

TECHNICAL DRAINAGE STUDY

Skye Canyon

Phase 3 Infrastructure

City of Las Vegas, Nevada

Job No.: OLY1602.000

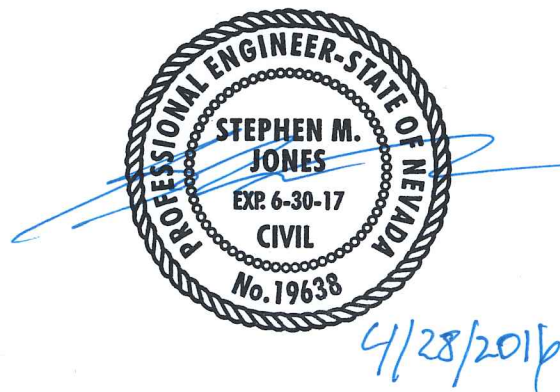
Date: April 2016

Prepared By:

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Assisted by: Cameron Bencini, EI

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Skye Canyon – Phase 3 Infrastructure Date: April 2016
 Location of Development: a) Descriptive (Cross Streets): North/South: Grand Canyon Drive
East/West: Skye Canyon Park Drive
 b) Section: 7 Township: 19 South Range: 60 East
 c) APN: 125-07-201-003

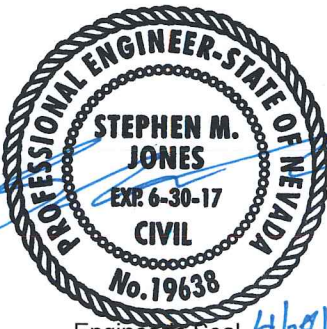
Name of Owner/Developer: M F Land, LLC / Ninety-Five Management, LLC
 Telephone No.: 702-220-6565 Fax No.: 702-220-6566 E-mail Address: bwilliamson@olympiacompanies.com
 Address: 11411 Southern Highlands Parkway, Suite 300; Las Vegas, NV 89141

Contact Person – Name: Steve Jones, P.E. Telephone No.: 702-284-5300
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 Firm: Slater Hanifan Group
 Address: 5740 S. Arville Street, Suite 216; Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐ Rezoning	☐ Subdivision Map	☐ Clearing and grading Only
☐ Parcel Map	☐ Planned Unit Development	☒ Other (Please specify below)
☐ Large Parcel Map	☐ Building Permit	☐ Roadway & Storm Drain Infrastructure

1. Total Owned Land Area: At Site: 37.5 Acres Being Developed/Disturbed: 3.4 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.): Roadway
5. Approximate upstream land area which drains to the subject site: 1.6 sq. miles +/-
6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: Master Drainage Study for Kyle Canyon (SHG, DS4420)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: East into ephemeral wash that crosses Grand Canyon approximately 700-ft north of Skye Canyon Park Drive
8. Briefly describe your proposed schedule for the subject project: Phase 3 is divided into 2 phases:
Roadways – Infrastructure TDS; Commercial Subdivision – Onsites TDS

 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		
	Local Entity File No. _____	Revision	Date
REFERENCE: <u>SHG Job No. OLY1602.000</u>		STANDARD FORM 1	
Updated 05/01/2008			

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL		
DRAINAGE SUBMITTAL CHECKLIST		
Project Name: Skye Canyon – Phase 3 Infrastructure		Map ID:
Firm Name: Slater Hanifan Group (SHG)		
Address: 5740 S. Arville St., Suite 216		
City: Las Vegas	State: Nevada	Zip: 89118
Phone Number: 702-284-5300		Fax Number: 702-284-5399
Property Owner/Developer: M F Land, LLC / Ninety-Five Management, LLC		
Address: 11411 Southern Highlands Parkway, Suite 300		
City: Las Vegas	State: NV	Zip: 89141
Reviewed By:	Date Received:	Date Accepted for Review:
The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL). This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use. If items are not applicable for the subject site, provide N/A.		
I. GENERAL REQUIREMENT:		
Yes	No	
X		Design Manual Standard Form 1 with the engineer's seal and signature.
X		Design Manual Standard Form 4 .
X		2 copies of the 24" x 36" Drainage Plan.
	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.
Reference:		STANDARD FORM 2

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HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☐	☐	N/A Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood Walls with 8-inch concrete masonry unit.
☐	☐	N/A Building and/or lot numbers.
☐	☐	N/A Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
☐	☐	N/A Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
☐	☐	N/A For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
☐	☐	N/A Appropriately elevated "humps" 6 inches above the 100-year water surface elevation at site accesses where the intent is to protect the site from the Q_{100} flows.
☒	☐	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

IV. HYDROLOGIC ANALYSIS

Yes	No	
☒	☐	Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
☒	☐	Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	Use of correct precipitation values in and around the McCarran Airport Rainfall Area.
☒	☐	A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	A summary table of storm water flows showing basin area, Q_{10} and Q_{100} for both individual basins and combined basin flows, where acceptable.
☒	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
X		Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
X		Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
X		A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
	N/A	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, which ever is greater.
	N/A	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub- and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
X		Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
X		Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
X		The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
-	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
X	-	Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions. Tentative Map to be obtained prior to TDS approval.
X	-	An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X	-	(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X	-	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X	-	Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
X	-	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
-	N/A	All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X	-	Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
-	N/A	Back of lot elevations and lot drainage pattern for all lots including common lots.
-	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X	-	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
-	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
-	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
-	N/A	Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
-	N/A	Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
-	N/A	The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
-	N/A	Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
-	N/A	Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
-	N/A	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
-	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

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1 INTRODUCTION

1.1 Project Overview & Study Purpose

Ninety-Five Management, LLC is proposing to install roadway and drainage infrastructure intended to support the development of a proposed commercial site within the Skye Canyon master planned community. The proposed infrastructure improvements are identified on improvement plans as *Skye Canyon Phase 3* (hereinafter referred to as Phase 3). The commercial site that the Phase 3 infrastructure surrounds is hereinafter referred to as the Commercial Site. The proposed Phase 3 improvements include the following areas:

- Grand Canyon Drive and Skye Park Drive, north of Skye Canyon Park Drive.
- A cul-de-sac roadway, identified as “Street D”, that junctions with Skye Park Drive at the northern end of the proposed infrastructure improvements.
- Grading and drainage facility installation within the proposed infrastructure improvements.

