60   | 248. | *    | 1  | 1520 | 185  | 0.  | *    | 2  | 0145 | 310  | 0.  | *    | 2  | 1210 | 435  | 0.  | *    |
| 1  | 0500 | 61   | 232. | *    | 1  | 1525 | 186  | 0.  | *    | 2  | 0150 | 311  | 0.  | *    | 2  | 1215 | 436  | 0.  | *    |
| 1  | 0505 | 62   | 209. | *    | 1  | 1530 | 187  | 0.  | *    | 2  | 0155 | 312  | 0.  | *    | 2  | 1220 | 437  | 0.  | *    |
| 1  | 0510 | 63   | 182. | *    | 1  | 1535 | 188  | 0.  | *    | 2  | 0200 | 313  | 0.  | *    | 2  | 1225 | 438  | 0.  | *    |
| 1  | 0515 | 64   | 155. | *    | 1  | 1540 | 189  | 0.  | *    | 2  | 0205 | 314  | 0.  | *    | 2  | 1230 | 439  | 0.  | *    |
| 1  | 0520 | 65   | 128. | *    | 1  | 1545 | 190  | 0.  | *    | 2  | 0210 | 315  | 0.  | *    | 2  | 1235 | 440  | 0.  | *    |
| 1  | 0525 | 66   | 104. | *    | 1  | 1550 | 191  | 0.  | *    | 2  | 0215 | 316  | 0.  | *    | 2  | 1240 | 441  | 0.  | *    |
| 1  | 0530 | 67   | 85.  | *    | 1  | 1555 | 192  | 0.  | *    | 2  | 0220 | 317  | 0.  | *    | 2  | 1245 | 442  | 0.  | *    |
| 1  | 0535 | 68   | 67.  | *    | 1  | 1600 | 193  | 0.  | *    | 2  | 0225 | 318  | 0.  | *    | 2  | 1250 | 443  | 0.  | *    |
| 1  | 0540 | 69   | 54.  | *    | 1  | 1605 | 194  | 0.  | *    | 2  | 0230 | 319  | 0.  | *    | 2  | 1255 | 444  | 0.  | *    |
| 1  | 0545 | 70   | 47.  | *    | 1  | 1610 | 195  | 0.  | *    | 2  | 0235 | 320  | 0.  | *    | 2  | 1300 | 445  | 0.  | *    |
| 1  | 0550 | 71   | 41.  | *    | 1  | 1615 | 196  | 0.  | *    | 2  | 0240 | 321  | 0.  | *    | 2  | 1305 | 446  | 0.  | *    |
| 1  | 0555 | 72   | 34.  | *    | 1  | 1620 | 197  | 0.  | *    | 2  | 0245 | 322  | 0.  | *    | 2  | 1310 | 447  | 0.  | *    |
| 1  | 0600 | 73   | 30.  | *    | 1  | 1625 | 198  | 0.  | *    | 2  | 0250 | 323  | 0.  | *    | 2  | 1315 | 448  | 0.  | *    |
| 1  | 0605 | 74   | 26.  | *    | 1  | 1630 | 199  | 0.  | *    | 2  | 0255 | 324  | 0.  | *    | 2  | 1320 | 449  | 0.  | *    |
| 1  | 0610 | 75   | 21.  | *    | 1  | 1635 | 200  | 0.  | *    | 2  | 0300 | 325  | 0.  | *    | 2  | 1325 | 450  | 0.  | *    |
| 1  | 0615 | 76   | 17.  | *    | 1  | 1640 | 201  | 0.  | *    | 2  | 0305 | 326  | 0.  | *    | 2  | 1330 | 451  | 0.  | *    |
| 1  | 0620 | 77   | 13.  | *    | 1  | 1645 | 202  | 0.  | *    | 2  | 0310 | 327  | 0.  | *    | 2  | 1335 | 452  | 0.  | *    |
| 1  | 0625 | 78   | 10.  | *    | 1  | 1650 | 203  | 0.  | *    | 2  | 0315 | 328  | 0.  | *    | 2  | 1340 | 453  | 0.  | *    |

| UL1.OUT |      |     |    |   |   |      |     |    |   |   |      |     |    |   |   |      |     |    |
|---------|------|-----|----|---|---|------|-----|----|---|---|------|-----|----|---|---|------|-----|----|
| 1       | 0630 | 79  | 7. | * | 1 | 1655 | 204 | 0. | * | 2 | 0320 | 329 | 0. | * | 2 | 1345 | 454 | 0. |
| 1       | 0635 | 80  | 5. | * | 1 | 1700 | 205 | 0. | * | 2 | 0325 | 330 | 0. | * | 2 | 1350 | 455 | 0. |
| 1       | 0640 | 81  | 4. | * | 1 | 1705 | 206 | 0. | * | 2 | 0330 | 331 | 0. | * | 2 | 1355 | 456 | 0. |
| 1       | 0645 | 82  | 3. | * | 1 | 1710 | 207 | 0. | * | 2 | 0335 | 332 | 0. | * | 2 | 1400 | 457 | 0. |
| 1       | 0650 | 83  | 2. | * | 1 | 1715 | 208 | 0. | * | 2 | 0340 | 333 | 0. | * | 2 | 1405 | 458 | 0. |
| 1       | 0655 | 84  | 1. | * | 1 | 1720 | 209 | 0. | * | 2 | 0345 | 334 | 0. | * | 2 | 1410 | 459 | 0. |
| 1       | 0700 | 85  | 1. | * | 1 | 1725 | 210 | 0. | * | 2 | 0350 | 335 | 0. | * | 2 | 1415 | 460 | 0. |
| 1       | 0705 | 86  | 1. | * | 1 | 1730 | 211 | 0. | * | 2 | 0355 | 336 | 0. | * | 2 | 1420 | 461 | 0. |
| 1       | 0710 | 87  | 0. | * | 1 | 1735 | 212 | 0. | * | 2 | 0400 | 337 | 0. | * | 2 | 1425 | 462 | 0. |
| 1       | 0715 | 88  | 0. | * | 1 | 1740 | 213 | 0. | * | 2 | 0405 | 338 | 0. | * | 2 | 1430 | 463 | 0. |
| 1       | 0720 | 89  | 0. | * | 1 | 1745 | 214 | 0. | * | 2 | 0410 | 339 | 0. | * | 2 | 1435 | 464 | 0. |
| 1       | 0725 | 90  | 0. | * | 1 | 1750 | 215 | 0. | * | 2 | 0415 | 340 | 0. | * | 2 | 1440 | 465 | 0. |
| 1       | 0730 | 91  | 0. | * | 1 | 1755 | 216 | 0. | * | 2 | 0420 | 341 | 0. | * | 2 | 1445 | 466 | 0. |
| 1       | 0735 | 92  | 0. | * | 1 | 1800 | 217 | 0. | * | 2 | 0425 | 342 | 0. | * | 2 | 1450 | 467 | 0. |
| 1       | 0740 | 93  | 0. | * | 1 | 1805 | 218 | 0. | * | 2 | 0430 | 343 | 0. | * | 2 | 1455 | 468 | 0. |
| 1       | 0745 | 94  | 0. | * | 1 | 1810 | 219 | 0. | * | 2 | 0435 | 344 | 0. | * | 2 | 1500 | 469 | 0. |
| 1       | 0750 | 95  | 0. | * | 1 | 1815 | 220 | 0. | * | 2 | 0440 | 345 | 0. | * | 2 | 1505 | 470 | 0. |
| 1       | 0755 | 96  | 0. | * | 1 | 1820 | 221 | 0. | * | 2 | 0445 | 346 | 0. | * | 2 | 1510 | 471 | 0. |
| 1       | 0800 | 97  | 0. | * | 1 | 1825 | 222 | 0. | * | 2 | 0450 | 347 | 0. | * | 2 | 1515 | 472 | 0. |
| 1       | 0805 | 98  | 0. | * | 1 | 1830 | 223 | 0. | * | 2 | 0455 | 348 | 0. | * | 2 | 1520 | 473 | 0. |
| 1       | 0810 | 99  | 0. | * | 1 | 1835 | 224 | 0. | * | 2 | 0500 | 349 | 0. | * | 2 | 1525 | 474 | 0. |
| 1       | 0815 | 100 | 0. | * | 1 | 1840 | 225 | 0. | * | 2 | 0505 | 350 | 0. | * | 2 | 1530 | 475 | 0. |
| 1       | 0820 | 101 | 0. | * | 1 | 1845 | 226 | 0. | * | 2 | 0510 | 351 | 0. | * | 2 | 1535 | 476 | 0. |
| 1       | 0825 | 102 | 0. | * | 1 | 1850 | 227 | 0. | * | 2 | 0515 | 352 | 0. | * | 2 | 1540 | 477 | 0. |
| 1       | 0830 | 103 | 0. | * | 1 | 1855 | 228 | 0. | * | 2 | 0520 | 353 | 0. | * | 2 | 1545 | 478 | 0. |
| 1       | 0835 | 104 | 0. | * | 1 | 1900 | 229 | 0. | * | 2 | 0525 | 354 | 0. | * | 2 | 1550 | 479 | 0. |
| 1       | 0840 | 105 | 0. | * | 1 | 1905 | 230 | 0. | * | 2 | 0530 | 355 | 0. | * | 2 | 1555 | 480 | 0. |
| 1       | 0845 | 106 | 0. | * | 1 | 1910 | 231 | 0. | * | 2 | 0535 | 356 | 0. | * | 2 | 1600 | 481 | 0. |
| 1       | 0850 | 107 | 0. | * | 1 | 1915 | 232 | 0. | * | 2 | 0540 | 357 | 0. | * | 2 | 1605 | 482 | 0. |
| 1       | 0855 | 108 | 0. | * | 1 | 1920 | 233 | 0. | * | 2 | 0545 | 358 | 0. | * | 2 | 1610 | 483 | 0. |
| 1       | 0900 | 109 | 0. | * | 1 | 1925 | 234 | 0. | * | 2 | 0550 | 359 | 0. | * | 2 | 1615 | 484 | 0. |
| 1       | 0905 | 110 | 0. | * | 1 | 1930 | 235 | 0. | * | 2 | 0555 | 360 | 0. | * | 2 | 1620 | 485 | 0. |
| 1       | 0910 | 111 | 0. | * | 1 | 1935 | 236 | 0. | * | 2 | 0600 | 361 | 0. | * | 2 | 1625 | 486 | 0. |
| 1       | 0915 | 112 | 0. | * | 1 | 1940 | 237 | 0. | * | 2 | 0605 | 362 | 0. | * | 2 | 1630 | 487 | 0. |
| 1       | 0920 | 113 | 0. | * | 1 | 1945 | 238 | 0. | * | 2 | 0610 | 363 | 0. | * | 2 | 1635 | 488 | 0. |
| 1       | 0925 | 114 | 0. | * | 1 | 1950 | 239 | 0. | * | 2 | 0615 | 364 | 0. | * | 2 | 1640 | 489 | 0. |
| 1       | 0930 | 115 | 0. | * | 1 | 1955 | 240 | 0. | * | 2 | 0620 | 365 | 0. | * | 2 | 1645 | 490 | 0. |
| 1       | 0935 | 116 | 0. | * | 1 | 2000 | 241 | 0. | * | 2 | 0625 | 366 | 0. | * | 2 | 1650 | 491 | 0. |
| 1       | 0940 | 117 | 0. | * | 1 | 2005 | 242 | 0. | * | 2 | 0630 | 367 | 0. | * | 2 | 1655 | 492 | 0. |
| 1       | 0945 | 118 | 0. | * | 1 | 2010 | 243 | 0. | * | 2 | 0635 | 368 | 0. | * | 2 | 1700 | 493 | 0. |
| 1       | 0950 | 119 | 0. | * | 1 | 2015 | 244 | 0. | * | 2 | 0640 | 369 | 0. | * | 2 | 1705 | 494 | 0. |
| 1       | 0955 | 120 | 0. | * | 1 | 2020 | 245 | 0. | * | 2 | 0645 | 370 | 0. | * | 2 | 1710 | 495 | 0. |
| 1       | 1000 | 121 | 0. | * | 1 | 2025 | 246 | 0. | * | 2 | 0650 | 371 | 0. | * | 2 | 1715 | 496 | 0. |
| 1       | 1005 | 122 | 0. | * | 1 | 2030 | 247 | 0. | * | 2 | 0655 | 372 | 0. | * | 2 | 1720 | 497 | 0. |
| 1       | 1010 | 123 | 0. | * | 1 | 2035 | 248 | 0. | * | 2 | 0700 | 373 | 0. | * | 2 | 1725 | 498 | 0. |
| 1       | 1015 | 124 | 0. | * | 1 | 2040 | 249 | 0. | * | 2 | 0705 | 374 | 0. | * | 2 | 1730 | 499 | 0. |
| 1       | 1020 | 125 | 0. | * | 1 | 2045 | 250 | 0. | * | 2 | 0710 | 375 | 0. | * | 2 | 1735 | 500 | 0. |

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| PEAK FLOW | TIME | MAXIMUM AVERAGE FLOW        |          |          |          |
|-----------|------|-----------------------------|----------|----------|----------|
| (CFS)     | (HR) | 6-HR                        | 24-HR    | 72-HR    | 41.58-HR |
| 817.      | 3.75 | 163.                        | 41.      | 24.      | 24.      |
|           |      | 1.727                       | 1.732    | 1.732    | 1.732    |
|           |      | (INCHES)                    | (INCHES) | (INCHES) | (INCHES) |
|           |      | (AC-FT)                     | (AC-FT)  | (AC-FT)  | (AC-FT)  |
|           |      | CUMULATIVE AREA = .88 SQ MI |          |          |          |

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HYDROGRAPH AT STATION DB1  
SUM OF 5 HYDROGRAPHS  
PLAN 1, RATIO = .98

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| DA | MON  | HRMN | ORD  | FLOW | * | DA   | MON | HRMN | ORD | FLOW | *    | DA  | MON | HRMN | ORD | FLOW | *   | DA | MON | HRMN | ORD | FLOW | *  |
|----|------|------|------|------|---|------|-----|------|-----|------|------|-----|-----|------|-----|------|-----|----|-----|------|-----|------|----|
| 1  | 0000 | 1    | 0.   | *    | 1 | 1025 | 126 | 0.   | *   | 1    | 2050 | 251 | 0.  | *    | 2   | 0715 | 376 | 0. |     |      |     |      | 0. |
| 1  | 0005 | 2    | 0.   | *    | 1 | 1030 | 127 | 0.   | *   | 1    | 2055 | 252 | 0.  | *    | 2   | 0720 | 377 | 0. |     |      |     |      | 0. |
| 1  | 0010 | 3    | 1.   | *    | 1 | 1035 | 128 | 0.   | *   | 1    | 2100 | 253 | 0.  | *    | 2   | 0725 | 378 | 0. |     |      |     |      | 0. |
| 1  | 0015 | 4    | 2.   | *    | 1 | 1040 | 129 | 0.   | *   | 1    | 2105 | 254 | 0.  | *    | 2   | 0730 | 379 | 0. |     |      |     |      | 0. |
| 1  | 0020 | 5    | 3.   | *    | 1 | 1045 | 130 | 0.   | *   | 1    | 2110 | 255 | 0.  | *    | 2   | 0735 | 380 | 0. |     |      |     |      | 0. |
| 1  | 0025 | 6    | 6.   | *    | 1 | 1050 | 131 | 0.   | *   | 1    | 2115 | 256 | 0.  | *    | 2   | 0740 | 381 | 0. |     |      |     |      | 0. |
| 1  | 0030 | 7    | 9.   | *    | 1 | 1055 | 132 | 0.   | *   | 1    | 2120 | 257 | 0.  | *    | 2   | 0745 | 382 | 0. |     |      |     |      | 0. |
| 1  | 0035 | 8    | 9.   | *    | 1 | 1100 | 133 | 0.   | *   | 1    | 2125 | 258 | 0.  | *    | 2   | 0750 | 383 | 0. |     |      |     |      | 0. |
| 1  | 0040 | 9    | 7.   | *    | 1 | 1105 | 134 | 0.   | *   | 1    | 2130 | 259 | 0.  | *    | 2   | 0755 | 384 | 0. |     |      |     |      | 0. |
| 1  | 0045 | 10   | 5.   | *    | 1 | 1110 | 135 | 0.   | *   | 1    | 2135 | 260 | 0.  | *    | 2   | 0800 | 385 | 0. |     |      |     |      | 0. |
| 1  | 0050 | 11   | 3.   | *    | 1 | 1115 | 136 | 0.   | *   | 1    | 2140 | 261 | 0.  | *    | 2   | 0805 | 386 | 0. |     |      |     |      | 0. |
| 1  | 0055 | 12   | 3.   | *    | 1 | 1120 | 137 | 0.   | *   | 1    | 2145 | 262 | 0.  | *    | 2   | 0810 | 387 | 0. |     |      |     |      | 0. |
| 1  | 0100 | 13   | 2.   | *    | 1 | 1125 | 138 | 0.   | *   | 1    | 2150 | 263 | 0.  | *    | 2   | 0815 | 388 | 0. |     |      |     |      | 0. |
| 1  | 0105 | 14   | 2.   | *    | 1 | 1130 | 139 | 0.   | *   | 1    | 2155 | 264 | 0.  | *    | 2   | 0820 | 389 | 0. |     |      |     |      | 0. |
| 1  | 0110 | 15   | 4.   | *    | 1 | 1135 | 140 | 0.   | *   | 1    | 2200 | 265 | 0.  | *    | 2   | 0825 | 390 | 0. |     |      |     |      | 0. |
| 1  | 0115 | 16   | 5.   | *    | 1 | 1140 | 141 | 0.   | *   | 1    | 2205 | 266 | 0.  | *    | 2   | 0830 | 391 | 0. |     |      |     |      | 0. |
| 1  | 0120 | 17   | 7.   | *    | 1 | 1145 | 142 | 0.   | *   | 1    | 2210 | 267 | 0.  | *    | 2   | 0835 | 392 | 0. |     |      |     |      | 0. |
| 1  | 0125 | 18   | 10.  | *    | 1 | 1150 | 143 | 0.   | *   | 1    | 2215 | 268 | 0.  | *    | 2   | 0840 | 393 | 0. |     |      |     |      | 0. |
| 1  | 0130 | 19   | 16.  | *    | 1 | 1155 | 144 | 0.   | *   | 1    | 2220 | 269 | 0.  | *    | 2   | 0845 | 394 | 0. |     |      |     |      | 0. |
| 1  | 0135 | 20   | 23.  | *    | 1 | 1200 | 145 | 0.   | *   | 1    | 2225 | 270 | 0.  | *    | 2   | 0850 | 395 | 0. |     |      |     |      | 0. |
| 1  | 0140 | 21   | 27.  | *    | 1 | 1205 | 146 | 0.   | *   | 1    | 2230 | 271 | 0.  | *    | 2   | 0855 | 396 | 0. |     |      |     |      | 0. |
| 1  | 0145 | 22   | 31.  | *    | 1 | 1210 | 147 | 0.   | *   | 1    | 2235 | 272 | 0.  | *    | 2   | 0900 | 397 | 0. |     |      |     |      | 0. |
| 1  | 0150 | 23   | 32.  | *    | 1 | 1215 | 148 | 0.   | *   | 1    | 2240 | 273 | 0.  | *    | 2   | 0905 | 398 | 0. |     |      |     |      | 0. |
| 1  | 0155 | 24   | 29.  | *    | 1 | 1220 | 149 | 0.   | *   | 1    | 2245 | 274 | 0.  | *    | 2   | 0910 | 399 | 0. |     |      |     |      | 0. |
| 1  | 0200 | 25   | 26.  | *    | 1 | 1225 | 150 | 0.   | *   | 1    | 2250 | 275 | 0.  | *    | 2   | 0915 | 400 | 0. |     |      |     |      | 0. |
| 1  | 0205 | 26   | 23.  | *    | 1 | 1230 | 151 | 0.   | *   | 1    | 2255 | 276 | 0.  | *    | 2   | 0920 | 401 | 0. |     |      |     |      | 0. |
| 1  | 0210 | 27   | 24.  | *    | 1 | 1235 | 152 | 0.   | *   | 1    | 2300 | 277 | 0.  | *    | 2   | 0925 | 402 | 0. |     |      |     |      | 0. |
| 1  | 0215 | 28   | 32.  | *    | 1 | 1240 | 153 | 0.   | *   | 1    | 2305 | 278 | 0.  | *    | 2   | 0930 | 403 | 0. |     |      |     |      | 0. |
| 1  | 0220 | 29   | 42.  | *    | 1 | 1245 | 154 | 0.   | *   | 1    | 2310 | 279 | 0.  | *    | 2   | 0935 | 404 | 0. |     |      |     |      | 0. |
| 1  | 0225 | 30   | 49.  | *    | 1 | 1250 | 155 | 0.   | *   | 1    | 2315 | 280 | 0.  | *    | 2   | 0940 | 405 | 0. |     |      |     |      | 0. |
| 1  | 0230 | 31   | 50.  | *    | 1 | 1255 | 156 | 0.   | *   | 1    | 2320 | 281 | 0.  | *    | 2   | 0945 | 406 | 0. |     |      |     |      | 0. |
| 1  | 0235 | 32   | 49.  | *    | 1 | 1300 | 157 | 0.   | *   | 1    | 2325 | 282 | 0.  | *    | 2   | 0950 | 407 | 0. |     |      |     |      | 0. |
| 1  | 0240 | 33   | 54.  | *    | 1 | 1305 | 158 | 0.   | *   | 1    | 2330 | 283 | 0.  | *    | 2   | 0955 | 408 | 0. |     |      |     |      | 0. |
| 1  | 0245 | 34   | 60.  | *    | 1 | 1310 | 159 | 0.   | *   | 1    | 2335 | 284 | 0.  | *    | 2   | 1000 | 409 | 0. |     |      |     |      | 0. |
| 1  | 0250 | 35   | 60.  | *    | 1 | 1315 | 160 | 0.   | *   | 1    | 2340 | 285 | 0.  | *    | 2   | 1005 | 410 | 0. |     |      |     |      | 0. |
| 1  | 0255 | 36   | 55.  | *    | 1 | 1320 | 161 | 0.   | *   | 1    | 2345 | 286 | 0.  | *    | 2   | 1010 | 411 | 0. |     |      |     |      | 0. |
| 1  | 0300 | 37   | 55.  | *    | 1 | 1325 | 162 | 0.   | *   | 1    | 2350 | 287 | 0.  | *    | 2   | 1015 | 412 | 0. |     |      |     |      | 0. |
| 1  | 0305 | 38   | 50.  | *    | 1 | 1330 | 163 | 0.   | *   | 1    | 2355 | 288 | 0.  | *    | 2   | 1020 | 413 | 0. |     |      |     |      | 0. |
| 1  | 0310 | 39   | 103. | *    | 1 | 1335 | 164 | 0.   | *   | 2    | 0000 | 289 | 0.  | *    | 2   | 1025 | 414 | 0. |     |      |     |      | 0. |
| 1  | 0315 | 40   | 158. | *    | 1 | 1340 | 165 | 0.   | *   | 2    | 0005 | 290 | 0.  | *    | 2   | 1030 | 415 | 0. |     |      |     |      | 0. |
| 1  | 0320 | 41   | 264. | *    | 1 | 1345 | 166 | 0.   | *   | 2    | 0010 | 291 | 0.  | *    | 2   | 1035 | 416 | 0. |     |      |     |      | 0. |
| 1  | 0325 | 42   | 413. | *    | 1 | 1350 | 167 | 0.   | *   | 2    | 0015 | 292 | 0.  | *    | 2   | 1040 | 417 | 0. |     |      |     |      | 0. |
| 1  | 0330 | 43   | 599. | *    | 1 | 1355 | 168 | 0.   | *   | 2    | 0020 | 293 | 0.  | *    | 2   | 1045 | 418 | 0. |     |      |     |      | 0. |
| 1  | 0335 | 44   | 741. | *    | 1 | 1400 | 169 | 0.   | *   | 2    | 0025 | 294 | 0.  | *    | 2   | 1050 | 419 | 0. |     |      |     |      | 0. |
| 1  | 0340 | 45   | 784. | *    | 1 | 1405 | 170 | 0.   | *   | 2    | 0030 | 295 | 0.  | *    | 2   | 1055 | 420 | 0. |     |      |     |      | 0. |
| 1  | 0345 | 46   | 794. | *    | 1 | 1410 | 171 | 0.   | *   | 2    | 0035 | 296 | 0.  | *    | 2   | 1100 | 421 | 0. |     |      |     |      | 0. |
| 1  | 0350 | 47   | 758. | *    | 1 | 1415 | 172 | 0.   | *   | 2    | 0040 | 297 | 0.  | *    | 2   | 1105 | 422 | 0. |     |      |     |      | 0. |
| 1  | 0355 | 48   | 678. | *    | 1 | 1420 | 173 | 0.   | *   | 2    | 0045 | 298 | 0.  | *    | 2   | 1110 | 423 | 0. |     |      |     |      | 0. |
| 1  | 0400 | 49   | 595. | *    | 1 | 1425 | 174 | 0.   | *   | 2    | 0050 | 299 | 0.  | *    | 2   | 1115 | 424 | 0. |     |      |     |      | 0. |
| 1  | 0405 | 50   | 505. | *    | 1 | 1430 | 175 | 0.   | *   | 2    | 0055 | 300 | 0.  | *    | 2   | 1120 | 425 | 0. |     |      |     |      | 0. |
| 1  | 0410 | 51   | 414. | *    | 1 | 1435 | 176 | 0.   | *   | 2    | 0100 | 301 | 0.  | *    | 2   | 1125 | 426 | 0. |     |      |     |      | 0. |
| 1  | 0415 | 52   | 339. | *    | 1 | 1440 | 177 | 0.   | *   | 2    | 0105 | 302 | 0.  | *    | 2   | 1130 | 427 | 0. |     |      |     |      | 0. |
| 1  | 0420 | 53   | 284. | *    | 1 | 1445 | 178 | 0.   | *   | 2    | 0110 | 303 | 0.  | *    | 2   | 1135 | 428 | 0. |     |      |     |      | 0. |
| 1  | 0425 | 54   | 247. | *    | 1 | 1450 | 179 | 0.   | *   | 2    | 0115 | 304 | 0.  | *    | 2   | 1140 | 429 | 0. |     |      |     |      | 0. |
| 1  | 0430 | 55   | 233. | *    | 1 | 1455 | 180 | 0.   | *   | 2    | 0120 | 305 | 0.  | *    | 2   | 1145 | 430 | 0. |     |      |     |      | 0. |
| 1  | 0435 | 56   | 235. | *    | 1 | 1500 | 181 | 0.   | *   | 2    | 0125 | 306 | 0.  | *    | 2   | 1150 | 431 | 0. |     |      |     |      | 0. |
| 1  | 0440 | 57   | 240. | *    | 1 | 1505 | 182 | 0.   | *   | 2    | 0130 | 307 | 0.  | *    | 2   | 1155 | 432 | 0. |     |      |     |      | 0. |
| 1  | 0445 | 58   | 231. | *    | 1 | 1510 | 183 | 0.   | *   | 2    | 0135 | 308 | 0.  | *    | 2   | 1200 | 433 | 0. |     |      |     |      | 0. |

| ULT1.OUT |      |     |      |   |   |      |     |    |   |   |      |     |    |   |   |      |     |    |
|----------|------|-----|------|---|---|------|-----|----|---|---|------|-----|----|---|---|------|-----|----|
| 1        | 0450 | 59  | 239. | * | 1 | 1515 | 184 | 0. | * | 2 | 0140 | 309 | 0. | * | 2 | 1205 | 434 | 0. |
| 1        | 0455 | 60  | 242. | * | 1 | 1520 | 185 | 0. | * | 2 | 0145 | 310 | 0. | * | 2 | 1210 | 435 | 0. |
| 1        | 0500 | 61  | 226. | * | 1 | 1525 | 186 | 0. | * | 2 | 0150 | 311 | 0. | * | 2 | 1215 | 436 | 0. |
| 1        | 0505 | 62  | 204. | * | 1 | 1530 | 187 | 0. | * | 2 | 0155 | 312 | 0. | * | 2 | 1220 | 437 | 0. |
| 1        | 0510 | 63  | 178. | * | 1 | 1535 | 188 | 0. | * | 2 | 0200 | 313 | 0. | * | 2 | 1225 | 438 | 0. |
| 1        | 0515 | 64  | 151. | * | 1 | 1540 | 189 | 0. | * | 2 | 0205 | 314 | 0. | * | 2 | 1230 | 439 | 0. |
| 1        | 0520 | 65  | 124. | * | 1 | 1545 | 190 | 0. | * | 2 | 0210 | 315 | 0. | * | 2 | 1235 | 440 | 0. |
| 1        | 0525 | 66  | 101. | * | 1 | 1550 | 191 | 0. | * | 2 | 0215 | 316 | 0. | * | 2 | 1240 | 441 | 0. |
| 1        | 0530 | 67  | 82.  | * | 1 | 1555 | 192 | 0. | * | 2 | 0220 | 317 | 0. | * | 2 | 1245 | 442 | 0. |
| 1        | 0535 | 68  | 65.  | * | 1 | 1600 | 193 | 0. | * | 2 | 0225 | 318 | 0. | * | 2 | 1250 | 443 | 0. |
| 1        | 0540 | 69  | 53.  | * | 1 | 1605 | 194 | 0. | * | 2 | 0230 | 319 | 0. | * | 2 | 1255 | 444 | 0. |
| 1        | 0545 | 70  | 45.  | * | 1 | 1610 | 195 | 0. | * | 2 | 0235 | 320 | 0. | * | 2 | 1300 | 445 | 0. |
| 1        | 0550 | 71  | 40.  | * | 1 | 1615 | 196 | 0. | * | 2 | 0240 | 321 | 0. | * | 2 | 1305 | 446 | 0. |
| 1        | 0555 | 72  | 34.  | * | 1 | 1620 | 197 | 0. | * | 2 | 0245 | 322 | 0. | * | 2 | 1310 | 447 | 0. |
| 1        | 0600 | 73  | 29.  | * | 1 | 1625 | 198 | 0. | * | 2 | 0250 | 323 | 0. | * | 2 | 1315 | 448 | 0. |
| 1        | 0605 | 74  | 26.  | * | 1 | 1630 | 199 | 0. | * | 2 | 0255 | 324 | 0. | * | 2 | 1320 | 449 | 0. |
| 1        | 0610 | 75  | 21.  | * | 1 | 1635 | 200 | 0. | * | 2 | 0300 | 325 | 0. | * | 2 | 1325 | 450 | 0. |
| 1        | 0615 | 76  | 17.  | * | 1 | 1640 | 201 | 0. | * | 2 | 0305 | 326 | 0. | * | 2 | 1330 | 451 | 0. |
| 1        | 0620 | 77  | 13.  | * | 1 | 1645 | 202 | 0. | * | 2 | 0310 | 327 | 0. | * | 2 | 1335 | 452 | 0. |
| 1        | 0625 | 78  | 10.  | * | 1 | 1650 | 203 | 0. | * | 2 | 0315 | 328 | 0. | * | 2 | 1340 | 453 | 0. |
| 1        | 0630 | 79  | 7.   | * | 1 | 1655 | 204 | 0. | * | 2 | 0320 | 329 | 0. | * | 2 | 1345 | 454 | 0. |
| 1        | 0635 | 80  | 5.   | * | 1 | 1700 | 205 | 0. | * | 2 | 0325 | 330 | 0. | * | 2 | 1350 | 455 | 0. |
| 1        | 0640 | 81  | 4.   | * | 1 | 1705 | 206 | 0. | * | 2 | 0330 | 331 | 0. | * | 2 | 1355 | 456 | 0. |
| 1        | 0645 | 82  | 3.   | * | 1 | 1710 | 207 | 0. | * | 2 | 0335 | 332 | 0. | * | 2 | 1400 | 457 | 0. |
| 1        | 0650 | 83  | 2.   | * | 1 | 1715 | 208 | 0. | * | 2 | 0340 | 333 | 0. | * | 2 | 1405 | 458 | 0. |
| 1        | 0655 | 84  | 1.   | * | 1 | 1720 | 209 | 0. | * | 2 | 0345 | 334 | 0. | * | 2 | 1410 | 459 | 0. |
| 1        | 0700 | 85  | 1.   | * | 1 | 1725 | 210 | 0. | * | 2 | 0350 | 335 | 0. | * | 2 | 1415 | 460 | 0. |
| 1        | 0705 | 86  | 1.   | * | 1 | 1730 | 211 | 0. | * | 2 | 0355 | 336 | 0. | * | 2 | 1420 | 461 | 0. |
| 1        | 0710 | 87  | 0.   | * | 1 | 1735 | 212 | 0. | * | 2 | 0400 | 337 | 0. | * | 2 | 1425 | 462 | 0. |
| 1        | 0715 | 88  | 0.   | * | 1 | 1740 | 213 | 0. | * | 2 | 0405 | 338 | 0. | * | 2 | 1430 | 463 | 0. |
| 1        | 0720 | 89  | 0.   | * | 1 | 1745 | 214 | 0. | * | 2 | 0410 | 339 | 0. | * | 2 | 1435 | 464 | 0. |
| 1        | 0725 | 90  | 0.   | * | 1 | 1750 | 215 | 0. | * | 2 | 0415 | 340 | 0. | * | 2 | 1440 | 465 | 0. |
| 1        | 0730 | 91  | 0.   | * | 1 | 1755 | 216 | 0. | * | 2 | 0420 | 341 | 0. | * | 2 | 1445 | 466 | 0. |
| 1        | 0735 | 92  | 0.   | * | 1 | 1800 | 217 | 0. | * | 2 | 0425 | 342 | 0. | * | 2 | 1450 | 467 | 0. |
| 1        | 0740 | 93  | 0.   | * | 1 | 1805 | 218 | 0. | * | 2 | 0430 | 343 | 0. | * | 2 | 1455 | 468 | 0. |
| 1        | 0745 | 94  | 0.   | * | 1 | 1810 | 219 | 0. | * | 2 | 0435 | 344 | 0. | * | 2 | 1500 | 469 | 0. |
| 1        | 0750 | 95  | 0.   | * | 1 | 1815 | 220 | 0. | * | 2 | 0440 | 345 | 0. | * | 2 | 1505 | 470 | 0. |
| 1        | 0755 | 96  | 0.   | * | 1 | 1820 | 221 | 0. | * | 2 | 0445 | 346 | 0. | * | 2 | 1510 | 471 | 0. |
| 1        | 0800 | 97  | 0.   | * | 1 | 1825 | 222 | 0. | * | 2 | 0450 | 347 | 0. | * | 2 | 1515 | 472 | 0. |
| 1        | 0805 | 98  | 0.   | * | 1 | 1830 | 223 | 0. | * | 2 | 0455 | 348 | 0. | * | 2 | 1520 | 473 | 0. |
| 1        | 0810 | 99  | 0.   | * | 1 | 1835 | 224 | 0. | * | 2 | 0500 | 349 | 0. | * | 2 | 1525 | 474 | 0. |
| 1        | 0815 | 100 | 0.   | * | 1 | 1840 | 225 | 0. | * | 2 | 0505 | 350 | 0. | * | 2 | 1530 | 475 | 0. |
| 1        | 0820 | 101 | 0.   | * | 1 | 1845 | 226 | 0. | * | 2 | 0510 | 351 | 0. | * | 2 | 1535 | 476 | 0. |
| 1        | 0825 | 102 | 0.   | * | 1 | 1850 | 227 | 0. | * | 2 | 0515 | 352 | 0. | * | 2 | 1540 | 477 | 0. |
| 1        | 0830 | 103 | 0.   | * | 1 | 1855 | 228 | 0. | * | 2 | 0520 | 353 | 0. | * | 2 | 1545 | 478 | 0. |
| 1        | 0835 | 104 | 0.   | * | 1 | 1900 | 229 | 0. | * | 2 | 0525 | 354 | 0. | * | 2 | 1550 | 479 | 0. |
| 1        | 0840 | 105 | 0.   | * | 1 | 1905 | 230 | 0. | * | 2 | 0530 | 355 | 0. | * | 2 | 1555 | 480 | 0. |
| 1        | 0845 | 106 | 0.   | * | 1 | 1910 | 231 | 0. | * | 2 | 0535 | 356 | 0. | * | 2 | 1600 | 481 | 0. |
| 1        | 0850 | 107 | 0.   | * | 1 | 1915 | 232 | 0. | * | 2 | 0540 | 357 | 0. | * | 2 | 1605 | 482 | 0. |
| 1        | 0855 | 108 | 0.   | * | 1 | 1920 | 233 | 0. | * | 2 | 0545 | 358 | 0. | * | 2 | 1610 | 483 | 0. |
| 1        | 0900 | 109 | 0.   | * | 1 | 1925 | 234 | 0. | * | 2 | 0550 | 359 | 0. | * | 2 | 1615 | 484 | 0. |
| 1        | 0905 | 110 | 0.   | * | 1 | 1930 | 235 | 0. | * | 2 | 0555 | 360 | 0. | * | 2 | 1620 | 485 | 0. |
| 1        | 0910 | 111 | 0.   | * | 1 | 1935 | 236 | 0. | * | 2 | 0600 | 361 | 0. | * | 2 | 1625 | 486 | 0. |
| 1        | 0915 | 112 | 0.   | * | 1 | 1940 | 237 | 0. | * | 2 | 0605 | 362 | 0. | * | 2 | 1630 | 487 | 0. |
| 1        | 0920 | 113 | 0.   | * | 1 | 1945 | 238 | 0. | * | 2 | 0610 | 363 | 0. | * | 2 | 1635 | 488 | 0. |
| 1        | 0925 | 114 | 0.   | * | 1 | 1950 | 239 | 0. | * | 2 | 0615 | 364 | 0. | * | 2 | 1640 | 489 | 0. |
| 1        | 0930 | 115 | 0.   | * | 1 | 1955 | 240 | 0. | * | 2 | 0620 | 365 | 0. | * | 2 | 1645 | 490 | 0. |
| 1        | 0935 | 116 | 0.   | * | 1 | 2000 | 241 | 0. | * | 2 | 0625 | 366 | 0. | * | 2 | 1650 | 491 | 0. |
| 1        | 0940 | 117 | 0.   | * | 1 | 2005 | 242 | 0. | * | 2 | 0630 | 367 | 0. | * | 2 | 1655 | 492 | 0. |
| 1        | 0945 | 118 | 0.   | * | 1 | 2010 | 243 | 0. | * | 2 | 0635 | 368 | 0. | * | 2 | 1700 | 493 | 0. |
| 1        | 0950 | 119 | 0.   | * | 1 | 2015 | 244 | 0. | * | 2 | 0640 | 369 | 0. | * | 2 | 1705 | 494 | 0. |
| 1        | 0955 | 120 | 0.   | * | 1 | 2020 | 245 | 0. | * | 2 | 0645 | 370 | 0. | * | 2 | 1710 | 495 | 0. |
| 1        | 1000 | 121 | 0.   | * | 1 | 2025 | 246 | 0. | * | 2 | 0650 | 371 | 0. | * | 2 | 1715 | 496 | 0. |
| 1        | 1005 | 122 | 0.   | * | 1 | 2030 | 247 | 0. | * | 2 | 0655 | 372 | 0. | * | 2 | 1720 | 497 | 0. |
| 1        | 1010 | 123 | 0.   | * | 1 | 2035 | 248 | 0. | * | 2 | 0700 | 373 | 0. | * | 2 | 1725 | 498 | 0. |
| 1        | 1015 | 124 | 0.   | * | 1 | 2040 | 249 | 0. | * | 2 | 0705 | 374 | 0. | * | 2 | 1730 | 499 | 0. |
| 1        | 1020 | 125 | 0.   | * | 1 | 2045 | 250 | 0. | * | 2 | 0710 | 375 | 0. | * | 2 | 1735 | 500 | 0. |