The overall Skye Canyon property has been master planned, and *Master Drainage Study Update #3 for Skye Canyon* has been submitted to the City of Las Vegas for review (CLV #DS4420-3). Note that the majority of the upstream master drainage infrastructure that provides the shadow of protection for Phase 3 is not installed currently; therefore, the area identified as Phase 3 has been proposed with interim drainage infrastructure and facilities intended to perpetuate existing condition drainage patterns through its improvements and not adversely impact the downstream properties. However, note that the Master Drainage Study has been utilized in preparing this study to show its impacts on the proposed improvements.

This study intends to provide a detailed hydrologic and hydraulic analysis for the proposed improvements. Drainage facilities have been proposed in order to protect the property from onsite and offsite runoff in accordance with local storm water criteria. Existing storm water facilities are identified and this study intends to show conformance to each existing facility’s design.

1.2 Description of Project

The Phase 3 project is located within Township 19 South, Range 60 East and Section 7, and consists of the perimeter roadways surrounding APN 125-07-201-003. A location map identifying the site in relation to major streets in the vicinity has been prepared as Exhibit A, included in Appendix A.

Note that the current parcel 125-07-201-003 has been divided based on the previous master land use plan, but the new master land use plan currently under review with the Development Agreement for the overall property divides this parcel further. A new tentative map is proposed to divide 125-07-201-003 into two (2) parcels, shown as General Commercial Parcel 2.37 and the remainder for future mapping. A follow-up commercial subdivision map will be recorded for the Parcel 2.37 to sub-divide ownership of the onsite commercial development. The Phase 3 improvements proposed by this study are intended to be the perimeter roadways for the commercial Parcel 2.37.

Note that the proposed roadways meet the standards of the typical sections included in the under review Development Agreement. The onsite parcel is to remain in existing state after completion of the proposed roadways.

1.3 FEMA Flood Zone Designation

The Phase 3 boundary has been delineated on current FEMA FIRM Panel Maps 32003C1735E, dated September 27, 2002, as Exhibit B included in Appendix A. Per the FIRM Panel, the project site is located within a FEMA designated Zone 'X', or outside the 500-year floodplain. A Zone 'X' is located outside a FEMA designated Special Flood Hazard Area (SFHA).

1.4 CCRFCD Facility Information

Per the Clark County Regional Flood Control District 2013 Las Vegas Valley Master Plan Update (Reference 1), the Phase 3 Site is not adjacent to or traversed by any existing or proposed CCRFCD master planned facility. Exhibit C identifying the project site on the MPU figure has been included in Appendix A for reference.

Note that the future MPU Amendment associated with the under review Master Drainage Study has no impacts on Phase 3. Any revisions of CCRFCD MPU regional alignments are outside of the influence of the proposed improvements.

1.5 Referenced Documents

The following documents have been utilized in preparation of this study. All referenced studies and improvement plans have been reviewed and determined acceptable for reference.

- *Master Drainage Study Update #3 for Skye Canyon*, prepared by Slater Hanifan Group (hereinafter referred to as the Master Drainage Study, Reference 4), conceptually presents hydrologic drainage patterns and the associated master drainage infrastructure required for the current master land use plan for the Skye Canyon property. The Master Drainage Study has been utilized because it has planned development within the upstream tributary watershed that has been referenced by this study. Relevant reference material from the Master Drainage Study has been included in Appendix H.
- *Technical Drainage Study for Skye Canyon Phase 1 Infrastructure*, prepared by Slater Hanifan Group (hereinafter referred to as the Phase 1 Study, Reference 5), technically designed Skye Canyon Park Drive adjacent to the proposed Phase 3 roadways and future onsite commercial development. The Phase 1 Study also installed an existing RCB storm drain within the alignment of the proposed Grand Canyon Drive roadway, which requires modification due to the curvature in the roadway alignment. Relevant reference material from the Phase 1 Study has been included in Appendix I.

1.6 Clean Water Act Permitting

The large natural washes that traverse across the Phase 3 site carrying flow rates from Concentration Points CPS and CPN, confluence at Concentration Point WC9, have been identified as ephemeral washes subject to jurisdiction under Clean Water Act permits.

A current active 401 permit filed with NDEP and 404 permit filed with USACE shows a planned fill activity in the area of the Phase 3 improvements. Coordination will continue with NDEP to fulfill 401 permit requirements as construction begins the fill of the ephemeral washes. A copy of the 401 and 404 permits has been included in Appendix K.

2 METHODOLOGY

2.1 Compliance

The methodologies utilized in the preparation of this study are in compliance with the Clark County Regional Flood Control District's Hydrologic and Drainage Design Manual (CCRFCD Manual, Reference 2).

2.2 Hydrologic Modeling

Modeling:

The SCS Unit Hydrograph Method (SCS Method) was utilized to determine peak flow rates. The SCS Method utilizes precipitation, drainage area, curve number and lag time parameters to determine peak flow rates. The SCS Method routine within the U.S. Army Corp of Engineers HEC-1 Flood Hydrograph Package program was utilized to model the drainage basins analyzed by this study.

Precipitation:

Phase 3 is located outside the McCarran Rainfall Area, as determined from the CCRFCD Manual Figure 513. Precipitation values of 2.93 inches and 1.61 inches during the 100-year and 10-year storm events, respectively, have been referenced from the Master Drainage Study. Depth-Area reduction factors (DARF) have been referenced from CCRFCD Manual Table 502 for pertinent drainage areas. Additionally, an SDN3 design storm distribution referenced from Table 503 of the CCRFCD Manual is used. Relevant tables and figures from the CCRFCD Manual have been included in Appendix B.

Note that several of the offsite basins included in this study have been referenced and utilize a 3.00 inches precipitation value for the 100-year storm event. These referenced basins extend west of Skye Village Road.

Note that only the proposed and ultimate condition hydrologic models have been analyzed with a 10-year storm event because it has design impacts on a proposed street (Grand Canyon Drive) that requires 10-year hydraulic flow criteria.