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| PEAK FLOW         | TIME | MAXIMUM AVERAGE FLOW |       |       |          |
|-------------------|------|----------------------|-------|-------|----------|
| (CFS)             | (HR) | 6-HR                 | 24-HR | 72-HR | 41.58-HR |
| 794.              | 3.75 | 158.                 | 40.   | 23.   | 23.      |
|                   |      | (INCHES)             | 1.675 | 1.680 | 1.680    |
|                   |      | (AC-FT)              | 78.   | 79.   | 79.      |
| CUMULATIVE AREA = |      | .88 SQ MI            |       |       |          |

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|    |    |                                     |         |         |         |         |         |         |         |         |         |         |
|----|----|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 89 | KK | *****                               |         |         |         |         |         |         |         |         |         |         |
|    |    | * RDB1 *                            |         |         |         |         |         |         |         |         |         |         |
| 91 | KO | *****                               |         |         |         |         |         |         |         |         |         |         |
|    |    | OUTPUT CONTROL VARIABLES            |         |         |         |         |         |         |         |         |         |         |
|    |    | IPRNT 1 PRINT CONTROL               |         |         |         |         |         |         |         |         |         |         |
|    |    | IPLOT 0 PLOT CONTROL                |         |         |         |         |         |         |         |         |         |         |
|    |    | QSCAL 0. HYDROGRAPH PLOT SCALE      |         |         |         |         |         |         |         |         |         |         |
|    |    | HYDROGRAPH ROUTING DATA             |         |         |         |         |         |         |         |         |         |         |
| 92 | RS | STORAGE ROUTING                     |         |         |         |         |         |         |         |         |         |         |
|    |    | NSTPS 1 NUMBER OF SUBREACHES        |         |         |         |         |         |         |         |         |         |         |
|    |    | ITVP ELEV TYPE OF INITIAL CONDITION |         |         |         |         |         |         |         |         |         |         |
|    |    | RSVRIC 3025.50 INITIAL CONDITION    |         |         |         |         |         |         |         |         |         |         |
|    |    | X .00 WORKING R AND D COEFFICIENT   |         |         |         |         |         |         |         |         |         |         |
| 93 | SA | AREA                                | 4.7     | 5.6     | 5.7     | 5.9     | 6.1     | 7.0     | 7.5     | 8.4     | 9.3     | 10.7    |
| 94 | SE | ELEVATION                           | 3025.50 | 3027.00 | 3028.00 | 3029.00 | 3030.00 | 3035.00 | 3037.00 | 3040.00 | 3043.00 | 3046.00 |
| 95 | SQ | DISCHARGE                           | 50.     | 61.     | 71.     | 75.     | 1436.   | 3921.   | 7136.   |         |         |         |
| 96 | SE | ELEVATION                           | 3025.50 | 3030.00 | 3035.00 | 3037.00 | 3040.00 | 3043.00 | 3046.00 |         |         |         |

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| COMPUTED STORAGE-ELEVATION DATA         |         |         |         |         |         |         |         |         |         |         |  |
|-----------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| STORAGE                                 | .00     | 7.67    | 13.32   | 19.15   | 25.16   | 57.91   | 72.38   | 96.09   | 122.60  | 152.58  |  |
| ELEVATION                               | 3025.50 | 3027.00 | 3028.00 | 3029.00 | 3030.00 | 3035.00 | 3037.00 | 3040.00 | 3043.00 | 3046.00 |  |
| COMPUTED STORAGE-OUTFLOW-ELEVATION DATA |         |         |         |         |         |         |         |         |         |         |  |
| STORAGE                                 | .00     | 7.67    | 13.32   | 19.15   | 25.16   | 57.91   | 72.38   | 96.09   | 122.60  | 152.58  |  |
| OUTFLOW                                 | 49.70   | 53.33   | 55.76   | 58.18   | 60.60   | 70.80   | 74.50   | 1436.00 | 3920.50 | 7136.30 |  |
| ELEVATION                               | 3025.50 | 3027.00 | 3028.00 | 3029.00 | 3030.00 | 3035.00 | 3037.00 | 3040.00 | 3043.00 | 3046.00 |  |

ULT1.OUT

HYDROGRAPH AT STATION RDB1  
PLAN 1, RATIO = 1.00

| DA | MON  | HRMN | ORD | OUTFLOW | STORAGE | STAGE | DA   | MON | HRMN | ORD  | OUTFLOW | STORAGE | STAGE | DA  | MON | HRMN | ORD    | OUTFLOW | STORAGE | STAGE |
|----|------|------|-----|---------|---------|-------|------|-----|------|------|---------|---------|-------|-----|-----|------|--------|---------|---------|-------|
| 1  | 0000 | 1    | 50. | .0      | 3025.5  | * 1   | 1355 | 168 | 57.  | 17.4 | 3028.7  | * 2     | 0350  | 335 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0005 | 2    | 50. | -.2     | 3025.5  | * 1   | 1400 | 169 | 57.  | 17.0 | 3028.6  | * 2     | 0355  | 336 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0010 | 3    | 50. | -.2     | 3025.5  | * 1   | 1405 | 170 | 57.  | 16.6 | 3028.6  | * 2     | 0400  | 337 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0015 | 4    | 50. | -.2     | 3025.5  | * 1   | 1410 | 171 | 57.  | 16.2 | 3028.5  | * 2     | 0405  | 338 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0020 | 5    | 50. | -.2     | 3025.5  | * 1   | 1415 | 172 | 57.  | 15.8 | 3028.4  | * 2     | 0410  | 339 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0025 | 6    | 50. | -.2     | 3025.5  | * 1   | 1420 | 173 | 57.  | 15.4 | 3028.4  | * 2     | 0415  | 340 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0030 | 7    | 50. | -.2     | 3025.5  | * 1   | 1425 | 174 | 56.  | 15.0 | 3028.3  | * 2     | 0420  | 341 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0035 | 8    | 50. | -.2     | 3025.5  | * 1   | 1430 | 175 | 56.  | 14.6 | 3028.2  | * 2     | 0425  | 342 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0040 | 9    | 50. | -.2     | 3025.5  | * 1   | 1435 | 176 | 56.  | 14.3 | 3028.2  | * 2     | 0430  | 343 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0045 | 10   | 50. | -.2     | 3025.5  | * 1   | 1440 | 177 | 56.  | 13.9 | 3028.1  | * 2     | 0435  | 344 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0050 | 11   | 50. | -.2     | 3025.5  | * 1   | 1445 | 178 | 56.  | 13.5 | 3028.0  | * 2     | 0440  | 345 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0055 | 12   | 50. | -.2     | 3025.5  | * 1   | 1450 | 179 | 56.  | 13.1 | 3028.0  | * 2     | 0445  | 346 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0100 | 13   | 50. | -.2     | 3025.5  | * 1   | 1455 | 180 | 55.  | 12.7 | 3027.9  | * 2     | 0450  | 347 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0105 | 14   | 50. | -.2     | 3025.5  | * 1   | 1500 | 181 | 55.  | 12.3 | 3027.8  | * 2     | 0455  | 348 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0110 | 15   | 50. | -.2     | 3025.5  | * 1   | 1505 | 182 | 55.  | 12.0 | 3027.8  | * 2     | 0500  | 349 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0115 | 16   | 50. | -.2     | 3025.5  | * 1   | 1510 | 183 | 55.  | 11.6 | 3027.7  | * 2     | 0505  | 350 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0120 | 17   | 50. | -.2     | 3025.5  | * 1   | 1515 | 184 | 55.  | 11.2 | 3027.6  | * 2     | 0510  | 351 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0125 | 18   | 50. | -.2     | 3025.5  | * 1   | 1520 | 185 | 55.  | 10.8 | 3027.6  | * 2     | 0515  | 352 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0130 | 19   | 50. | -.2     | 3025.5  | * 1   | 1525 | 186 | 55.  | 10.4 | 3027.5  | * 2     | 0520  | 353 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0135 | 20   | 50. | -.2     | 3025.5  | * 1   | 1530 | 187 | 54.  | 10.1 | 3027.4  | * 2     | 0525  | 354 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0140 | 21   | 50. | -.2     | 3025.5  | * 1   | 1535 | 188 | 54.  | 9.7  | 3027.4  | * 2     | 0530  | 355 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0145 | 22   | 50. | -.2     | 3025.5  | * 1   | 1540 | 189 | 54.  | 9.3  | 3027.3  | * 2     | 0535  | 356 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0150 | 23   | 50. | -.2     | 3025.5  | * 1   | 1545 | 190 | 54.  | 9.0  | 3027.2  | * 2     | 0540  | 357 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0155 | 24   | 50. | -.2     | 3025.5  | * 1   | 1550 | 191 | 54.  | 8.6  | 3027.1  | * 2     | 0545  | 358 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0200 | 25   | 50. | -.2     | 3025.5  | * 1   | 1555 | 192 | 54.  | 8.2  | 3027.0  | * 2     | 0550  | 359 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0205 | 26   | 50. | -.2     | 3025.5  | * 1   | 1600 | 193 | 53.  | 7.8  | 3027.0  | * 2     | 0555  | 360 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0210 | 27   | 50. | -.2     | 3025.5  | * 1   | 1605 | 194 | 53.  | 7.5  | 3027.0  | * 2     | 0600  | 361 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0215 | 28   | 50. | -.2     | 3025.5  | * 1   | 1610 | 195 | 53.  | 7.1  | 3026.9  | * 2     | 0605  | 362 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0220 | 29   | 50. | -.2     | 3025.5  | * 1   | 1615 | 196 | 53.  | 6.7  | 3026.8  | * 2     | 0610  | 363 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0225 | 30   | 50. | -.2     | 3025.5  | * 1   | 1620 | 197 | 53.  | 6.3  | 3026.7  | * 2     | 0615  | 364 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0230 | 31   | 50. | -.2     | 3025.5  | * 1   | 1625 | 198 | 53.  | 6.0  | 3026.7  | * 2     | 0620  | 365 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0235 | 32   | 50. | -.1     | 3025.5  | * 1   | 1630 | 199 | 52.  | 5.7  | 3026.6  | * 2     | 0625  | 366 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0240 | 33   | 50. | -.1     | 3025.5  | * 1   | 1635 | 200 | 52.  | 5.3  | 3026.5  | * 2     | 0630  | 367 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0245 | 34   | 50. | .0      | 3025.5  | * 1   | 1640 | 201 | 52.  | 4.9  | 3026.5  | * 2     | 0635  | 368 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0250 | 35   | 50. | .0      | 3025.5  | * 1   | 1645 | 202 | 52.  | 4.6  | 3026.4  | * 2     | 0640  | 369 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0255 | 36   | 50. | .2      | 3025.5  | * 1   | 1650 | 203 | 52.  | 4.2  | 3026.3  | * 2     | 0645  | 370 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0300 | 37   | 50. | .5      | 3025.5  | * 1   | 1655 | 204 | 52.  | 3.9  | 3026.3  | * 2     | 0650  | 371 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0305 | 38   | 50. | .3      | 3025.6  | * 1   | 1700 | 205 | 51.  | 3.5  | 3026.2  | * 2     | 0655  | 372 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0310 | 39   | 50. | .6      | 3025.6  | * 1   | 1705 | 206 | 51.  | 3.2  | 3026.1  | * 2     | 0700  | 373 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0315 | 40   | 50. | 1.2     | 3025.7  | * 1   | 1710 | 207 | 51.  | 2.8  | 3026.0  | * 2     | 0705  | 374 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0320 | 41   | 51. | 9.7     | 3026.0  | * 1   | 1715 | 208 | 51.  | 2.5  | 3025.9  | * 2     | 0710  | 375 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0325 | 42   | 52. | 4.4     | 3026.4  | * 1   | 1720 | 209 | 51.  | 2.1  | 3025.9  | * 2     | 0715  | 376 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0330 | 43   | 53. | 7.6     | 3027.0  | * 1   | 1725 | 210 | 51.  | 1.8  | 3025.8  | * 2     | 0720  | 377 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0335 | 44   | 55. | 12.0    | 3027.8  | * 1   | 1730 | 211 | 50.  | 1.4  | 3025.8  | * 2     | 0725  | 378 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0340 | 45   | 57. | 17.0    | 3028.6  | * 1   | 1735 | 212 | 50.  | 1.1  | 3025.7  | * 2     | 0730  | 379 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0345 | 46   | 59. | 22.2    | 3029.5  | * 1   | 1740 | 213 | 50.  | .7   | 3025.6  | * 2     | 0735  | 380 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0350 | 47   | 61. | 27.3    | 3029.3  | * 1   | 1745 | 214 | 50.  | .4   | 3025.6  | * 2     | 0740  | 381 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0355 | 48   | 63. | 32.0    | 3031.0  | * 1   | 1750 | 215 | 50.  | .0   | 3025.5  | * 2     | 0745  | 382 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0400 | 49   | 64. | 36.0    | 3031.7  | * 1   | 1755 | 216 | 50.  | -.2  | 3025.5  | * 2     | 0750  | 383 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0405 | 50   | 65. | 39.5    | 3032.2  | * 1   | 1800 | 217 | 50.  | -.2  | 3025.5  | * 2     | 0755  | 384 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0410 | 51   | 66. | 42.3    | 3032.6  | * 1   | 1805 | 218 | 50.  | -.2  | 3025.5  | * 2     | 0800  | 385 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0415 | 52   | 67. | 44.5    | 3033.0  | * 1   | 1810 | 219 | 50.  | -.2  | 3025.5  | * 2     | 0805  | 386 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0420 | 53   | 67. | 46.2    | 3033.2  | * 1   | 1815 | 220 | 50.  | -.2  | 3025.5  | * 2     | 0810  | 387 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0425 | 54   | 68. | 47.7    | 3033.4  | * 1   | 1820 | 221 | 50.  | -.2  | 3025.5  | * 2     | 0815  | 388 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0430 | 55   | 68. | 48.9    | 3033.6  | * 1   | 1825 | 222 | 50.  | -.2  | 3025.5  | * 2     | 0820  | 389 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0435 | 56   | 68. | 50.1    | 3033.8  | * 1   | 1830 | 223 | 50.  | -.2  | 3025.5  | * 2     | 0825  | 390 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0440 | 57   | 69. | 51.3    | 3034.0  | * 1   | 1835 | 224 | 50.  | -.2  | 3025.5  | * 2     | 0830  | 391 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0445 | 58   | 69. | 52.4    | 3034.2  | * 1   | 1840 | 225 | 50.  | -.2  | 3025.5  | * 2     | 0835  | 392 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0450 | 59   | 69. | 53.6    | 3034.3  | * 1   | 1845 | 226 | 50.  | -.2  | 3025.5  | * 2     | 0840  | 393 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0455 | 60   | 70. | 54.8    | 3034.5  | * 1   | 1850 | 227 | 50.  | -.2  | 3025.5  | * 2     | 0845  | 394 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0500 | 61   | 70. | 56.0    | 3034.7  | * 1   | 1855 | 228 | 50.  | -.2  | 3025.5  | * 2     | 0850  | 395 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0505 | 62   | 71. | 57.0    | 3034.9  | * 1   | 1900 | 229 | 50.  | -.2  | 3025.5  | * 2     | 0855  | 396 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0510 | 63   | 71. | 57.9    | 3035.0  | * 1   | 1905 | 230 | 50.  | -.2  | 3025.5  | * 2     | 0900  | 397 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0515 | 64   | 71. | 58.6    | 3035.1  | * 1   | 1910 | 231 | 50.  | -.2  | 3025.5  | * 2     | 0905  | 398 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0520 | 65   | 71. | 59.1    | 3035.2  | * 1   | 1915 | 232 | 50.  | -.2  | 3025.5  | * 2     | 0910  | 399 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0525 | 66   | 71. | 59.4    | 3035.2  | * 1   | 1920 | 233 | 50.  | -.2  | 3025.5  | * 2     | 0915  | 400 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0530 | 67   | 71. | 59.5    | 3035.2  | * 1   | 1925 | 234 | 50.  | -.2  | 3025.5  | * 2     | 0920  | 401 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0535 | 68   | 71. | 59.6    | 3035.2  | * 1   | 1930 | 235 | 50.  | -.2  | 3025.5  | * 2     | 0925  | 402 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0540 | 69   | 71. | 59.5    | 3035.2  | * 1   | 1935 | 236 | 50.  | -.2  | 3025.5  | * 2     | 0930  | 403 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0545 | 70   | 71. | 59.3    | 3035.2  | * 1   | 1940 | 237 | 50.  | -.2  | 3025.5  | * 2     | 0935  | 404 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0550 | 71   | 71. | 59.2    | 3035.2  | * 1   | 1945 | 238 | 50.  | -.2  | 3025.5  | * 2     | 0940  | 405 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0555 | 72   | 71. | 58.9    | 3035.1  | * 1   | 1950 | 239 | 50.  | -.2  | 3025.5  | * 2     | 0945  | 406 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0600 | 73   | 71. | 58.7    | 3035.1  | * 1   | 1955 | 240 | 50.  | -.2  | 3025.5  | * 2     | 0950  | 407 | 50. | -.2  | 3025.5 |         |         |       |
| 1  | 0605 | 74   | 71. | 58.4    | 3035.1  | * 1   | 2000 | 241 | 50.  | -.2  | 3025.5  | * 2     | 0955  | 408 | 50. | -.2  | 3025.5 |         |         |       |
| 1  |      |      |     |         |         |       |      |     |      |      |         |         |       |     |     |      |        |         |         |       |



|          |      |     |     |      |        |   |   |      |     |     |    |        |   |   |          |     |    |        |
|----------|------|-----|-----|------|--------|---|---|------|-----|-----|----|--------|---|---|----------|-----|----|--------|
| ULT1_OUT |      |     |     |      |        |   |   |      |     |     |    |        |   |   |          |     |    |        |
| 1        | 0955 | 120 | 64. | 37.6 | 3031.9 | * | 1 | 2350 | 287 | 50. | -2 | 3025.5 | * | 2 | 1345 454 | 50. | -2 | 3025.5 |
| 1        | 1000 | 121 | 64. | 37.1 | 3031.8 | * | 1 | 2355 | 288 | 50. | -2 | 3025.5 | * | 2 | 1350 455 | 50. | -2 | 3025.5 |
| 1        | 1005 | 122 | 64. | 36.7 | 3031.8 | * | 2 | 0000 | 289 | 50. | -2 | 3025.5 | * | 2 | 1355 456 | 50. | -2 | 3025.5 |
| 1        | 1010 | 123 | 64. | 36.3 | 3031.7 | * | 2 | 0005 | 290 | 50. | -2 | 3025.5 | * | 2 | 1400 457 | 50. | -2 | 3025.5 |
| 1        | 1015 | 124 | 64. | 35.8 | 3031.6 | * | 2 | 0010 | 291 | 50. | -2 | 3025.5 | * | 2 | 1405 458 | 50. | -2 | 3025.5 |
| 1        | 1020 | 125 | 64. | 35.4 | 3031.6 | * | 2 | 0015 | 292 | 50. | -2 | 3025.5 | * | 2 | 1410 459 | 50. | -2 | 3025.5 |
| 1        | 1025 | 126 | 64. | 34.9 | 3031.5 | * | 2 | 0020 | 293 | 50. | -2 | 3025.5 | * | 2 | 1415 460 | 50. | -2 | 3025.5 |
| 1        | 1030 | 127 | 64. | 34.5 | 3031.4 | * | 2 | 0025 | 294 | 50. | -2 | 3025.5 | * | 2 | 1420 461 | 50. | -2 | 3025.5 |
| 1        | 1035 | 128 | 63. | 34.1 | 3031.4 | * | 2 | 0030 | 295 | 50. | -2 | 3025.5 | * | 2 | 1425 462 | 50. | -2 | 3025.5 |
| 1        | 1040 | 129 | 63. | 33.6 | 3031.3 | * | 2 | 0035 | 296 | 50. | -2 | 3025.5 | * | 2 | 1430 463 | 50. | -2 | 3025.5 |
| 1        | 1045 | 130 | 63. | 33.2 | 3031.2 | * | 2 | 0040 | 297 | 50. | -2 | 3025.5 | * | 2 | 1435 464 | 50. | -2 | 3025.5 |
| 1        | 1050 | 131 | 63. | 32.8 | 3031.2 | * | 2 | 0045 | 298 | 50. | -2 | 3025.5 | * | 2 | 1440 465 | 50. | -2 | 3025.5 |
| 1        | 1055 | 132 | 63. | 32.3 | 3031.1 | * | 2 | 0050 | 299 | 50. | -2 | 3025.5 | * | 2 | 1445 466 | 50. | -2 | 3025.5 |
| 1        | 1100 | 133 | 63. | 31.9 | 3031.0 | * | 2 | 0055 | 300 | 50. | -2 | 3025.5 | * | 2 | 1450 467 | 50. | -2 | 3025.5 |
| 1        | 1105 | 134 | 63. | 31.5 | 3031.0 | * | 2 | 0100 | 301 | 50. | -2 | 3025.5 | * | 2 | 1455 468 | 50. | -2 | 3025.5 |
| 1        | 1110 | 135 | 62. | 31.0 | 3030.9 | * | 2 | 0105 | 302 | 50. | -2 | 3025.5 | * | 2 | 1500 469 | 50. | -2 | 3025.5 |
| 1        | 1115 | 136 | 62. | 30.6 | 3030.8 | * | 2 | 0110 | 303 | 50. | -2 | 3025.5 | * | 2 | 1505 470 | 50. | -2 | 3025.5 |
| 1        | 1120 | 137 | 62. | 30.2 | 3030.8 | * | 2 | 0115 | 304 | 50. | -2 | 3025.5 | * | 2 | 1510 471 | 50. | -2 | 3025.5 |
| 1        | 1125 | 138 | 62. | 29.8 | 3030.7 | * | 2 | 0120 | 305 | 50. | -2 | 3025.5 | * | 2 | 1515 472 | 50. | -2 | 3025.5 |
| 1        | 1130 | 139 | 62. | 29.3 | 3030.6 | * | 2 | 0125 | 306 | 50. | -2 | 3025.5 | * | 2 | 1520 473 | 50. | -2 | 3025.5 |
| 1        | 1135 | 140 | 62. | 28.9 | 3030.6 | * | 2 | 0130 | 307 | 50. | -2 | 3025.5 | * | 2 | 1525 474 | 50. | -2 | 3025.5 |
| 1        | 1140 | 141 | 62. | 28.5 | 3030.5 | * | 2 | 0135 | 308 | 50. | -2 | 3025.5 | * | 2 | 1530 475 | 50. | -2 | 3025.5 |
| 1        | 1145 | 142 | 61. | 28.0 | 3030.4 | * | 2 | 0140 | 309 | 50. | -2 | 3025.5 | * | 2 | 1535 476 | 50. | -2 | 3025.5 |
| 1        | 1150 | 143 | 61. | 27.6 | 3030.4 | * | 2 | 0145 | 310 | 50. | -2 | 3025.5 | * | 2 | 1540 477 | 50. | -2 | 3025.5 |
| 1        | 1155 | 144 | 61. | 27.2 | 3030.3 | * | 2 | 0150 | 311 | 50. | -2 | 3025.5 | * | 2 | 1545 478 | 50. | -2 | 3025.5 |
| 1        | 1200 | 145 | 61. | 26.8 | 3030.2 | * | 2 | 0155 | 312 | 50. | -2 | 3025.5 | * | 2 | 1550 479 | 50. | -2 | 3025.5 |
| 1        | 1205 | 146 | 61. | 26.4 | 3030.2 | * | 2 | 0200 | 313 | 50. | -2 | 3025.5 | * | 2 | 1555 480 | 50. | -2 | 3025.5 |
| 1        | 1210 | 147 | 61. | 25.9 | 3030.1 | * | 2 | 0205 | 314 | 50. | -2 | 3025.5 | * | 2 | 1600 481 | 50. | -2 | 3025.5 |
| 1        | 1215 | 148 | 61. | 25.5 | 3030.1 | * | 2 | 0210 | 315 | 50. | -2 | 3025.5 | * | 2 | 1605 482 | 50. | -2 | 3025.5 |
| 1        | 1220 | 149 | 61. | 25.1 | 3030.0 | * | 2 | 0215 | 316 | 50. | -2 | 3025.5 | * | 2 | 1610 483 | 50. | -2 | 3025.5 |
| 1        | 1225 | 150 | 60. | 24.7 | 3029.9 | * | 2 | 0220 | 317 | 50. | -2 | 3025.5 | * | 2 | 1615 484 | 50. | -2 | 3025.5 |
| 1        | 1230 | 151 | 60. | 24.3 | 3029.9 | * | 2 | 0225 | 318 | 50. | -2 | 3025.5 | * | 2 | 1620 485 | 50. | -2 | 3025.5 |
| 1        | 1235 | 152 | 60. | 23.9 | 3029.8 | * | 2 | 0230 | 319 | 50. | -2 | 3025.5 | * | 2 | 1625 486 | 50. | -2 | 3025.5 |
| 1        | 1240 | 153 | 60. | 23.4 | 3029.7 | * | 2 | 0235 | 320 | 50. | -2 | 3025.5 | * | 2 | 1630 487 | 50. | -2 | 3025.5 |
| 1        | 1245 | 154 | 60. | 23.0 | 3029.6 | * | 2 | 0240 | 321 | 50. | -2 | 3025.5 | * | 2 | 1635 488 | 50. | -2 | 3025.5 |
| 1        | 1250 | 155 | 60. | 22.6 | 3029.6 | * | 2 | 0245 | 322 | 50. | -2 | 3025.5 | * | 2 | 1640 489 | 50. | -2 | 3025.5 |
| 1        | 1255 | 156 | 59. | 22.2 | 3029.5 | * | 2 | 0250 | 323 | 50. | -2 | 3025.5 | * | 2 | 1645 490 | 50. | -2 | 3025.5 |
| 1        | 1300 | 157 | 59. | 21.8 | 3029.4 | * | 2 | 0255 | 324 | 50. | -2 | 3025.5 | * | 2 | 1650 491 | 50. | -2 | 3025.5 |
| 1        | 1305 | 158 | 59. | 21.4 | 3029.4 | * | 2 | 0300 | 325 | 50. | -2 | 3025.5 | * | 2 | 1655 492 | 50. | -2 | 3025.5 |
| 1        | 1310 | 159 | 59. | 21.0 | 3029.3 | * | 2 | 0305 | 326 | 50. | -2 | 3025.5 | * | 2 | 1700 493 | 50. | -2 | 3025.5 |
| 1        | 1315 | 160 | 59. | 20.6 | 3029.2 | * | 2 | 0310 | 327 | 50. | -2 | 3025.5 | * | 2 | 1705 494 | 50. | -2 | 3025.5 |
| 1        | 1320 | 161 | 59. | 20.2 | 3029.2 | * | 2 | 0315 | 328 | 50. | -2 | 3025.5 | * | 2 | 1710 495 | 50. | -2 | 3025.5 |
| 1        | 1325 | 162 | 58. | 19.8 | 3029.1 | * | 2 | 0320 | 329 | 50. | -2 | 3025.5 | * | 2 | 1715 496 | 50. | -2 | 3025.5 |
| 1        | 1330 | 163 | 58. | 19.4 | 3029.0 | * | 2 | 0325 | 330 | 50. | -2 | 3025.5 | * | 2 | 1720 497 | 50. | -2 | 3025.5 |
| 1        | 1335 | 164 | 58. | 19.0 | 3029.0 | * | 2 | 0330 | 331 | 50. | -2 | 3025.5 | * | 2 | 1725 498 | 50. | -2 | 3025.5 |
| 1        | 1340 | 165 | 58. | 18.6 | 3028.9 | * | 2 | 0335 | 332 | 50. | -2 | 3025.5 | * | 2 | 1730 499 | 50. | -2 | 3025.5 |
| 1        | 1345 | 166 | 58. | 18.2 | 3028.8 | * | 2 | 0340 | 333 | 50. | -2 | 3025.5 | * | 2 | 1735 500 | 50. | -2 | 3025.5 |
| 1        | 1350 | 167 | 58. | 17.8 | 3028.8 | * | 2 | 0345 | 334 | 50. | -2 | 3025.5 | * | 2 |          |     |    |        |

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| PEAK FLOW         | TIME    |      | 6-HR      | MAXIMUM AVERAGE FLOW    | 72-HR   | 41.58-HR |
|-------------------|---------|------|-----------|-------------------------|---------|----------|
| +                 | (CFS)   | (HR) |           | 24-HR                   |         |          |
| +                 | 71.     | 5.58 | (CFS)     | 68.                     | 57.     | 54.      |
|                   |         |      | (INCHES)  | 2.417                   | 3.960   | 3.960    |
|                   |         |      | (AC-FT)   | 34.                     | 113.    | 185.     |
| PEAK STORAGE      | TIME    |      | 6-HR      | MAXIMUM AVERAGE STORAGE | 72-HR   | 41.58-HR |
| +                 | (AC-FT) | (HR) |           | 24-HR                   |         |          |
| +                 | 60.     | 5.58 | 50.       | 19.                     | 11.     | 11.      |
| PEAK STAGE        | TIME    |      | 6-HR      | MAXIMUM AVERAGE STAGE   | 72-HR   | 41.58-HR |
| +                 | (FEET)  | (HR) |           | 24-HR                   |         |          |
| +                 | 3035.23 | 5.58 | 3033.77   | 3028.70                 | 3027.35 | 3027.35  |
| CUMULATIVE AREA = |         |      | .88 SQ MI |                         |         |          |

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HYDROGRAPH AT STATION RDB1  
PLAN 1, RATIO = .98

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| DA | MON  | HRMN | ORD | OUTFLOW | STORAGE | STAGE | * | DA   | MON | HRMN | ORD  | OUTFLOW | STORAGE | STAGE | *    | DA  | MON | HRMN | ORD    | OUTFLOW | STORAGE | STAGE |
|----|------|------|-----|---------|---------|-------|---|------|-----|------|------|---------|---------|-------|------|-----|-----|------|--------|---------|---------|-------|
| 1  | 0000 | 1    | 50. | .0      | 3025.5  | *     | 1 | 1355 | 168 | 57.  | 15.7 | 3028.4  | *       | 2     | 0350 | 335 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0005 | 2    | 50. | -2      | 3025.5  | *     | 1 | 1400 | 169 | 57.  | 15.3 | 3028.3  | *       | 2     | 0355 | 336 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0010 | 3    | 50. | -2      | 3025.5  | *     | 1 | 1405 | 170 | 56.  | 14.9 | 3028.3  | *       | 2     | 0400 | 337 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0015 | 4    | 50. | -2      | 3025.5  | *     | 1 | 1410 | 171 | 56.  | 14.5 | 3028.2  | *       | 2     | 0405 | 338 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0020 | 5    | 50. | -2      | 3025.5  | *     | 1 | 1415 | 172 | 56.  | 14.1 | 3028.1  | *       | 2     | 0410 | 339 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0025 | 6    | 50. | -2      | 3025.5  | *     | 1 | 1420 | 173 | 56.  | 13.7 | 3028.1  | *       | 2     | 0415 | 340 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0030 | 7    | 50. | -2      | 3025.5  | *     | 1 | 1425 | 174 | 56.  | 13.3 | 3028.0  | *       | 2     | 0420 | 341 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0035 | 8    | 50. | -2      | 3025.5  | *     | 1 | 1430 | 175 | 56.  | 13.0 | 3027.9  | *       | 2     | 0425 | 342 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0040 | 9    | 50. | -2      | 3025.5  | *     | 1 | 1435 | 176 | 55.  | 12.6 | 3027.9  | *       | 2     | 0430 | 343 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0045 | 10   | 50. | -2      | 3025.5  | *     | 1 | 1440 | 177 | 55.  | 12.2 | 3027.8  | *       | 2     | 0435 | 344 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0050 | 11   | 50. | -2      | 3025.5  | *     | 1 | 1445 | 178 | 55.  | 11.8 | 3027.7  | *       | 2     | 0440 | 345 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0055 | 12   | 50. | -2      | 3025.5  | *     | 1 | 1450 | 179 | 55.  | 11.4 | 3027.7  | *       | 2     | 0445 | 346 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0100 | 13   | 50. | -2      | 3025.5  | *     | 1 | 1455 | 180 | 55.  | 11.1 | 3027.6  | *       | 2     | 0450 | 347 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0105 | 14   | 50. | -2      | 3025.5  | *     | 1 | 1500 | 181 | 55.  | 10.7 | 3027.5  | *       | 2     | 0455 | 348 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0110 | 15   | 50. | -2      | 3025.5  | *     | 1 | 1505 | 182 | 54.  | 10.3 | 3027.5  | *       | 2     | 0500 | 349 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0115 | 16   | 50. | -2      | 3025.5  | *     | 1 | 1510 | 183 | 54.  | 9.9  | 3027.4  | *       | 2     | 0505 | 350 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0120 | 17   | 50. | -2      | 3025.5  | *     | 1 | 1515 | 184 | 54.  | 9.6  | 3027.3  | *       | 2     | 0510 | 351 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0125 | 18   | 50. | -2      | 3025.5  | *     | 1 | 1520 | 185 | 54.  | 9.2  | 3027.3  | *       | 2     | 0515 | 352 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0130 | 19   | 50. | -2      | 3025.5  | *     | 1 | 1525 | 186 | 54.  | 8.8  | 3027.2  | *       | 2     | 0520 | 353 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0135 | 20   | 50. | -2      | 3025.5  | *     | 1 | 1530 | 187 | 54.  | 8.4  | 3027.1  | *       | 2     | 0525 | 354 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0140 | 21   | 50. | -2      | 3025.5  | *     | 1 | 1535 | 188 | 54.  | 8.1  | 3027.1  | *       | 2     | 0530 | 355 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0145 | 22   | 50. | -2      | 3025.5  | *     | 1 | 1540 | 189 | 53.  | 7.7  | 3027.0  | *       | 2     | 0535 | 356 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0150 | 23   | 50. | -2      | 3025.5  | *     | 1 | 1545 | 190 | 53.  | 7.3  | 3026.9  | *       | 2     | 0540 | 357 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0155 | 24   | 50. | -2      | 3025.5  | *     | 1 | 1550 | 191 | 53.  | 7.0  | 3026.9  | *       | 2     | 0545 | 358 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0200 | 25   | 50. | -2      | 3025.5  | *     | 1 | 1555 | 192 | 53.  | 6.6  | 3026.8  | *       | 2     | 0550 | 359 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0205 | 26   | 50. | -2      | 3025.5  | *     | 1 | 1600 | 193 | 53.  | 6.2  | 3026.7  | *       | 2     | 0555 | 360 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0210 | 27   | 50. | -2      | 3025.5  | *     | 1 | 1605 | 194 | 52.  | 5.9  | 3026.7  | *       | 2     | 0600 | 361 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0215 | 28   | 50. | -2      | 3025.5  | *     | 1 | 1610 | 195 | 52.  | 5.5  | 3026.6  | *       | 2     | 0605 | 362 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0220 | 29   | 50. | -2      | 3025.5  | *     | 1 | 1615 | 196 | 52.  | 5.2  | 3026.6  | *       | 2     | 0610 | 363 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0225 | 30   | 50. | -2      | 3025.5  | *     | 1 | 1620 | 197 | 52.  | 4.8  | 3026.5  | *       | 2     | 0615 | 364 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0230 | 31   | 50. | -2      | 3025.5  | *     | 1 | 1625 | 198 | 52.  | 4.4  | 3026.4  | *       | 2     | 0620 | 365 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0235 | 32   | 50. | -2      | 3025.5  | *     | 1 | 1630 | 199 | 52.  | 4.1  | 3026.3  | *       | 2     | 0625 | 366 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0240 | 33   | 50. | -2      | 3025.5  | *     | 1 | 1635 | 200 | 51.  | 3.7  | 3026.2  | *       | 2     | 0630 | 367 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0245 | 34   | 50. | -1      | 3025.5  | *     | 1 | 1640 | 201 | 51.  | 3.4  | 3026.2  | *       | 2     | 0635 | 368 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0250 | 35   | 50. | 0       | 3025.5  | *     | 1 | 1645 | 202 | 51.  | 3.0  | 3026.1  | *       | 2     | 0640 | 369 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0255 | 36   | 50. | 0       | 3025.5  | *     | 1 | 1650 | 203 | 51.  | 2.7  | 3026.0  | *       | 2     | 0645 | 370 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0300 | 37   | 50. | 1       | 3025.5  | *     | 1 | 1655 | 204 | 51.  | 2.3  | 3026.0  | *       | 2     | 0650 | 371 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0305 | 38   | 50. | 1       | 3025.5  | *     | 1 | 1700 | 205 | 51.  | 2.0  | 3025.9  | *       | 2     | 0655 | 372 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0310 | 39   | 50. | 1       | 3025.5  | *     | 1 | 1705 | 206 | 50.  | 1.6  | 3025.8  | *       | 2     | 0700 | 373 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0315 | 40   | 50. | 1.0     | 3025.7  | *     | 1 | 1710 | 207 | 50.  | 1.3  | 3025.8  | *       | 2     | 0705 | 374 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0320 | 41   | 51. | 2.1     | 3025.9  | *     | 1 | 1715 | 208 | 50.  | 1.0  | 3025.7  | *       | 2     | 0710 | 375 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0325 | 42   | 52. | 4       | 3026.3  | *     | 1 | 1720 | 209 | 50.  | .6   | 3025.6  | *       | 2     | 0715 | 376 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0330 | 43   | 53. | 7.2     | 3026.9  | *     | 1 | 1725 | 210 | 50.  | .2   | 3025.5  | *       | 2     | 0720 | 377 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0335 | 44   | 55. | 11.4    | 3027.7  | *     | 1 | 1730 | 211 | 50.  | -.1  | 3025.5  | *       | 2     | 0725 | 378 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0340 | 45   | 57. | 16.3    | 3028.5  | *     | 1 | 1735 | 212 | 50.  | -.2  | 3025.5  | *       | 2     | 0730 | 379 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0345 | 46   | 59. | 21.3    | 3029.4  | *     | 1 | 1740 | 213 | 50.  | -.2  | 3025.5  | *       | 2     | 0735 | 380 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0350 | 47   | 61. | 26.3    | 3030.2  | *     | 1 | 1745 | 214 | 50.  | -.2  | 3025.5  | *       | 2     | 0740 | 381 | 50. | -2   | 3025.5 |         |         |       |
| 1  | 0355 | 48   | 62. | 30.8    | 3030.9  | *     | 1 | 1750 | 215 | 50.  | -.2  | 3025.5  | *       | 2     | 0745 | 382 | 50. | -2   | 3025.5 |         |         |       |

# 70 cfs LONG-TERM DISCHARGE @ 0600 HRS

|   |      |     |     |      |        |   |   |      |     |     |    |        |   |   |      |     |     |    |        |
|---|------|-----|-----|------|--------|---|---|------|-----|-----|----|--------|---|---|------|-----|-----|----|--------|
| 1 | 0400 | 49  | 64. | 34.7 | 3031.5 | * | 1 | 1755 | 216 | 50. | -2 | 3025.5 | * | 2 | 0750 | 383 | 50. | -2 | 3025.5 |
| 1 | 0405 | 50  | 65. | 38.1 | 3032.0 | * | 1 | 1800 | 217 | 50. | -2 | 3025.5 | * | 2 | 0755 | 384 | 50. | -2 | 3025.5 |
| 1 | 0410 | 51  | 65. | 40.8 | 3032.4 | * | 1 | 1805 | 218 | 50. | -2 | 3025.5 | * | 2 | 0800 | 385 | 50. | -2 | 3025.5 |
| 1 | 0415 | 52  | 66. | 42.9 | 3032.7 | * | 1 | 1810 | 219 | 50. | -2 | 3025.5 | * | 2 | 0805 | 386 | 50. | -2 | 3025.5 |
| 1 | 0420 | 53  | 67. | 44.6 | 3033.0 | * | 1 | 1815 | 220 | 50. | -2 | 3025.5 | * | 2 | 0810 | 387 | 50. | -2 | 3025.5 |
| 1 | 0425 | 54  | 67. | 46.0 | 3033.2 | * | 1 | 1820 | 221 | 50. | -2 | 3025.5 | * | 2 | 0815 | 388 | 50. | -2 | 3025.5 |
| 1 | 0430 | 55  | 67. | 47.2 | 3033.4 | * | 1 | 1825 | 222 | 50. | -2 | 3025.5 | * | 2 | 0820 | 389 | 50. | -2 | 3025.5 |
| 1 | 0435 | 56  | 68. | 48.3 | 3033.5 | * | 1 | 1830 | 223 | 50. | -2 | 3025.5 | * | 2 | 0825 | 390 | 50. | -2 | 3025.5 |
| 1 | 0440 | 57  | 68. | 49.5 | 3033.7 | * | 1 | 1835 | 224 | 50. | -2 | 3025.5 | * | 2 | 0830 | 391 | 50. | -2 | 3025.5 |
| 1 | 0445 | 58  | 69. | 50.6 | 3033.9 | * | 1 | 1840 | 225 | 50. | -2 | 3025.5 | * | 2 | 0835 | 392 | 50. | -2 | 3025.5 |
| 1 | 0450 | 59  | 69. | 51.7 | 3034.1 | * | 1 | 1845 | 226 | 50. | -2 | 3025.5 | * | 2 | 0840 | 393 | 50. | -2 | 3025.5 |
| 1 | 0455 | 60  | 69. | 52.9 | 3034.2 | * | 1 | 1850 | 227 | 50. | -2 | 3025.5 | * | 2 | 0845 | 394 | 50. | -2 | 3025.5 |
| 1 | 0500 | 61  | 70. | 54.1 | 3034.4 | * | 1 | 1855 | 228 | 50. | -2 | 3025.5 | * | 2 | 0850 | 395 | 50. | -2 | 3025.5 |
| 1 | 0505 | 62  | 70. | 55.1 | 3034.6 | * | 1 | 1900 | 229 | 50. | -2 | 3025.5 | * | 2 | 0855 | 396 | 50. | -2 | 3025.5 |
| 1 | 0510 | 63  | 70. | 55.9 | 3034.7 | * | 1 | 1905 | 230 | 50. | -2 | 3025.5 | * | 2 | 0900 | 397 | 50. | -2 | 3025.5 |
| 1 | 0515 | 64  | 70. | 56.5 | 3034.8 | * | 1 | 1910 | 231 | 50. | -2 | 3025.5 | * | 2 | 0905 | 398 | 50. | -2 | 3025.5 |
| 1 | 0520 | 65  | 71. | 57.0 | 3034.9 | * | 1 | 1915 | 232 | 50. | -2 | 3025.5 | * | 2 | 0910 | 399 | 50. | -2 | 3025.5 |
| 1 | 0525 | 66  | 71. | 57.3 | 3034.9 | * | 1 | 1920 | 233 | 50. | -2 | 3025.5 | * | 2 | 0915 | 400 | 50. | -2 | 3025.5 |
| 1 | 0530 | 67  | 71. | 57.4 | 3034.9 | * | 1 | 1925 | 234 | 50. | -2 | 3025.5 | * | 2 | 0920 | 401 | 50. | -2 | 3025.5 |
| 1 | 0535 | 68  | 71. | 57.5 | 3034.9 | * | 1 | 1930 | 235 | 50. | -2 | 3025.5 | * | 2 | 0925 | 402 | 50. | -2 | 3025.5 |
| 1 | 0540 | 69  | 71. | 57.4 | 3034.9 | * | 1 | 1935 | 236 | 50. | -2 | 3025.5 | * | 2 | 0930 | 403 | 50. | -2 | 3025.5 |
| 1 | 0545 | 70  | 71. | 57.2 | 3034.9 | * | 1 | 1940 | 237 | 50. | -2 | 3025.5 | * | 2 | 0935 | 404 | 50. | -2 | 3025.5 |
| 1 | 0550 | 71  | 71. | 57.0 | 3034.9 | * | 1 | 1945 | 238 | 50. | -2 | 3025.5 | * | 2 | 0940 | 405 | 50. | -2 | 3025.5 |
| 1 | 0555 | 72  | 70. | 56.8 | 3034.8 | * | 1 | 1950 | 239 | 50. | -2 | 3025.5 | * | 2 | 0945 | 406 | 50. | -2 | 3025.5 |
| 1 | 0600 | 73  | 70. | 56.5 | 3034.8 | * | 1 | 1955 | 240 | 50. | -2 | 3025.5 | * | 2 | 0950 | 407 | 50. | -2 | 3025.5 |
| 1 | 0605 | 74  | 70. | 56.2 | 3034.7 | * | 1 | 2000 | 241 | 50. | -2 | 3025.5 | * | 2 | 0955 | 408 | 50. | -2 | 3025.5 |
| 1 | 0610 | 75  | 70. | 55.9 | 3034.7 | * | 1 | 2005 | 242 | 50. | -2 | 3025.5 | * | 2 | 1000 | 409 | 50. | -2 | 3025.5 |
| 1 | 0615 | 76  | 70. | 55.6 | 3034.6 | * | 1 | 2010 | 243 | 50. | -2 | 3025.5 | * | 2 | 1005 | 410 | 50. | -2 | 3025.5 |
| 1 | 0620 | 77  | 70. | 55.2 | 3034.6 | * | 1 | 2015 | 244 | 50. | -2 | 3025.5 | * | 2 | 1010 | 411 | 50. | -2 | 3025.5 |
| 1 | 0625 | 78  | 70. | 54.8 | 3034.5 | * | 1 | 2020 | 245 | 50. | -2 | 3025.5 | * | 2 | 1015 | 412 | 50. | -2 | 3025.5 |
| 1 | 0630 | 79  | 70. | 54.4 | 3034.5 | * | 1 | 2025 | 246 | 50. | -2 | 3025.5 | * | 2 | 1020 | 413 | 50. | -2 | 3025.5 |
| 1 | 0635 | 80  | 70. | 53.9 | 3034.4 | * | 1 | 2030 | 247 | 50. | -2 | 3025.5 | * | 2 | 1025 | 414 | 50. | -2 | 3025.5 |
| 1 | 0640 | 81  | 69. | 53.5 | 3034.3 | * | 1 | 2035 | 248 | 50. | -2 | 3025.5 | * | 2 | 1030 | 415 | 50. | -2 | 3025.5 |
| 1 | 0645 | 82  | 69. | 53.0 | 3034.3 | * | 1 | 2040 | 249 | 50. | -2 | 3025.5 | * | 2 | 1035 | 416 | 50. | -2 | 3025.5 |
| 1 | 0650 | 83  | 69. | 52.6 | 3034.2 | * | 1 | 2045 | 250 | 50. | -2 | 3025.5 | * | 2 | 1040 | 417 | 50. | -2 | 3025.5 |
| 1 | 0655 | 84  | 69. | 52.1 | 3034.1 | * | 1 | 2050 | 251 | 50. | -2 | 3025.5 | * | 2 | 1045 | 418 | 50. | -2 | 3025.5 |
| 1 | 0700 | 85  | 69. | 51.6 | 3034.0 | * | 1 | 2055 | 252 | 50. | -2 | 3025.5 | * | 2 | 1050 | 419 | 50. | -2 | 3025.5 |
| 1 | 0705 | 86  | 69. | 51.2 | 3034.0 | * | 1 | 2100 | 253 | 50. | -2 | 3025.5 | * | 2 | 1055 | 420 | 50. | -2 | 3025.5 |
| 1 | 0710 | 87  | 69. | 50.7 | 3033.9 | * | 1 | 2105 | 254 | 50. | -2 | 3025.5 | * | 2 | 1100 | 421 | 50. | -2 | 3025.5 |
| 1 | 0715 | 88  | 68. | 50.2 | 3033.8 | * | 1 | 2110 | 255 | 50. | -2 | 3025.5 | * | 2 | 1105 | 422 | 50. | -2 | 3025.5 |
| 1 | 0720 | 89  | 68. | 49.8 | 3033.8 | * | 1 | 2115 | 256 | 50. | -2 | 3025.5 | * | 2 | 1110 | 423 | 50. | -2 | 3025.5 |
| 1 | 0725 | 90  | 68. | 49.3 | 3033.7 | * | 1 | 2120 | 257 | 50. | -2 | 3025.5 | * | 2 | 1115 | 424 | 50. | -2 | 3025.5 |
| 1 | 0730 | 91  | 68. | 48.8 | 3033.6 | * | 1 | 2125 | 258 | 50. | -2 | 3025.5 | * | 2 | 1120 | 425 | 50. | -2 | 3025.5 |
| 1 | 0735 | 92  | 68. | 48.4 | 3033.5 | * | 1 | 2130 | 259 | 50. | -2 | 3025.5 | * | 2 | 1125 | 426 | 50. | -2 | 3025.5 |
| 1 | 0740 | 93  | 68. | 47.9 | 3033.5 | * | 1 | 2135 | 260 | 50. | -2 | 3025.5 | * | 2 | 1130 | 427 | 50. | -2 | 3025.5 |
| 1 | 0745 | 94  | 68. | 47.4 | 3033.4 | * | 1 | 2140 | 261 | 50. | -2 | 3025.5 | * | 2 | 1135 | 428 | 50. | -2 | 3025.5 |
| 1 | 0750 | 95  | 67. | 47.0 | 3033.3 | * | 1 | 2145 | 262 | 50. | -2 | 3025.5 | * | 2 | 1140 | 429 | 50. | -2 | 3025.5 |
| 1 | 0755 | 96  | 67. | 46.5 | 3033.3 | * | 1 | 2150 | 263 | 50. | -2 | 3025.5 | * | 2 | 1145 | 430 | 50. | -2 | 3025.5 |
| 1 | 0800 | 97  | 67. | 46.0 | 3033.2 | * | 1 | 2155 | 264 | 50. | -2 | 3025.5 | * | 2 | 1150 | 431 | 50. | -2 | 3025.5 |
| 1 | 0805 | 98  | 67. | 45.5 | 3033.1 | * | 1 | 2200 | 265 | 50. | -2 | 3025.5 | * | 2 | 1155 | 432 | 50. | -2 | 3025.5 |
| 1 | 0810 | 99  | 67. | 45.1 | 3033.0 | * | 1 | 2205 | 266 | 50. | -2 | 3025.5 | * | 2 | 1200 | 433 | 50. | -2 | 3025.5 |
| 1 | 0815 | 100 | 67. | 44.6 | 3033.0 | * | 1 | 2210 | 267 | 50. | -2 | 3025.5 | * | 2 | 1205 | 434 | 50. | -2 | 3025.5 |
| 1 | 0820 | 101 | 67. | 44.2 | 3032.9 | * | 1 | 2215 | 268 | 50. | -2 | 3025.5 | * | 2 | 1210 | 435 | 50. | -2 | 3025.5 |
| 1 | 0825 | 102 | 66. | 43.7 | 3032.8 | * | 1 | 2220 | 269 | 50. | -2 | 3025.5 | * | 2 | 1215 | 436 | 50. | -2 | 3025.5 |
| 1 | 0830 | 103 | 66. | 43.3 | 3032.8 | * | 1 | 2225 | 270 | 50. | -2 | 3025.5 | * | 2 | 1220 | 437 | 50. | -2 | 3025.5 |
| 1 | 0835 | 104 | 66. | 42.8 | 3032.7 | * | 1 | 2230 | 271 | 50. | -2 | 3025.5 | * | 2 | 1225 | 438 | 50. | -2 | 3025.5 |
| 1 | 0840 | 105 | 66. | 42.4 | 3032.6 | * | 1 | 2235 | 272 | 50. | -2 | 3025.5 | * | 2 | 1230 | 439 | 50. | -2 | 3025.5 |
| 1 | 0845 | 106 | 66. | 41.9 | 3032.6 | * | 1 | 2240 | 273 | 50. | -2 | 3025.5 | * | 2 | 1235 | 440 | 50. | -2 | 3025.5 |
| 1 | 0850 | 107 | 66. | 41.5 | 3032.5 | * | 1 | 2245 | 274 | 50. | -2 | 3025.5 | * | 2 | 1240 | 441 | 50. | -2 | 3025.5 |
| 1 | 0855 | 108 | 66. | 41.0 | 3032.4 | * | 1 | 2250 | 275 | 50. | -2 | 3025.5 | * | 2 | 1245 | 442 | 50. | -2 | 3025.5 |
| 1 | 0900 | 109 | 65. | 40.6 | 3032.4 | * | 1 | 2255 | 276 | 50. | -2 | 3025.5 | * | 2 | 1250 | 443 | 50. | -2 | 3025.5 |
| 1 | 0905 | 110 | 65. | 40.1 | 3032.3 | * | 1 | 2300 | 277 | 50. | -2 | 3025.5 | * | 2 | 1255 | 444 | 50. | -2 | 3025.5 |
| 1 | 0910 | 111 | 65. | 39.7 | 3032.2 | * | 1 | 2305 | 278 | 50. | -2 | 3025.5 | * | 2 | 1300 | 445 | 50. | -2 | 3025.5 |
| 1 | 0915 | 112 | 65. | 39.2 | 3032.1 | * | 1 | 2310 | 279 | 50. | -2 | 3025.5 | * | 2 | 1305 | 446 | 50. | -2 | 3025.5 |
| 1 | 0920 | 113 | 65. | 38.8 | 3032.1 | * | 1 | 2315 | 280 | 50. | -2 | 3025.5 | * | 2 | 1310 | 447 | 50. | -2 | 3025.5 |
| 1 | 0925 | 114 | 65. | 38.3 | 3032.0 | * | 1 | 2320 | 281 | 50. | -2 | 3025.5 | * | 2 | 1315 | 448 | 50. | -2 | 3025.5 |
| 1 | 0930 | 115 | 65. | 37.9 | 3031.9 | * | 1 | 2325 | 282 | 50. | -2 | 3025.5 | * | 2 | 1320 | 449 | 50. | -2 | 3025.5 |
| 1 | 0935 | 116 | 64. | 37.4 | 3031.9 | * | 1 | 2330 | 283 | 50. | -2 | 3025.5 | * | 2 | 1325 | 450 | 50. | -2 | 3025.5 |
| 1 | 0940 | 117 | 64. | 37.0 | 3031.8 | * | 1 | 2335 | 284 | 50. | -2 | 3025.5 | * | 2 | 1330 | 451 | 50. | -2 | 3025.5 |
| 1 | 0945 | 118 | 64. | 36.5 | 3031.7 | * | 1 | 2340 | 285 | 50. | -2 | 3025.5 | * | 2 | 1335 | 452 | 50. | -2 | 3025.5 |
| 1 | 0950 | 119 | 64. | 36.1 | 3031.7 | * | 1 | 2345 | 286 | 50. | -2 | 3025.5 | * | 2 | 1340 | 453 | 50. | -2 | 3025.5 |
| 1 | 0955 | 120 | 64. | 35.7 | 3031.6 | * | 1 | 2350 | 287 | 50. | -2 | 3025.5 | * | 2 | 1345 | 454 | 50. | -2 | 3025.5 |
| 1 | 1000 | 121 | 64. | 35.2 | 3031.5 | * | 1 | 2355 | 288 | 50. | -2 | 3025.5 | * | 2 | 1350 | 455 | 50. | -2 | 3025.5 |
| 1 | 1005 | 122 | 64. | 34.8 | 3031.5 | * | 1 | 2400 | 289 | 50. | -2 | 3025.5 | * | 2 | 1355 | 456 | 50. | -2 | 3025.5 |
| 1 | 1010 | 123 | 63. | 34.3 | 3031.4 | * | 2 | 0005 | 290 | 50. | -2 | 3025.5 | * | 2 | 1400 | 457 | 50. | -2 | 3025.5 |
| 1 | 1015 | 124 | 63. | 33.9 | 3031.3 | * | 2 | 0010 | 291 | 50. | -2 | 3025.5 | * | 2 | 1405 | 458 | 50. | -2 | 3025.5 |
| 1 | 1020 | 125 | 63. | 33.5 | 3031.3 | * | 2 | 0015 | 292 | 50. | -2 | 3025.5 | * | 2 | 1410 | 459 | 50. | -2 | 3025.5 |
| 1 | 1025 | 126 | 63. | 33.0 | 3031.2 | * | 2 | 0020 | 293 | 50. | -2 | 3025.5 | * | 2 | 1415 | 460 | 50. | -2 | 3025.5 |
| 1 | 1030 | 127 | 63. | 32.6 | 3031.1 | * | 2 | 0025 | 294 | 50. | -2 | 3025.5 |   |   |      |     |     |    |        |

ULT1.OUT

| PEAK STORAGE      | TIME | 6-HR      | MAXIMUM AVERAGE STORAGE | 24-HR   | 72-HR   | 41.58-HR |
|-------------------|------|-----------|-------------------------|---------|---------|----------|
| + (AC-FT)         | (HR) |           |                         |         |         |          |
| 57.               | 5.58 | 48.       | 18.                     | 10.     | 10.     |          |
| PEAK STAGE        | TIME | 6-HR      | MAXIMUM AVERAGE STAGE   | 24-HR   | 72-HR   | 41.58-HR |
| + (FEET)          | (HR) |           |                         |         |         |          |
| 3034.93           | 5.58 | 3033.47   | 3028.53                 | 3027.25 | 3027.25 |          |
| CUMULATIVE AREA = |      | .88 SQ MI |                         |         |         |          |

1

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

| OPERATION                 | STATION | AREA    | PLAN         | RATIOS APPLIED TO PRECIPITATION |                |
|---------------------------|---------|---------|--------------|---------------------------------|----------------|
|                           |         |         |              | RATIO 1<br>1.00                 | RATIO 2<br>.98 |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF1                    | .41     | 1       | FLOW<br>TIME | 403.<br>3.75                    | 391.<br>3.75   |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF7                    | .03     | 1       | FLOW<br>TIME | 55.<br>3.50                     | 54.<br>3.50    |
| 2 COMBINED AT             |         |         |              |                                 |                |
| + CP2                     | .44     | 1       | FLOW<br>TIME | 432.<br>3.75                    | 420.<br>3.75   |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF2                    | .04     | 1       | FLOW<br>TIME | 48.<br>3.58                     | 47.<br>3.58    |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF3                    | .03     | 1       | FLOW<br>TIME | 38.<br>3.58                     | 37.<br>3.58    |
| 3 COMBINED AT             |         |         |              |                                 |                |
| + CP1                     | .50     | 1       | FLOW<br>TIME | 485.<br>3.75                    | 471.<br>3.75   |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF4                    | .06     | 1       | FLOW<br>TIME | 84.<br>3.58                     | 82.<br>3.58    |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF5                    | .26     | 1       | FLOW<br>TIME | 236.<br>3.83                    | 229.<br>3.83   |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + OFF6                    | .04     | 1       | FLOW<br>TIME | 59.<br>3.58                     | 57.<br>3.58    |
| HYDROGRAPH AT             |         |         |              |                                 |                |
| + ON1                     | .03     | 1       | FLOW<br>TIME | 47.<br>3.58                     | 46.<br>3.58    |
| 5 COMBINED AT             |         |         |              |                                 |                |
| + DB1                     | .88     | 1       | FLOW<br>TIME | 817.<br>3.75                    | 794.<br>3.75   |
| ROUTED TO                 |         |         |              |                                 |                |
| + RDB1                    | .88     | 1       | FLOW<br>TIME | 71.<br>5.58                     | 71.<br>5.58    |
| ** PEAK STAGES IN FEET ** |         |         |              |                                 |                |
| 1                         | STAGE   | 3035.23 | 3034.93      |                                 |                |
|                           | TIME    | 5.58    | 5.58         |                                 |                |

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

APN 125-07-601-006



# **APN 125-07-601-006 Downstream Section** **Worksheet for Irregular Channel**

| Project Description |                    |
|---------------------|--------------------|
| Worksheet           | APN 125-07-601-006 |
| Flow Element        | Irregular Channel  |
| Method              | Manning's Formula  |
| Solve For           | Channel Depth      |

| Input Data    |           |
|---------------|-----------|
| Channel Slope | 1.80 %    |
| Discharge     | 70.00 cfs |

| Options                         |                          |
|---------------------------------|--------------------------|
| Current Roughness Method        | Improved Lotter's Method |
| Open Channel Weighting Method   | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method          |

| Results                 |                |
|-------------------------|----------------|
| Mannings Coefficient    | 0.030          |
| Water Surface Elevation | 45.97 ft       |
| Elevation Range         | 45.00 to 50.00 |
| Flow Area               | 17.0 ft²       |
| Wetted Perimeter        | 35.10 ft       |
| Top Width               | 35.04 ft       |
| Actual Depth            | 0.97 ft        |
| Critical Elevation      | 45.99 ft       |
| Critical Slope          | 1.66 %         |
| Velocity                | 4.11 ft/s      |
| Velocity Head           | 0.26 ft        |
| Specific Energy         | 46.24 ft       |
| Froude Number           | 1.04           |
| Flow Type               | Supercritical  |

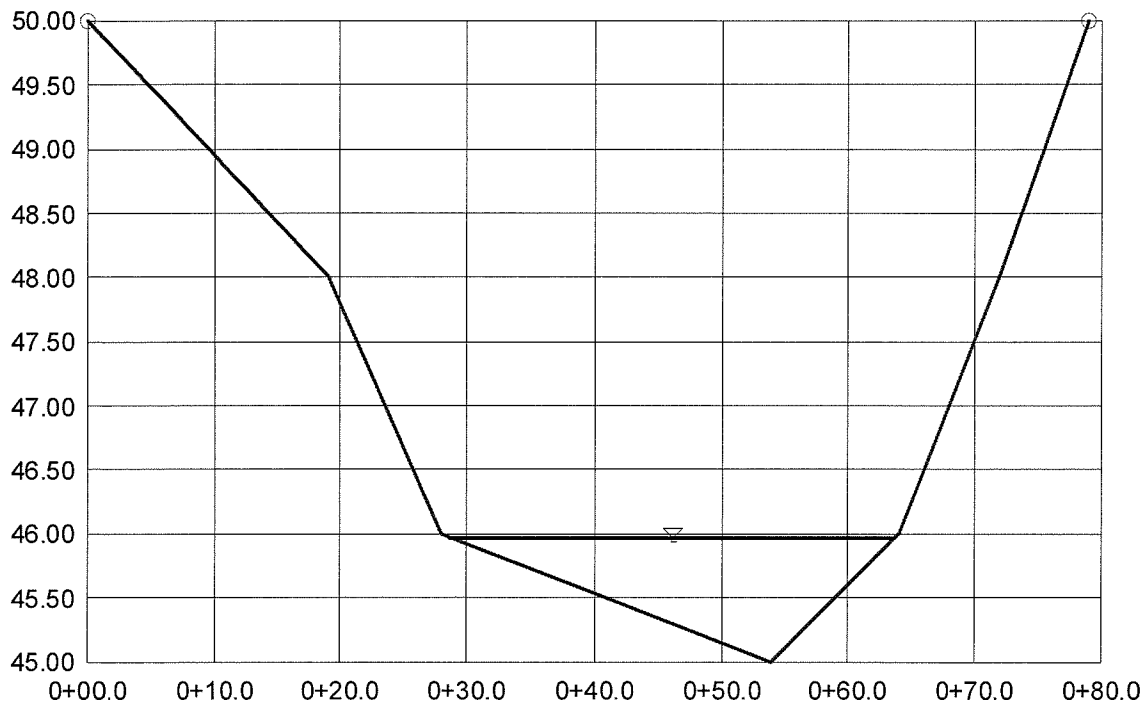
| Roughness Segments |             |                      |
|--------------------|-------------|----------------------|
| Start Station      | End Station | Mannings Coefficient |
| 0+00.0             | 0+79.0      | 0.030                |

| Natural Channel Points |                |
|------------------------|----------------|
| Station (ft)           | Elevation (ft) |
| 0+00.0                 | 50.00          |
| 0+19.0                 | 48.00          |
| 0+28.0                 | 46.00          |
| 0+54.0                 | 45.00          |
| 0+64.0                 | 46.00          |
| 0+72.0                 | 48.00          |
| 0+79.0                 | 50.00          |

# **APN 125-07-601-006 Downstream Section** **Cross Section for Irregular Channel**

| Project Description |                    |
|---------------------|--------------------|
| Worksheet           | APN 125-07-601-006 |
| Flow Element        | Irregular Channel  |
| Method              | Manning's Formula  |
| Solve For           | Channel Depth      |

| Section Data            |                |
|-------------------------|----------------|
| Mannings Coefficient    | 0.030          |
| Channel Slope           | 1.80 %         |
| Water Surface Elevation | 45.97 ft       |
| Elevation Range         | 45.00 to 50.00 |
| Discharge               | 70.00 cfs      |



V:10.0  
H:1  
NTS

|                                                                              |                                                                                  |                                                                                                                         |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>CITY OF LAS VEGAS</b>                                                     |                                                                                  | <b>DATE:</b>                                                                                                            |
| <b>INTER-OFFICE MEMORANDUM</b>                                               |                                                                                  | February 7, 2012                                                                                                        |
| <b>TO:</b><br>Land Development Services<br>Department of Building and Safety |                                                                                  | <b>FROM:</b><br>Albert Sung, P.E. <i>PBJ</i><br>Flood Control Project Engineer <i>for</i><br>Department of Public Works |
| <b>SUBJECT:</b>                                                              | Conceptual Drainage Study for:                                                   |                                                                                                                         |
|                                                                              | <b>STOCKPILE PERMIT – Northeast corner of Horse Drive and Grand Canyon Drive</b> |                                                                                                                         |
| <b>Cross Streets:</b>                                                        | Horse Drive & Grand Canyon                                                       | Grand Canyon Village Square                                                                                             |
| <b>File Number:</b>                                                          | F:\Depot\DSMemos\DS4548A.doc                                                     | Bart Anderson, P.E., DevCo                                                                                              |
| <b>Parcel Number:</b>                                                        | 12507601005                                                                      | Dispatch Transportation, LLC                                                                                            |
| <b>Zoning Action:</b>                                                        | N/A, CLV Permit # 201994-C-11                                                    |                                                                                                                         |
| <b>FEMA Flood Zone</b>                                                       | YES                                                                              | NO <b>X</b>                                                                                                             |
| <b>Proposed Storm Drain</b>                                                  | YES                                                                              | NO <b>X</b>                                                                                                             |

| HISTORY                   | DATE RECEIVED | DATE REVIEWED | COMMENTS                   | REVIEW FEES     | FEES PAID Transaction # |
|---------------------------|---------------|---------------|----------------------------|-----------------|-------------------------|
| 1 <sup>st</sup> Submittal | 2/06/2012     | 2/07/2012     | See Comments Below         | \$400.00        | 184874                  |
|                           |               |               | <b>TOTAL FEES (LDDRS):</b> | <b>\$400.00</b> | ----                    |

**REMARKS: This Approval is for the Stockpile Permit ONLY. This Drainage Study is Conceptual in nature. Clark County Dust Permit # 40686.**

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

|          |                                                                                                   |
|----------|---------------------------------------------------------------------------------------------------|
| <b>X</b> | is approved subject to conformance to all City standards and the following conditions:            |
|          | must be resubmitted or supplemented including the following:                                      |
|          | is conditionally approved subject to Clark County Regional Flood Control District concurrence.    |
|          | is conditionally approved subject to Clark County Department of Development Services concurrence. |
|          | is conditionally approved subject to NDOT concurrence.                                            |

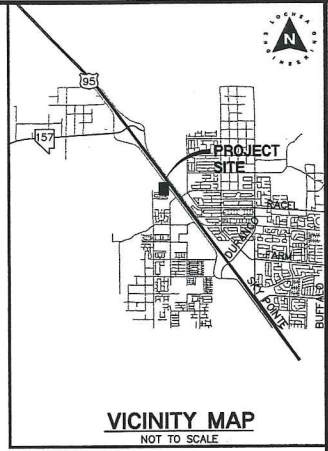
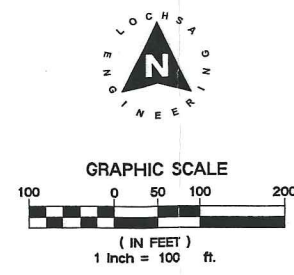
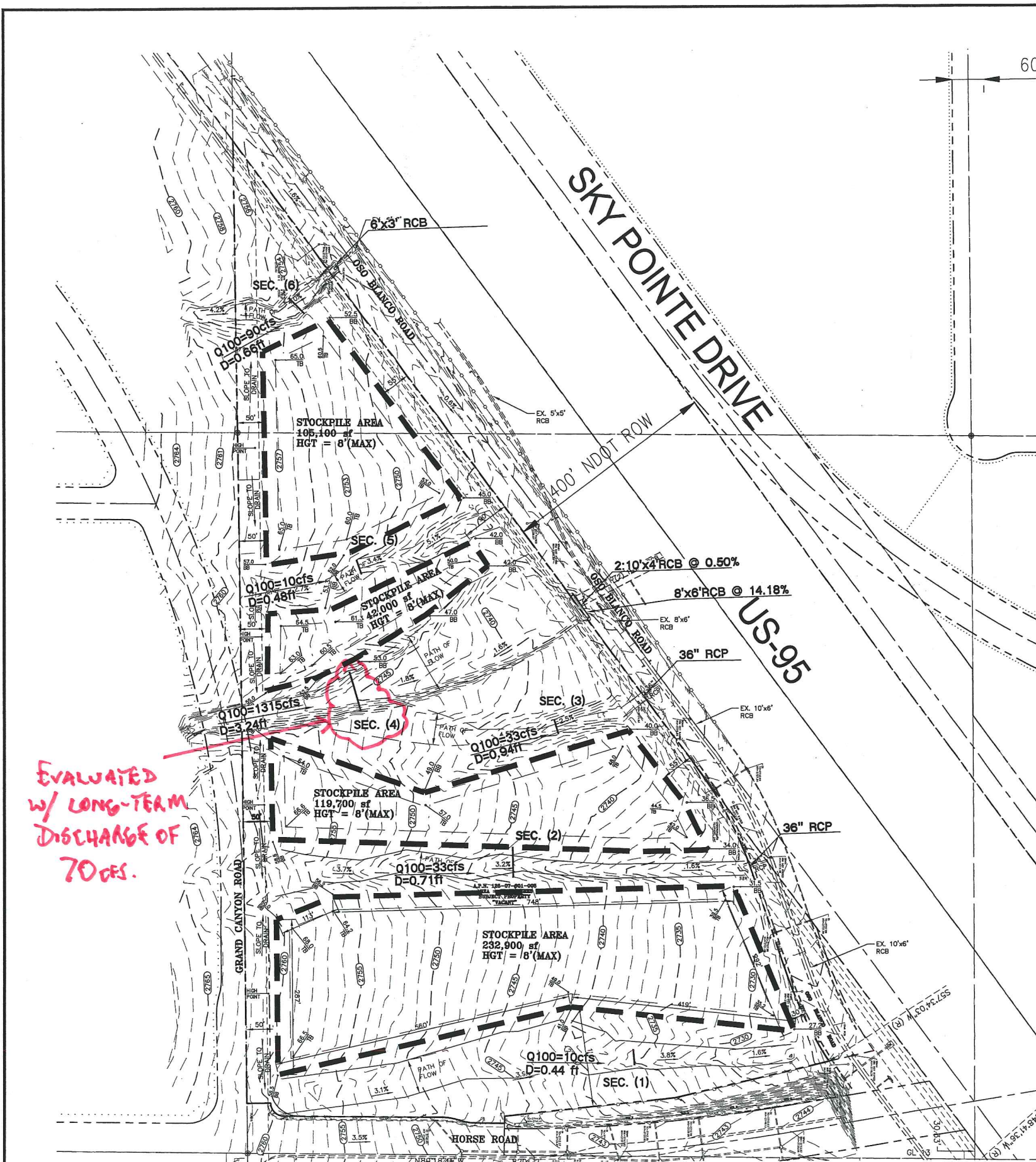
1. A review of the grading and stockpile plan has been completed and no apparent drainage impacts from the stockpile request are noted. Planning Department Concurrence has been provided.
2. Further development of this site will require that a Technical Drainage Study be submitted and approved prior to any further site development.

**NOTE:** Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

**END OF REMARKS**  
PBJ

T/R/S: T19S/R60E/S07  
AREA G-07





NOTE: STOCKPILE TO COMPLY WITH THE APPROVED DUST MITIGATION PLAN

FLOOD ZONE NOTE

The project site is covered by the Flood Insurance Rate Map (FIRM) for the Clark County, Nevada, and Incorporated areas, Community Panel Number: 32003C1735E, Effective Date: September 27, 2002. The site falls entirely within Zone "X", defined by FEMA as Areas determined to be outside the 0.2% annual chance flood.

NOTE:

LOCHSA ENGINEERING ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS PLAN ARE FROM THE BEST AVAILABLE INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO, THE WATER, FIRE, SANITARY SEWER, STORM SEWER, TELEPHONE, POWER, GAS, AND IRRIGATION LINES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF CONFLICT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE PROJECT ARCHITECT, OWNER'S REPRESENTATIVE AND THE PROJECT ENGINEER IMMEDIATELY.

A.P.N.: 125-07-601-005

BASIS OF BEARINGS

LEGAL DESCRIPTION

THE LAND REFERRED TO IN THIS COMMITMENT IS SITUATED IN THE COUNTY OF CLARK, STATE OF NEVADA, AND DESCRIBED AS FOLLOWS:  
THAT PORTION OF THE SOUTHWEST QUARTER (SW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF SECTION 7, TOWNSHIP 19 SOUTH, RANGE 80 EAST, M.D.M., DESCRIBED AS FOLLOWS:  
LOT ONE (1) AS SHOWN BY MAP THEREOF IN FILE 105, OF PARCEL MAPS PAGE 18, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.  
EXCEPTING THEREFROM THOSE PORTIONS OF LAND CONVEYED TO CITY OF LAS VEGAS BY GRANT DEED RECORDED JULY 13, 2007 IN BOOK 20070713 AS DOCUMENT NO. 00379 AND 00380 OF OFFICIAL RECORDS.  
FURTHER EXCEPTING THEREFROM THOSE PORTIONS OF LAND CONVEYED TO THE CITY OF LAS VEGAS BY GRANT DEED RECORDED APRIL 14, 2008 IN BOOK 20080414 AS DOCUMENT NO. 02846 OF OFFICIAL RECORDS.