Soils:

The SCS curve number loss rate methodology was utilized to approximate infiltration for the drainage basins. Per the SCS Soil Survey of the Las Vegas Valley Area (Soil Survey,

Reference 3), this study's drainage basins lie within the following soil types delineated on Exhibit D, included in Appendix A.

- Soil 155 – Cave gravelly fine sandy loam, 4 to 15 percent slopes. This soil is composed of 5% HSG 'A', 5% HSG 'B' and 90% HSG 'D'.
- Soil 191 – Dalian very cobbly fine sandy loam, 2 to 8 percent slopes. This soil is composed of 5% HSG 'A', 85% HSG 'B' and 10% HSG 'D'.
- Soil 400 – Tencee very gravelly fine sandy loam, 2 to 8 percent slopes. This soil is composed of 10% HSG 'B' and 90% HSG 'D'.

Curve Number:

Several subbasins have been referenced from the Master Drainage Study and Phase 1 Study. The curve numbers utilized from these basins are accepted for reference.

Several new subbasins have been analyzed in this study, with land uses as identified below:

- Undeveloped areas have been analyzed with a land use corresponding to "desert shrub – poor condition".
- As a result of a size-able landscaped common lot behind curb-line present within each roadway basin, a composite curve number associated with "roadway" and "natural desert landscaping" has been utilized.
- The future commercial development within the Phase 3 area has utilized a land use corresponding to "commercial". This subbasin and curve number has been referenced from the Master Drainage Study.

Composite curve number computations utilizing the associated soil group percentages and CCRFCD Manual curve number tables are included in Appendix B for reference.

Lag Time:

The lag time is defined as the time measured from the center of mass of effective rainfall to the time to peak of the outflow hydrograph. The lag time is related to the time of concentration as 0.6 times the time of concentration. The time of concentration is defined as the time required for runoff to flow from the hydraulically most distant point of a basin to the outlet point of the basin. Standard Form 4, as outlined in the CCRFCD Manual, was utilized to determine the lag times for basins modeled. The lag time computations have been included in Appendix B.

2.3 Hydraulic Modeling & Criteria

Street Flow:

Street flows have been analyzed utilizing the FlowMaster Version 7.0 software by Haestad Methods. In accordance with the CCRFCD Manual, the depth times velocity factor ($D \times V$) for street flow for the minor 10-year storm event must be less than or equal to 6, with a maximum depth of 1-ft. The depth times velocity factor ($D \times V$) for street flow for the major 100-year storm event must be less than or equal to 8, with a maximum depth of 2-ft.

Additionally, Grand Canyon Drive is a street with a right-of-way classified as a major collector or larger are subject to additional 10-year dry lane criteria. A 12-ft wide dry lane (excluding center turning lane) must be provided during the 10-year storm event.

Curb Inlets:

Curb inlets have been assessed using an in-house computation spreadsheet which utilizes equations outlined in Section 805 of the CCRFCD Manual, which includes a 50% clogging factor in determining sizes.

Storm Drains:

The hydraulic analysis for the proposed storm drain has been performed utilizing the Water Surface and Pressure Gradient (WSPG) Hydraulic Analysis System software by the Los Angeles County Department of Public Works. As outlined in the CCRFCD Manual, storm drain facilities are designed to maintain its hydraulic gradient line (HGL) minimum 1-ft below above finished grade and limit the flow velocities in the facility to less than 25 ft/s.

Additionally several storm drains proposed function as inlets with headwall openings; therefore, inlet control nomographs Figures 1004 and 1005 from the CCRFCD Manual have been utilized in design.

3 EXISTING DRAINAGE CONDITION

3.1 Definition of Existing Condition

The existing condition considers the Phase 3 roadways and onsite commercial development undeveloped in its natural terrain. Upstream within the contributing watershed, the following improvements are considered constructed and functioning per the drainage studies prepared to support each improvement.

Phase 1:

- All subbasins identified in the hydrologic summary tables as referenced from the Phase 1 Study include a double asterisk behind the subbasin identifier.
- 6-ft wide by 5-ft high RCB that extends north from Skye Canyon Park Drive within the Grand Canyon alignment for daylighting into the existing natural wash that traverses across Phase 3.

Phase 2:

- All subbasins identified in the hydrologic summary tables as referenced from the Master Drainage Study include a single asterisk behind the subbasin identifier.

Detention Basin 1:

- Subbasin ON1, Concentration Point DB1 and Detention Route RDB1.

3.2 Discussion of Existing Condition

Refer to Exhibit E, included in Appendix A, for a detailed illustration of the existing condition drainage patterns.

Offsite flows impact the western limits of the Phase 3 site from two primary ephemeral washes, represented by Concentration Points CPS and CPN. The flow in the two washes combine into a single wash, combining with the runoff from Subbasin ON1N-E, at Concentration Point WC9. Additionally, offsite flows from the existing Phase 1 developments are captured by existing storm drain infrastructure in Skye Canyon Park Drive, represented by Concentration Point WC7, and the combined storm drain flow is routed north in Grand Canyon Drive, and discharged as surface flow at Concentration Point WC9. The surface flow at WC9 is conveyed east within the natural wash. Flow from Basin EX-W6 is conveyed east as surface flow and does not combine with flows at WC9.

3.3 Summary of Existing Condition Flows

Refer to Exhibit E, included in Appendix A, for summary of all subbasins and concentration points included in this study's existing condition HEC-1 model in Appendix C. However, for discussion purposes, a summary of the existing condition flow rates within or near the Phase 3 boundary is presented below in Table 1.

Table 1: Summary of Existing Condition Flow Rates		
Subbasin ID	Area (ac)	Q ₁₀₀ (cfs)
ON1-E	22.1	50
EX-W6	9.9	23
Total Onsite	32.0	73
Concentration Point ID	Area (mi ²)	Q ₁₀₀ (cfs)
WC7 (Ex. Phase 1 6' x 5' RCB @ East Phase 3 Boundary)	0.07	121
CPN (Ex. North Ephemeral Wash @ West Phase 3 Boundary)	0.36	353
CPS (Ex. South Ephemeral Wash @ West Phase 3 Boundary)	1.23	415
WC9 (Ephemeral Wash @ Phase 3 Discharge Point)	1.70	737

4 PROPOSED DRAINAGE CONDITION

4.1 Definition of Proposed Condition

The proposed condition considers that the Phase 3 roadways as shown on the included plans are constructed and the onsite commercial development remains undeveloped per the existing condition. Additionally, the upstream contributing watershed remains in the exact state as described in the existing condition Section 3 of this study.

Note that a proposed detention basin is located in the contributing north ephemeral wash for purposes to reduce the peak discharge at Concentration Point WC9 from exceeding existing condition toward downstream property after development of Phase 3 begins. Note the detention basin is designed for the larger volume required to be detained after the onsite commercial development is constructed (Future Condition, refer to Section 5 of this study); therefore, the peak discharge is improved at a greater rate during this proposed condition after only the roadways are completed.

4.2 Discussion of Proposed Condition

Refer to Exhibit F, included in Appendix A, for a detailed illustration of the proposed condition drainage patterns.

During the proposed condition, the offsite flows at the primary ephemeral washes totaled at Concentration Points CPS and CPN are obstructed by proposed Skye Park Drive and Street “D”. Therefore, culvert crossings have been provided to perpetuate these major offsite flows under the roadways and return the flows to the same ephemeral washes that experience the flows during the existing condition across the future onsite commercial development. The same technique for a provided culvert crossing is present at Grand Canyon Drive.

Drop inlets and minor storm drain facilities designed for ultimate condition development flow collect the small storm flows that are produced by a storm event that falls on the roadway itself for Skye Park Drive (Subbasin WSPD3) and Street D (Subbasin WSPD0). Note that due to the roadway profile of Grand Canyon in cut below existing ground, runoff from Subbasin EX-W6 does surface drain into Grand Canyon during the proposed condition. The minor storm drains and drop inlet facilities connect into the proposed culvert crossings under the Phase 3 roadways.

In order to attenuate the increase in peak flow rate that occurs when transitioning from existing condition to proposed condition, a detention basin is proposed at Concentration Point CPN upstream of its Street “D” culvert crossing. Note that the proposed detention basin has been located at CPN rather than CPS because Skye Canyon Detention Basin 1 is located upstream of CPS and multiple detention basins in series is not desirable. Further discussion regarding the design of this detention basin follows in Section 8 of this study.

Note that construction of the curving Grand Canyon Drive and the culvert crossing for the ephemeral wash at Concentration Point WC9 requires the developer to remove and replace a portion of the existing 6-ft by 5-ft RCB to horizontally fit within the proposed roadway improvements while maintaining the same discharge point. Note that drop inlets intended to collect a portion of EX-W6 flows in Grand Canyon are proposed to connect into this replace portion of the RCB; therefore, the flow rate at Concentration Point WC7 plus the drop inlet collection quantity is the total runoff in this facility.

Also note that a storm drain facility has been extended north of the Grand Canyon culvert crossing within the roadway for future use by the onsite commercial development. However, in the proposed condition it is considered not in use with only smaller flows from Grand Canyon collected and conveyed in the storm drain.

4.3 Summary of Proposed Condition Flows

Refer to Exhibit F, included in Appendix A, for summary of all subbasins and concentration points included in this study’s proposed condition HEC-1 model in Appendix C. However, for discussion purposes, a summary of the proposed condition flow rates within or near the Phase 3 boundary is presented below in Table 2.

Table 2: Summary of Proposed Condition Flow Rates		
Subbasin ID	Area (ac)	Q ₁₀₀ (cfs)
ON1-E	20.8	47
EX-W6	7.7	18
WSPD0	0.6	2
WSPD3	1.4	5
WGRC1A	1.4	4
Total Onsite	32.0	76
Concentration Point ID	Area (mi ²)	Q ₁₀₀ (cfs)
WC7 (Ex. Phase 1 6' x 5' RCB @ East Phase 3 Boundary)	0.07	121
DBN (Ex. North Ephemeral Wash @ West Phase 3 Boundary)	0.36	284
CPS (Ex. South Ephemeral Wash @ West Phase 3 Boundary)	1.23	415
WC9a (Confluence of North/South Ephemeral Wash @ Grand Canyon)	1.63	587
WC9 (Ephemeral Wash @ Phase 3 Discharge Point)	1.70	720

Note that after use of the proposed detention basin DBN, the peak flow rate at the discharge point WC9 from Phase 3 is anticipated to be less than occurs during the existing condition. Therefore, no adverse impacts occur to the downstream property.

5 FUTURE DRAINAGE CONDITION

5.1 Definition of Future Condition

The future condition considers that the Phase 3 area of development is full build-out, consisting of the roadways shown on the included plans and the onsite commercial development. However, the upstream contributing watershed remains in the exact state as described in the existing condition Section 3 of this study.

Note that a proposed detention basin is located in the contributing north ephemeral wash for purposes to reduce the peak discharge at Concentration Point WC9 from exceeding existing condition toward downstream property after development of Phase 3 begins. The future condition described in this study produces the largest post-development peak flow rate that requires attenuation for allowance to build-out the Phase 3 area. Therefore, the peak discharge during the future condition is improved to a rate similar to the peak discharge during the existing condition.

5.2 Discussion of Future Condition

Refer to Exhibit G, included in Appendix A, for a detailed illustration of the future condition drainage patterns.

It is anticipated that during the future condition, the onsite commercial development constructed by others will connect its onsite storm drain facilities into the culvert crossings provided at CPS and CPN and extend the facilities as storm drain conveyance to the larger

culvert crossing at WC9a and its discharge across Grand Canyon Drive and WC9. For conservative purposes, this study's design considers that the entirety of the runoff produced by the onsite commercial development is collected onsite into either of the storm drain extensions totaled at WC9a. The concentration point WC9A combines with the flow in Grand Canyon and discharge onto the downstream property at WC9 through the provided culvert crossing. Utilizing existing topography, Subbasin WGC3 has been prorated to determine adequate estimations of the flow to be collected by each storm drain extension through the future commercial site.