SAFETY ALERT

Call Before You Overhead



| LEGEND | CL OR SURVEY LINE | EASEMENT LINE | DESCRIPTION: | CONTOUR LINES | EDGE OF PAVEMENT | "A" TYPE CURBS | "L" TYPE CURBS | WALLS | FENCES | AC PAVEMENT | CONCRETE | SPOT ELEVATIONS | SIGNS | MANHOLE W/ DESCRIPTION | MANHOLE DESCRIPTIONS                                                     | FIRE HYDRANTS | GATE VALVES | REDUCERS | CLEAN OUTS | UTILITY BOX OR VAULT | BACKWATER VALVES | 100w HPS STREETLIGHTS | 150w HPS STREETLIGHTS | 200w HPS STREETLIGHTS | 250w HPS STREETLIGHTS |
|--------|-------------------|---------------|--------------|---------------|------------------|----------------|----------------|-------|--------|-------------|----------|-----------------|-------|------------------------|--------------------------------------------------------------------------|---------------|-------------|----------|------------|----------------------|------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|        | PROPERTY LINE     | SAWCUT LINE   | EXISTING:    | (2210)        |                  |                |                |       |        |             |          | (12.34) BC      |       | ⑤                      | ① = SANITARY SEWER<br>② = STORM DRAIN<br>③ = ELECTRICAL<br>④ = TELEPHONE |               |             |          |            |                      | BWV              |                       |                       |                       |                       |
|        | ROW LINE          | SCARP LINE    | PROPOSED:    | (2122)        |                  |                |                |       |        |             |          | (12.34) BC      |       | ⑥                      |                                                                          |               |             |          |            |                      |                  |                       |                       |                       |                       |

|                           |                          |                         |                                                                                                                                 |                |              |             |
|---------------------------|--------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|-------------|
| DATE: 02-06-12            | DESIGNED BY: [Signature] | CHECKED BY: [Signature] | PROJECT No.: 101070                                                                                                             | SHEET No.: DR1 | SHEET 1 OF 1 | DRAWING No. |
| DRAWN BY: [Signature]     |                          |                         | LOCHSA ENGINEERING<br>6345 SOUTH JONES BOULEVARD SUITE 100<br>LAS VEGAS, NV 89118<br>PHONE: (702) 365-9312, FAX: (702) 365-9317 |                |              |             |
| EXISTING DRAINAGE PATTERN |                          |                         | N.E. CORNER<br>HORSE AND GRAND CANYON                                                                                           |                |              |             |
| DATE: 02-06-12            |                          |                         | SCALE: 1"=100'                                                                                                                  |                |              |             |
| DATE: 02-06-12            |                          |                         | PROJECT No.: 101070                                                                                                             |                |              |             |
| DATE: 02-06-12            |                          |                         | SHEET No.: DR1                                                                                                                  |                |              |             |
| DATE: 02-06-12            |                          |                         | SHEET 1 OF 1                                                                                                                    |                |              |             |
| DATE: 02-06-12            |                          |                         | DRAWING No.                                                                                                                     |                |              |             |





# **CONCEPTUAL OFFSITE HYDROLOGY REPORT**

**For  
US-95 Environmental Document**

**Rainbow Boulevard**

**To**

**Kyle Canyon Road**

**May 2004**

**Revised October 2004**



**E.A. NO. 73013**



**Update to Volume 1**

# PRELIMINARY

NOT FOR CONSTRUCTION  
10/14/2004

| FED. RD. REG. NO. | STATE  | PROJECT NO. | COUNTY | SHEET NO. |
|-------------------|--------|-------------|--------|-----------|
| 9                 | NEVADA | -           | CLARK  | EC-4      |

1" = 200'

US-95 CULVERTS  
IMPACTED BY DAI OUTFALL  
LONG-TERM DISECHARGE

PROPOSED HORSE INTERCHANGE

CULVERT HD07C

CULVERT HD07B

CULVERT HD07A

PROPOSED HORSE INTERCHANGE

US 95

OFF17

OFF24B

OFF19

OFF20B

CULVERT HD05C

CULVERT HD06C

CULVERT HD06B

CULVERT HD06A

CULVERT HD05B

CULVERT HD05A

## LEGEND

- 1842 EXISTING FLOWS (IN CFS)
- 1842 EXISTING ROADWAY OVERTOPPING FLOWS (IN CFS)

STATE OF NEVADA  
DEPARTMENT OF TRANSPORTATION  
US 95 ENVIRONMENTAL DOCUMENT  
RAINBOW BOULEVARD TO KYLE CANYON  
EXISTING CONDITIONS EXHIBIT

VTM nevada  
CONSULTING ENGINEERS  
PLANNERS  
LAND SURVEYORS  
2727 S. RAINBOW BLVD  
LAS VEGAS, NV 89144  
PHONE (702) 247-4000  
FAX (702) 247-4262

DESIGN BY  
DRAWN BY  
CHECKED BY  
REVIEWED BY

10/14/2004 01:38:39 PM I:\62000\shells\preliminary drainage\100 scale existing conditions\ec-04.dgn



**TABLE 3.2.2**  
**US-95 EXISTING CONDITIONS CULVERT ANALYSES SUMMARY**

| West Frontage Road (Row "A")      |                    |       |                      |                      |                      |                       |                                       |                                      | Southbound Interchange Ramps (Row "W") |                    |       |                      |                      |                      |                       |                                       | Southbound US-95 (Row "B")           |                                   |                    |       |                      |                                     |                      |                       | Northbound US-95 (Row "C")            |                                      |                                   |                    |       |                      |                                     |                      | LOCATION |                       |                                       |                                        |
|-----------------------------------|--------------------|-------|----------------------|----------------------|----------------------|-----------------------|---------------------------------------|--------------------------------------|----------------------------------------|--------------------|-------|----------------------|----------------------|----------------------|-----------------------|---------------------------------------|--------------------------------------|-----------------------------------|--------------------|-------|----------------------|-------------------------------------|----------------------|-----------------------|---------------------------------------|--------------------------------------|-----------------------------------|--------------------|-------|----------------------|-------------------------------------|----------------------|----------|-----------------------|---------------------------------------|----------------------------------------|
| FACILITY                          | DRAIN AREA (sq mi) | DARF  | Q <sub>t</sub> (cfs) | Q <sub>c</sub> (cfs) | Q <sub>r</sub> (cfs) | Q <sub>ch</sub> (cfs) | Q <sub>cap</sub> <sup>(1)</sup> (cfs) | Q <sub>sp</sub> <sup>(4)</sup> (cfs) | FACILITY                               | DRAIN AREA (sq mi) | DARF  | Q <sub>t</sub> (cfs) | Q <sub>c</sub> (cfs) | Q <sub>r</sub> (cfs) | Q <sub>ch</sub> (cfs) | Q <sub>cap</sub> <sup>(1)</sup> (cfs) | Q <sub>sp</sub> <sup>(4)</sup> (cfs) | FACILITY                          | DRAIN AREA (sq mi) | DARF  | Q <sub>t</sub> (cfs) | Q <sub>c</sub> <sup>(2)</sup> (cfs) | Q <sub>r</sub> (cfs) | Q <sub>ch</sub> (cfs) | Q <sub>cap</sub> <sup>(1)</sup> (cfs) | Q <sub>sp</sub> <sup>(4)</sup> (cfs) | FACILITY                          | DRAIN AREA (sq mi) | DARF  | Q <sub>t</sub> (cfs) | Q <sub>c</sub> <sup>(3)</sup> (cfs) | Q <sub>r</sub> (cfs) |          | Q <sub>ch</sub> (cfs) | Q <sub>cap</sub> <sup>(1)</sup> (cfs) | Q <sub>sp</sub> <sup>(4)</sup> (cfs)   |
| Culvert KC06A<br>6' x 3' RCBC     | 0.08               | 0.997 | 60                   | 60                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert KC06B<br>6' x 3' RCBC     | 0.08               | 0.997 | 59                   | 59                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert KC06C<br>6' x 3' RCBC     | 0.08               | 0.997 | 59                   | 59                                  | 0                    | 0        | 0                     | 0                                     | NORTH OF KYLE CANYON                   |
| Culvert KC05A<br>6' x 3' RCBC     | 0.19               | 0.992 | 115                  | 104                  | 0                    | 11                    | 11                                    | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert KC05B<br>6' x 3' RCBC     | 0.19               | 0.992 | 105                  | 104                                 | 0                    | 1                     | 1                                     | 0                                    | Culvert KC05C<br>6' x 3' RCBC     | 0.19               | 0.992 | 104                  | 104                                 | 0                    | 0        | 0                     | 0                                     |                                        |
| Culvert KC04A<br>3: 42" CMP       | 0.39               | 0.984 | 53                   | 53                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert KC04B<br>42" CMP          | 0.39               | 0.984 | 53                   | 53                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert KC04C<br>42" CMP          | 0.39               | 0.984 | 53                   | 52                                  | 0                    | 1        | 1                     | 0                                     |                                        |
| Culvert KC03A<br>42" CMP          | 0.16               | 0.994 | 101                  | 74                   | 0                    | 27                    | 27                                    | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert KC03B<br>42" CMP          | 0.17               | 0.993 | 80                   | 70                                  | 0                    | 10                    | 10                                    | 0                                    | Culvert KC03C<br>42" CMP          | 0.17               | 0.993 | 71                   | 70                                  | 0                    | 1        | 1                     | 0                                     |                                        |
| Culvert KC02A<br>6' x 3' RCBC     | 0.04               | 0.998 | 27                   | 27                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert KC02B<br>6' x 3' RCBC     | 0.23               | 0.991 | 49                   | 49                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert KC02C<br>6' x 3' RCBC     | 0.23               | 0.991 | 50                   | 50                                  | 0                    | 0        | 0                     | 0                                     |                                        |
| Culvert HD03A<br>2: 6' x 3' RCBC  | 0.03               | 0.999 | 15                   | 15                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD01B<br>6' x 3' RCBC     | 0.06               | 0.998 | 29                   | 29                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert HD01C<br>6' x 3' RCBC     | 0.06               | 0.998 | 29                   | 29                                  | 0                    | 0        | 0                     | 0                                     | BETWEEN GRAND TETON & KYLE CANYON      |
| Culvert HD02A<br>2: 6' x 3' RCBC  | 0.05               | 0.998 | 22                   | 22                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD02B<br>42" CMP          | 0.07               | 0.997 | 29                   | 29                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert HD02C<br>42" CMP          | 0.07               | 0.997 | 29                   | 29                                  | 0                    | 0        | 0                     | 0                                     |                                        |
| Culvert HD04A<br>2: 10' x 4' RCBC | 3.24               | 0.918 | 2,296                | 1,001                | 412                  | 883                   | 526                                   | 357                                  |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD04B<br>3: 42" CMP       | 3.24               | 0.918 | 1,413                | 326                                 | 390                  | 697                   | 1,003                                 | 51                                   | Culvert HD04C<br>3: 42" CMP       | 3.24               | 0.918 | 716                  | 214                                 | 91                   | 411      | 462                   | 0                                     |                                        |
| Culvert HD05A<br>6' x 3' RCBC     | 3.34               | 0.917 | 593                  | 211                  | 58                   | 324                   | 324                                   | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD05B<br>6' x 4' RCBC     | 3.34               | 0.917 | 1,250                | 260                                 | 366                  | 624                   | 624                                   | 0                                    | Culvert HD05C<br>6' x 4' RCBC     | 3.34               | 0.917 | 1,056                | 236                                 | 88                   | 732      | 732                   | 0                                     |                                        |
| Culvert HD06A<br>2: 10' x 4' RCBC | 4.36               | 0.908 | 1,395                | 881                  | 45                   | 469                   | 469                                   | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD06B<br>2: 10' x 4' RCBC | 4.36               | 0.908 | 1,419                | 795                                 | 110                  | 514                   | 514                                   | 0                                    | Culvert HD06C<br>2: 10' x 4' RCBC | 4.36               | 0.908 | 1,603                | 807                                 | 142                  | 654      | 654                   | 0                                     |                                        |
| Culvert HD07A<br>36" CMP          | 4.41               | 0.908 | 495                  | 62                   | 0                    | 433                   | 337                                   | 96                                   |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD07B<br>36" CMP          | 4.41               | 0.908 | 567                  | 68                                  | 0                    | 499                   | 523                                   | 0                                    | Culvert HD07C<br>36" CMP          | 4.41               | 0.908 | 718                  | 72                                  | 101                  | 545      | 545                   | 0                                     |                                        |
| Culvert HD08A<br>6' x 3' RCBC     | 4.65               | 0.907 | 552                  | 165                  | 0                    | 387                   | 368                                   | 19                                   |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD08B<br>6' x 4' RCBC     | 4.65               | 0.907 | 670                  | 181                                 | 4                    | 485                   | 486                                   | 0                                    | Culvert HD08C-DI<br>Type 2A       | 4.65               | 0.907 | 542                  | 10                                  | 188                  | 344      | 344                   | 0                                     |                                        |
| Culvert HD09A<br>2: 42" CMP       | 6.15               | 0.899 | 1,554                | 231                  | 517                  | 806                   | 273                                   | 533                                  |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD09B<br>2: 42" CMP       | 6.15               | 0.899 | 1,170                | 219                                 | 1                    | 950                   | 1,070                                 | 406                                  | Culvert HD09C<br>Spill            | 6.15               | 0.899 | 336                  | 0                                   | 0                    | 336      | 678                   | 0                                     |                                        |
| Culvert HD10A<br>2: 10' x 4' RCBC | 6.17               | 0.898 | 299                  | 299                  | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD10B<br>10' x 4' RCBC    | 6.17               | 0.898 | 1,365                | 347                                 | 22                   | 996                   | 996                                   | 0                                    | Culvert HD10C-DI<br>Type 2A       | 6.17               | 0.898 | 695                  | 9                                   | 589                  | 97       | 97                    | 0                                     |                                        |
| Culvert HD11A<br>10' x 10' RCBC   | 0.21               | 0.992 | 161                  | 161                  | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert HD11B<br>10' x 10' RCBC   | 6.38               | 0.896 | 1,112                | 1,085                               | 0                    | 27                    | 27                                    | 0                                    | Culvert HD11C<br>10' x 10' RCBC   | 6.38               | 0.896 | 1,163                | 1,083                               | 0                    | 80       | 80                    | 0                                     |                                        |
| Culvert NB01A<br>24" CMP          | 0.01               | 1.000 | 5                    | 5                    | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert NB01B<br>24" CMP          | 6.39               | 0.896 | 26                   | 7                                   | 0                    | 19                    | 19                                    | 0                                    | Culvert NB01C<br>24" CMP          | 6.39               | 0.896 | 85                   | 9                                   | 0                    | 76       | 76                    | 0                                     | BETWEEN NORTHERN BELTWAY & GRAND TETON |
| Culvert NB02A<br>2: 42" CMP       | 0.09               | 0.996 | 40                   | 40                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert NB02B<br>2: 42" CMP       | 6.48               | 0.895 | 50                   | 50                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert NB02C-DI<br>2: 42" CMP    | 6.39               | 0.896 | 73                   | 6                                   | 0                    | 67       | 67                    | 0                                     |                                        |
| Culvert NB03A<br>30" CMP          | 0.04               | 0.998 | 21                   | 21                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert NB03B<br>30" CMP          | 0.04               | 0.998 | 25                   | 25                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert NB03C<br>30" CMP          | 6.52               | 0.895 | 77                   | 31                                  | 0                    | 46       | 46                    | 0                                     |                                        |
| Culvert NB04A<br>6' x 3' RCBC     | 0.61               | 0.978 | 558                  | 139                  | 165                  | 254                   | 254                                   | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert NB04B<br>6' x 3' RCBC     | 0.61               | 0.978 | 305                  | 135                                 | 23                   | 147                   | 147                                   | 0                                    | Culvert NB04C-DI<br>Type 2A       | 7.13               | 0.889 | 44                   | 3                                   | 13                   | 28       | 28                    | 0                                     |                                        |
| Culvert NB05A<br>6' x 3' RCBC     | 0.70               | 0.976 | 283                  | 159                  | 117                  | 7                     | 7                                     | 0                                    | Culvert NB05W<br>6' x 4' RCBC          | 0.70               | 0.976 | 422                  | 175                  | 0                    | 247                   | 247                                   | 0                                    | Culvert NB05BC<br>6' x 4' RCBC    | 0.70               | 0.976 | 175                  | 123                                 | 0                    | 52                    | 52                                    | 0                                    | Culvert NB05C-DI<br>Type 2A       | 7.13               | 0.889 | 27                   | 4                                   | 0                    | 23       | 23                    | 0                                     |                                        |
| Culvert NB06A<br>30" CMP          | 0.74               | 0.975 | 25                   | 25                   | 0                    | 0                     | 0                                     | 0                                    | Culvert NB06BW<br>30" CMP              | 0.74               | 0.975 | 260                  | 166                  | 0                    | 94                    | 94                                    | 0                                    | Culvert NB06CB<br>30" CMP         | 0.76               | 0.975 | 163                  | 39                                  | 15                   | 109                   | 109                                   | 0                                    | Culvert NB06CC<br>30" CMP         | 7.28               | 0.887 | 53                   | 31                                  | 0                    | 22       | 22                    | 0                                     |                                        |
| Culvert NB07AA<br>24" CMP         | 0.01               | 1.000 | 8                    | 8                    | 0                    | 0                     | 0                                     | 0                                    | Culvert NB08W<br>6' x 3' RCBC          | 0.77               | 0.975 | 100                  | 100                  | 0                    | 0                     | 0                                     | 0                                    | Culvert NB08AB<br>30" CMP         | 0.79               | 0.974 | 75                   | 62                                  | 0                    | 13                    | 13                                    | 0                                    | Culvert NB08AC<br>30" CMP         | 7.31               | 0.887 | 77                   | 31                                  | 0                    | 46       | 46                    | 0                                     |                                        |
| Culvert NB07BA<br>30" CMP         | 0.13               | 0.995 | 59                   | 32                   | 0                    | 27                    | 27                                    | 0                                    | Culvert NB09W<br>30" CMP               | 0.14               | 0.994 | 37                   | 37                   | 0                    | 0                     | 0                                     | 0                                    | Culvert NB09ABC<br>6' x 3' RCBC   | 0.96               | 0.971 | 52                   | 52                                  | 0                    | 0                     | 0                                     | 0                                    |                                   |                    |       |                      |                                     |                      |          |                       |                                       |                                        |
| Culvert NB10A<br>2: 24" CMP       | 0.02               | 0.999 | 11                   | 11                   | 0                    | 0                     | 0                                     | 0                                    |                                        |                    |       |                      |                      |                      |                       |                                       |                                      | Culvert NB10B<br>2: 24" CMP       | 0.02               | 0.999 | 11                   | 11                                  | 0                    | 0                     | 0                                     | 0                                    | Culvert NB10C<br>2: 24" CMP       | 7.50               | 0.885 | 46                   | 27                                  | 0                    | 19       | 19                    | 0                                     |                                        |

COMMENTS : ONSITE = Not Analyzed (Not Offsite Flow Design Point)

NOTES : 1. Resistor/...

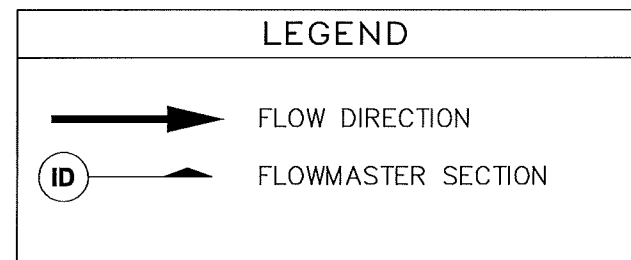
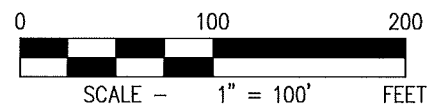
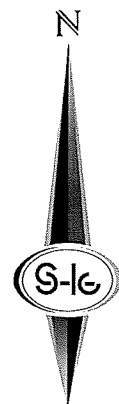
**COMMENTS :** ONSITE = Not Analyzed (Not Offsite Flow Design Point)  
Highlighted Cells = Locations Where Roadway Overtopping Occurs  
See Figures No. 2 & 3 to clarify concepts.  
Refer to "Project 1A Drainage Study" for Culvert Analysis from Cheyenne to Rainbow.

**NOTES :** 1. Registers the lesser value between overtopping flow over channel/berm (Q<sub>ch</sub>) or actual channel capacity (Q<sub>cap</sub>). For Roadside Channels east of the Frontage Road, spill flow over roadway from the west is added. See Roadside Ditch Capacity Analysis at the end of Appendix "E". See Figures No. 2 & 3 to clarify concepts.  
2. At detention basin locations detention basin outflow is registered  
3. At drop inlet locations drop inlet flow is registered  
4. Q<sub>sp</sub> equals the amount of flow greater than Q<sub>cap</sub>. Q<sub>sp</sub> is taken directly from the HEC-1 output in order to account for time of peak, but the following equation illustrates the relationship, Q<sub>sp(B)</sub> + Q<sub>cap(B)</sub> = Q<sub>ch(B)</sub> + Q<sub>sp(A)</sub>.



*“Brent Lane Storm Drain Improvements” Calculations*



[illegible]

**NINETY-FIVE MANAGEMENT, LLC**

**BRENT LANE STORM DRAIN IMPROVEMENTS**  
**LONG-TERM DISCHARGE DRAINAGE EXHIBIT**

DATE: 10/26/2015

DRAFTER: CS

DESIGNER: CS

CHECKED: SMJ

PROJECT NO.  
OLY1401.004

EXHIBIT  
SHEET 1 OF 1

**S-I-G**  
**SLATER**  
**HANIFAN**  
**GROUP**  
**CONSULTING ENGINEERS & PLANNERS**  
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118  
PHONE (702) 284-4300 FAX (702) 284-4309

**Brent Lane SD - Section 1**  
**Worksheet for Trapezoidal Channel**

| Project Description |                     |
|---------------------|---------------------|
| Worksheet           | @ DI                |
| Flow Element        | Trapezoidal Channel |
| Method              | Manning's Formula   |
| Solve For           | Channel Depth       |

| Input Data           |            |
|----------------------|------------|
| Mannings Coefficient | 0.035      |
| Channel Slope        | 4.00 %     |
| Left Side Slope      | 3.00 H : V |
| Right Side Slope     | 4.00 H : V |
| Bottom Width         | 8.00 ft    |
| Discharge            | 70.00 cfs  |

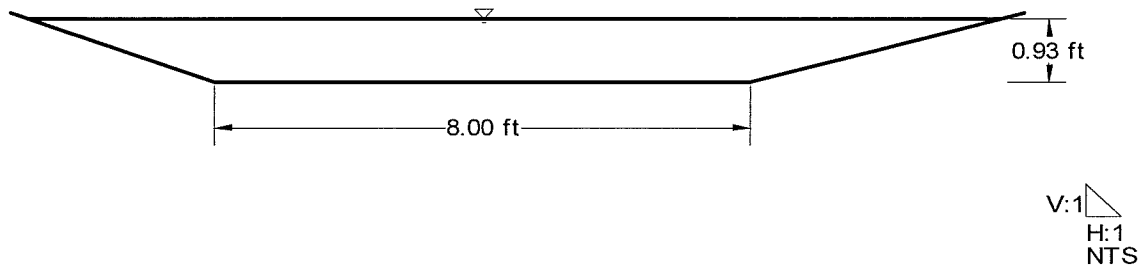
| Results          |                      |
|------------------|----------------------|
| Depth            | 0.93 ft              |
| Flow Area        | 10.4 ft <sup>2</sup> |
| Wetted Perimeter | 14.74 ft             |
| Top Width        | 14.48 ft             |
| Critical Depth   | 1.12 ft              |
| Critical Slope   | 1.94 %               |
| Velocity         | 6.73 ft/s            |
| Velocity Head    | 0.70 ft              |
| Specific Energy  | 1.63 ft              |
| Froude Number    | 1.40                 |
| Flow Type        | Supercritical        |

# Brent Lane SD - Section 1

## Cross Section for Trapezoidal Channel

| Project Description |                     |
|---------------------|---------------------|
| Worksheet           | @ DI                |
| Flow Element        | Trapezoidal Channel |
| Method              | Manning's Formula   |
| Solve For           | Channel Depth       |

| Section Data         |            |
|----------------------|------------|
| Mannings Coefficient | 0.035      |
| Channel Slope        | 4.00 %     |
| Depth                | 0.93 ft    |
| Left Side Slope      | 3.00 H : V |
| Right Side Slope     | 4.00 H : V |
| Bottom Width         | 8.00 ft    |
| Discharge            | 70.00 cfs  |



## Grate Inlet Headwater Depth Computation

### FACILITY DESCRIPTION

Project Name: Brent Lane Storm Drain Improvements  
Date: 10/26/2015  
File Name: OLY1401-004 DI Calc.xls  
By: SMJ

#### DB1 Long-Term Discharge Drop Inlet @ Brent-Fort Apache

#### Known Information:

|                             |      |
|-----------------------------|------|
| Q = Flow (cfs)              | 70.0 |
| W = Width of Grate (ft)     | 6.00 |
| L = Length of Grate (ft)    | 5.00 |
| D = Diameter of Circle (in) |      |
| Cf = Clogging Factor (%)    | 50   |

#### Weir Conditions:

$$HW = (Q/(Cw * Pc))^{2/3}$$

|                                  |      |
|----------------------------------|------|
| Cw = Weir Coefficient            | 3.00 |
| P = Perimeter of grate (ft)      | 22.0 |
| Pc = Perimeter (w/clogging) (ft) | 11.0 |
| HW = Headwater depth (ft)        | 1.65 |

#### Orifice Conditions:

$$HW = (Q/(Co * Ac))^2 / 2 * g$$

|                                                       |       |
|-------------------------------------------------------|-------|
| Co = Orifice Coefficient                              | 0.67  |
| Ag = Grate Area (ft <sup>2</sup> )                    | 30.00 |
| Gf = Grate Opening Factor                             | 0.67  |
| Ac = Grate Open Area (w/ clogging) (ft <sup>2</sup> ) | 10.05 |
| g = Gravity (fps)                                     | 32.20 |
| HW = Headwater depth (ft)                             | 1.68  |

#### Worst Case Scenario Occurs Under Orifice Conditions

Headwater Depth = 1.68 ft with grate

**Proposed 6-ft by 5-ft NDOT Type 2 Drop Inlet w/ 2-ft Ponding**



Brent.WSP

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T1 BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)

T2 PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC

T3 CONVEYS LONG-TERM DISCHARGE OF DB1

|    |                |    |    |        |         |    |                |     |     |
|----|----------------|----|----|--------|---------|----|----------------|-----|-----|
| SO | 1000.002652.97 | 54 |    |        | 2657.47 |    |                |     |     |
| R  | 1085.402653.27 | 54 |    | .013   |         |    |                | 15. | 1   |
| JX | 1085.402653.47 | 54 | 18 | 24.013 | 7.      | 7. | 2664.172657.93 | 75. | 90. |
| R  | 1144.652653.85 | 54 |    | .013   |         |    |                | 15. | 1   |
| R  | 1618.082655.48 | 54 |    | .013   |         |    |                |     | 2   |
| JX | 1618.082655.88 | 54 | 24 | .013   | 29.     |    | 2655.68        | 45. |     |
| R  | 1819.922657.26 | 54 |    | .013   |         |    |                |     | 1   |
| JX | 1819.922657.74 | 48 | 24 | .013   | 4.      |    | 2665.82        | 90. |     |
| R  | 2167.572658.88 | 48 |    | .013   |         |    |                |     | 1   |
| R  | 2474.322659.98 | 48 |    | .013   |         |    |                | 80. | 1   |
| TS | 2479.322660.84 | 30 |    | .013   |         |    |                |     |     |
| R  | 2514.542661.02 | 30 |    | .013   |         |    |                | 10. | 1   |
| R  | 2568.432665.17 | 30 |    | .013   |         |    |                |     | 1   |
| R  | 2790.432670.82 | 30 |    | .013   |         |    |                |     | 1   |
| TS | 2795.432670.82 | 42 |    | .013   |         |    |                |     |     |
| R  | 2815.432671.32 | 42 |    | .013   |         |    |                |     |     |
| SH | 2815.432671.32 | 42 |    |        |         |    |                |     |     |
| CD | 18             | 4  |    |        |         |    |                |     | 1.5 |
| CD | 24             | 4  |    |        |         |    |                |     | 2.  |
| CD | 30             | 4  |    |        |         |    |                |     | 2.5 |
| CD | 36             | 4  |    |        |         |    |                |     | 3.  |
| CD | 42             | 4  |    |        |         |    |                |     | 3.5 |
| CD | 48             | 4  |    |        |         |    |                |     | 4.  |
| CD | 54             | 4  |    |        |         |    |                |     | 4.5 |

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## BRENT.OUT

♀  
DATE: 10/26/2015  
TIME: 15:46

F0515P

## WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

| CARD CODE | SECT NO | CHN TYPE | NO OF PIERS | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|-----------|---------|----------|-------------|----------------|-------------------|------------|----|----|----------|------|------|------|------|------|------|------|------|------|-------|
| CD        | 18      | 4        |             |                | 1.50              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 24      | 4        |             |                | 2.00              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 30      | 4        |             |                | 2.50              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 36      | 4        |             |                | 3.00              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 42      | 4        |             |                | 3.50              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 48      | 4        |             |                | 4.00              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |
| CD        | 54      | 4        |             |                | 4.50              |            |    |    |          |      |      |      |      |      |      |      |      |      |       |

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PAGE NO 3

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## WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)

HEADING LINE NO 2 IS -

PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC

HEADING LINE NO 3 IS -

CONVEYS LONG-TERM DISCHARGE OF DB1  
F 0 5 1 5 P

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PAGE NO 2

## WATER SURFACE PROFILE - ELEMENT CARD LISTING

| ELEMENT NO | 1 IS A | SYSTEM OUTLET | U/S DATA | STATION | INVERT  | SECT | W S ELEV |       |       |     |     |          |          |       |       |  |  |  |  |
|------------|--------|---------------|----------|---------|---------|------|----------|-------|-------|-----|-----|----------|----------|-------|-------|--|--|--|--|
|            |        |               |          | 1000.00 | 2652.97 | 54   | 2657.47  |       |       |     |     |          |          |       |       |  |  |  |  |
| ELEMENT NO | 2 IS A | REACH         | U/S DATA | STATION | INVERT  | SECT |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          | 1085.40 | 2653.27 | 54   |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          |         |         |      |          |       |       |     |     |          |          |       |       |  |  |  |  |
| ELEMENT NO | 3 IS A | JUNCTION      | U/S DATA | STATION | INVERT  | SECT | LAT-1    | LAT-2 | N     | Q3  | Q4  | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |  |  |  |  |
|            |        |               |          | 1085.40 | 2653.47 | 54   | 18       | 24    | 0.013 | 7.0 | 7.0 | 2664.17  | 2657.93  | 75.00 | 90.00 |  |  |  |  |
| ELEMENT NO | 4 IS A | REACH         | U/S DATA | STATION | INVERT  | SECT |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          | 1144.65 | 2653.85 | 54   |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          |         |         |      |          |       |       |     |     |          |          |       |       |  |  |  |  |
| ELEMENT NO | 5 IS A | REACH         | U/S DATA | STATION | INVERT  | SECT |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          | 1618.08 | 2655.48 | 54   |          |       |       |     |     |          |          |       |       |  |  |  |  |
|            |        |               |          |         |         |      |          |       |       |     |     |          |          |       |       |  |  |  |  |
| ELEMENT NO | 6 IS A | JUNCTION      | U/S DATA | STATION | INVERT  | SECT | LAT-1    | LAT-2 | N     | Q3  | Q4  | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |  |  |  |  |
|            |        |               |          |         |         |      |          |       |       |     |     |          |          |       |       |  |  |  |  |

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|            |                    |         |         |         |       |       |       |                    |      |          |          |       |        |       |
|------------|--------------------|---------|---------|---------|-------|-------|-------|--------------------|------|----------|----------|-------|--------|-------|
|            |                    |         | 1618.08 | 2655.88 | 54    | 24    | 0     | BRENT.OUT<br>0.013 | 29.0 | 0.0      | 2655.68  | 0.00  | 45.00  | 0.00  |
| ELEMENT NO | 7 IS A REACH       |         | *       | *       | *     |       |       |                    |      |          |          |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT    |       |       | N     |                    |      |          | RADIUS   | ANGLE | ANG PT | MAN H |
|            |                    | 1819.92 | 2657.26 | 54      |       |       | 0.013 |                    |      |          | 0.00     | 0.00  | 0.00   | 1     |
| ELEMENT NO | 8 IS A JUNCTION    |         | *       | *       | *     | *     |       |                    |      |          |          |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT    | LAT-1 | LAT-2 | N     | Q3                 | Q4   | INVERT-3 | INVERT-4 | PHI 3 | PHI 4  |       |
|            |                    | 1819.92 | 2657.74 | 48      | 24    | 0     | 0.013 | 4.0                | 0.0  | 2665.82  | 0.00     | 90.00 | 0.00   |       |
| ELEMENT NO | 9 IS A REACH       |         | *       | *       | *     |       |       |                    |      |          |          |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT    |       |       | N     |                    |      |          | RADIUS   | ANGLE | ANG PT | MAN H |
|            |                    | 2167.57 | 2658.88 | 48      |       |       | 0.013 |                    |      |          | 0.00     | 0.00  | 0.00   | 1     |
| ELEMENT NO | 10 IS A REACH      |         | *       | *       | *     |       |       |                    |      |          |          |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT    |       |       | N     |                    |      |          | RADIUS   | ANGLE | ANG PT | MAN H |
|            |                    | 2474.32 | 2659.98 | 48      |       |       | 0.013 |                    |      |          | 0.00     | 80.00 | 0.00   | 1     |
| ELEMENT NO | 11 IS A TRANSITION |         | *       | *       | *     |       |       |                    |      |          |          |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT    |       |       | N     |                    |      |          |          |       |        |       |
|            |                    | 2479.32 | 2660.84 | 30      |       |       | 0.013 |                    |      |          |          |       |        |       |

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#### WATER SURFACE PROFILE - ELEMENT CARD LISTING

|            |                    |         |         |      |   |  |       |  |  |  |        |       |        |       |
|------------|--------------------|---------|---------|------|---|--|-------|--|--|--|--------|-------|--------|-------|
| ELEMENT NO | 12 IS A REACH      |         | *       | *    | * |  |       |  |  |  |        |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT |   |  | N     |  |  |  | RADIUS | ANGLE | ANG PT | MAN H |
|            |                    | 2514.54 | 2661.02 | 30   |   |  | 0.013 |  |  |  | 0.00   | 10.00 | 0.00   | 1     |
| ELEMENT NO | 13 IS A REACH      |         | *       | *    | * |  |       |  |  |  |        |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT |   |  | N     |  |  |  | RADIUS | ANGLE | ANG PT | MAN H |
|            |                    | 2568.43 | 2665.17 | 30   |   |  | 0.013 |  |  |  | 0.00   | 0.00  | 0.00   | 1     |
| ELEMENT NO | 14 IS A REACH      |         | *       | *    | * |  |       |  |  |  |        |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT |   |  | N     |  |  |  | RADIUS | ANGLE | ANG PT | MAN H |
|            |                    | 2790.43 | 2670.82 | 30   |   |  | 0.013 |  |  |  | 0.00   | 0.00  | 0.00   | 1     |
| ELEMENT NO | 15 IS A TRANSITION |         | *       | *    | * |  |       |  |  |  |        |       |        |       |
|            | U/S DATA           | STATION | INVERT  | SECT |   |  | N     |  |  |  |        |       |        |       |
|            |                    | 2795.43 | 2670.82 | 42   |   |  | 0.013 |  |  |  |        |       |        |       |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

|            |                          |         |         |      |   |  |       |  |  |  |          |       |        |       |
|------------|--------------------------|---------|---------|------|---|--|-------|--|--|--|----------|-------|--------|-------|
| ELEMENT NO | 16 IS A REACH            |         | *       | *    | * |  |       |  |  |  |          |       |        |       |
|            | U/S DATA                 | STATION | INVERT  | SECT |   |  | N     |  |  |  | RADIUS   | ANGLE | ANG PT | MAN H |
|            |                          | 2815.43 | 2671.32 | 42   |   |  | 0.013 |  |  |  | 0.00     | 0.00  | 0.00   | 0     |
| ELEMENT NO | 17 IS A SYSTEM HEADWORKS |         | *       |      |   |  |       |  |  |  |          |       |        |       |
|            | U/S DATA                 | STATION | INVERT  | SECT |   |  |       |  |  |  | W S ELEV |       |        |       |
|            |                          | 2815.43 | 2671.32 | 42   |   |  |       |  |  |  | 0.00     |       |        |       |

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

\*\* WARNING NO. 2 \*\* - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC ?

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WATER SURFACE PROFILE LISTING  
BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
CONVEYS LONG-TERM DISCHARGE OF DB1



| STATION   | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL  | VEL<br>HEAD | BRENT.OUT<br>ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |            | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR |
|-----------|----------------|------------------|--------------|-------|------|-------------|--------------------------------|---------------|-------------------|------------|-------------|-----------------|------|------------|-------|
| L/ELEM    | SO             |                  |              |       |      | SF AVE      | HF                             |               |                   | NORM DEPTH |             |                 | ZR   |            |       |
| *****     |                |                  |              |       |      |             |                                |               |                   |            |             |                 |      |            |       |
| 1000.00   | 2652.97        | 4.500            | 2657.470     | 117.0 | 7.36 | 0.840       | 2658.310                       | 0.00          | 3.184             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 85.40     | 0.00351        |                  |              |       |      | .003540     | 0.30                           |               |                   | 3.704      |             |                 | 0.00 |            |       |
| 1085.40   | 2653.27        | 4.586            | 2657.856     | 117.0 | 7.36 | 0.840       | 2658.696                       | 0.00          | 3.184             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| JUNCT STR | 0.00000        |                  |              |       |      | .003142     | 0.00                           |               |                   |            |             |                 | 0.00 |            |       |
| 1085.40   | 2653.47        | 4.764            | 2658.234     | 103.0 | 6.48 | 0.651       | 2658.885                       | 0.00          | 2.984             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 59.25     | 0.00641        |                  |              |       |      | .002743     | 0.16                           |               |                   | 2.653      |             |                 | 0.00 |            |       |
| 1144.65   | 2653.85        | 4.611            | 2658.461     | 103.0 | 6.48 | 0.651       | 2659.112                       | 0.00          | 2.984             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 198.25    | 0.00344        |                  |              |       |      | .002726     | 0.54                           |               |                   | 3.314      |             |                 | 0.00 |            |       |
| 1342.90   | 2654.53        | 4.500            | 2659.033     | 103.0 | 6.48 | 0.651       | 2659.684                       | 0.00          | 2.984             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 275.18    | 0.00344        |                  |              |       |      | .002540     | 0.70                           |               |                   | 3.314      |             |                 | 0.00 |            |       |
| 1618.08   | 2655.48        | 4.214            | 2659.694     | 103.0 | 6.65 | 0.687       | 2660.381                       | 0.00          | 2.984             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| JUNCT STR | 0.00000        |                  |              |       |      | .001804     | 0.00                           |               |                   |            |             |                 | 0.00 |            |       |
| 1618.08   | 2655.88        | 4.088            | 2659.968     | 74.0  | 4.88 | 0.369       | 2660.337                       | 0.00          | 2.512             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 37.30     | 0.00684        |                  |              |       |      | .001280     | 0.05                           |               |                   | 2.130      |             |                 | 0.00 |            |       |
| 1655.38   | 2656.14        | 3.844            | 2659.979     | 74.0  | 5.11 | 0.406       | 2660.385                       | 0.00          | 2.512             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 29.24     | 0.00684        |                  |              |       |      | .001385     | 0.04                           |               |                   | 2.130      |             |                 | 0.00 |            |       |
| 1684.62   | 2656.34        | 3.644            | 2659.979     | 74.0  | 5.36 | 0.447       | 2660.426                       | 0.00          | 2.512             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 24.72     | 0.00684        |                  |              |       |      | .001524     | 0.04                           |               |                   | 2.130      |             |                 | 0.00 |            |       |
| 1709.34   | 2656.50        | 3.468            | 2659.972     | 74.0  | 5.62 | 0.491       | 2660.463                       | 0.00          | 2.512             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 20.96     | 0.00684        |                  |              |       |      | .001691     | 0.04                           |               |                   | 2.130      |             |                 | 0.00 |            |       |
| 1730.30   | 2656.65        | 3.311            | 2659.958     | 74.0  | 5.90 | 0.540       | 2660.498                       | 0.00          | 2.512             |            | 4.50        | 0.00            | 0.00 | 0          | 0.00  |
| 18.38     | 0.00684        |                  |              |       |      | .001887     | 0.03                           |               |                   | 2.130      |             |                 | 0.00 |            |       |

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WATER SURFACE PROFILE LISTING  
BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
CONVEYS LONG-TERM DISCHARGE OF DB1

| STATION | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q | VEL | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |  | HGT/<br>DIA | BASE/<br>ID NO. | ZL | NO<br>PIER | AVBPR |
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|--|-------------|-----------------|----|------------|-------|
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|--|-------------|-----------------|----|------------|-------|

## BRENT.OUT

| L/ELEM                         | SO      | SF AVE |          | HF   |       | NORM DEPTH |          | ZR   |       |      |      |      |   |      |
|--------------------------------|---------|--------|----------|------|-------|------------|----------|------|-------|------|------|------|---|------|
| 1748.68                        | 2656.77 | 3.166  | 2659.939 | 74.0 | 6.19  | 0.594      | 2660.533 | 0.00 | 2.512 | 4.50 | 0.00 | 0.00 | 0 | 0.00 |
| 7.06                           | 0.00684 |        |          |      |       | .002038    | 0.01     |      | 2.130 |      | 0.00 |      |   |      |
| 1755.74                        | 2656.82 | 3.113  | 2659.934 | 74.0 | 6.30  | 0.617      | 2660.551 | 0.00 | 2.512 | 4.50 | 0.00 | 0.00 | 0 | 0.00 |
| HYDRAULIC JUMP                 |         |        |          |      |       |            |          |      |       |      |      | 0.00 |   |      |
| 1755.74                        | 2656.82 | 2.008  | 2658.829 | 74.0 | 10.78 | 1.805      | 2660.634 | 0.00 | 2.512 | 4.50 | 0.00 | 0.00 | 0 | 0.00 |
| 16.98                          | 0.00684 |        |          |      |       | .008530    | 0.14     |      | 2.130 |      | 0.00 |      |   |      |
| 1772.72                        | 2656.94 | 1.992  | 2658.929 | 74.0 | 10.89 | 1.842      | 2660.771 | 0.00 | 2.512 | 4.50 | 0.00 | 0.00 | 0 | 0.00 |
| 47.20                          | 0.00684 |        |          |      |       | .009242    | 0.44     |      | 2.130 |      | 0.00 |      |   |      |
| 1819.92                        | 2657.26 | 1.921  | 2659.181 | 74.0 | 11.42 | 2.026      | 2661.207 | 0.00 | 2.512 | 4.50 | 0.00 | 0.00 | 0 | 0.00 |
| JUNCT STR                      | 0.00000 |        |          |      |       | .007168    | 0.00     |      |       |      | 0.00 |      |   |      |
| 1819.92                        | 2657.74 | 2.529  | 2660.269 | 70.0 | 8.36  | 1.085      | 2661.354 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 7.73                           | 0.00328 |        |          |      |       | .004245    | 0.03     |      | 2.835 |      | 0.00 |      |   |      |
| 1827.65                        | 2657.76 | 2.635  | 2660.400 | 70.0 | 7.97  | 0.986      | 2661.386 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 51.36                          | 0.00328 |        |          |      |       | .003772    | 0.19     |      | 2.835 |      | 0.00 |      |   |      |
| 1879.01                        | 2657.93 | 2.750  | 2660.684 | 70.0 | 7.60  | 0.897      | 2661.581 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 197.89                         | 0.00328 |        |          |      |       | .003416    | 0.68     |      | 2.835 |      | 0.00 |      |   |      |
| 2076.90                        | 2658.58 | 2.835  | 2661.418 | 70.0 | 7.35  | 0.839      | 2662.257 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 90.67                          | 0.00328 |        |          |      |       | .003279    | 0.30     |      | 2.835 |      | 0.00 |      |   |      |
| 2167.57                        | 2658.88 | 2.835  | 2661.715 | 70.0 | 7.35  | 0.839      | 2662.554 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 61.91                          | 0.00359 |        |          |      |       | .003309    | 0.20     |      | 2.740 |      | 0.00 |      |   |      |
| 2229.48                        | 2659.10 | 2.816  | 2661.918 | 70.0 | 7.40  | 0.851      | 2662.769 | 0.00 | 2.529 | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| HYDRAULIC JUMP                 |         |        |          |      |       |            |          |      |       |      |      | 0.00 |   |      |
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WATER SURFACE PROFILE LISTING  
BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
CONVEYS LONG-TERM DISCHARGE OF DB1

| STATION | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q | VEL | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH | HGT/<br>DIA | BASE/<br>ID NO. | ZL | NO<br>PIER | AVBPR |
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|-------------|-----------------|----|------------|-------|
| L/ELEM  | SO             |                  |              |   |     | SF AVE      | HF                |               | NORM DEPTH        |             |                 | ZR |            |       |

## BRENT.OUT

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|         |         |       |          |      |       |         |          |      |       |       |      |      |      |   |      |
|---------|---------|-------|----------|------|-------|---------|----------|------|-------|-------|------|------|------|---|------|
| 2229.48 | 2659.10 | 2.270 | 2661.372 | 70.0 | 9.51  | 1.405   | 2662.777 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 0.40    | 0.00359 |       |          |      |       | .006258 | 0.00     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2229.88 | 2659.10 | 2.270 | 2661.373 | 70.0 | 9.51  | 1.404   | 2662.777 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17.64   | 0.00359 |       |          |      |       | .006671 | 0.12     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2247.52 | 2659.17 | 2.184 | 2661.351 | 70.0 | 9.97  | 1.544   | 2662.895 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18.23   | 0.00359 |       |          |      |       | .007560 | 0.14     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2265.75 | 2659.23 | 2.102 | 2661.334 | 70.0 | 10.46 | 1.699   | 2663.033 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18.42   | 0.00359 |       |          |      |       | .008574 | 0.16     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2284.17 | 2659.30 | 2.024 | 2661.322 | 70.0 | 10.97 | 1.869   | 2663.191 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18.36   | 0.00359 |       |          |      |       | .009734 | 0.18     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2302.53 | 2659.36 | 1.950 | 2661.314 | 70.0 | 11.51 | 2.056   | 2663.370 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 18.01   | 0.00359 |       |          |      |       | .011059 | 0.20     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2320.54 | 2659.43 | 1.879 | 2661.308 | 70.0 | 12.07 | 2.261   | 2663.569 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17.59   | 0.00359 |       |          |      |       | .012571 | 0.22     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2338.13 | 2659.49 | 1.811 | 2661.303 | 70.0 | 12.66 | 2.487   | 2663.790 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 17.16   | 0.00359 |       |          |      |       | .014297 | 0.25     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2355.29 | 2659.55 | 1.746 | 2661.299 | 70.0 | 13.28 | 2.736   | 2664.035 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16.68   | 0.00359 |       |          |      |       | .016271 | 0.27     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2371.97 | 2659.61 | 1.684 | 2661.297 | 70.0 | 13.92 | 3.010   | 2664.307 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 16.19   | 0.00359 |       |          |      |       | .018529 | 0.30     |      |       | 2.740 |      | 0.00 |      |   |      |
| 2388.16 | 2659.67 | 1.625 | 2661.296 | 70.0 | 14.60 | 3.311   | 2664.607 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15.64   | 0.00359 |       |          |      |       | .021109 | 0.33     |      |       | 2.740 |      | 0.00 |      |   |      |

LICENSEE: SLATER HANIFAN GROUP

F0515P

PAGE 4

WATER SURFACE PROFILE LISTING  
 BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
 PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
 CONVEYS LONG-TERM DISCHARGE OF DB1

| STATION | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q | VEL | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH | HGT/<br>DIA | BASE/<br>ID NO. | ZL | NO<br>PIER | AVBPR |
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|-------------|-----------------|----|------------|-------|
| L/ELEM  | SO             |                  |              |   |     | SF AVE      | HF                |               | NORM DEPTH        |             |                 | ZR |            |       |
| *****   |                |                  |              |   |     |             |                   |               |                   |             |                 |    |            |       |

|           |         |       |          |      |       |         |                       |      |       |       |      |      |      |   |      |
|-----------|---------|-------|----------|------|-------|---------|-----------------------|------|-------|-------|------|------|------|---|------|
| 2403.80   | 2659.73 | 1.568 | 2661.295 | 70.0 | 15.31 | 3.642   | BRENT.OUT<br>2664.937 | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 15.11     | 0.00359 |       |          |      |       | .024054 | 0.36                  |      |       | 2.740 |      |      | 0.00 |   |      |
| 2418.91   | 2659.78 | 1.513 | 2661.294 | 70.0 | 16.06 | 4.006   | 2665.300              | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 14.62     | 0.00359 |       |          |      |       | .027425 | 0.40                  |      |       | 2.740 |      |      | 0.00 |   |      |
| 2433.53   | 2659.83 | 1.461 | 2661.295 | 70.0 | 16.85 | 4.407   | 2665.702              | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 14.10     | 0.00359 |       |          |      |       | .031284 | 0.44                  |      |       | 2.740 |      |      | 0.00 |   |      |
| 2447.63   | 2659.88 | 1.411 | 2661.295 | 70.0 | 17.67 | 4.847   | 2666.142              | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 13.57     | 0.00359 |       |          |      |       | .035687 | 0.48                  |      |       | 2.740 |      |      | 0.00 |   |      |
| 2461.20   | 2659.93 | 1.362 | 2661.295 | 70.0 | 18.53 | 5.331   | 2666.626              | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| 13.12     | 0.00359 |       |          |      |       | .040726 | 0.53                  |      |       | 2.740 |      |      | 0.00 |   |      |
| 2474.32   | 2659.98 | 1.316 | 2661.296 | 70.0 | 19.43 | 5.864   | 2667.160              | 0.00 | 2.529 |       | 4.00 | 0.00 | 0.00 | 0 | 0.00 |
| TRANS STR | 0.17200 |       |          |      |       | .038613 | 0.19                  |      |       |       |      |      | 0.00 |   |      |
| 2479.32   | 2660.84 | 1.904 | 2662.744 | 70.0 | 17.45 | 4.727   | 2667.471              | 0.00 | 2.440 |       | 2.50 | 0.00 | 0.00 | 0 | 0.00 |
| 9.92      | 0.00511 |       |          |      |       | .035305 | 0.35                  |      |       | 2.500 |      |      | 0.00 |   |      |
| 2489.24   | 2660.89 | 1.836 | 2662.727 | 70.0 | 18.12 | 5.096   | 2667.823              | 0.00 | 2.440 |       | 2.50 | 0.00 | 0.00 | 0 | 0.00 |
| 12.68     | 0.00511 |       |          |      |       | .038985 | 0.49                  |      |       | 2.500 |      |      | 0.00 |   |      |
| 2501.92   | 2660.96 | 1.756 | 2662.712 | 70.0 | 19.00 | 5.606   | 2668.318              | 0.00 | 2.440 |       | 2.50 | 0.00 | 0.00 | 0 | 0.00 |
| 12.62     | 0.00511 |       |          |      |       | .043681 | 0.55                  |      |       | 2.500 |      |      | 0.00 |   |      |
| 2514.54   | 2661.02 | 1.682 | 2662.702 | 70.0 | 19.93 | 6.165   | 2668.867              | 0.00 | 2.440 |       | 2.50 | 0.00 | 0.00 | 0 | 0.00 |
| 13.12     | 0.07701 |       |          |      |       | .043950 | 0.58                  |      |       | 1.416 |      |      | 0.00 |   |      |
| 2527.66   | 2662.03 | 1.747 | 2663.777 | 70.0 | 19.10 | 5.668   | 2669.445              | 0.00 | 2.440 |       | 2.50 | 0.00 | 0.00 | 0 | 0.00 |
| 11.62     | 0.07701 |       |          |      |       | .039482 | 0.46                  |      |       | 1.416 |      |      | 0.00 |   |      |

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WATER SURFACE PROFILE LISTING  
BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
CONVEYS LONG-TERM DISCHARGE OF DB1

| STATION | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q    | VEL   | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR |
|---------|----------------|------------------|--------------|------|-------|-------------|-------------------|---------------|-------------------|-------------|-----------------|------|------------|-------|
| L/ELEM  | SO             |                  |              |      |       | SF AVE      | HF                |               |                   | NORM DEPTH  |                 | ZR   |            |       |
| 2539.28 | 2662.93        | 1.826            | 2664.751     | 70.0 | 18.21 | 5.152       | 2669.903          | 0.00          | 2.440             | 2.50        | 0.00            | 0.00 | 0          | 0.00  |



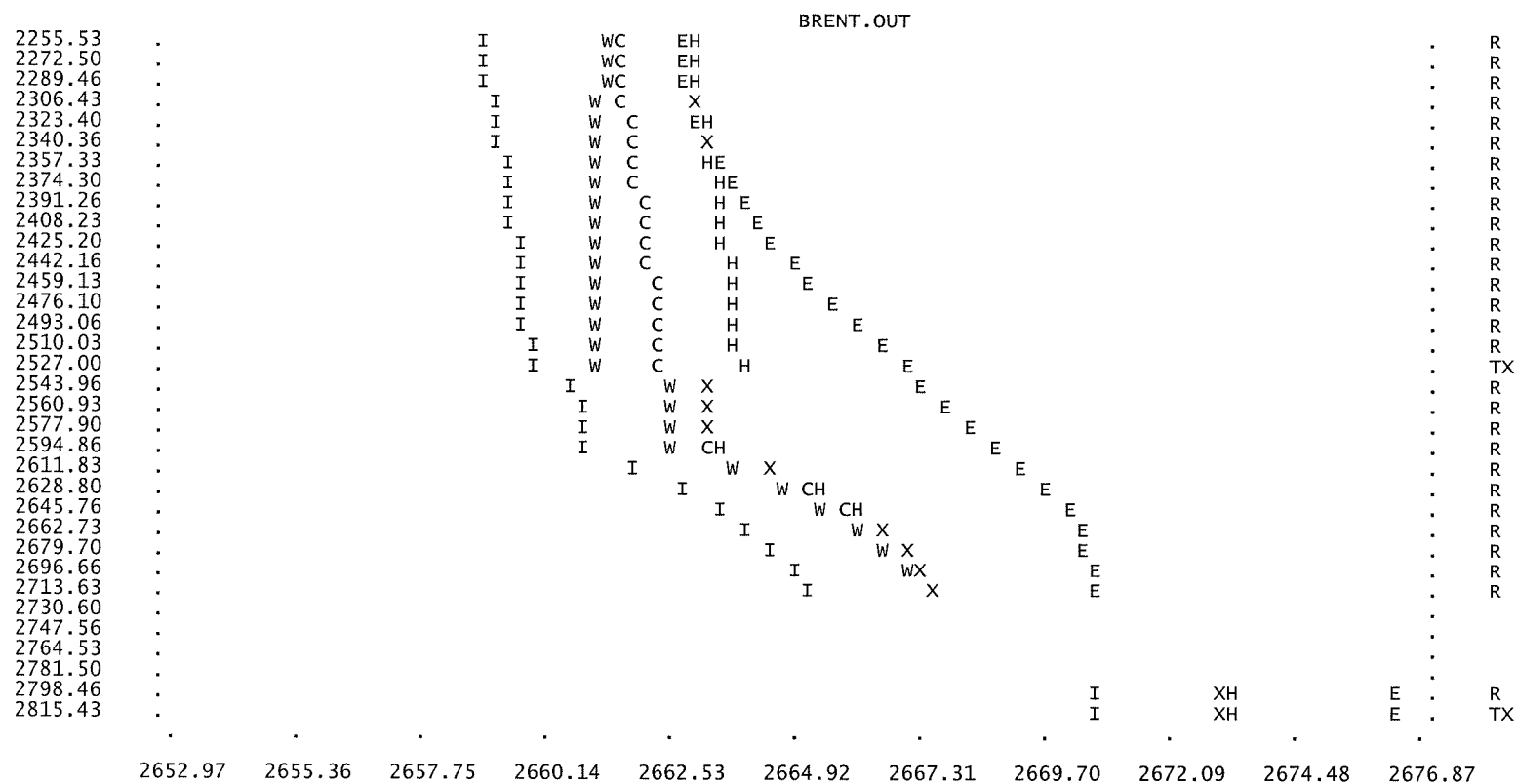
|           |         |       |          |      |       |       |          |      |       | BRENT.OUT |      |      |      |   |      |  |
|-----------|---------|-------|----------|------|-------|-------|----------|------|-------|-----------|------|------|------|---|------|--|
|           |         |       |          |      |       |       |          |      |       | 0.32      |      |      |      |   |      |  |
| 9.15      | 0.07701 |       |          |      |       |       | .035361  |      |       | 1.416     |      | 0.00 |      |   |      |  |
| 2548.43   | 2663.63 | 1.913 | 2665.543 | 70.0 | 17.37 | 4.683 | 2670.226 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 7.32      | 0.07701 |       |          |      |       |       | .031834  | 0.23 |       | 1.416     |      | 0.00 |      |   |      |  |
| 2555.75   | 2664.19 | 2.008 | 2666.202 | 70.0 | 16.56 | 4.258 | 2670.460 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 5.78      | 0.07701 |       |          |      |       |       | .028886  | 0.17 |       | 1.416     |      | 0.00 |      |   |      |  |
| 2561.53   | 2664.64 | 2.117 | 2666.756 | 70.0 | 15.79 | 3.870 | 2670.626 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 4.40      | 0.07701 |       |          |      |       |       | .026604  | 0.12 |       | 1.416     |      | 0.00 |      |   |      |  |
| 2565.93   | 2664.98 | 2.247 | 2667.225 | 70.0 | 15.05 | 3.519 | 2670.744 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 2.50      | 0.07701 |       |          |      |       |       | .025762  | 0.06 |       | 1.416     |      | 0.00 |      |   |      |  |
| 2568.43   | 2665.17 | 2.440 | 2667.610 | 70.0 | 14.35 | 3.198 | 2670.808 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 222.00    | 0.02545 |       |          |      |       |       | .025541  | 5.67 |       | 2.270     |      | 0.00 |      |   |      |  |
| 2790.43   | 2670.82 | 2.368 | 2673.188 | 70.0 | 14.56 | 3.290 | 2676.478 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 2790.43   | 2670.82 | 2.440 | 2673.260 | 70.0 | 14.35 | 3.198 | 2676.458 | 0.00 | 2.440 |           | 2.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| TRANS STR | 0.00000 |       |          |      |       |       | .015361  | 0.08 |       |           |      | 0.00 |      |   |      |  |
| 2795.43   | 2670.82 | 5.130 | 2675.950 | 70.0 | 7.28  | 0.822 | 2676.772 | 0.00 | 2.622 |           | 3.50 | 0.00 | 0.00 | 0 | 0.00 |  |
| 20.00     | 0.02500 |       |          |      |       |       | .004841  | 0.10 |       | 1.624     |      | 0.00 |      |   |      |  |
| 2815.43   | 2671.32 | 4.727 | 2676.047 | 70.0 | 7.28  | 0.822 | 2676.869 | 0.00 | 2.622 |           | 3.50 | 0.00 | 0.00 | 0 | 0.00 |  |

BRENT LANE STORM DRAIN IMPROVEMENTS (OLY1401.004)  
PART OF SKYE CANYON DETENTION BASIN 1 TDS - CCRFCD RTC  
CONVEYS LONG-TERM DISCHARGE OF DB1

|         |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 1000.00 | .I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1016.97 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1033.93 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1050.90 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1067.87 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1084.83 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1101.80 | .I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1118.77 | .I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1135.73 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1152.70 | .I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1169.67 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1186.63 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1203.60 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1220.57 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1237.53 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1254.50 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1271.47 | .  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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[illegible]



# NOTES

## 1. GLOSSARY

- I = INVERT ELEVATION
- C = CRITICAL DEPTH
- W = WATER SURFACE ELEVATION
- H = HEIGHT OF CHANNEL
- E = ENERGY GRADE LINE
- X = CURVES CROSSING OVER
- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

## 2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

# DEPARTMENT OF PUBLIC WORKS



## HORSE DRIVE IMPROVEMENTS HORSE DRIVE/U.S. 95 INTERCHANGE

BID NUMBER: 09.1730.07

FUNDED BY:

REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA,  
SURFACE TRANSPORTATION PROGRAM,  
CITY OF LAS VEGAS SANITATION,  
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT  
AND  
NEVADA DEPARTMENT OF TRANSPORTATION

Mayor:  
OSCAR B. GOODMAN

City Council:  
GARY REESE, MAYOR PRO-TEM  
LARRY BROWN  
STEVE WOLFSON  
LOIS TARKANIAN  
STEVEN D. ROSS  
RICKI Y. BARLOW

City Manager:  
DOUGLAS A. SELBY

Director of Public Works:  
JORGE CERVANTES, P.E.

Acting City Engineer:  
CHERI EDELMAN, PE

### REVIEWED

*Cheri Edelman* 10/21/08  
City Engineer, Acting Date

*Mary Jane* 10/7/08  
City Traffic Engineer Date

*Rufus M. Hall* 10/16/08  
City Project Manager Date

*Clark County Regional Flood Control District* 7/8/2008  
Date

*Regional Transportation Commission Of Southern Nevada* 7-1-08  
Date

*Cox Communications Las Vegas, Inc.* 7-1-08  
Date

*Embarq Telephone* 7/3/08  
Date

THE AFFIXED EMBARGO 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.

*Nevada Power Company-Distribution* 7/1/08  
Date

NEVADA POWER ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER 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.

*Southwest Gas Corporation* 7/1/08  
Date

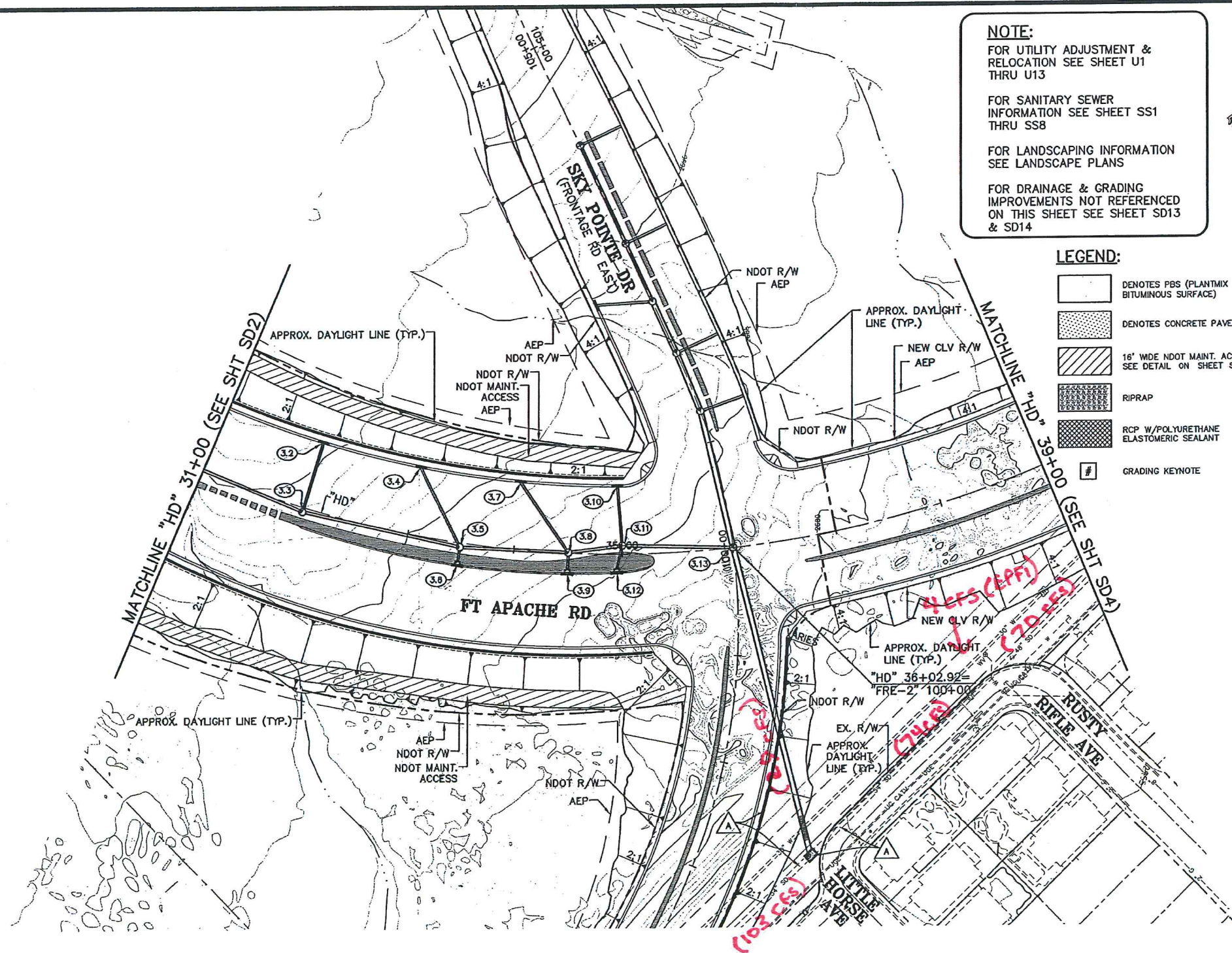
*Las Vegas Valley Water District* 7/14/08  
Date

LVMWD PROJECT # H80315

SHEETS: I1, I3, R2-R6, U1, U4, U2, U4-U7, U10, U11, C1A, C1, C8, C20, C21, C24, C25, P1, P3, P3A, P4, P7, P8, P11, P12, P15, S51, S56, SD1, SD1A, SD3-SB5, SD7-SB8A, SD12, SD13, SD17, SD26, SD31, SD32, SD34, SD36, RW1-RW3, RW6-RW9, RW20, RW21, RW24, RW28, RW31

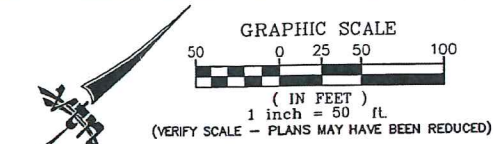
|                                                                                                                                                                                          |                  |           |               |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|---------------|-----|
| DATE                                                                                                                                                                                     | REVISIONS        | W.A. #    | DESIGN BY     | KOG |
|                                                                                                                                                                                          |                  |           |               |     |
| SCALE (N)                                                                                                                                                                                | DATE: 06/30/2008 | SCALE (H) | DRAWN BY: DRF |     |
|                                                                                                                                                                                          |                  |           |               |     |
| <p>CONSULTING ENGINEERS<br/>PLANNERS<br/>LAND SURVEYORS<br/>vtm nevada</p> <p>2727 S. RAINBOW BLVD.<br/>LAS VEGAS, NEVADA 89146-5148<br/>PHONE (702) 362-2500<br/>FAX (702) 362-2507</p> |                  |           |               |     |
| <p>REGISTERED PROFESSIONAL ENGINEER<br/>STATE OF NEVADA<br/>CIVIL<br/>No. 9171</p>                                                                                                       |                  |           |               |     |
| <p>DEPARTMENT OF PUBLIC WORKS</p> <p>HORSE DRIVE / US 95 INTERCHANGE</p> <p>COVER SHEET</p>                                                                                              |                  |           |               |     |
| <p>DRAWING NO. 107V3759</p> <p>11/</p>                                                                                                                                                   |                  |           |               |     |





**NOTE:**  
FOR UTILITY ADJUSTMENT & RELOCATION SEE SHEET U1 THRU U13  
  
FOR SANITARY SEWER INFORMATION SEE SHEET SS1 THRU SS8  
  
FOR LANDSCAPING INFORMATION SEE LANDSCAPE PLANS  
  
FOR DRAINAGE & GRADING IMPROVEMENTS NOT REFERENCED ON THIS SHEET SEE SHEET SD13 & SD14

- LEGEND:**
- [Symbol] DENOTES PBS (PLANTMIX BITUMINOUS SURFACE)
  - [Symbol] DENOTES CONCRETE PAVEMENT
  - [Symbol] 16' WIDE NDOT MAINT. ACCESS SEE DETAIL ON SHEET SD1
  - [Symbol] RIPRAP
  - [Symbol] RCP W/POLYURETHANE ELASTOMERIC SEALANT
  - [Symbol] GRADING KEYNOTE



**DRAINAGE CONSTRUCTION NOTES:**

- (3.1) NOTE NOT USED
- (3.2) "HD" 32+00.00, 63.50' LT. INSTALL NDOT TYPE 3 DROP INLET (PER NDOT STD. DWG. R-4.2.3) INSTALL 61.52 L.F. 18" RCP SEE SHEET SD25
- (3.3) "HD" 32+00.00, 4.00' RT. INSTALL NDOT 72" TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 144.46 L.F. 24" RCP SEE SHEET SD24 & SD25
- (3.4) "HD" 33+00.00, 63.50' LT. INSTALL NDOT TYPE 3 DROP INLET (PER NDOT STD. DWG. R-4.2.3) INSTALL 77.42 L.F. 18" RCP SEE SHEET SD25
- (3.5) "HD" 33+50.00, 4.00' RT. INSTALL NDOT 72" TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 94.23 L.F. 24" RCP SEE SHEET SD24 & SD25
- (3.6) "HD" 33+50.00, 20.36' RT. INSTALL 8" TYPE "A" DROP INLET INSTALL 10.35 L.F. 18" RCP SEE SHEET SD25
- (3.7) "HD" 34+00.00, 63.50' LT. INSTALL NDOT TYPE 3 DROP INLET (PER NDOT STD. DWG. R-4.2.3) INSTALL 73.78 L.F. 18" RCP SEE SHEET SD25
- (3.8) "HD" 34+50.00, 0.50' LT. INSTALL NDOT 72" TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 44.32 L.F. 24" RCP SEE SHEET SD24 & SD25
- (3.9) "HD" 34+50.00, 18.50' RT. INSTALL 8" TYPE "A" DROP INLET INSTALL 13.01 L.F. 18" RCP SEE SHEET SD25
- (3.10) "HD" 34+95.00, 63.50' LT. INSTALL NDOT TYPE 3 DROP INLET (PER NDOT STD. DWG. R-4.2.3) INSTALL 49.97 L.F. 18" RCP SEE SHEET SD25
- (3.11) "HD" 35+00.00, 7.75' LT. INSTALL NDOT 72" TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 97.13 L.F. 24" RCP SEE SHEET SD24 & SD25
- (3.12) "HD" 34+95.00, 16.67' RT. INSTALL 8" TYPE "A" DROP INLET INSTALL 19.03 L.F. 18" RCP SEE SHEET SD25
- (3.13) "HD" 36+02.92, 0' RT. = "FRE-2" 100+00.00, 0' RT. INSTALL 72" NDOT TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) (SAME AS NOTE #13.8) SEE SHEET SD24 & SD31

**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.

**NOTE:**  
[Symbol] PROTECT IN PLACE

**APPROVED**  
*[Signature]* 7/14/08  
LAS VEGAS VALLEY WATER DISTRICT  
LVVWD PROJECT # H80315

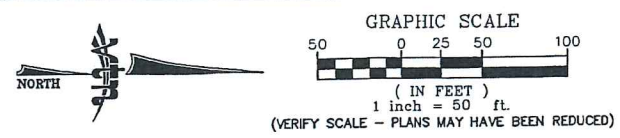
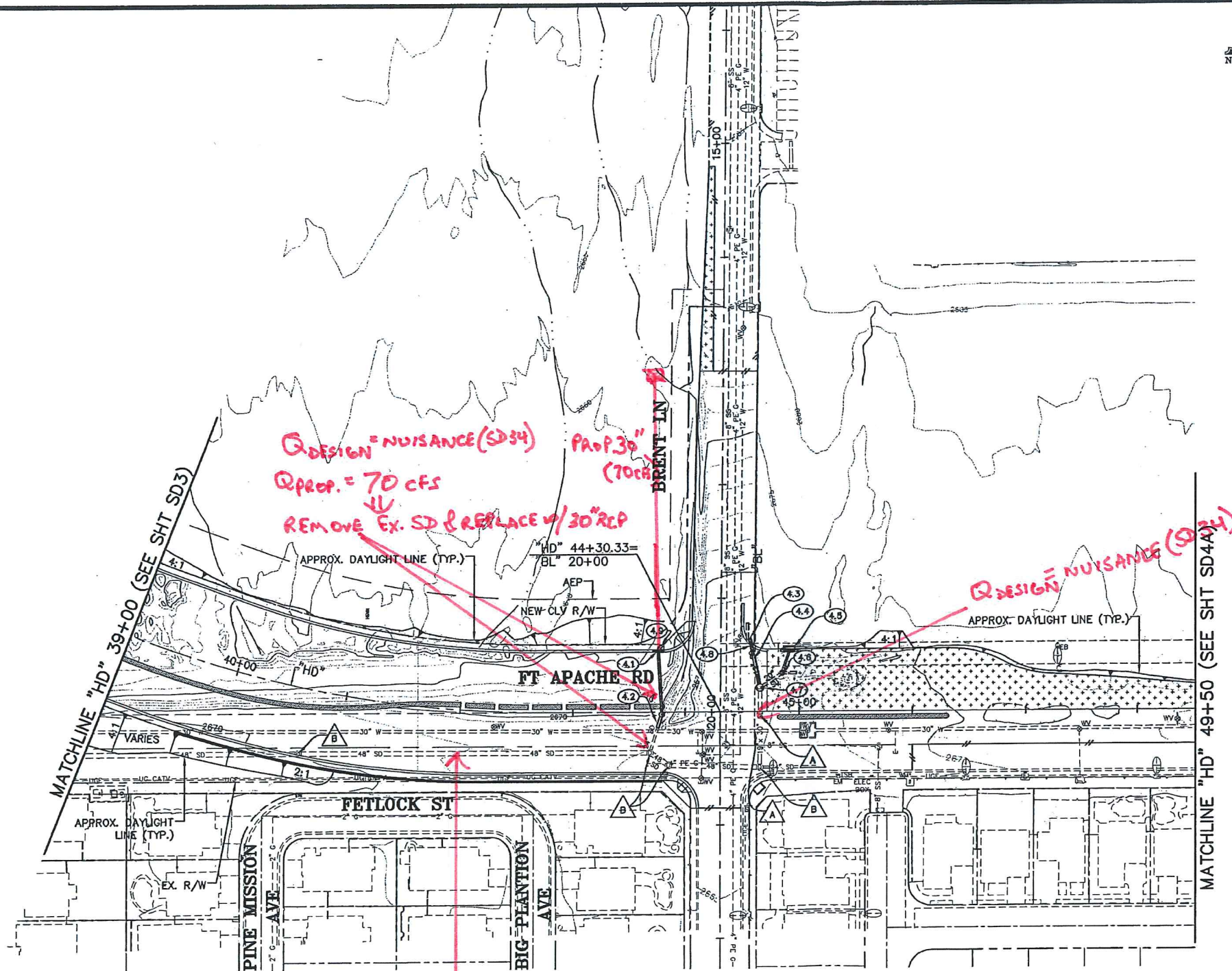
**Call before you Overhead**  
1-702-227-2929  
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

**Call before you Dig**  
1-800-227-2600  
CLAY COUNTY PUBLIC UTILITIES  
1-702-456-7544

|                                                                                       |            |                     |            |                                                                                                                                                                                      |            |                     |                                  |
|---------------------------------------------------------------------------------------|------------|---------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------|----------------------------------|
| PUBLIC WORKS DEPARTMENT<br>400 E. STEWART AVE.<br>LAS VEGAS, NV 89101<br>702-259-6272 |            |                     |            | CITY OF LAS VEGAS, NV<br>727 SOUTH BURNHAM BOULEVARD LAS VEGAS, NEVADA 89146-5144<br>PH (702) 872-7500 FAX (702) 382-2597<br>nevada CONSULTING ENGINEERS • PLANNERS • LAND SURVEYORS |            |                     |                                  |
| STORM DRAIN AND GRADING PLAN<br>"HD" 31+00 TO "HD" 39+00                              |            |                     |            | HORSE DRIVE / US 95 INTERCHANGE                                                                                                                                                      |            |                     |                                  |
| DRAWN BY:<br>at                                                                       | 06/20/2008 | DESIGNED BY:<br>JLB | 06/20/2008 | CHECKED BY:<br>JAL                                                                                                                                                                   | 06/20/2008 | PROJECT NO:<br>6500 | SCALE: 1"=50' HORZ.<br>VERT. N/A |
| SHEET<br>SD3                                                                          |            |                     |            | DRAWING NO.<br>107V3769                                                                                                                                                              |            |                     |                                  |

114284





- LEGEND:**
- [Symbol] DENOTES PBS (PLANTMIX BITUMINOUS SURFACE)
  - [Symbol] DENOTES CONCRETE PAVEMENT
  - [Symbol] 16' WIDE NDOT MAINT. ACCESS SEE DETAIL ON SHEET SD1
  - [Symbol] RIPRAP
  - [Symbol] RCP W/POLYURETHANE ELASTOMERIC SEALANT
  - [Symbol] GRADING KEYNOTE

**DRAINAGE CONSTRUCTION NOTES:**

- "HD" 43+75.89, 54.50' LT. INSTALL NDOT TYPE 3 DROP INLET (PER NDOT STD. DWG. R-4.2.3) INSTALL 52.51' L.F. 24" RCP SEE SHEET SD34
- "HD" 43+76.55, 10.33' RT. INSTALL 48" NDOT TYPE 1 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 10.15' L.F. 24" RCP CONNECT TO EXISTING 24" RCP SEE SHEET SD34
- "HD" 44+56.02, 64.75' LT. INSTALL 41.55' L.F. 24" RCP INSTALL PRECAST RCP PLUG (PER DETAIL SHEET SD39) SEE SHEET SD34
- "HD" 44+54.93, 63.12' LT. TO "HD" 44+64.03, 23.98' LT. REMOVE EXISTING DROP INLET REMOVE 40.20± L.F. EXISTING 12" RCP
- "HD" 44+90.89, 55.00' LT. INSTALL 10.00' TYPE "CM2" DROP INLET (PER DETAIL SHEET SD43) INSTALL 18.13' L.F. 18" RCP SEE SHEET SD34
- "HD" 44+84.31, 34.01' LT. REMOVE EXISTING DROP INLET INSTALL 48" NDOT TYPE 1 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) CONNECT TO EXISTING 20" RCP SEE SHEET SD34
- "HD" 44+84.71, 21.06' LT. REMOVE EXISTING SDMH INSTALL 72" NDOT TYPE 2 MODIFIED MANHOLE (PER NDOT STD. DWG. R-4.3.1) CONNECT TO EXISTING 19"x 30" RCP SEE SHEET SD34
- "HD" 44+60.00, 49.43' LT. TO "HD" 44+56.02, 64.75' LT. RCP TO BE SEALED WITH POLYURETHANE ELASTOMERIC SEALANT WHEN WITHIN 10' OF WATERLINE. CONTRACTOR TO SUBMIT MATERIAL FOR "LAS VEGAS VALLEY WATER DISTRICT" APPROVAL.
- "HD" 43+78.72, 58.62' LT. INSTALL 5.00' L.F. 24" RCP W/24" PLUG TO BE REMOVED IN FUTURE SEE SHEET SD34

**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:**
- FOR UTILITY ADJUSTMENT & RELOCATION SEE SHEET U1 THRU U13
  - FOR SANITARY SEWER INFORMATION SEE SHEET SS1 THRU SS8
  - FOR LANDSCAPING INFORMATION SEE LANDSCAPE PLANS

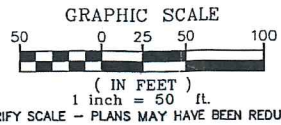
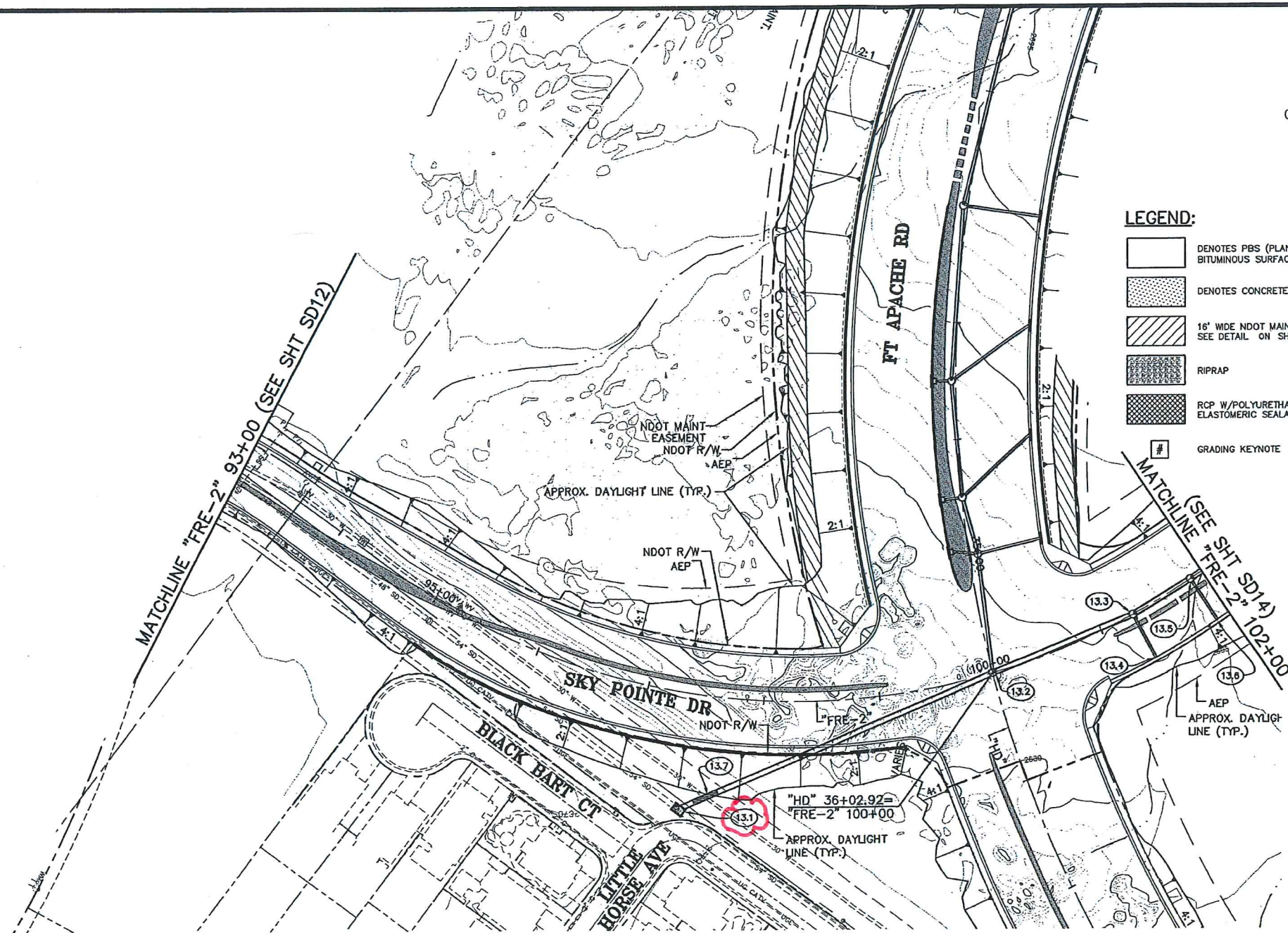
- NOTE:**
- A PROTECT IN PLACE
  - B ADJUST SDMH RIM TO GRADE