The drop inlets and minor storm drain facilities in the proposed roadways function the same during the future condition as described during the proposed condition with the exception of Grand Canyon Drive. Due to the conservative estimation of the entirety of onsite flow collected by onsite storm drain facilities at WC9a, the 6-ft by 5-ft RCB in Grand Canyon Drive no longer collects a portion of the onsite flow (proposed condition EX-W6) during the future condition.

The proposed detention basin at CPN is maintained in functionality during the future condition. The larger offsite flow rates are not cut-off and routed away from Phase 3 until the ultimate condition, described in the following Section 6 of this study.

After assumed extension of storm drain through the onsite commercial development, the storm drain trunk extending north in Grand Canyon is anticipated to be in use during the future condition by conveyance of the attenuated CPN flows plus a portion of the onsite commercial development's runoff.

5.3 Summary of Future Condition Flows

Refer to Exhibit G, included in Appendix A, for summary of all subbasins and concentration points included in this study's proposed condition HEC-1 model in Appendix C. However, for discussion purposes, a summary of the proposed condition flow rates within or near the Phase 3 boundary is presented below in Table 3.

Table 3: Summary of Future Condition Flow Rates		
Subbasin ID	Area (ac)	Q ₁₀₀ (cfs)
WGC3	28.4	89
WSPD0	0.6	2
WSPD3	1.4	5
WGRC1A	1.4	4
Total Onsite	32.0	100
Concentration Point ID	Area (mi ²)	Q ₁₀₀ (cfs)
WC7 (Ex. Phase 1 6' x 5' RCB @ East Phase 3 Boundary)	0.07	121
DBN (Ex. North Ephemeral Wash @ West Phase 3 Boundary)	0.36	284
CPS (Ex. South Ephemeral Wash @ West Phase 3 Boundary)	1.23	415
WC9a (Confluence of North/South Ephemeral Wash @ Grand Canyon)	1.64	615
WC9 (Ephemeral Wash @ Phase 3 Discharge Point)	1.70	736

Note that after use of the proposed detention basin DBN, the peak flow rate at the discharge point WC9 from Phase 3 is anticipated to be less than occurs during the existing condition. Therefore, no adverse impacts occur to the downstream property.

6 ULTIMATE DRAINAGE CONDITION

6.1 Definition of Ultimate Condition

The ultimate condition considers that the entire Skye Canyon master planned community and its master drainage infrastructure conceptually shown in the Master Drainage Study is built and functioning.

The proposed Phase 3 roadways and future onsite commercial development are to be constructed in conformance with drainage patterns outlined in the Master Drainage Study with overall drainage area contribution to a discharge point into a large natural wash at Grand Canyon north of Skye Canyon Park Drive.

The proposed detention basin utilized in the proposed and future conditions is anticipated to no longer be needed during the ultimate condition, because of installation of upstream master drainage infrastructure.

6.2 Discussion of Ultimate Condition

Refer to Exhibit H, included in Appendix A, for a detailed illustration of the ultimate condition drainage patterns.

During the ultimate condition, the large drainage area and flows contributing to the major ephemeral washes at Skye Park Drive and Street “D” is cut-off by upstream master drainage infrastructure, namely the storm drain shown in red within Skye Village Road on the drainage exhibit. Rather the contributing drainage areas have transitioned to the referenced Master Drainage Study tributary characterized by Concentration Points WC6 to the south ephemeral wash and WC8 to the north ephemeral wash. The flows totaled at these locations are conveyed by the future infrastructure through the onsite commercial development to Concentration Points WC9a and following WC9 discharge to the downstream property.

The flow at WC8 had been shown in the Master Drainage Study to contribute to WC9 through Subbasin WGC3. However, both the Master Drainage Study and Phase 1 Study had shown the routing of flow at WC6 to be received by WC7 and then routed to WC9. Although the flow at WC6 is collected at a low point and culvert crossing in Skye Park Drive, it remains routed to WC9 only through the future commercial development and not via master infrastructure projects. Note the entirety of ultimate condition flows from WC6 and WC8 are collected via the proposed infrastructure. Proposed infrastructure downstream of the future commercial development is also provided for entire collection and conveyance of flows at WC9a and WC9. Note that it is assumed the entire flow at WC7 is already conveyed within storm drain with collection in Skye Canyon Park Drive by the Phase 1 Study.

6.3 Summary of Ultimate Condition Flows

Refer to Exhibit H, included in Appendix A, for summary of all subbasins and concentration points included in this study's proposed condition HEC-1 model in Appendix C. However, for discussion purposes, a summary of the proposed condition flow rates within or near the Phase 3 boundary is presented below in Table 4.

Table 4: Summary of Ultimate Condition Flow Rates		
Concentration Point ID	Area (mi²)	Q₁₀₀ (cfs)
WC7 (Ex. Phase 1 6' x 5' RCB @ East Phase 3 Boundary)	0.07	121
WC6 (Skye Park Drive)	0.04	69
WC8 (Street D)	0.02	37
WC9A (Total Flow in Future Commercial Development Storm Drain)	0.10	195
WC9 (Ephemeral Wash @ Phase 3 Discharge Point)	0.18	317

In accordance with the drainage patterns established in the Master Drainage Study, Table 5 below represents a comparison between the discharge flow rate at WC9 determined in this study versus the flow rate anticipated in the Master Drainage Study.

Table 5: Ultimate Condition Flow Rate Comparison @ WC9: Phase 3 vs. Master Drainage Study		
Concentration Point ID	Phase 3 Q₁₀₀ (cfs)	Master Drainage Study Q₁₀₀ (cfs)
WC9	317	322

The above table shows that the development of Phase 3 and the proposed drainage patterns presented in this study are in conformance with the overall drainage plan for the Skye Canyon property represented in the referenced Master Drainage Study.

7 STREET FLOW & DROP INLET HYDRAULICS

7.1 Skye Park Drive

Due to roadway design, it is anticipated that the only condition that produces flow rates larger than the quantity that occurs on the street itself is during the ultimate condition. Therefore, all flow rates utilized for street hydraulic analysis in Skye Park have been excerpted from the ultimate condition for conservative purposes.