**APPROVED**  
*Joseph Morgan*  
LAS VEGAS VALLEY WATER DISTRICT  
LVWD PROJECT # H80315  
DATE 7/21/08

**Call before you Dig**  
Avoid cutting underground utility lines. It's costly.  
**Call 811**  
1-702-227-2929  
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT  
1-800-227-2600  
CLUE CALL CENTER OPERATIONS  
1-702-455-7544

|                                                            |  |  |  |                                                                                                  |  |  |  |
|------------------------------------------------------------|--|--|--|--------------------------------------------------------------------------------------------------|--|--|--|
| PUBLIC WORKS DEPARTMENT                                    |  |  |  | CITY OF LAS VEGAS, NV                                                                            |  |  |  |
| 400 E. STEWART AVE.<br>LAS VEGAS, NV 89101<br>702-229-4272 |  |  |  | 277 SOUTH RAINBOW BOULEVARD LAS VEGAS, NEVADA 89146-5416<br>PH (702) 875-7550 FAX (702) 382-2587 |  |  |  |
| STORM DRAIN AND GRADING PLAN                               |  |  |  | HORSE DRIVE / US 95 INTERCHANGE                                                                  |  |  |  |
| DRAWN BY: [Signature]                                      |  |  |  | DESIGNED BY: [Signature]                                                                         |  |  |  |
| CHECKED BY: [Signature]                                    |  |  |  | PROJECT NO: [Number]                                                                             |  |  |  |
| SCALE: 1"=50'                                              |  |  |  | SHEET SD4                                                                                        |  |  |  |
| DATE: 08/10/2008                                           |  |  |  | 113 OF 453 SHEETS                                                                                |  |  |  |
| DRAWING NO. 107V3769                                       |  |  |  | DRAWING NO. 107V3769                                                                             |  |  |  |





#### LEGEND:

- DENOTES PBS (PLANTMIX BITUMINOUS SURFACE)
- DENOTES CONCRETE PAVEMENT
- 16' WIDE NDOT MAINT. ACCESS SEE DETAIL ON SHEET SD1
- RIPRAP
- RCP W/POLYURETHANE ELASTOMERIC SEALANT
- GRADING KEYNOTE

**NOTE:**  
A PROTECT IN PLACE

#### 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
4. FOR DRAINAGE & GRADING IMPROVEMENTS NOT REFERENCED ON THIS SHEET SEE SHEET SD3

#### DRAINAGE CONSTRUCTION NOTES:

- 13.1 "FRE-2" 97+41.10, 140.17' RT. REMOVE EXIST. MANHOLE. INSTALL NDOT TYPE 4 MANHOLE (PER NDOT STD. DWG. R-4.3.2) (SAME AS NOTE #3.13) CONNECT TO EXIST. 54" RCP SEE SHEET SD31
- 13.2 "HD" 36+02.92, 0' RT. "FRE-2" 100+00.00, 0' RT. INSTALL 72" NDOT TYPE 2 MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 288.53 L.F. 36"x60" HERCP SEE SHEET SD24 & SD31
- 13.3 "FRE-2" 101+30.00, 0' RT. INSTALL 72" NDOT TYPE 2 MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 123.74 L.F. 48" RCP SEE SHEET SD31
- 13.4 "FRE-2" 101+30.00, 42.00' RT. INSTALL 39.00 L.F. 18" RCP W/18" PLUG TO BE REMOVED IN FUTURE SEE SHEET SD31
- 13.5 "FRE-2" 101+88.16, 0' RT. INSTALL 72" NDOT TYPE 2 MANHOLE (PER NDOT STD. DWG. R-4.3.1) INSTALL 52.14 L.F. 48" RCP SEE SHEET SD31
- 13.6 "FRE-2" 101+88.16, 42.00' RT. INSTALL 39.00 L.F. 18" RCP W/18" PLUG TO BE REMOVED IN FUTURE SEE SHEET SD31
- 13.7 "FRE-2" 97+69.37, 81.09' RT. TO "FRE-2" 97+52.03, 92.49' RT. RCP 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)

#### 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.

APPROVED

*Douglas Morgan*  
LAS VEGAS VALLEY WATER DISTRICT  
LVVWD PROJECT # H80315

7/14/08  
DATE

**Call before you Overhead**  
1-702-227-2929  
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

**Call before you Dig**  
1-800-227-2800  
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT



SHEET  
**SD13**  
12 OF 43 SHEETS  
DRAWING NO.  
**107V3769**

**PUBLIC WORKS DEPARTMENT**  
400 E. STEWART AVE.  
LAS VEGAS, NV 89101  
702-229-4272

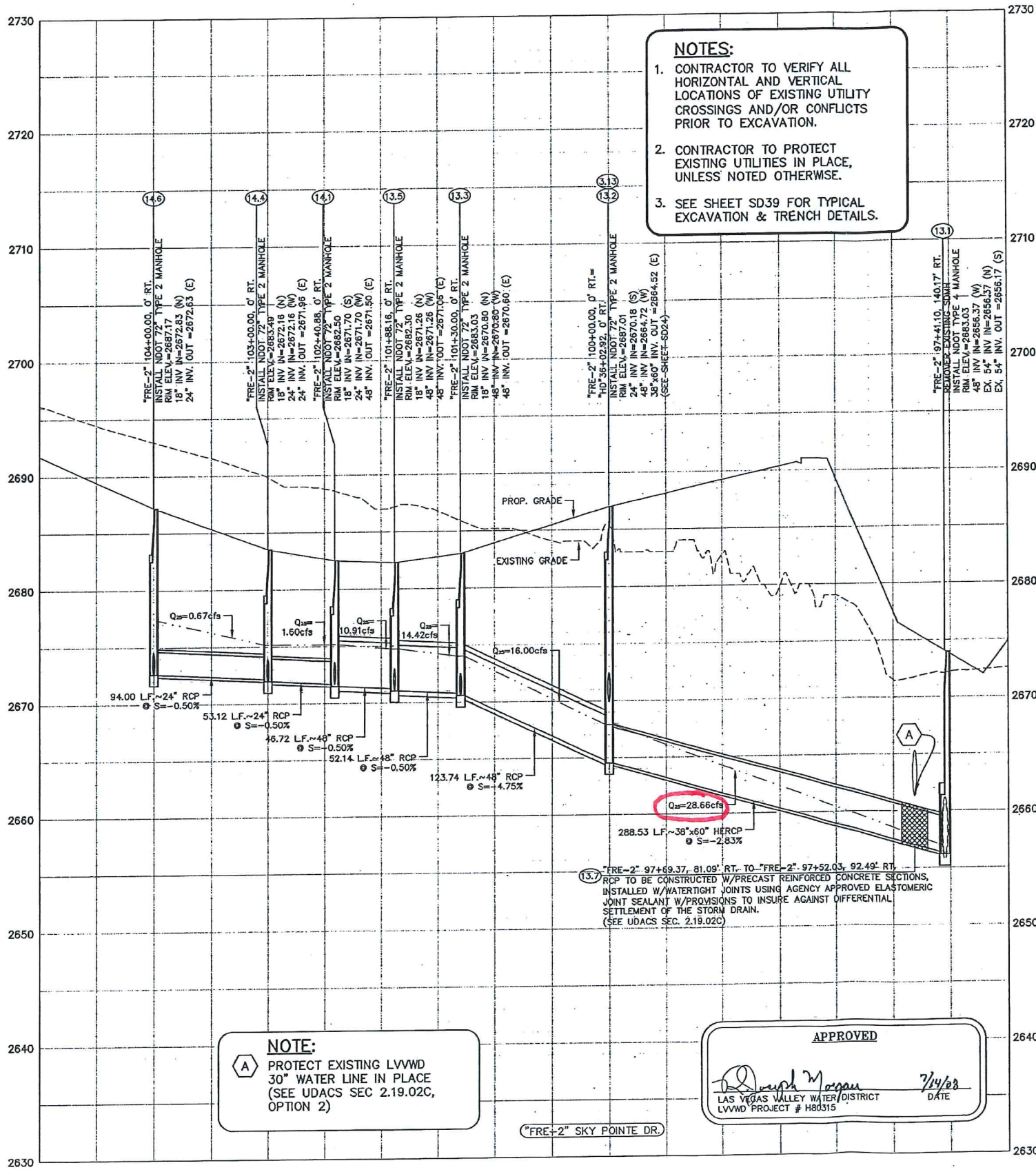
**STORM DRAIN AND GRADING PLAN**  
"FRE-2" 93+00 TO "FRE-2" 102+00  
**HORSE DRIVE / US 95 INTERCHANGE**

DRAWN BY: 06/20/2008  
DESIGNED BY: 06/20/2008  
CHECKED BY: 06/20/2008  
PROJECT NO: 1-467  
SCALE: 1"=40' HORZ. VERT. 1"=4'

REVISION  
DATE  
BY  
REV

U:\6600 DWA DESIGN\6600-SD-HORSE.dwg



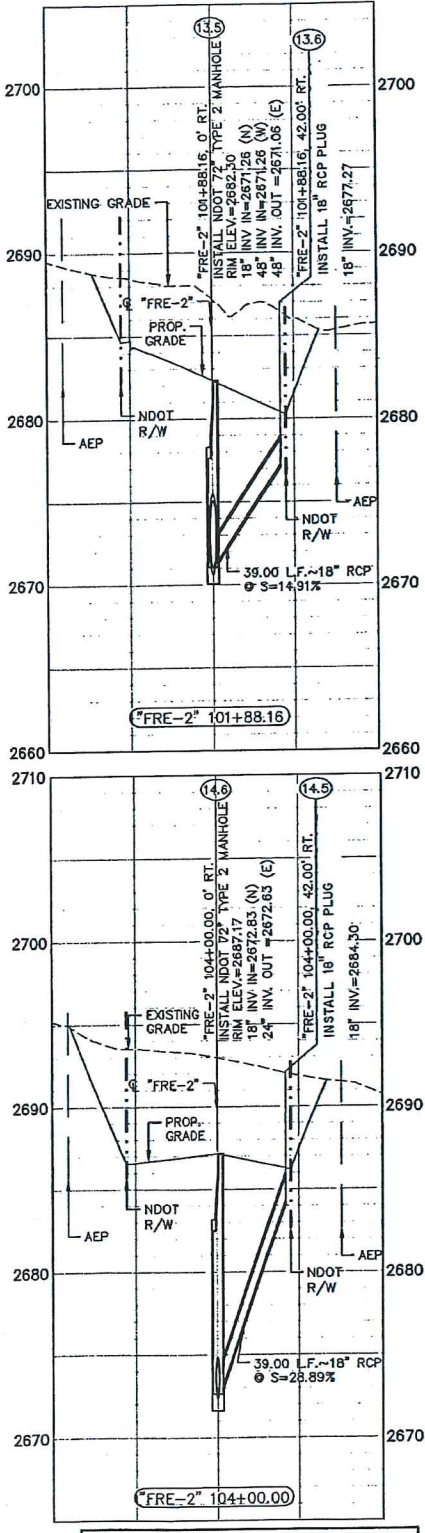
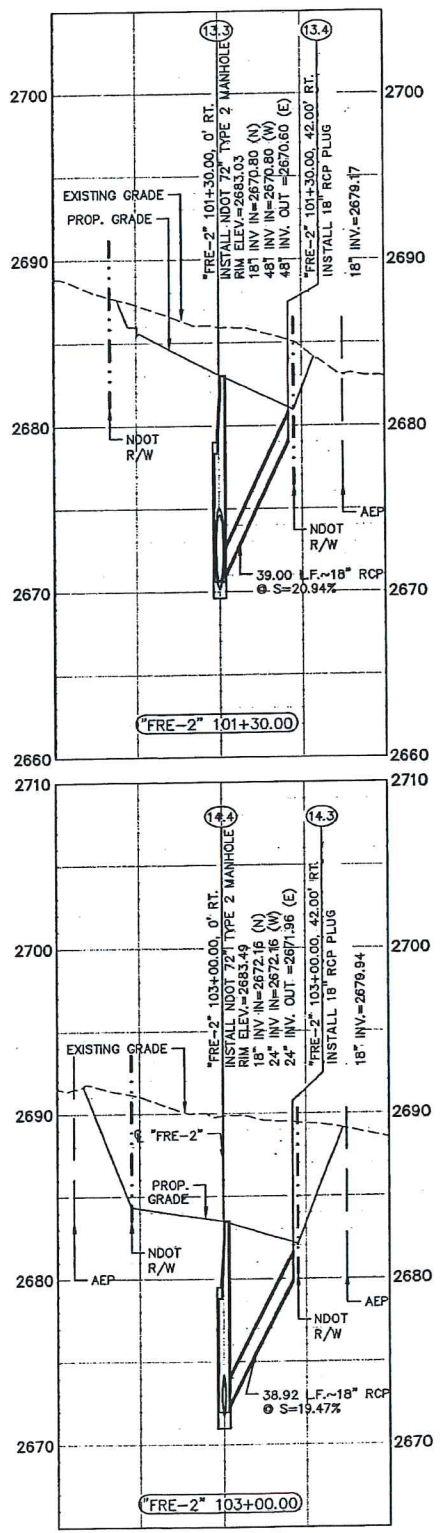


- NOTES:**
1. CONTRACTOR TO VERIFY ALL HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING UTILITY CROSSINGS AND/OR CONFLICTS PRIOR TO EXCAVATION.
  2. CONTRACTOR TO PROTECT EXISTING UTILITIES IN PLACE, UNLESS NOTED OTHERWISE.
  3. SEE SHEET SD39 FOR TYPICAL EXCAVATION & TRENCH DETAILS.

**NOTE:**  
 A PROTECT EXISTING LVVWD 30" WATER LINE IN PLACE (SEE UDACS SEC 2.19.02C, OPTION 2)

**APPROVED**  
*[Signature]*  
 LAS VEGAS VALLEY WATER DISTRICT  
 LVVWD PROJECT # H80315  
 7/4/08  
 DATE

"FRE-2" SKY POINTE DR.

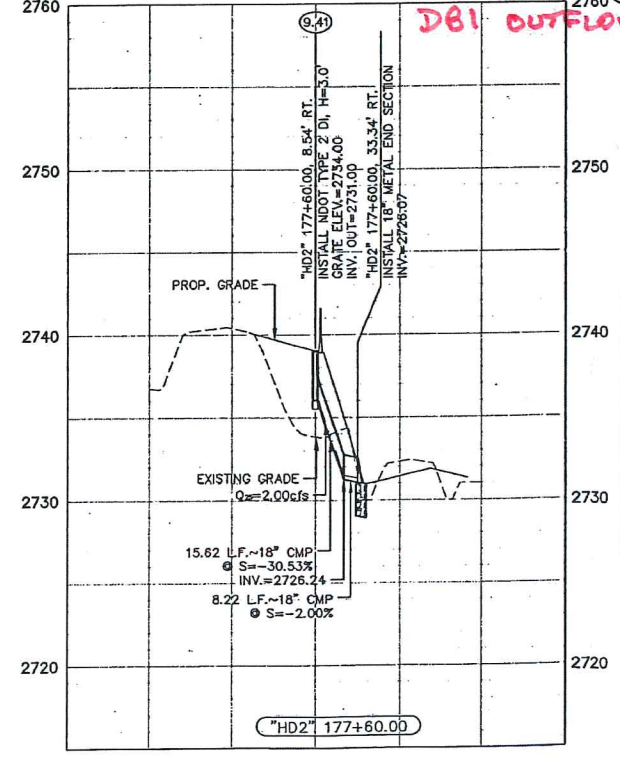
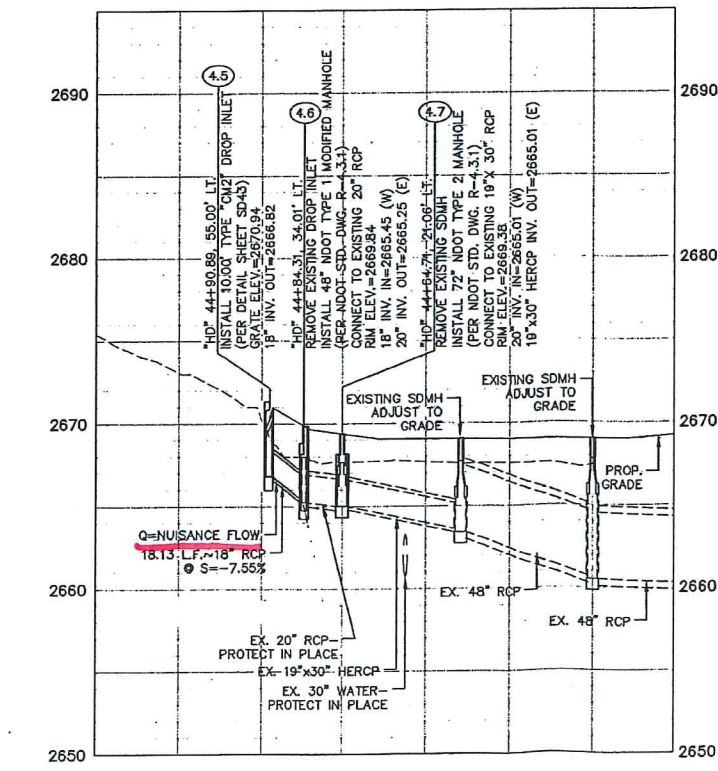
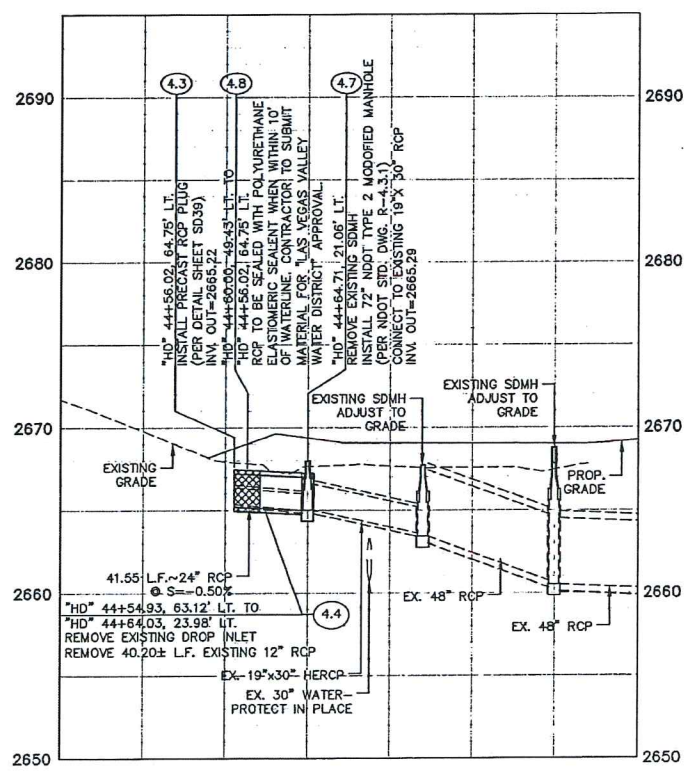
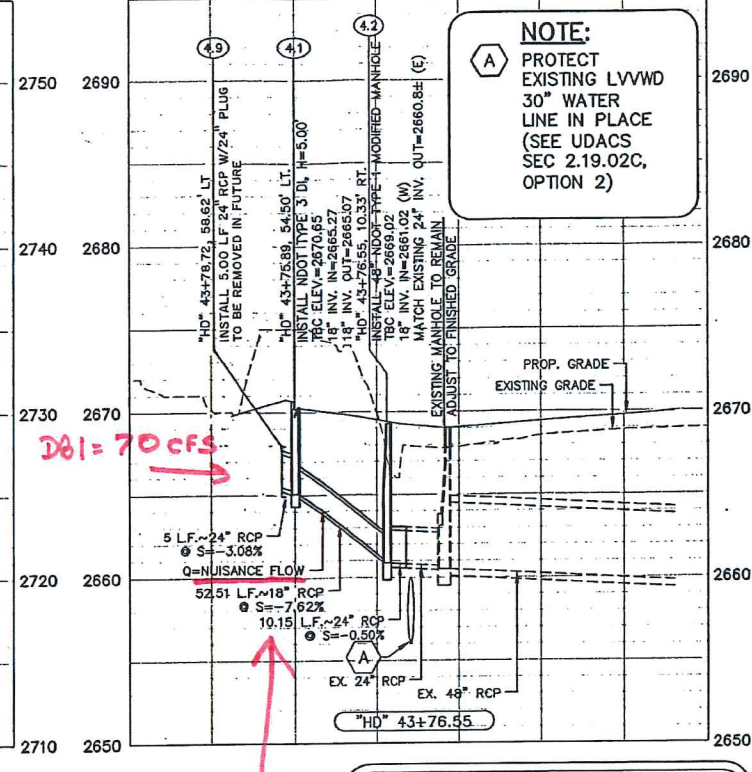
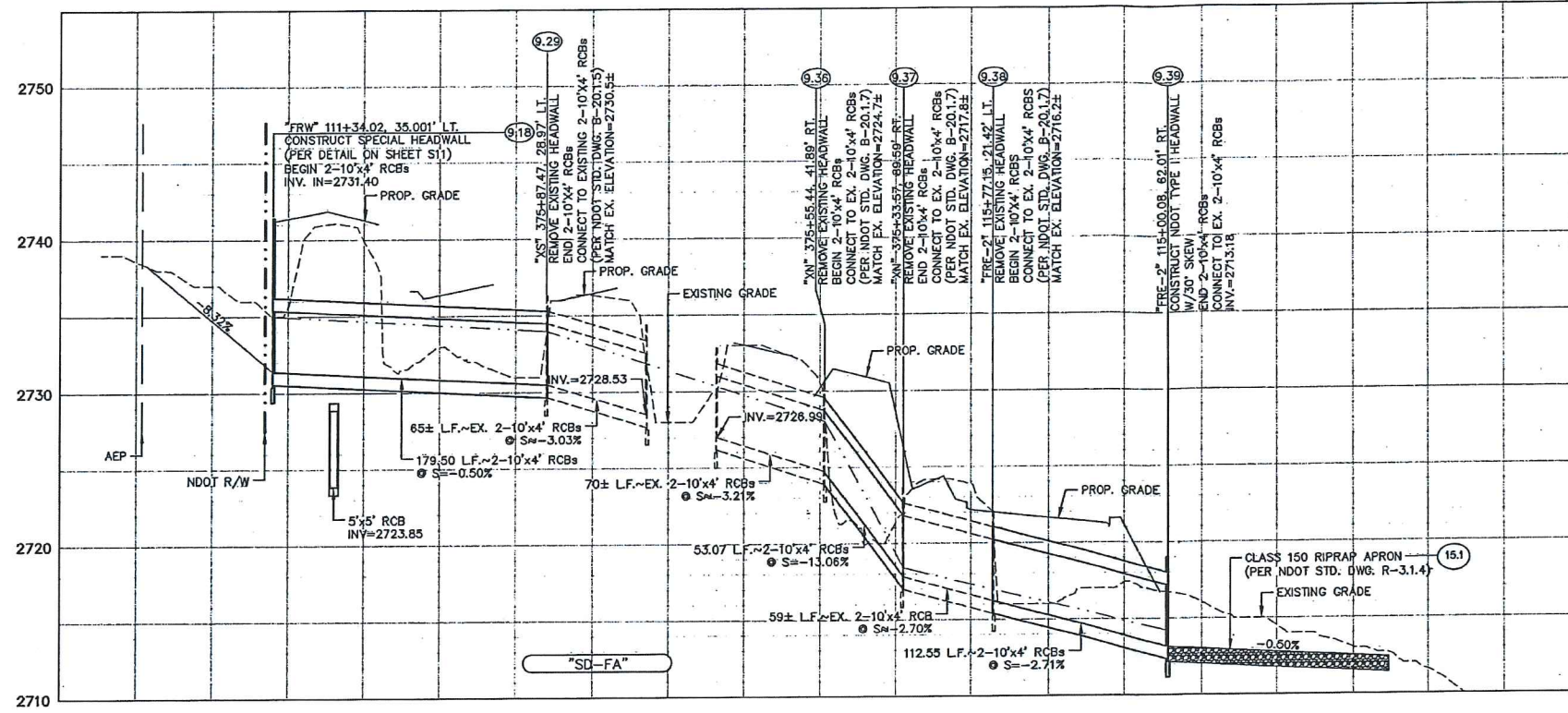


**Call before you Dig**  
 1-702-227-2929  
 NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

**Call 811**  
 1-800-227-2800  
 1-702-455-7544

|                                                                                              |                        |                                                                                                                                                         |                                      |
|----------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>PUBLIC WORKS DEPARTMENT</b><br>400 E. STEWART AVE.<br>LAS VEGAS, NV 89101<br>702-229-8272 |                        | <b>CITY OF LAS VEGAS, NV</b><br>777 SOUTH MAINWAY BOULEVARD LAS VEGAS NEVADA 89148<br>PH (702) 875-7559 FAX (702) 382-2387<br>nevada@cityoflasvegas.com |                                      |
| <b>STORM DRAIN PROFILES</b>                                                                  |                        | <b>HORSE DRIVE / US 95 INTERCHANGE</b>                                                                                                                  |                                      |
| DRAWN BY: 5/20/2008                                                                          | DESIGNED BY: 5/20/2008 | CHECKED BY: 5/20/2008                                                                                                                                   | PROJECT NO: 1-60' HORIZ. 1"=5' VERT. |
|                                                                                              |                        |                                                                                                                                                         |                                      |
| SHEET SD31                                                                                   |                        | 145 OF 153 SHEETS                                                                                                                                       |                                      |
| DRAWING NO. 107V3759                                                                         |                        |                                                                                                                                                         |                                      |





**APPROVED**  
*Joseph Morgan*  
 LAS VEGAS VALLEY WATER DISTRICT  
 LVWD PROJECT # H03015  
 DATE 7/24/08

- 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.

**Call before you Overhead**  
 1-702-227-2929  
 NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

**Call 811**  
 1-800-227-2600  
 NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

|                                                                                              |                        |                                                                                                                                 |                                      |
|----------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>PUBLIC WORKS DEPARTMENT</b><br>400 E. STEWART AVE.<br>LAS VEGAS, NV 89101<br>702-228-6272 |                        | <b>CITY OF LAS VEGAS, NV</b><br>277 SOUTH BURNING WILLOW LAS VEGAS, NEVADA 89106-9108<br>PH: (702) 975-7550 FAX: (702) 981-2487 |                                      |
| <b>STORM DRAIN PROFILES</b>                                                                  |                        | <b>HORSE DRIVE / US 95 INTERCHANGE</b>                                                                                          |                                      |
| DRAWN BY: 5/29/2007                                                                          | DESIGNED BY: 5/29/2007 | CHECKED BY: 5/29/2007                                                                                                           | PROJECT NO: 1-50' HORIZ. 1"=5' VERT. |
| SHEET <b>SD34</b>                                                                            |                        | OF 453 SHEETS                                                                                                                   |                                      |
| DRAWING NO.                                                                                  |                        | REVISION                                                                                                                        |                                      |

114320

# IMPROVEMENT PLANS FOR SPRING MOUNTAIN RANCH FORT APACHE ROAD

CITY OF LAS VEGAS  
STATE OF NEVADA

## REAL HOMES

3606 N. RANCHO STE. 102  
LAS VEGAS, NEVADA, 89130  
(702) 647-2660

ADJACENT PARCEL  
APN# 125-07-602-002

### APPROVALS

*Charlie Kalkowski* 3/26/03  
CITY ENGINEER CHARLIE KALKOWSKI PE# 4784 DATE

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* 3/14/03  
M. Margo Wheeler, AICP, Current Planning Manager  
PLANNING DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING AND DEVELOPMENT DEPARTMENT

*John Marshall* 7/20/03  
CITY ENGINEER JOHN MARSHALL DATE

*John Marshall* 7/20/03  
LAS VEGAS VALLEY WATER DISTRICT 12,300-11 DATE

*Quanda Oddio* 3/10/03  
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.

*John Marshall* 7-13-03  
SOUTHWEST GAS COMPANY Ron Castle DATE

*David Brennan* 3/10/03  
COMMUNICATIONS INC. LAS VEGAS DATE

*David Brennan* 3/10/03  
SPRINT DESANT-WHEATMAN DAVID BRENNAN DATE

THE ATTACHED 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.

### LEGAL DESCRIPTION

A PORTION OF LOT 9 OF SPRING MOUNTAIN RANCH LOCATED IN THE SOUTH HALF (S 1/2) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 8, TOWNSHIP 19 SOUTH, RANGE 40 EAST, M.D.M., CITY OF LAS VEGAS, NEVADA.

### NEW BENCHMARK

CITY OF LAS VEGAS BENCHMARK BLV90-BNES-(1LV90-BNES)  
BLM BRASS CAP LOCATED AT DURANGO DRIVE  
AND RICH MOUNTAIN ROAD  
NAVD88 ELEVATION = 771.8489 METERS (2532.63 FEET) BLV90-BNES (NEW)  
NAVD88 ELEVATION = 771.9689 METERS (2532.70 FEET) 1LV90-BNES (OLD)

### ORIGINAL BENCHMARK: (NO LONGER EXISTS)

C.L.V. BM #7, STA. 1LV9017NES  
BLM BRASS CAP AT INTERSECTION OF  
DURANGO DRIVE AND GRAND TETON DRIVE  
ELEVATION = 2541.392 (NAVD 88)  
ELEVATION = 774.6179 METERS

### BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH, AS DERIVED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83) EAST ZONE (2701), AS DETERMINED BY CLARK COUNTY CTS CONTROL POINTS 001, 002, AND 006.

Call  
before you  
Dig  
1-800-227-2600

Call  
before you  
Overhead  
1-702-593-6111

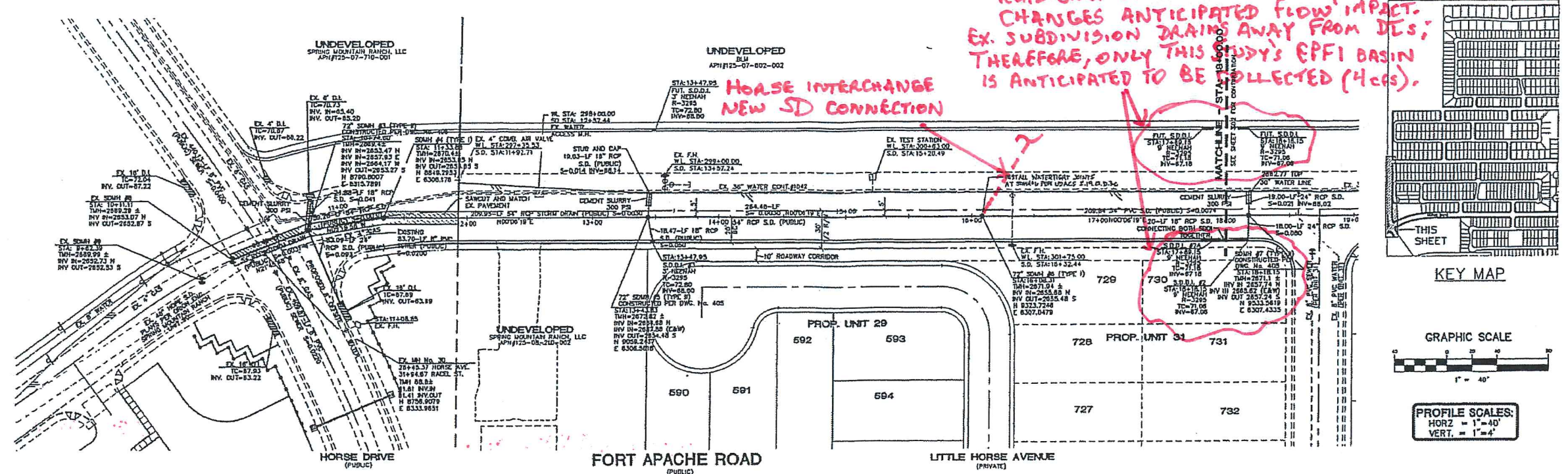
50642

|                                                                                                                                |                                                                                                                                |                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| REAL HOMES                                                                                                                     | CITY OF LAS VEGAS                                                                                                              | SPRING MOUNTAIN RANCH<br>FORT APACHE ROAD                                                                                      |
| 1717 SOUTH PARADISE BOULEVARD LAS VEGAS, NEVADA 89106-5104<br>PH: (702) 873-7550 FAX: (702) 382-1387<br>www.cityoflasvegas.com | 1717 SOUTH PARADISE BOULEVARD LAS VEGAS, NEVADA 89106-5104<br>PH: (702) 873-7550 FAX: (702) 382-1387<br>www.cityoflasvegas.com | 1717 SOUTH PARADISE BOULEVARD LAS VEGAS, NEVADA 89106-5104<br>PH: (702) 873-7550 FAX: (702) 382-1387<br>www.cityoflasvegas.com |
| REAL HOMES                                                                                                                     | COVER SHEET                                                                                                                    | SPRING MOUNTAIN RANCH<br>FORT APACHE ROAD                                                                                      |
| DESIGNED BY: [Signature]                                                                                                       | CHECKED BY: [Signature]                                                                                                        | PROJECT NO: [Signature]                                                                                                        |
| DATE: 3/10/03                                                                                                                  | DATE: 3/10/03                                                                                                                  | DATE: 3/10/03                                                                                                                  |
| SCALE: 1"=40'                                                                                                                  | SCALE: 1"=40'                                                                                                                  | SCALE: 1"=40'                                                                                                                  |
| 1 of 12 SHEETS                                                                                                                 | 1 of 12 SHEETS                                                                                                                 | 1 of 12 SHEETS                                                                                                                 |
| 16744518-FA                                                                                                                    | 16744518-FA                                                                                                                    | 16744518-FA                                                                                                                    |



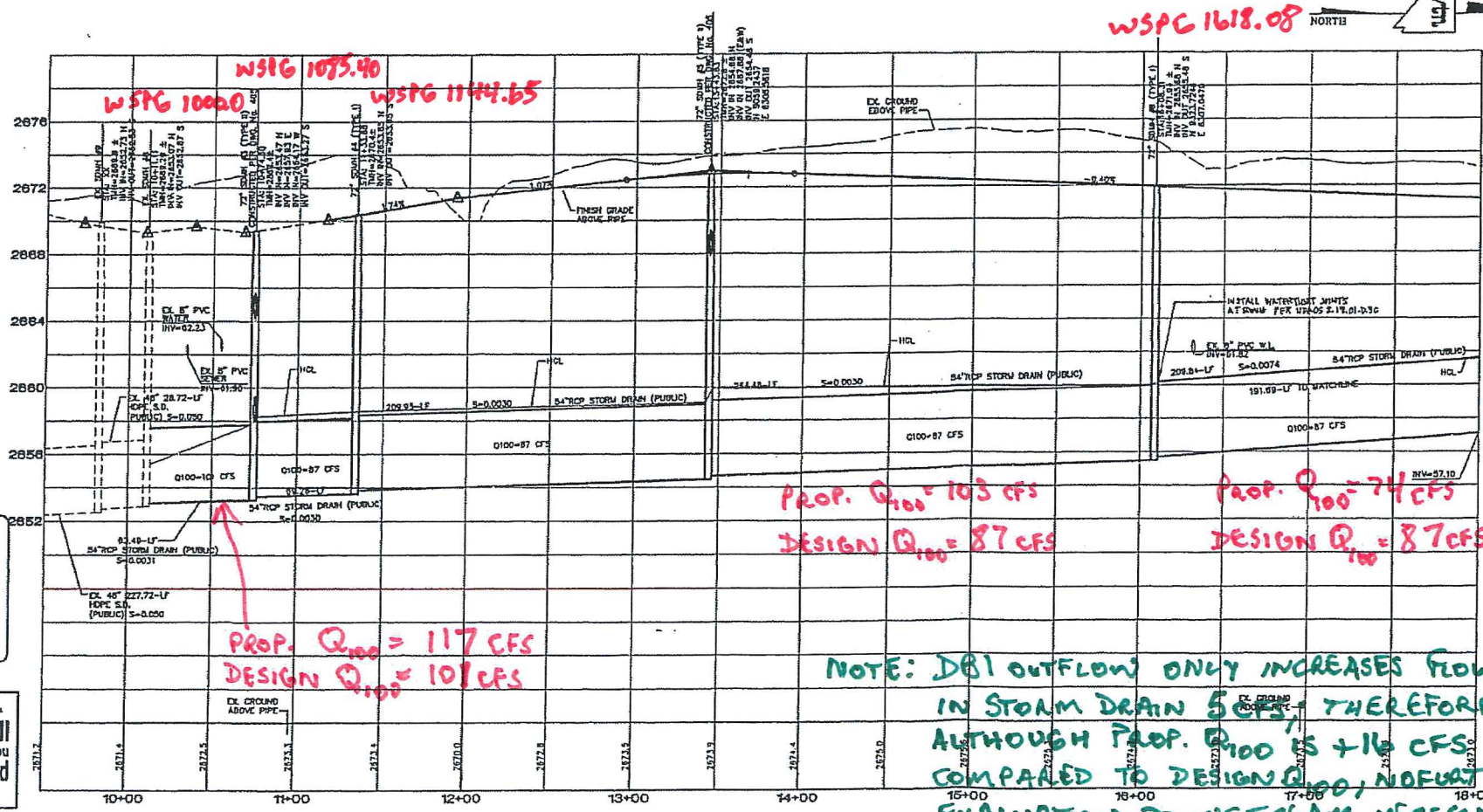
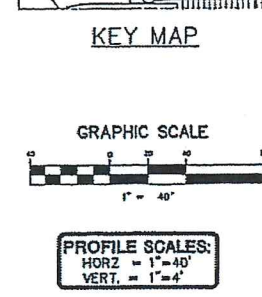






REALIGNED FT. APACHE ROAD BY HOASE INTERCHANGE  
CHANGES ANTICIPATED FLOW IMPACT.  
EX. SUBDIVISION DRAINS AWAY FROM DLS;  
THEREFORE, ONLY THIS STUDY'S EPFI BASIN  
IS ANTICIPATED TO BE COLLECTED (HCS).

HOASE INTERCHANGE  
NEW SD CONNECTION

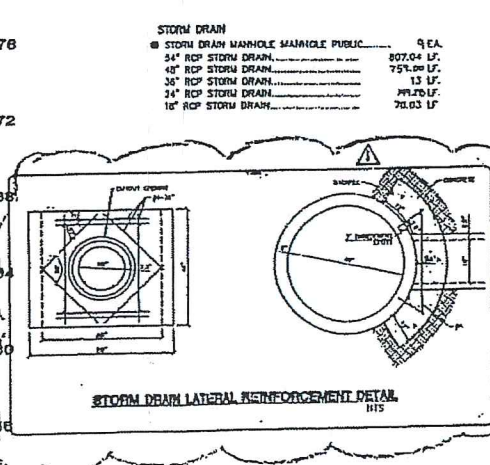


PROP.  $Q_{100} = 103$  CFS  
DESIGN  $Q_{100} = 87$  CFS

PROP.  $Q_{100} = 74$  CFS  
DESIGN  $Q_{100} = 87$  CFS

PROP.  $Q_{100} = 117$  CFS  
DESIGN  $Q_{100} = 101$  CFS

NOTE: DBI OUTFLOW ONLY INCREASES FLOW  
IN STORM DRAIN 5 CFS; THEREFORE,  
ALTHOUGH PROP.  $Q_{100}$  IS +16 CFS  
COMPARED TO DESIGN  $Q_{100}$ , NO FURTHER  
EVALUATION DOWNSTREAM NECESSARY.



**LEGAL DESCRIPTION**  
A PORTION OF LOT 9 OF SPRING MOUNTAIN RANCH, LOCATED IN THE SOUTH HALF (S 1/2) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 8, TOWNSHIP 19 SOUTH, RANGE 90 EAST, W.D.M., CITY OF LAS VEGAS, NEVADA.

**NEW BENCHMARK**  
CITY OF LAS VEGAS BENCHMARK BLV90-BNES=(BLV90-BNES)  
BLM BRASS CAP LOCATED AT DURANGO DRIVE  
AND IRON MOUNTAIN ROAD  
NAVD88 ELEVATION = 771.9469 METERS (2532.63 FEET) BLV90-BNES (NEW)  
NAVD88 ELEVATION = 771.9689 METERS (2532.70 FEET) BLV90-BNES (OLD)

**ORIGINAL BENCHMARK: (NO LONGER EXISTS)**  
C.L.V. BM 17, STA. 11V9017NES  
BLM BRASS CAP AT INTERSECTION OF  
DURANGO DRIVE AND GRAND TETON DRIVE  
ELEVATION = 2541.392 (NAVD 88)  
ELEVATION = 774.6179 METERS

**BASIS OF BEARINGS:**  
THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH, AS DERIVED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83) EAST ZONE (2701) AS DETERMINED BY CLARK COUNTY GIS CONTROL POINTS 801, 802, AND 808.

**DISCLAIMER NOTE**  
UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD 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.

Call before you Dig  
1-800-227-2600

Call before you Overhead  
1-702-593-8111

**REAL HOMES**  
JADA H. BARNES, INC.  
LAS VEGAS, NEVADA 89130  
(702) 847-2880

**STORM DRAIN PLAN AND PROFILE**  
FORT APACHE ROAD  
STA: 8+50.00 TO 18+00.00

**SPRING MOUNTAIN RANCH**  
FORT APACHE ROAD

**CITY OF LAS VEGAS**  
2727 SOUTH BARNES BOULEVARD LAS VEGAS, NEVADA 89146-3140  
PH: (702) 875-1330 FAX: (702) 381-2557

**nvtn**  
nevada CONSULTING ENGINEERS & PLANNERS • LAND SURVEYORS

**DESIGNED BY:** JMB  
**CHECKED BY:** MFM  
**PROJECT NO.:** 6298

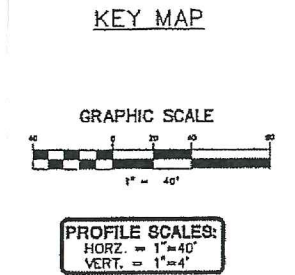
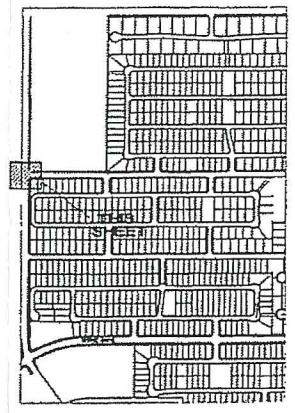
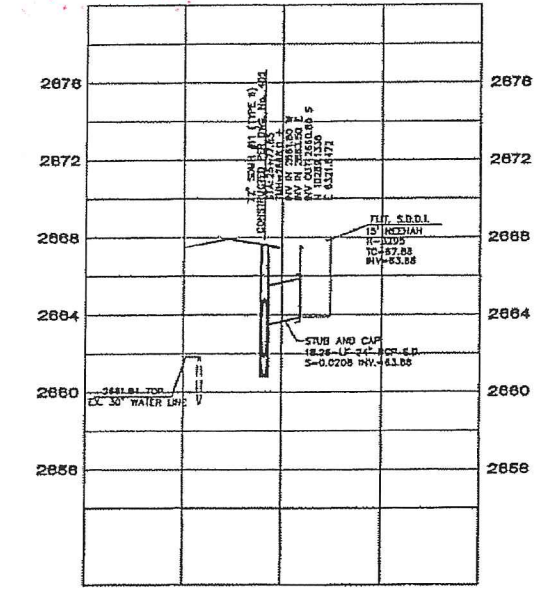
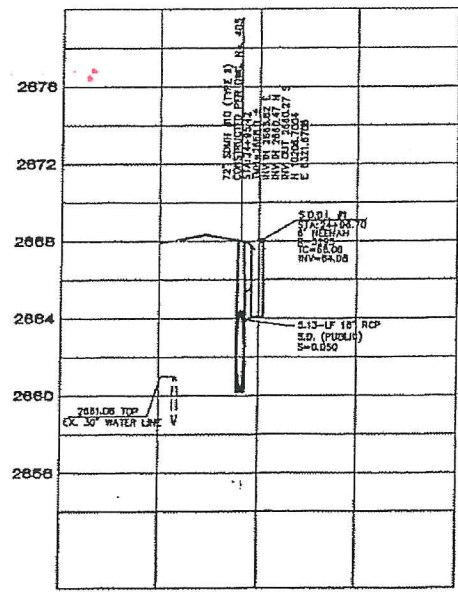
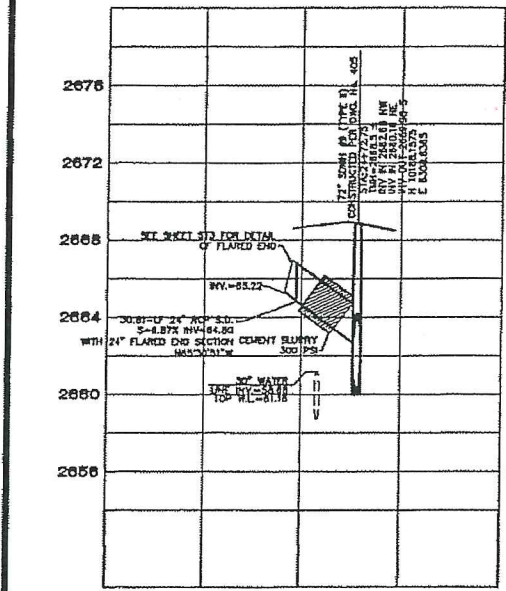
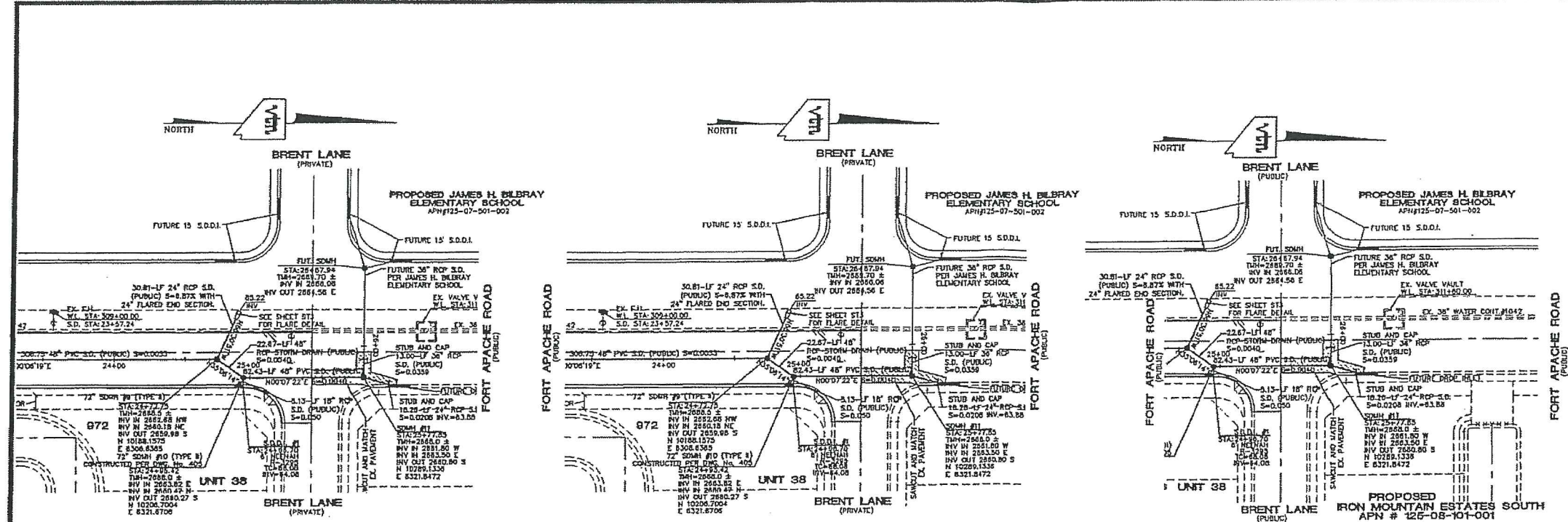
**SCALE:** 1"=40' (HORIZ)  
1"=4' (VERT.)

**EXPRES 12-31-03**

**SHEET**  
SD1  
8 OF 12 SHEETS

**DRAWING NO.:** 337 Y 4518-FA





FOR QUANTITIES SEE SHEET SD1

**DISCLAIMER NOTE**  
 UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UNDERGROUND AND OVERHEAD 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.

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

**Call before you Overhead**  
 1-702-593-6111

#### LEGAL DESCRIPTION

A PORTION OF LOT 8 OF SPRING MOUNTAIN RANCH LOCATED IN THE SOUTH HALF (S 1/2) OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 8, TOWNSHIP 19 SOUTH, RANGE 60 EAST, N.M.D., CITY OF LAS VEGAS, NEVADA.

#### NEW BENCHMARK

CITY OF LAS VEGAS BENCHMARK BLV90-BNES=(ILV90-BNES)  
 BLV BRASS CAP LOCATED AT DURANGO DRIVE  
 AND IRON MOUNTAIN ROAD  
 NAVD88 ELEVATION = 771.9469 METERS (2532.63 FEET) ILV90-BNES (NEW)  
 NAVD88 ELEVATION = 771.9689 METERS (2532.70 FEET) ILV90-BNES (OLD)

#### ORIGINAL BENCHMARK: (NO LONGER EXISTS)

C.L.V. BM #7, STA. 11V9017NES  
 BLV BRASS CAP AT INTERSECTION OF  
 DURANGO DRIVE AND GRAND TETON DRIVE  
 ELEVATION = 2541.392 (NAVD 88)  
 ELEVATION = 774.6179 METERS

#### BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJECT IS GRID NORTH AS DERIVED BY THE NEVADA COORDINATE SYSTEM OF 1983 (NCS83) EAST ZONE (2701) AS DETERMINED BY CLARK COUNTY GS CONTROL POINTS 601, 602, AND 603.

|                                                                                        |                     |                                                                                                                                                                                                                 |                     |
|----------------------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>REAL HOME</b><br>1111 S. DURANGO DRIVE<br>LAS VEGAS, NEVADA 89105<br>(702) 697-2800 |                     | <b>CITY OF LAS VEGAS</b><br>2227 SOUTH RANGEN BOULEVARD LAS VEGAS, NEVADA 89146-5148<br>PH. (702) 873-7250 FAX (702) 352-2397<br>PH. (702) 873-7250 FAX (702) 352-2397<br>PH. (702) 873-7250 FAX (702) 352-2397 |                     |
| <b>DROP INLET PLAN AND PROFILES</b><br>FORT APACHE ROAD                                |                     | <b>SPRING MOUNTAIN RANCH</b><br>FORT APACHE ROAD                                                                                                                                                                |                     |
| DRAWN BY:<br>WMS                                                                       | DESIGNED BY:<br>WMS | CHECKED BY:<br>WMS                                                                                                                                                                                              | PROJECT NO:<br>0008 |
| DATE:<br>JAN 2003                                                                      |                     | SCALE:<br>1"=40' HORIZ.<br>1"=4' VERT.                                                                                                                                                                          |                     |
| SHEET<br><b>SD4</b><br>11 OF 12 SHEETS<br>DRAWING NO.<br>3274 4519-FA                  |                     |                                                                                                                                                                                                                 |                     |

## APPENDIX D

Response to Comment No. 7 – Exhibit/Models/Calculations



## Inflow Energy Calculations



# Inflow to Collector Channel - South Wash

## Worksheet for Irregular Channel

| Project Description |                                     |
|---------------------|-------------------------------------|
| Worksheet           | Inflow to Collector Channel - South |
| Flow Element        | Irregular Channel                   |
| Method              | Manning's Formula                   |
| Solve For           | Channel Depth                       |

| Input Data    |            |
|---------------|------------|
| Channel Slope | 3.50 %     |
| Discharge     | 468.00 cfs |

| Options                         |                          |
|---------------------------------|--------------------------|
| Current Roughness Method        | Improved Lotter's Method |
| Open Channel Weighting Method   | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method          |

| Results                 |                      |
|-------------------------|----------------------|
| Mannings Coefficient    | 0.040                |
| Water Surface Elevation | 3,064.21 ft          |
| Elevation Range         | 3,062.50 to 3,067.00 |
| Flow Area               | 79.6 ft <sup>2</sup> |
| Wetted Perimeter        | 102.41 ft            |
| Top Width               | 102.31 ft            |
| Actual Depth            | 1.71 ft              |
| Critical Elevation      | 3,064.31 ft          |
| Critical Slope          | 2.46 %               |
| Velocity                | 5.88 ft/s            |
| Velocity Head           | 0.54 ft              |
| Specific Energy         | 3,064.75 ft          |
| Froude Number           | 1.17                 |
| Flow Type               | Supercritical        |

| Roughness Segments |             |                      |
|--------------------|-------------|----------------------|
| Start Station      | End Station | Mannings Coefficient |
| 0+00.0             | 0+30.0      | 0.035                |
| 0+30.0             | 1+70.0      | 0.040                |
| 1+70.0             | 3+14.0      | 0.035                |

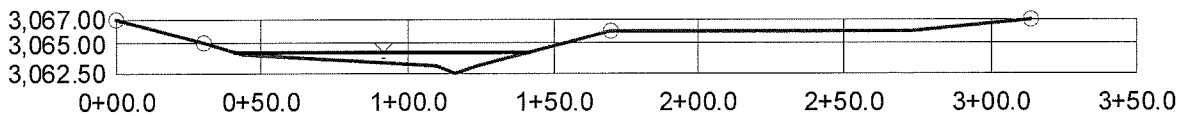
| Natural Channel Points |                |
|------------------------|----------------|
| Station (ft)           | Elevation (ft) |
| 0+00.0                 | 3,067.00       |
| 0+30.0                 | 3,065.00       |
| 0+43.0                 | 3,064.00       |
| 1+10.0                 | 3,063.00       |
| 1+16.0                 | 3,062.50       |
| 1+24.0                 | 3,063.00       |
| 1+70.0                 | 3,066.00       |
| 2+73.0                 | 3,066.00       |
| 3+14.0                 | 3,067.00       |



## Inflow to Collector Channel - South Wash Cross Section for Irregular Channel

| Project Description |                                     |
|---------------------|-------------------------------------|
| Worksheet           | Inflow to Collector Channel - South |
| Flow Element        | Irregular Channel                   |
| Method              | Manning's Formula                   |
| Solve For           | Channel Depth                       |

| Section Data            |                      |
|-------------------------|----------------------|
| Mannings Coefficient    | 0.040                |
| Channel Slope           | 3.50 %               |
| Water Surface Elevation | 3,064.21 ft          |
| Elevation Range         | 3,062.50 to 3,067.00 |
| Discharge               | 468.00 cfs           |



V:4.0  
H:1  
NTS

# Inflow to Collector Channel - North Wash

## Worksheet for Irregular Channel

| Project Description |                                     |
|---------------------|-------------------------------------|
| Worksheet           | Inflow to Collector Channel - North |
| Flow Element        | Irregular Channel                   |
| Method              | Manning's Formula                   |
| Solve For           | Channel Depth                       |

| Input Data    |           |
|---------------|-----------|
| Channel Slope | 3.50 %    |
| Discharge     | 38.00 cfs |

| Options                         |                          |
|---------------------------------|--------------------------|
| Current Roughness Method        | Improved Lotter's Method |
| Open Channel Weighting Method   | Improved Lotter's Method |
| Closed Channel Weighting Method | Horton's Method          |

| Results                 |                      |
|-------------------------|----------------------|
| Mannings Coefficient    | 0.040                |
| Water Surface Elevation | 3,042.66 ft          |
| Elevation Range         | 3,042.00 to 3,045.00 |
| Flow Area               | 8.7 ft <sup>2</sup>  |
| Wetted Perimeter        | 17.66 ft             |
| Top Width               | 17.56 ft             |
| Actual Depth            | 0.66 ft              |
| Critical Elevation      | 3,042.69 ft          |
| Critical Slope          | 2.92 %               |
| Velocity                | 4.35 ft/s            |
| Velocity Head           | 0.29 ft              |
| Specific Energy         | 3,042.95 ft          |
| Froude Number           | 1.09                 |
| Flow Type               | Supercritical        |

| Roughness Segments |             |                      |
|--------------------|-------------|----------------------|
| Start Station      | End Station | Mannings Coefficient |
| 0+00.0             | 0+40.0      | 0.040                |

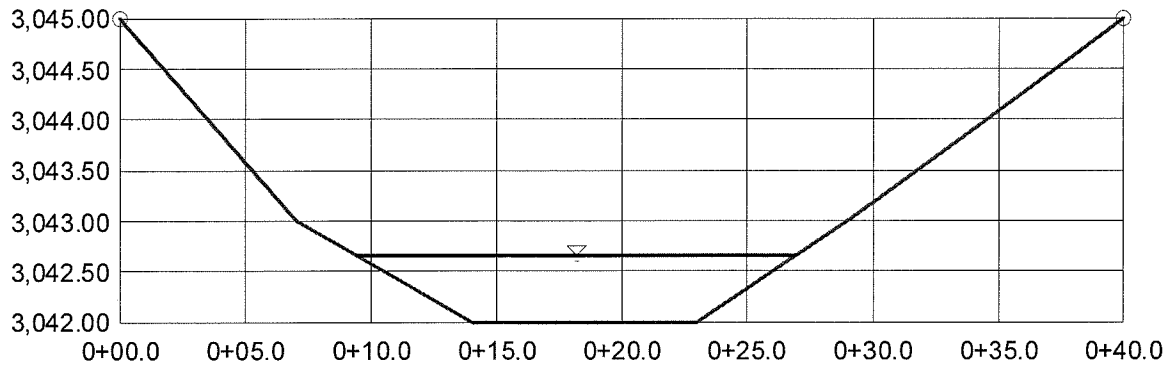
| Natural Channel Points |                |
|------------------------|----------------|
| Station (ft)           | Elevation (ft) |
| 0+00.0                 | 3,045.00       |
| 0+07.0                 | 3,043.00       |
| 0+14.0                 | 3,042.00       |
| 0+23.0                 | 3,042.00       |
| 0+29.0                 | 3,043.00       |
| 0+40.0                 | 3,045.00       |

# Inflow to Collector Channel - North Wash

## Cross Section for Irregular Channel

| Project Description |                                     |
|---------------------|-------------------------------------|
| Worksheet           | Inflow to Collector Channel - North |
| Flow Element        | Irregular Channel                   |
| Method              | Manning's Formula                   |
| Solve For           | Channel Depth                       |

| Section Data            |                      |
|-------------------------|----------------------|
| Mannings Coefficient    | 0.040                |
| Channel Slope           | 3.50 %               |
| Water Surface Elevation | 3,042.66 ft          |
| Elevation Range         | 3,042.00 to 3,045.00 |
| Discharge               | 38.00 cfs            |



V:4.0  
H:1  
NTS



*Exhibit H – Future Outlet Pipe Concept*

[illegible][illegible]

# SKYE CANYON DETENTION BASIN 1 FUTURE OUTLET PIPES CONCEPT

**EXHIBIT H**  
SHEET 1 OF 1

*AutoCAD Printout – Stage-Storage Design Parameters*

# STAGE STORAGE TABLE

| ELEV     | AREA<br>(sq. ft.) | DEPTH<br>(ft) | AVG END<br>INC. VOL.<br>(cu. ft.) | AVG END<br>TOTAL VOL.<br>(cu. ft.) | CONIC<br>INC. VOL.<br>(cu. ft.) | CONIC<br>TOTAL VOL.<br>(cu. ft.) |
|----------|-------------------|---------------|-----------------------------------|------------------------------------|---------------------------------|----------------------------------|
| 3,024.00 | 50,319.03         | N/A           | N/A                               | 0.00                               | N/A                             | 0.00                             |
| 3,025.00 | 165,564.12        | 1.00          | 82782.06                          | 20754420602.99                     | 55188.04                        | 13836280401.99                   |
| 3,026.00 | 218,334.98        | 1.00          | 109771.97                         | 20754530374.96                     | 78596.91                        | 13836358998.90                   |
| 3,027.00 | 243,558.62        | 1.00          | 230946.80                         | 20754761321.76                     | 230831.93                       | 13836589830.83                   |
| 3,028.00 | 251,037.14        | 1.00          | 247297.88                         | 20755008619.65                     | 247288.46                       | 13836837119.29                   |
| 3,029.00 | 258,706.78        | 1.00          | 254871.96                         | 20755263491.61                     | 254862.35                       | 13837091981.64                   |
| 3,030.00 | 266,520.99        | 1.00          | 262613.89                         | 20755526105.50                     | 262604.20                       | 13837354585.84                   |
| 3,031.00 | 274,441.29        | 1.00          | 270481.14                         | 20755796586.64                     | 270471.48                       | 13837625057.31                   |
| 3,032.00 | 282,383.18        | 1.00          | 278412.23                         | 20756074998.87                     | 278402.79                       | 13837903460.11                   |
| 3,033.00 | 290,458.26        | 1.00          | 286420.72                         | 20756361419.59                     | 286411.24                       | 13838189871.34                   |
| 3,034.00 | 298,583.80        | 1.00          | 294521.03                         | 20756655940.62                     | 294511.69                       | 13838484383.03                   |
| 3,035.00 | 306,715.11        | 1.00          | 302649.45                         | 20756958590.08                     | 302640.35                       | 13838787023.38                   |
| 3,036.00 | 314,942.71        | 1.00          | 310828.91                         | 20757269418.99                     | 310819.84                       | 13839097843.22                   |
| 3,037.00 | 325,072.08        | 1.00          | 320007.40                         | 20757589426.39                     | 319994.04                       | 13839417837.26                   |
| 3,038.00 | 337,320.49        | 1.00          | 331196.28                         | 20757920622.67                     | 331177.41                       | 13839749014.67                   |
| 3,039.00 | 350,082.38        | 1.00          | 343701.43                         | 20758264324.10                     | 343681.69                       | 13840092696.35                   |
| 3,040.00 | 364,026.08        | 1.00          | 357054.23                         | 20758621378.33                     | 357031.54                       | 13840449727.89                   |
| 3,041.00 | 376,210.51        | 1.00          | 370118.29                         | 20758991496.63                     | 370101.58                       | 13840819829.47                   |
| 3,042.00 | 389,107.42        | 1.00          | 382658.96                         | 20759374155.59                     | 382640.85                       | 13841202470.32                   |
| 3,043.00 | 405,612.24        | 1.00          | 397359.83                         | 20759771515.42                     | 397331.26                       | 13841599801.58                   |
| 3,044.00 | 423,206.33        | 1.00          | 414409.29                         | 20760185924.70                     | 414378.16                       | 13842014179.74                   |
| 3,045.00 | 443,293.39        | 1.00          | 433249.86                         | 20760619174.56                     | 433211.05                       | 13842447390.79                   |
| 3,046.00 | 465,768.30        | 1.00          | 454530.84                         | 20761073705.41                     | 454484.53                       | 13842901875.32                   |



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*Outlet Pipe*  
*Hydraulics*

# 60-inch RCP "Free-Flow" Outflow Pipe Worksheet for Circular Channel

| Project Description |                   |
|---------------------|-------------------|
| Worksheet           | Outflow Pipe      |
| Flow Element        | Circular Channel  |
| Method              | Manning's Formula |
| Solve For           | Channel Depth     |

| Input Data           |           |
|----------------------|-----------|
| Mannings Coefficient | 0.013     |
| Channel Slope        | 0.40 %    |
| Diameter             | 60.0 in   |
| Discharge            | 71.00 cfs |

| Results           |                     |
|-------------------|---------------------|
| Depth             | 2.29 ft             |
| Flow Area         | 8.8 ft <sup>2</sup> |
| Wetted Perimeter  | 7.44 ft             |
| Top Width         | 0.00 ft             |
| Critical Depth    | 2.38 ft             |
| Percent Full      | 45.9 %              |
| Critical Slope    | 0.35 %              |
| Velocity          | 8.08 ft/s           |
| Velocity Head     | 1.01 ft             |
| Specific Energy   | 3.31 ft             |
| Froude Number     | 1.07                |
| Maximum Discharge | 177.18 cfs          |
| Discharge Full    | 164.71 cfs          |
| Slope Full        | 0.07 %              |
| Flow Type         | Supercritical       |

→ DOESN'T EXCEED 2.5' (1/2 FULL);  
THEREFORE, TAILWATER OF 2.5' UTILIZED  
IN 24" ORFICE CALCULATION IS  
CONSERVATIVE & OK

# 60-inch RCP "Free-Flow" Outflow Pipe

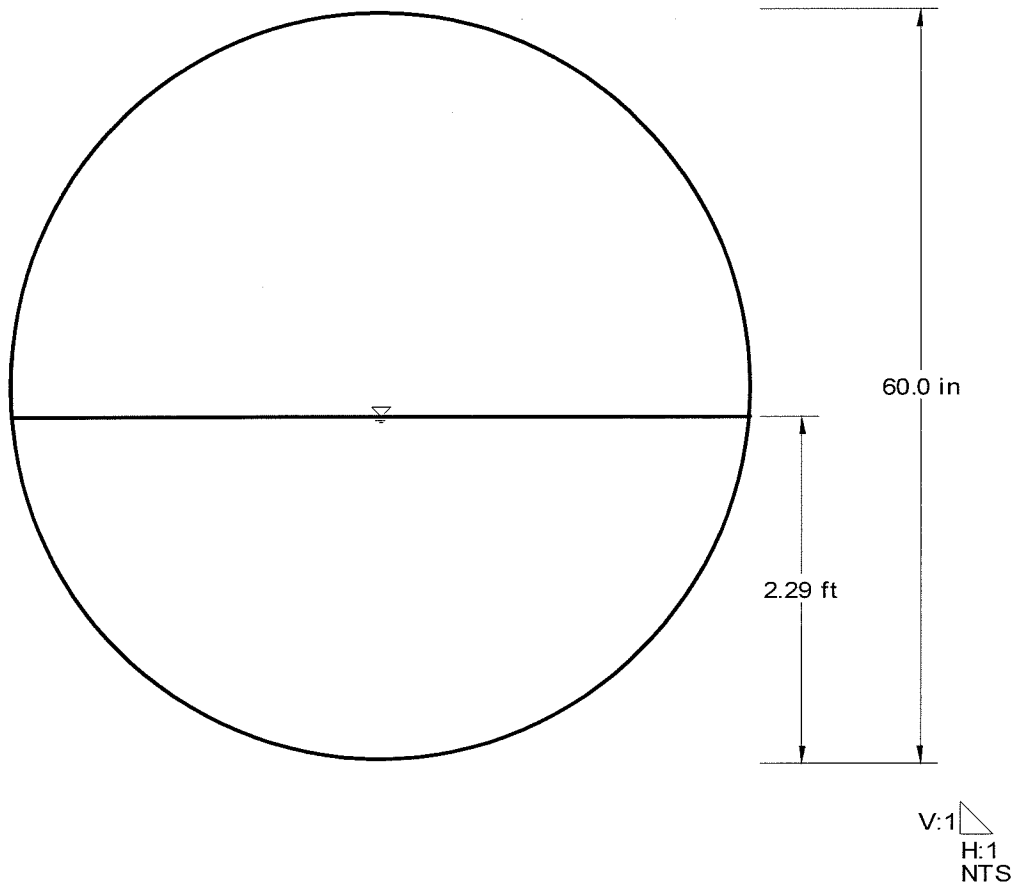
## Cross Section for Circular Channel

### Project Description

|              |                   |
|--------------|-------------------|
| Worksheet    | Outflow Pipe      |
| Flow Element | Circular Channel  |
| Method       | Manning's Formula |
| Solve For    | Channel Depth     |

### Section Data

|                      |           |
|----------------------|-----------|
| Mannings Coefficient | 0.013     |
| Channel Slope        | 0.40 %    |
| Depth                | 2.29 ft   |
| Diameter             | 60.0 in   |
| Discharge            | 71.00 cfs |



---

*Stage-Discharge*  
*Curve*



## 24-inch Orifice Discharge Curve Rating Table for Circular Orifice

| Project Description |                  |
|---------------------|------------------|
| Worksheet           | Outfall          |
| Type                | Circular Orifice |
| Solve For           | Discharge        |

| Input Data            |             |
|-----------------------|-------------|
| Centroid Elevation    | 3,014.80 ft |
| Tailwater Elevation   | 3,016.30 ft |
| Discharge Coefficient | 0.65        |
| Diameter              | 24.0 in     |

→ CONSIDERS 2.5' DEPTH IN 60" RCP OUTLET

| Attribute                | Minimum  | Maximum  | Increment |
|--------------------------|----------|----------|-----------|
| Headwater Elevation (ft) | 3,014.00 | 3,046.00 | 1.00      |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|--------------------------|-----------------|-----------------|
| 3,014.00                 | N/A             | N/A             |
| 3,015.00                 | N/A             | N/A             |
| 3,016.00                 | N/A             | N/A             |
| 3,017.00                 | 13.71           | 4.36            |
| 3,018.00                 | 21.36           | 6.80            |
| 3,019.00                 | 26.92           | 8.57            |
| 3,020.00                 | 31.51           | 10.03           |
| 3,021.00                 | 35.51           | 11.30           |
| 3,022.00                 | 39.11           | 12.45           |
| 3,023.00                 | 42.40           | 13.50           |
| 3,024.00                 | 45.45           | 14.47           |
| 3,025.00                 | 48.32           | 15.38           |
| 3,026.00                 | 51.02           | 16.24           |
| 3,027.00                 | 53.58           | 17.06           |
| 3,028.00                 | 56.03           | 17.84           |
| 3,029.00                 | 58.38           | 18.58           |
| 3,030.00                 | 60.63           | 19.30           |
| 3,031.00                 | 62.80           | 19.99           |
| 3,032.00                 | 64.91           | 20.66           |
| 3,033.00                 | 66.94           | 21.31           |
| 3,034.00                 | 68.92           | 21.94           |
| 3,035.00                 | 70.84           | 22.55           |
| 3,036.00                 | 72.70           | 23.14           |
| 3,037.00                 | 74.53           | 23.72           |
| 3,038.00                 | 76.31           | 24.29           |
| 3,039.00                 | 78.04           | 24.84           |
| 3,040.00                 | 79.75           | 25.38           |
| 3,041.00                 | 81.41           | 25.91           |
| 3,042.00                 | 83.04           | 26.43           |
| 3,043.00                 | 84.64           | 26.94           |
| 3,044.00                 | 86.21           | 27.44           |
| 3,045.00                 | 87.75           | 27.93           |
| 3,046.00                 | 89.27           | 28.42           |

# **PMF Overflow Spillway Discharge Curve** **Rating Table for Generic Weir**

| Project Description |                     |
|---------------------|---------------------|
| Worksheet           | PMF Spillway - Weir |
| Type                | Generic Weir        |
| Solve For           | Discharge           |

| Input Data            |             |
|-----------------------|-------------|
| Crest Elevation       | 3,037.00 ft |
| Discharge Coefficient | 3.00 US     |
| Crest Length          | 87.00 ft    |

| Attribute                | Minimum  | Maximum  | Increment |
|--------------------------|----------|----------|-----------|
| Headwater Elevation (ft) | 3,037.00 | 3,046.00 | 1.00      |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|--------------------------|-----------------|-----------------|
| 3,037.00                 | N/A             | N/A             |
| 3,038.00                 | 261.00          | 3.00            |
| 3,039.00                 | 738.22          | 4.24            |
| 3,040.00                 | 1,356.20        | 5.20            |
| 3,041.00                 | 2,088.00        | 6.00            |
| 3,042.00                 | 2,918.07        | 6.71            |
| 3,043.00                 | 3,835.90        | 7.35            |
| 3,044.00                 | 4,833.79        | 7.94            |
| 3,045.00                 | 5,905.76        | 8.49            |
| 3,046.00                 | 7,047.00        | 9.00            |

### DB1 - Stage-Discharge Summary

| Stage (elevation) | 24" Orifice Outlet<br>Pipe Flow (cfs) | Spillway Flow<br>(cfs) | Total Flow (cfs) |
|-------------------|---------------------------------------|------------------------|------------------|
| 3013.8            | 0.00                                  | 0.00                   | 0                |
| 3014              | 0.00                                  | 0.00                   | 0                |
| 3015              | 0.00                                  | 0.00                   | 0                |
| 3016              | 0.00                                  | 0.00                   | 0                |
| 3017              | 13.71                                 | 0.00                   | 13.7             |
| 3018              | 21.36                                 | 0.00                   | 21.4             |
| 3019              | 26.92                                 | 0.00                   | 26.9             |
| 3020              | 31.51                                 | 0.00                   | 31.5             |
| 3021              | 35.51                                 | 0.00                   | 35.5             |
| 3022              | 39.11                                 | 0.00                   | 39.1             |
| 3023              | 42.40                                 | 0.00                   | 42.4             |
| 3024              | 45.45                                 | 0.00                   | 45.5             |
| 3025              | 48.32                                 | 0.00                   | 48.3             |
| 3026              | 51.02                                 | 0.00                   | 51.0             |
| 3027              | 53.58                                 | 0.00                   | 53.6             |
| 3028              | 56.03                                 | 0.00                   | 56.0             |
| 3029              | 58.38                                 | 0.00                   | 58.4             |
| 3030              | 60.63                                 | 0.00                   | 60.6             |
| 3031              | 62.80                                 | 0.00                   | 62.8             |
| 3032              | 64.91                                 | 0.00                   | 64.9             |
| 3033              | 66.94                                 | 0.00                   | 66.9             |
| 3034              | 68.92                                 | 0.00                   | 68.9             |
| 3035              | 70.84                                 | 0.00                   | 70.8             |
| 3036              | 72.70                                 | 0.00                   | 72.7             |
| 3037              | 74.53                                 | 0.00                   | 74.5             |
| 3038              | 76.31                                 | 261.00                 | 337.3            |
| 3039              | 78.04                                 | 738.22                 | 816.3            |
| 3040              | 79.75                                 | 1356.20                | 1436.0           |
| 3041              | 81.41                                 | 2088.00                | 2169.4           |
| 3042              | 83.04                                 | 2918.07                | 3001.1           |
| 3043              | 84.64                                 | 3835.90                | 3920.5           |
| 3044              | 86.21                                 | 4833.79                | 4920.0           |
| 3045              | 87.75                                 | 5905.76                | 5993.5           |
| 3046              | 89.27                                 | 7047.00                | 7136.3           |

## Collector Channel WSPG Model



| Summary of Collector Channel Hydraulic Characteristics            |                           |                       |                            |                                             |                                 |                                   |                                   |
|-------------------------------------------------------------------|---------------------------|-----------------------|----------------------------|---------------------------------------------|---------------------------------|-----------------------------------|-----------------------------------|
| Station                                                           | Q <sub>100</sub><br>(cfs) | Flow<br>Depth<br>(ft) | Flow<br>Velocity<br>(ft/s) | Hydraulic<br>Freeboard<br>(ft) <sup>1</sup> | Sedimentation<br>Freeboard (ft) | Required<br>Channel<br>Depth (ft) | Proposed<br>Channel<br>Depth (ft) |
| 2494.58                                                           | 471                       | 0.68                  | 27.63                      | 1.61                                        | 1.0                             | 3.29                              | 4.5                               |
| 2460.28                                                           | 471                       | 1.44                  | 13.08                      | 1.37                                        | 1.0                             | 3.81                              | 4.0                               |
| 2428.03                                                           | 471                       | 2.16                  | 11.78                      | 1.38                                        | 1.0                             | 4.54                              | 5.0                               |
| 2041.13                                                           | 471                       | 1.14                  | 26.70                      | 1.70                                        | 1.0                             | 3.84                              | 5.0                               |
| 1874.19                                                           | 471                       | 2.42                  | 10.10                      | 1.34                                        | 1.0                             | 4.76                              | 5.0                               |
| 1231.55                                                           | 471                       | 2.85                  | 8.05                       | 1.29                                        | 0.9                             | 5.00                              | 5.0                               |
| 1 – Hydraulic Freeboard obtained from CCRFCD Manual Equation 747. |                           |                       |                            |                                             |                                 |                                   |                                   |

Chn1.WSP

0  
T1 SKYE CANYON DETENTION BASIN, OLY1401.004  
T2 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
T3 COLLECTOR CHANNEL  
SO -2494.583025.90 2 3030.30  
R -2460.283036.90 2 .015  
TS -2428.033037.06 1 .015  
R -2041.133039.00 1 .015  
R -1874.193055.69 1 .015  
R -1231.553058.96 1 .015  
SH -1231.553055.96 1  
CD 1 1 0 0.0 5. 12. 3. 3.  
CD 2 2 0 0.0 5. 25. 0. 0.  
..

0  
Q  
→

471.