At the intersection of Skye Park and Street "D", it is anticipated per the Master Drainage Study, that the flow rate at WC8 is entirely conveyed as street flow. Half of WC8 flow continues south in the west half of the crowned street, and a flow split into Street "D" occurs at the intersection for the remaining half of WC8 flow in the east half of the street. The methodology for computing the flow split at this location has been determined utilizing

balancing of water surface elevations in the normal depth Flowmaster Sections SP3 and D2.

The remaining 25 cfs at Section SP2 that bypasses the intersection of Street “D” combines with 2.5 cfs (half WSPD3) and an assumed 10 cfs of the total 64 cfs generated by Subbasin WML16 for a combined 37.5 cfs at Section SP1 approaching the drop inlets at the low point in Skye Park from the north.

A flow rate of 2.5 cfs at Section SP4 generated by half Subbasin WSPD3 is anticipated to impact the drop inlets at the low point in Skye Park from the south. All street flow is collected by the drop inlets in low point.

Refer to Exhibit I, included in Appendix A, for a summary of the street flow hydraulics discussed above. Note that Skye Park is not subject to satisfying the 10-year dry lane requirements; therefore, only 100-year flow computations have been analyzed because the 100-year flows meet 10-year DxV criteria. Refer to Appendix D for the street flow hydraulic calculations prepared by this study.

7.2 Street D

Due to roadway design, it is anticipated that the only condition that produces flow rates larger than the quantity that occurs on the street itself is during the ultimate condition. Therefore, all flow rates utilized for street hydraulic analysis in Street D have been excerpted from the ultimate condition for conservative purposes.

At the intersection of Skye Park and Street “D”, per discussion in Section 7.1, a flow split from Skye Park Drive occurs. The split flow of 12 cfs from Skye Park is anticipated to be entirely collected by the drop inlets proposed near the intersection, with no bypass. Therefore, only the flow of 2 cfs generated by Subbasin WSPD0 is conveyed north in Street “D” at Section D1 and outlet through a sidewalk underdrain at the north terminus of the cul-de-sac to continue into the future planned park in the master land use plan. In the interim prior to development of the park conveyance for the 2 cfs, the minor flow daylights onto existing ground and is conveyed away from Phase 3 with minimal impacts.

Refer to Exhibit I, included in Appendix A, for a summary of the street flow hydraulics discussed above. Note that Street “D” is not subject to satisfying the 10-year dry lane requirements; therefore, only 100-year flow computations have been analyzed because the 100-year flows meet 10-year DxV criteria. Refer to Appendix D for the street flow hydraulic calculations prepared by this study.

7.3 Grand Canyon Drive

Due to roadway design, it is anticipated that the proposed condition produces the largest flow rates in Grand Canyon because of the surface flow of Subbasin EX-W6 into the roadway. Therefore, all flow rates utilized for street hydraulic analysis in Grand Canyon have been excerpted from the proposed condition for conservative purposes.

Note that the future and ultimate conditions consider that the entirety of the future commercial development discharge its entirety of flow into anticipated storm drain; however, that is only for conservative purposes in designing storm drain adequately. It is likely that the design of the commercial development may bypass a portion of its runoff into

Grand Canyon, but will be required to limit its quantity to not exceed the 18 cfs (EX-W6) accounted for in the proposed condition.

A majority of the flow from EX-W6 is anticipated to impact Grand Canyon between approximate Stations 41+00 and 43+00; therefore drop inlets are provided at approx. Station 43+50 to collect the quantity that meets 10-year dry lane criteria at Section GC1. The remaining bypass flow from GC1 continues north to the drop inlets at the low point in Grand Canyon. All street flow is collected by the drop inlet in low point.

A flow rate of 3/2 cfs (Q_{100}/Q_{10}) at Section GC2 generated by half of Subbasin WGRC1A and ultimate condition Subbasin OFF1 is anticipated to impact the drop inlets at the low point in Skye Park from the south. All street flow is collected by the drop inlet in low point.

Refer to Exhibit I, included in Appendix A, for a summary of the street flow hydraulics discussed above. Note that Grand Canyon is classified as a roadway subject to 10-year dry lane criteria; therefore, additional 10-year flow calculations have been provided to show criteria is met. Refer to Appendix D for the street flow hydraulic calculations prepared by this study.

7.4 Skye Canyon Park Drive

This roadway was fully designed and constructed by the Phase 1 Study. Phase 3 shows a lessened impact to the existing roadway, because it had formerly anticipated the flow from WC6 to be conveyed within its street and infrastructure. As a result, of the low point proposed in the profile of Skye Park, the entirety flow from Skye Park no longer impacts the existing Skye Canyon Park. Therefore, the flow in this corridor has decreased by the amount summarized below in Table 6.

Table 6: Ultimate Condition Flow Rate Comparison @ WC7: Phase 3 vs. Phase 1 Study		
Concentration Point ID	Phase 3 Q_{100} (cfs)	Phase 1 Q_{100} (cfs)
WC7	121	197

Upon coordination of the site planning for the future commercial subdivision, a driveway has been proposed in conflict with the dual drop inlets existing between Skye Park Drive and Grand Canyon Drive. As a result of the significant decrease in total flow to Skye Canyon Park Drive, it is estimated only roadway flows now contribute to drop inlets from Skye Village Drive to Grand Canyon. It is proposed to remove the downstream 12.5-ft drop inlet and utilize only the upstream 15.0-ft drop inlet at the driveway conflict for nuisance flow collection. This revision to the existing drop inlets is considered acceptable, because the existing drop inlets remaining at the intersection of Grand Canyon have been designed adequately for the remaining flow. Refer to Exhibit I and the markups on the referenced Phase 1 Study's hydraulic exhibit in Appendix I for the resulting flows in Skye Canyon Park after completion of Phase 3.

8 STORM DRAIN & DETENTION BASIN HYDRAULICS

8.1 Skye Park Drive

Refer to Exhibit I, in Appendix A, for a summary of the proposed facilities and the flow rates conveyed during proposed, future and ultimate drainage conditions to determine the controlling design scenario. All Skye Park facilities have been denoted with 'SPD' in its identifier on the exhibit. All storm drain hydraulic computations have been included in Appendix E.

A 72-inch RCP culvert crossing is proposed to convey the flows at CPS under the roadway. It is recognized that the inlet control nomograph shows a resulting headwater depth that is above criteria. However, the resulting inlet headwater elevation (2803.8-ft) remains an additional estimated 4-ft below the roadway crest for freeboard. Additionally, the use of the 72-inch RCP conveying the larger CPS flow is considered interim and will eventually be conveying significantly less flow from upstream tributary area. A 100-year flow rate of 54 cfs of the total 64 cfs generated by Subbasin WML16 has been designated by this study to contribute to the culvert in the ultimate condition. Furthermore, an emergency overflow path is provided by grading a ditch and berm toward Skye Canyon Park to maintain the flows out of the roadway and not through the future commercial development. The overflow ditch and berm has been designed by calculating a weir depth of 2.77-ft for the contributing flow of 415 cfs to spill into the 30-ft minimum width conveyance area and providing a 3-ft minimum height berm adjacent to the overflow ditch for containment. Therefore, the 72-inch RCP culvert crossing is considered acceptable.

Two (2) 10-ft Type CM2 drop inlets in low point connect into the 72-inch RCP culvert crossing, via 30-inch RCP, within the roadway itself. As a result of these inlets proposed in a sag location, a weir water surface elevation of 2808.46-ft is produced in the case of an emergency overflow event before it is anticipated that the overflow path will direct the storm water south toward Skye Canyon Park over the Skye Park high point. A future high point is anticipated in the driveway in the vicinity to ensure direction of the emergency overflow south and not through the planned commercial development.

8.2 Street D

Refer to Exhibit I, in Appendix A, for a summary of the proposed facilities and the flow rates conveyed within proposed, future and ultimate drainage conditions to determine the controlling design scenario. All Street D facilities have been denoted with 'D' in its identifier on the exhibit. All storm drain hydraulic computations have been included in Appendix F.

Detention Basin: Upstream of the culvert crossing at CPN is a proposed 3 acre-ft detention basin utilized to reduce the peak flow rate to not exceed existing condition at the Phase 3 discharge point. The detention basin design has been ascertained by Modified Puls routing in the future condition HEC-1 model. Note that although the detention basin is located at CPN, it's design has been developed from the increase in peak flow rate at WC9 or the project discharge point. Since CPN is only undeveloped existing property and the detention basin is intended only for interim use to be not necessary in the ultimate condition, it has been placed upstream of the Street "D" culvert crossing.

An orifice size of 54-inch RCP is required to restrict the peak outflow from the detention basin to 284 cfs at "DBN". Note that the stage-discharge rating table for a 54-inch RCP utilizes a maximum headwater elevation of 2812.0-ft or the elevation of the overflow

spillway crest, and a tailwater condition obtained from a Flowmaster normal channel depth calculation for the receiving 60-inch RCP culvert.

Culvert Crossing: A 60-inch RCP culvert crossing is proposed to convey the flows discharging from the detention basin at CPN under the roadway. It is noted that a 54-inch RCP headwall opening is present at the outfall of the detention basin; however, it transitions to a 60-inch RCP at the junction with the proposed 20.0-ft Type CM2 drop inlet in the west half of Street “D”. Although at continuous grade, the two (2) 20-ft drop inlets in Street “D” that the 60-inch culvert crossing passes through are designed to collect the entire approaching flow with no bypass. Furthermore, an emergency overflow path for the contributing 346 cfs at CPN is provided by grading a ditch and berm north away from Phase 3 that daylights north of Street “D” and away from future Phase 3 development and the proposed roadway. The overflow ditch and berm has been designed by calculating a weir depth of 2.78-ft to spill into the 25-ft minimum width conveyance area and providing a 3-ft minimum height berm adjacent to the overflow ditch for containment. Therefore, the 60-inch RCP culvert crossing with upstream detention basin is considered acceptable.

8.3 Grand Canyon Drive

Refer to Exhibit I, in Appendix A, for a summary of the proposed facilities and the flow rates conveyed within proposed, future and ultimate drainage conditions to determine the controlling design scenario. All Grand Canyon facilities have been denoted with ‘GC’ in its identifier on the exhibit. All storm drain hydraulic computations have been included in Appendix G.

A 14-ft wide by 5-ft high RCB culvert crossing is proposed to convey the flows at WC9a under the roadway. An improved 14-ft wide by 7-ft high RCB inlet has been added to the culvert to maintain inlet control that meets criteria for the incoming flow during the proposed condition. During the future and ultimate conditions, this improved inlet is not needed and it is anticipated a 66-inch RCP stub provided by this study’s improvements will be in use by the onsite commercial development. The flow estimated by this study to be collected into the 66-inch RCP stub in the future is the arithmetic addition of flow at CPS and the pro-rated south portion of the Subbasin WGC3. A headwall at the edge of pavement is proposed to daylight the culvert within the existing right-of-way with the minimum extent of outlet protection meeting CCRFCD manual criteria and maintaining a similar existing flow depth and velocity of the outflow onto the downstream property owner.

A trunk 66-inch RCP storm drain that connects into the proposed 14-ft by 5-ft RCB culvert crossing is anticipated to be extended to the north terminus of the proposed roadway and capped for future connection. This trunk also provides a 66-inch RCP lateral to be utilized by the future commercial development. The flow estimated by this study to be collected into the 66-inch RCP lateral in the future is the arithmetic addition of the attenuated flow at DBN and the pro-rated north portion of the Subbasin WGC3.

Additionally, the 6-ft wide by 5-ft high RCB storm drain from Phase 1 extends from the south and Grand Canyon, and is required to be re-aligned. This storm drain conveys the flow from WC7 north to the same discharge point as the 14-ft by 5-ft RCB culvert through a shared headwall and outlet protection.

8.4 WSPG Hydraulic Modeling

All trunk storm drains proposed in this study have been modeled with WSPG. Minor lateral storm drains have been evaluated utilizing inlet control to determine if the pipe opening at the inlet box is adequate size. The hydraulic models have been performed utilizing the drainage condition with the largest peak flow rate, per summary tables on Exhibit I. Additionally, the storm drains anticipated to be extended through the future commercial development have been conceptually analyzed for a distance upstream to provide educated estimate of required pipe sizes. All HGLs from the pertinent models have been annotated on the profile sheets included in this study.