Chn1.WSQ

CHNL.OUT

‡  
DATE: 10/ 8/2015  
TIME: 8:42

F0515P  
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

| CARD<br>CODE | SECT<br>NO | CHN<br>TYPE | NO OF<br>PIERS | AVE PIER<br>WIDTH | HEIGHT 1<br>DIAMETER | BASE<br>WIDTH | ZL   | ZR   | INV<br>DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|--------------|------------|-------------|----------------|-------------------|----------------------|---------------|------|------|-------------|------|------|------|------|------|------|------|------|------|-------|
| CD           | 1          | 1           | 0              | 0.00              | 5.00                 | 12.00         | 3.00 | 3.00 | 0.00        |      |      |      |      |      |      |      |      |      |       |
| CD           | 2          | 2           | 0              | 0.00              | 5.00                 | 25.00         |      |      | 0.00        |      |      |      |      |      |      |      |      |      |       |
| F 0 5 1 5 P  |            |             |                |                   |                      |               |      |      |             |      |      |      |      |      |      |      |      |      |       |

PAGE NO 3 ‡

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON DETENTION BASIN, OLY1401.004

HEADING LINE NO 2 IS -

TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1

HEADING LINE NO 3 IS -

COLLECTOR CHANNEL

F 0 5 1 5 P

‡

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
|------------|---|----|---|------------------|----------|---------|------|--|--|--|--|--|--|--|--|--|--|--|--|
| ELEMENT NO | 1 | IS | A | SYSTEM OUTLET    | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -2494.58 | 3025.90 | 2    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 2 | IS | A | REACH            | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -2460.28 | 3036.90 | 2    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 3 | IS | A | TRANSITION       | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -2428.03 | 3037.06 | 1    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 4 | IS | A | REACH            | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -2041.13 | 3039.00 | 1    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 5 | IS | A | REACH            | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -1874.19 | 3055.69 | 1    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 6 | IS | A | REACH            | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -1231.55 | 3058.96 | 1    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |
| ELEMENT NO | 7 | IS | A | SYSTEM HEADWORKS | *        | *       | *    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   | U/S DATA         | STATION  | INVERT  | SECT |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  | -1231.55 | 3055.96 | 1    |  |  |  |  |  |  |  |  |  |  |  |  |
|            |   |    |   |                  |          |         |      |  |  |  |  |  |  |  |  |  |  |  |  |

W S ELEV  
3030.30

RADIUS ANGLE ANG PT MAN H  
0.00 0.00 0.00 0

W S ELEV  
0.00



## CHNL.OUT

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

\*\* WARNING NO. 2 \*\* - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC  $\frac{1}{2}$   
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WATER SURFACE PROFILE LISTING  
 SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
 COLLECTOR CHANNEL

| STATION  | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL   | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR         |
|----------|----------------|------------------|--------------|-------|-------|-------------|-------------------|---------------|-------------------|-------------|-----------------|------|------------|---------------|
| L/ELEM   | SO             |                  |              |       |       | SF AVE      | HF                |               |                   | NORM DEPTH  |                 |      | ZR         |               |
| -2494.58 | 3025.90        | 0.682            | 3026.582     | 471.0 | 27.63 | 11.854      | 3038.436          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 3.90     | 0.32070        |                  |              |       |       | .132046     | 0.51              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2490.68 | 3027.15        | 0.705            | 3027.855     | 471.0 | 26.74 | 11.100      | 3038.955          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 4.76     | 0.32070        |                  |              |       |       | .115977     | 0.55              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2485.92 | 3028.68        | 0.739            | 3029.416     | 471.0 | 25.49 | 10.091      | 3039.507          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 3.98     | 0.32070        |                  |              |       |       | .099294     | 0.40              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2481.94 | 3029.95        | 0.775            | 3030.729     | 471.0 | 24.31 | 9.174       | 3039.903          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 3.38     | 0.32070        |                  |              |       |       | .085025     | 0.29              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2478.56 | 3031.04        | 0.813            | 3031.850     | 471.0 | 23.17 | 8.339       | 3040.189          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 2.90     | 0.32070        |                  |              |       |       | .072818     | 0.21              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2475.66 | 3031.97        | 0.853            | 3032.819     | 471.0 | 22.10 | 7.581       | 3040.400          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 2.50     | 0.32070        |                  |              |       |       | .062375     | 0.16              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2473.16 | 3032.77        | 0.894            | 3033.664     | 471.0 | 21.07 | 6.892       | 3040.556          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 2.18     | 0.32070        |                  |              |       |       | .053440     | 0.12              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2470.98 | 3033.47        | 0.938            | 3034.408     | 471.0 | 20.09 | 6.266       | 3040.674          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 1.91     | 0.32070        |                  |              |       |       | .045793     | 0.09              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2469.07 | 3034.08        | 0.984            | 3035.065     | 471.0 | 19.15 | 5.696       | 3040.761          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 1.67     | 0.32070        |                  |              |       |       | .039248     | 0.07              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2467.40 | 3034.62        | 1.032            | 3035.648     | 471.0 | 18.26 | 5.178       | 3040.826          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 1.46     | 0.32070        |                  |              |       |       | .033646     | 0.05              |               |                   | 0.528       |                 | 0.00 |            |               |
| -2465.94 | 3035.09        | 1.082            | 3036.168     | 471.0 | 17.41 | 4.707       | 3040.875          | 0.00          | 2.226             | 5.00        | 25.00           | 0.00 | 0          | 0.00          |
| 1.29     | 0.32070        |                  |              |       |       | .028850     | 0.04              |               |                   | 0.528       |                 | 0.00 |            | $\frac{1}{2}$ |

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WATER SURFACE PROFILE LISTING  
SKYE CANYON DETENTION BASIN, OLY1401.004  
TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
COLLECTOR CHANNEL

PAGE 2

| STATION   | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL   | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |            | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR |
|-----------|----------------|------------------|--------------|-------|-------|-------------|-------------------|---------------|-------------------|------------|-------------|-----------------|------|------------|-------|
| L/ELEM    | SO             |                  |              |       |       | SF AVE      | HF                |               |                   | NORM DEPTH |             |                 | ZR   |            |       |
| *****     |                |                  |              |       |       |             |                   |               |                   |            |             |                 |      |            |       |
| -2464.65  | 3035.50        | 1.135            | 3036.633     | 471.0 | 16.60 | 4.280       | 3040.913          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| 1.13      | 0.32070        |                  |              |       |       | .024743     | 0.03              |               |                   | 0.528      |             |                 | 0.00 |            |       |
| -2463.52  | 3035.86        | 1.190            | 3037.050     | 471.0 | 15.83 | 3.891       | 3040.941          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| 0.98      | 0.32070        |                  |              |       |       | .021226     | 0.02              |               |                   | 0.528      |             |                 | 0.00 |            |       |
| -2462.54  | 3036.18        | 1.248            | 3037.424     | 471.0 | 15.09 | 3.537       | 3040.961          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| 0.86      | 0.32070        |                  |              |       |       | .018212     | 0.02              |               |                   | 0.528      |             |                 | 0.00 |            |       |
| -2461.68  | 3036.45        | 1.309            | 3037.762     | 471.0 | 14.39 | 3.215       | 3040.977          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| 0.75      | 0.32070        |                  |              |       |       | .015631     | 0.01              |               |                   | 0.528      |             |                 | 0.00 |            |       |
| -2460.93  | 3036.69        | 1.373            | 3038.066     | 471.0 | 13.72 | 2.923       | 3040.989          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| 0.65      | 0.32070        |                  |              |       |       | .013420     | 0.01              |               |                   | 0.528      |             |                 | 0.00 |            |       |
| -2460.28  | 3036.90        | 1.440            | 3038.340     | 471.0 | 13.08 | 2.657       | 3040.997          | 0.00          | 2.226             |            | 5.00        | 25.00           | 0.00 | 0          | 0.00  |
| TRANS STR | 0.00496        |                  |              |       |       | .010115     | 0.33              |               |                   |            |             |                 | 0.00 |            |       |
| -2428.03  | 3037.06        | 2.163            | 3039.223     | 471.0 | 11.78 | 2.154       | 3041.377          | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 7.89      | 0.00501        |                  |              |       |       | .007924     | 0.06              |               |                   | 2.431      |             |                 | 3.00 |            |       |
| -2420.14  | 3037.10        | 2.149            | 3039.249     | 471.0 | 11.88 | 2.191       | 3041.440          | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 40.30     | 0.00501        |                  |              |       |       | .008593     | 0.35              |               |                   | 2.431      |             |                 | 3.00 |            |       |
| -2379.84  | 3037.30        | 2.075            | 3039.377     | 471.0 | 12.46 | 2.410       | 3041.787          | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 34.99     | 0.00501        |                  |              |       |       | .009827     | 0.34              |               |                   | 2.431      |             |                 | 3.00 |            |       |
| -2344.85  | 3037.48        | 2.002            | 3039.479     | 471.0 | 13.07 | 2.651       | 3042.130          | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 31.25     | 0.00501        |                  |              |       |       | .011240     | 0.35              |               |                   | 2.431      |             |                 | 3.00 |            |       |
| -2313.60  | 3037.63        | 1.932            | 3039.566     | 471.0 | 13.70 | 2.916       | 3042.482          | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 28.44     | 0.00501        |                  |              |       |       | .012861     | 0.37              |               |                   | 2.431      |             |                 | 3.00 |            |       |

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WATER SURFACE PROFILE LISTING  
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SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
 COLLECTOR CHANNEL

CHNL.OUT

| STATION  | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL   | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR |
|----------|----------------|------------------|--------------|-------|-------|-------------|-------------------|---------------|-------------------|-------------|-----------------|------|------------|-------|
| L/ELEM   | SO             |                  |              |       |       | SF AVE      | HF                |               |                   | NORM DEPTH  |                 | ZR   |            |       |
| *****    |                |                  |              |       |       |             |                   |               |                   |             |                 |      |            |       |
| -2285.16 | 3037.78        | 1.863            | 3039.639     | 471.0 | 14.37 | 3.207       | 3042.846          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 26.21    | 0.00501        |                  |              |       |       | .014719     | 0.39              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2258.95 | 3037.91        | 1.797            | 3039.705     | 471.0 | 15.07 | 3.528       | 3043.233          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 24.37    | 0.00501        |                  |              |       |       | .016851     | 0.41              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2234.58 | 3038.03        | 1.732            | 3039.762     | 471.0 | 15.81 | 3.881       | 3043.643          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 22.80    | 0.00501        |                  |              |       |       | .019297     | 0.44              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2211.78 | 3038.14        | 1.670            | 3039.814     | 471.0 | 16.58 | 4.269       | 3044.083          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 21.43    | 0.00501        |                  |              |       |       | .022107     | 0.47              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2190.35 | 3038.25        | 1.609            | 3039.861     | 471.0 | 17.39 | 4.696       | 3044.557          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 20.23    | 0.00501        |                  |              |       |       | .025333     | 0.51              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2170.12 | 3038.35        | 1.551            | 3039.904     | 471.0 | 18.24 | 5.165       | 3045.069          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 19.13    | 0.00501        |                  |              |       |       | .029038     | 0.56              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2150.99 | 3038.45        | 1.494            | 3039.943     | 471.0 | 19.13 | 5.682       | 3045.625          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 18.14    | 0.00501        |                  |              |       |       | .033296     | 0.60              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2132.85 | 3038.54        | 1.439            | 3039.979     | 471.0 | 20.06 | 6.250       | 3046.229          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 17.23    | 0.00501        |                  |              |       |       | .038193     | 0.66              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2115.62 | 3038.63        | 1.385            | 3040.012     | 471.0 | 21.04 | 6.875       | 3046.887          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 16.39    | 0.00501        |                  |              |       |       | .043825     | 0.72              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2099.23 | 3038.71        | 1.334            | 3040.043     | 471.0 | 22.07 | 7.563       | 3047.606          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 15.59    | 0.00501        |                  |              |       |       | .050304     | 0.78              |               |                   | 2.431       |                 | 3.00 |            |       |
| -2083.64 | 3038.79        | 1.284            | 3040.071     | 471.0 | 23.15 | 8.319       | 3048.390          | 0.00          | 2.849             | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 14.86    | 0.00501        |                  |              |       |       | .057760     | 0.86              |               |                   | 2.431       |                 | 3.00 |            |       |

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WATER SURFACE PROFILE LISTING

SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1

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| COLLECTOR CHANNEL |                |                  |              |       |       |             |                   |               |                   | CHNL.OUT |             |                 |            |            |       |
|-------------------|----------------|------------------|--------------|-------|-------|-------------|-------------------|---------------|-------------------|----------|-------------|-----------------|------------|------------|-------|
| STATION           | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL   | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |          | HGT/<br>DIA | BASE/<br>ID NO. | ZL         | NO<br>PIER | AVBPR |
| L/ELEM            | SO             |                  |              |       |       | SF AVE      | HF                |               |                   |          |             |                 | NORM DEPTH |            | ZR    |
| *****             |                |                  |              |       |       |             |                   |               |                   |          |             |                 |            |            |       |
| -2068.78          | 3038.86        | 1.235            | 3040.096     | 471.0 | 24.28 | 9.151       | 3049.247          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 14.15             | 0.00501        |                  |              |       |       | .066347     | 0.94              |               |                   | 2.431    |             |                 | 3.00       |            |       |
| -2054.63          | 3038.93        | 1.188            | 3040.120     | 471.0 | 25.46 | 10.066      | 3050.186          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 13.50             | 0.00501        |                  |              |       |       | .076237     | 1.03              |               |                   | 2.431    |             |                 | 3.00       |            |       |
| -2041.13          | 3039.00        | 1.143            | 3040.143     | 471.0 | 26.70 | 11.073      | 3051.216          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 19.61             | 0.09998        |                  |              |       |       | .079307     | 1.56              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -2021.52          | 3040.96        | 1.161            | 3042.121     | 471.0 | 26.20 | 10.656      | 3052.777          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 33.07             | 0.09998        |                  |              |       |       | .072080     | 2.38              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1988.45          | 3044.27        | 1.207            | 3045.474     | 471.0 | 24.98 | 9.686       | 3055.160          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 22.38             | 0.09998        |                  |              |       |       | .062739     | 1.40              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1966.07          | 3046.50        | 1.255            | 3047.759     | 471.0 | 23.81 | 8.806       | 3056.565          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 16.57             | 0.09998        |                  |              |       |       | .054627     | 0.91              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1949.50          | 3048.16        | 1.304            | 3049.465     | 471.0 | 22.71 | 8.006       | 3057.471          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 12.92             | 0.09998        |                  |              |       |       | .047581     | 0.61              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1936.58          | 3049.45        | 1.354            | 3050.807     | 471.0 | 21.65 | 7.278       | 3058.085          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 10.41             | 0.09998        |                  |              |       |       | .041459     | 0.43              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1926.17          | 3050.49        | 1.407            | 3051.901     | 471.0 | 20.64 | 6.616       | 3058.517          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 8.58              | 0.09998        |                  |              |       |       | .036137     | 0.31              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1917.59          | 3051.35        | 1.461            | 3052.812     | 471.0 | 19.68 | 6.015       | 3058.827          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 7.17              | 0.09998        |                  |              |       |       | .031508     | 0.23              |               |                   | 1.079    |             |                 | 3.00       |            |       |
| -1910.42          | 3052.07        | 1.517            | 3053.585     | 471.0 | 18.76 | 5.468       | 3059.053          | 0.00          | 2.849             |          | 5.00        | 12.00           | 3.00       | 0          | 0.00  |
| 6.06              | 0.09998        |                  |              |       |       | .027482     | 0.17              |               |                   | 1.079    |             |                 | 3.00       |            |       |

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WATER SURFACE PROFILE LISTING  
 SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
 COLLECTOR CHANNEL



| STATION  | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q     | VEL   | VEL<br>HEAD | CHNL.OUT<br>ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |            | HGT/<br>DIA | BASE/<br>ID NO. | ZL   | NO<br>PIER | AVBPR |
|----------|----------------|------------------|--------------|-------|-------|-------------|-------------------------------|---------------|-------------------|------------|-------------|-----------------|------|------------|-------|
| L/ELEM   | SO             |                  |              |       |       | SF AVE      | HF                            |               |                   | NORM DEPTH |             |                 | ZR   |            |       |
| *****    |                |                  |              |       |       |             |                               |               |                   |            |             |                 |      |            |       |
| -1904.36 | 3052.67        | 1.574            | 3054.248     | 471.0 | 17.89 | 4.971       | 3059.219                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 5.17     | 0.09998        |                  |              |       |       | .023978     | 0.12                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1899.19 | 3053.19        | 1.634            | 3054.824     | 471.0 | 17.06 | 4.519       | 3059.343                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 4.42     | 0.09998        |                  |              |       |       | .020928     | 0.09                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1894.77 | 3053.63        | 1.695            | 3055.327     | 471.0 | 16.27 | 4.108       | 3059.435                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 3.80     | 0.09998        |                  |              |       |       | .018271     | 0.07                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1890.97 | 3054.01        | 1.758            | 3055.770     | 471.0 | 15.51 | 3.735       | 3059.505                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 3.26     | 0.09998        |                  |              |       |       | .015956     | 0.05                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1887.71 | 3054.34        | 1.823            | 3056.161     | 471.0 | 14.79 | 3.395       | 3059.556                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 2.81     | 0.09998        |                  |              |       |       | .013940     | 0.04                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1884.90 | 3054.62        | 1.890            | 3056.509     | 471.0 | 14.10 | 3.086       | 3059.595                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 2.41     | 0.09998        |                  |              |       |       | .012181     | 0.03                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1882.49 | 3054.86        | 1.960            | 3056.820     | 471.0 | 13.44 | 2.806       | 3059.626                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 2.05     | 0.09998        |                  |              |       |       | .010648     | 0.02                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1880.44 | 3055.07        | 2.031            | 3057.096     | 471.0 | 12.82 | 2.551       | 3059.647                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 1.75     | 0.09998        |                  |              |       |       | .009310     | 0.02                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1878.69 | 3055.24        | 2.105            | 3057.345     | 471.0 | 12.22 | 2.319       | 3059.664                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 1.47     | 0.09998        |                  |              |       |       | .008141     | 0.01                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1877.22 | 3055.39        | 2.180            | 3057.567     | 471.0 | 11.65 | 2.108       | 3059.675                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 1.23     | 0.09998        |                  |              |       |       | .007122     | 0.01                          |               |                   | 1.079      |             |                 | 3.00 |            |       |
| -1875.99 | 3055.51        | 2.258            | 3057.768     | 471.0 | 11.11 | 1.916       | 3059.684                      | 0.00          | 2.849             |            | 5.00        | 12.00           | 3.00 | 0          | 0.00  |
| 1.00     | 0.09998        |                  |              |       |       | .006232     | 0.01                          |               |                   | 1.079      |             |                 | 3.00 |            |       |

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WATER SURFACE PROFILE LISTING  
 SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
 COLLECTOR CHANNEL

| STATION | INVERT<br>ELEV | DEPTH<br>OF FLOW | W.S.<br>ELEV | Q | VEL | VEL<br>HEAD | ENERGY<br>GRD.EL. | SUPER<br>ELEV | CRITICAL<br>DEPTH |  | HGT/<br>DIA | BASE/<br>ID NO. | ZL | NO<br>PIER | AVBPR |
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|--|-------------|-----------------|----|------------|-------|
|---------|----------------|------------------|--------------|---|-----|-------------|-------------------|---------------|-------------------|--|-------------|-----------------|----|------------|-------|

| CHNL.OUT |         |        |          |       |       |         |          |      |       |            |      |       |      |   |      |
|----------|---------|--------|----------|-------|-------|---------|----------|------|-------|------------|------|-------|------|---|------|
| L/ELEM   | SO      | SF AVE |          |       |       | HF      |          |      |       | NORM DEPTH |      |       | ZR   |   |      |
| *****    |         |        |          |       |       |         |          |      |       |            |      |       |      |   |      |
| -1874.99 | 3055.61 | 2.338  | 3057.948 | 471.0 | 10.59 | 1.742   | 3059.690 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 0.80     | 0.09998 |        |          |       |       | .005455 | 0.00     |      |       | 1.079      |      |       | 3.00 |   |      |
| -1874.19 | 3055.69 | 2.421  | 3058.111 | 471.0 | 10.10 | 1.584   | 3059.695 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 350.62   | 0.00509 |        |          |       |       | .005092 | 1.79     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1523.57 | 3057.47 | 2.421  | 3059.895 | 471.0 | 10.10 | 1.584   | 3061.479 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 192.77   | 0.00509 |        |          |       |       | .004848 | 0.93     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1330.80 | 3058.45 | 2.485  | 3060.940 | 471.0 | 9.74  | 1.473   | 3062.413 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 61.09    | 0.00509 |        |          |       |       | .004317 | 0.26     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1269.71 | 3058.77 | 2.572  | 3061.338 | 471.0 | 9.29  | 1.339   | 3062.677 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 24.80    | 0.00509 |        |          |       |       | .003781 | 0.09     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1244.91 | 3058.89 | 2.662  | 3061.554 | 471.0 | 8.86  | 1.218   | 3062.772 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 10.57    | 0.00509 |        |          |       |       | .003312 | 0.04     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1234.34 | 3058.95 | 2.753  | 3061.699 | 471.0 | 8.44  | 1.107   | 3062.806 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |
| 2.79     | 0.00509 |        |          |       |       | .002901 | 0.01     |      |       | 2.421      |      |       | 3.00 |   |      |
| -1231.55 | 3058.96 | 2.849  | 3061.809 | 471.0 | 8.05  | 1.005   | 3062.814 | 0.00 | 2.849 |            | 5.00 | 12.00 | 3.00 | 0 | 0.00 |

SKYE CANYON DETENTION BASIN, OLY1401.004  
 TECHNICAL DRAINAGE STUDY - CCRFCD RTC #1  
 COLLECTOR CHANNEL

|          |     |   |   |   |   |   |   |   |   |   |   |   |   |    |
|----------|-----|---|---|---|---|---|---|---|---|---|---|---|---|----|
| -2494.58 | .IW | C | H | E |   |   |   |   |   |   |   |   |   | R  |
| -2484.48 | .   | I | W | C | H | E |   |   |   |   |   |   |   | R  |
| -2474.37 | .   |   | I | W | C | H | E |   |   |   |   |   |   | R  |
| -2464.27 | .   |   |   | I | W | C | H | E |   |   |   |   |   | R  |
| -2454.16 | .   |   |   |   | I | W | C | H | E |   |   |   |   | R  |
| -2444.06 | .   |   |   |   |   | I | W | C | H | E |   |   |   | R  |
| -2433.95 | .   |   |   |   |   |   | I | W | C | H | E |   |   | R  |
| -2423.85 | .   |   |   |   |   |   |   | I | W | C | H | E |   | R  |
| -2413.75 | .   |   |   |   |   |   |   |   | I | W | C | H | E | R  |
| -2403.64 | .   |   |   |   |   |   |   |   |   | I | W | C | H | R  |
| -2393.54 | .   |   |   |   |   |   |   |   |   |   | I | W | C | R  |
| -2383.43 | .   |   |   |   |   |   |   |   |   |   |   | I | W | R  |
| -2373.33 | .   |   |   |   |   |   |   |   |   |   |   |   | I | R  |
| -2363.22 | .   |   |   |   |   |   |   |   |   |   |   |   |   | R  |
| -2353.12 | .   |   |   |   |   |   |   |   |   |   |   |   |   | R  |
| -2343.02 | .   |   |   |   |   |   |   |   |   |   |   |   |   | R  |
| -2332.91 | .   |   |   |   |   |   |   |   |   |   |   |   |   | TX |

CHNL.OUT

[illegible]

CHNL.OUT

[illegible]



CHNL.OUT

N O T E S

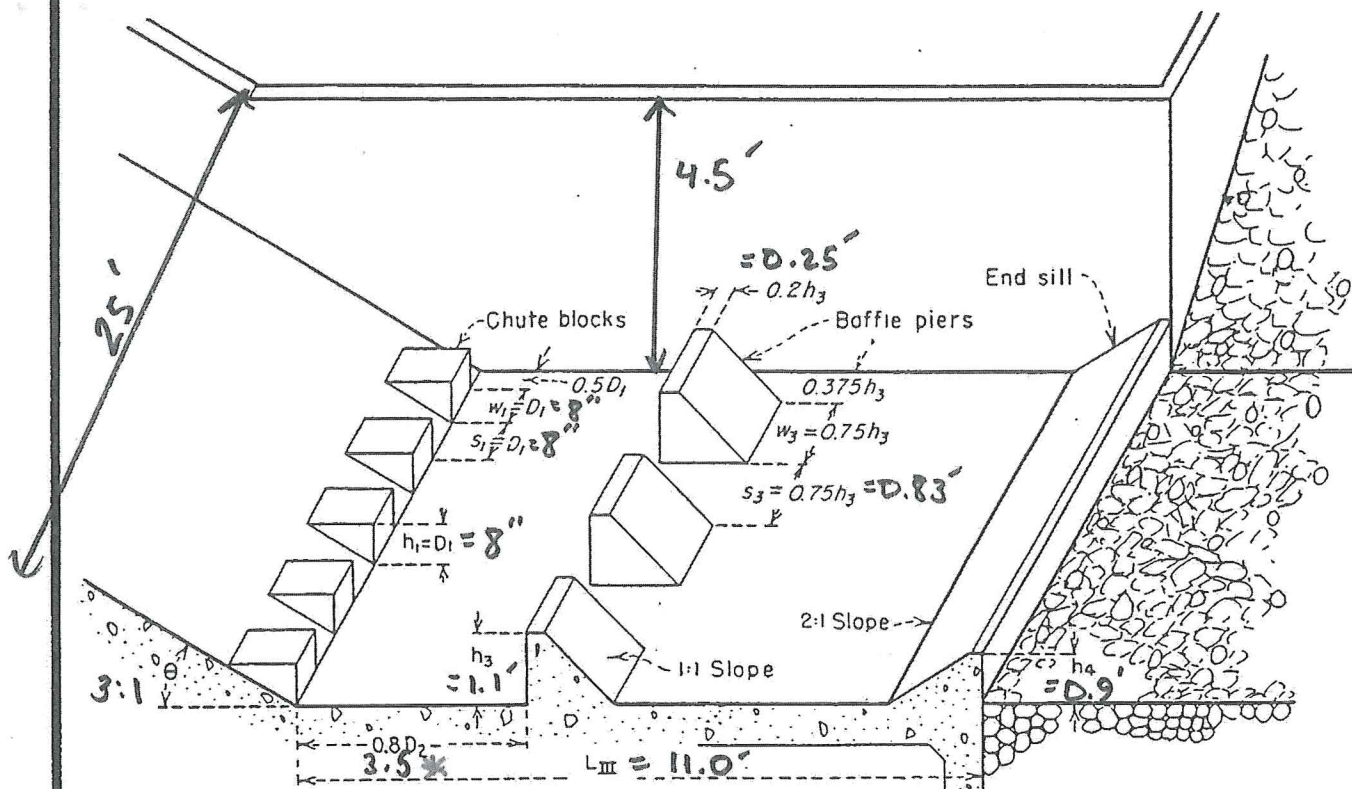
1. GLOSSARY

I = INVERT ELEVATION  
C = CRITICAL DEPTH  
W = WATER SURFACE ELEVATION  
H = HEIGHT OF CHANNEL  
E = ENERGY GRADE LINE  
X = CURVES CROSSING OVER  
B = BRIDGE ENTRANCE OR EXIT  
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY?

# SHORT STILLING BASIN (USBR TYPE III)

REFERENCED FROM ADDENDUM #1 (12/24/14)



$$D_1 = 0.68' = 8''$$

$$D_2 = 4.4'$$

$$L = 11.0'$$

$$h_3 = 1.1'$$

$$h_4 = 0.9'$$

UTILIZED TO DETERMINE STARTING WSE

→ INCREASED TO 13.5-FT (PER \*)

NOTE: See Figure 1109 for design data

\* INCREASED TO 6-FT FOR MAINTENANCE ACCESS,  
AS REQUESTED BY CLV

| Revision | Date |
|----------|------|
|          |      |
|          |      |
|          |      |
|          |      |

## Debris Tower Dewatering Calculations

## Dewatering Time Calculation

**Project:** Skye Canyon Detention Basin No. 1  
**Date:** 10/7/2015

| (1)<br>Elevation<br>(Feet) | Storage<br>Volume (Cu.<br>Ft.) | Difference in<br>Storage<br>Volumes | (4)<br>Discharge<br>(cfs) | Average<br>Discharge<br>(cfs) | (6)<br>Time<br>(Hrs.) | (7)<br>Accumulated<br>Time (Hrs.) |
|----------------------------|--------------------------------|-------------------------------------|---------------------------|-------------------------------|-----------------------|-----------------------------------|
| 3025.5                     | 162159                         | 0                                   | 9.88                      | 0.00                          | 0.00                  | 0.00                              |
| 3025.0                     | 120608                         | 41551                               | 2.72                      | 2.72                          | 4.24                  | 4.24                              |
| 3024.5                     | 76670                          | 43938                               | 2.24                      | 2.48                          | 4.92                  | 9.16                              |
| 3024.0                     | 32731                          | 43939                               | 1.68                      | 1.96                          | 6.23                  | 15.39                             |
| 3023.6                     | 16366                          | 16365                               | 0.96                      | 1.32                          | 3.44                  | 18.84                             |
| 3022.6                     | 0                              | 16366                               | 0.00                      | 0.48                          | 9.47                  | 28.31                             |

Debris storage area drains in 28 hours which is less than maximum allowed 7 days.  
**Debris Tower Acceptable.**

Row 1 @ Elevation 3022.62-ft (4 - 3" PVC Openings)  
Row 2 @ Elevation 3023.62-ft (4 - 3" PVC Openings)  
Row 3 @ Elevation 3025.00-ft (Beehive Grate)

| Elevation (ft) | Row 1 (cfs) | Row 2 (cfs) | Row 3 (cfs) | Q Total (cfs) |
|----------------|-------------|-------------|-------------|---------------|
| 3022.6         | 0.00        | 0.00        | 0.00        | 0.00          |
| 3023.0         | 0.52        | 0.00        | 0.00        | 0.52          |
| 3023.6         | 0.96        | 0.00        | 0.00        | 0.96          |
| 3024.0         | 1.16        | 0.52        | 0.00        | 1.68          |
| 3024.5         | 1.36        | 0.88        | 0.00        | 2.24          |
| 3025.0         | 1.56        | 1.16        | 0.00        | 2.72          |
| 3025.5         | 1.72        | 1.36        | 6.80        | 9.88          |



# Debris Tower Orifice Calculator (3-inch PVC Opening)

## Rating Table for Circular Orifice

| Project Description |                        |
|---------------------|------------------------|
| Worksheet           | Debris Tower - Level 1 |
| Type                | Circular Orifice       |
| Solve For           | Discharge              |

| Input Data            |         |
|-----------------------|---------|
| Centroid Elevation    | 0.13 ft |
| Tailwater Elevation   | 0.00 ft |
| Discharge Coefficient | 0.65    |
| Diameter              | 3.0 in  |

| Attribute                | Minimum | Maximum | Increment |
|--------------------------|---------|---------|-----------|
| Headwater Elevation (ft) | 0.00    | 2.90    | 0.10      |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|--------------------------|-----------------|-----------------|
| 0.00                     | N/A             | N/A             |
| 0.10                     | N/A             | N/A             |
| 0.20                     | 0.07            | 1.38            |
| 0.30                     | 0.11            | 2.15            |
| 0.40                     | 0.13            | 2.71            |
| 0.50                     | 0.16            | 3.17            |
| 0.60                     | 0.18            | 3.57            |
| 0.70                     | 0.19            | 3.94            |
| 0.80                     | 0.21            | 4.27            |
| 0.90                     | 0.22            | 4.58            |
| 1.00                     | 0.24            | 4.86            |
| 1.10                     | 0.25            | 5.14            |
| 1.20                     | 0.26            | 5.39            |
| 1.30                     | 0.28            | 5.64            |
| 1.40                     | 0.29            | 5.88            |
| 1.50                     | 0.30            | 6.10            |
| 1.60                     | 0.31            | 6.32            |
| 1.70                     | 0.32            | 6.53            |
| 1.80                     | 0.33            | 6.74            |
| 1.90                     | 0.34            | 6.94            |
| 2.00                     | 0.35            | 7.13            |
| 2.10                     | 0.36            | 7.32            |
| 2.20                     | 0.37            | 7.50            |
| 2.30                     | 0.38            | 7.68            |
| 2.40                     | 0.39            | 7.86            |
| 2.50                     | 0.39            | 8.03            |
| 2.60                     | 0.40            | 8.19            |
| 2.70                     | 0.41            | 8.36            |
| 2.80                     | 0.42            | 8.52            |
| 2.90                     | 0.43            | 8.68            |

**Curb Opening Hydraulics Calculator**

**Modified Manning Calculators**

**Weir Orifice Calculator**

**R-4999 Vane Trench Grate Hydraulics Calculator**

**Neenah Grate Information**

**Inlet Spacing Calculator**

## Weir & Orifice Calculator

The Weir and Orifice Calculator is used to determine the inlet capacity in sag (ponding) conditions by use of the Weir and Orifice equations. Knowing this information will allow you to select the proper grate type and size for your specific job or project.

### Weir Flow Calculations

Weir Equation:  $Q = 3.3P(h)^{1.5}$

- **Q** = Capacity in CFS
- **P** = Feet perimeter
- **h** = Head in feet
- [Weir Information](#)

### Orifice Flow Calculations

Orifice Flow Equation:  $Q = 0.6A \sqrt{2gh}$

- **Q** = Capacity in CFS

- **A** = Free open area of grate in sq. ft.
- **g** = 32.2 (feet per sec/sec)
- **h** = Head in feet
- [Orifice Information](#)

## Instructions:

1. Select a catalog number (will automatically fill in Open Area and Perimeter) or enter your own values
2. Enter head value
3. Click "calculate"

The results will determine automatically if your situation falls into a Weir, Transitional or Orifice flow. Additionally, Neenah grates which fall within the parameters chosen will appear below the calculator.

### Catalog Number and Grate Type:

R-4346: Beehive ▼

Feet perimeter (P):

8.6

Head in feet (h):

.5

Free open area in sq. ft. (A):

2

Calculate

Weir capacity in cfs:

Transitional flow in cfs:

Orifice capacity in cfs:

6.8

Based on orifice flow, the following grates match the criteria you entered.

| Catalog Number                    | Grate Type |
|-----------------------------------|------------|
| <u><a href="#">R-1792-GG</a></u>  | G          |
| <u><a href="#">R-1879-A6G</a></u> | A or C     |
| <u><a href="#">R-2557</a></u>     | G          |
| <u><a href="#">R-2558</a></u>     | G          |
| <u><a href="#">R-2560-E2</a></u>  | Beehive    |
| <u><a href="#">R-2561</a></u>     | Beehive    |
| <u><a href="#">R-3357-A</a></u>   | K          |
| R-3393-A                          | K          |
| <u><a href="#">R-3503-B</a></u>   | M          |

| Catalog Number  | Grate Type |
|-----------------|------------|
| R-3511          | M          |
| R-3516-1        | M          |
| <u>R-4215-A</u> | Beehive    |
| <u>R-4342</u>   | Beehive    |
| R-4345          | Beehive    |
| R-4346          | Beehive    |
| R-4692-A        | D          |
| R-4730          | A          |
| R-4732          | A          |
| R-4825-B        | C          |
| R-4852          | C          |
| R-4855          | A          |
| R-4977-2        | A          |
| R-4977-2        | B          |

For additional information regarding Neenah Inlet Grate Capacities, please contact Ryan Bonell P.E., at (920) 729.3463 or email at [ryan.bonell@neenahenterprises.com](mailto:ryan.bonell@neenahenterprises.com), or Joe Falle P.E., at (920)729.3653 or email at [joseph.falle@neenahenterprises.com](mailto:joseph.falle@neenahenterprises.com).

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## APPENDIX E

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### Response to Comment No. 8 – Inflow Velocities (Adjusted 4:1 H:V Slope Hydraulic Calculations)



# OFF4 Lateral Inflow Channel

## Worksheet for Trapezoidal Channel

| Project Description |                           |
|---------------------|---------------------------|
| Worksheet           | OFF4 Inflow Channel (DB1) |
| Flow Element        | Trapezoidal Channel       |
| Method              | Manning's Formula         |
| Solve For           | Channel Depth             |

| Input Data           |            |
|----------------------|------------|
| Mannings Coefficient | 0.020      |
| Channel Slope        | 25.00 %    |
| Left Side Slope      | 3.00 H : V |
| Right Side Slope     | 3.00 H : V |
| Bottom Width         | 26.00 ft   |
| Discharge            | 84.00 cfs  |

| Results          |                     |
|------------------|---------------------|
| Depth            | 0.23 ft             |
| Flow Area        | 6.1 ft <sup>2</sup> |
| Wetted Perimeter | 27.46 ft            |
| Top Width        | 27.38 ft            |
| Critical Depth   | 0.67 ft             |
| Critical Slope   | 0.69 %              |
| Velocity         | 13.68 ft/s          |
| Velocity Head    | 2.91 ft             |
| Specific Energy  | 3.14 ft             |
| Froude Number    | 5.09                |
| Flow Type        | Supercritical       |

**OFF5 Lateral Inflow Channel**  
**Worksheet for Trapezoidal Channel**

| Project Description |                           |
|---------------------|---------------------------|
| Worksheet           | OFF5 Inflow Channel (DB1) |
| Flow Element        | Trapezoidal Channel       |
| Method              | Manning's Formula         |
| Solve For           | Channel Depth             |

| Input Data           |            |
|----------------------|------------|
| Mannings Coefficient | 0.020      |
| Channel Slope        | 25.00 %    |
| Left Side Slope      | 3.00 H : V |
| Right Side Slope     | 3.00 H : V |
| Bottom Width         | 75.00 ft   |
| Discharge            | 236.00 cfs |

| Results          |                      |
|------------------|----------------------|
| Depth            | 0.23 ft              |
| Flow Area        | 17.2 ft <sup>2</sup> |
| Wetted Perimeter | 76.44 ft             |
| Top Width        | 76.36 ft             |
| Critical Depth   | 0.67 ft              |
| Critical Slope   | 0.67 %               |
| Velocity         | 13.73 ft/s           |
| Velocity Head    | 2.93 ft              |
| Specific Energy  | 3.16 ft              |
| Froude Number    | 5.10                 |
| Flow Type        | Supercritical        |

## APPENDIX F

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### Response to Comment No. 19 – Trash Rack Capacity (50% Clogging Factor Flow Calculation)

## TOTAL GRATE SURFACE AREA

\* 8-FT WIDTH

\* 7-FT LENGTH

$$\Sigma 56 \text{ FT}^2$$

## TOTAL GRATE OF PIPE

\*  $\frac{5''}{12} = 0.42\text{-FT}$  WIDTH

\* 7-FT LENGTH

\* 7 PIPES

$$\Sigma 20.6 \text{ FT}^2$$

## TOTAL OPEN AREA

$$56 - 20.6 \text{ FT}^2 = 35.4 \text{ FT}^2$$

@ 50% CLOGGING

$$\Sigma 17.7 \text{ FT}^2$$

MAX. FLOW @ 5 FT/S

$$Q = VA = 5(17.7)$$

$$Q = 88.5 \text{ CFS}$$

$$\underline{\underline{Q_{\text{OUT}} = 71 \text{ CFS OR}}}$$