Additionally, the culvert crossings under Skye Park and Street “D” have been analyzed utilizing inlet control nomograph and Flowmatser normal depth calculations because its design scenario closely represents a culvert with no additional junction losses.

9 CONCLUSIONS & RECOMMENDATIONS

1. The proposed improvements are not located within a FEMA designated SFHA.
2. The project is not adjacent to any CCRFCD regional facility alignments and do not impact any MPU regional hydrology.
3. With use of proposed detention near the intersection of Skye Park Drive and Street “D”, the Phase 3 development area can develop without adverse impacts to the downstream property. This project does not increase peak flow rate, depth and velocity at its same point of discharge as in the existing condition.
4. The proposed roadway and drainage infrastructure have been designed to function in the condition that only the roadways are present in the field and also after build-out of the commercial development shown in the current master land use plan as Parcel 2.37.
5. Phase 3 assumes that Skye Canyon Phase 1, Phase 2 and Detention Basin 1 improvements are constructed and functioning. Refer to each development package for detailed improvements.
6. Phase 3 is in conformance with the current Master Drainage Study for Skye Canyon.
7. Street flow and drainage facilities satisfy local criteria.
8. The grading plan, storm drain profile and detail sheets for this project have been included with this study. These plans support the drainage patterns and conclusions detailed in this study.

10 REFERENCES

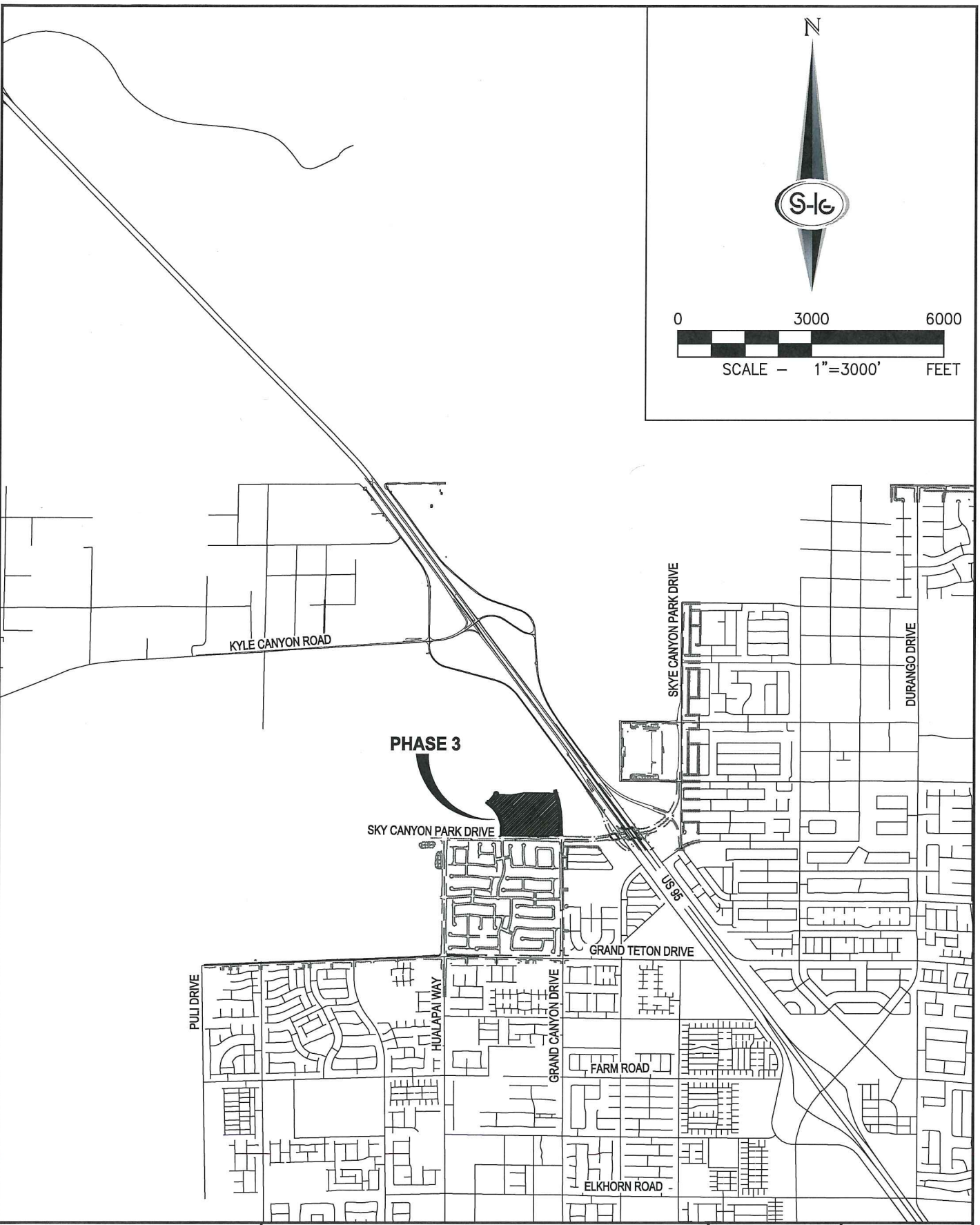
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2. *Hydrologic Criteria and Drainage Design Manual*. Clark County Regional Flood Control District, 1990.
3. *Soil Survey of Las Vegas Valley Area, Nevada*. U.S. Department of Agriculture, Soil Conservation Service, July 1985.
4. *Master Drainage Study Update #3 for Skye Canyon*; Slater Hanifan Group, 2016.
5. *Technical Drainage Study for Skye Canyon – Phase 1 Infrastructure*; Slater Hanifan Group, 2014.

APPENDIX A

Drainage Exhibits

- Exhibit A – Location Map
- Exhibit B – FEMA FIRM Panel
- Exhibit C – 2013 CCRFCD MPU Facilities
- Exhibit D1 thru D4 – Soils Map
- Exhibit E – Existing Condition Drainage Map
- Exhibit F – Proposed Condition Drainage Map
- Exhibit G – Future Condition Drainage Map
- Exhibit H – Ultimate Condition Drainage Map
- Exhibit I – Drainage Facilities & Hydraulics Summary Map

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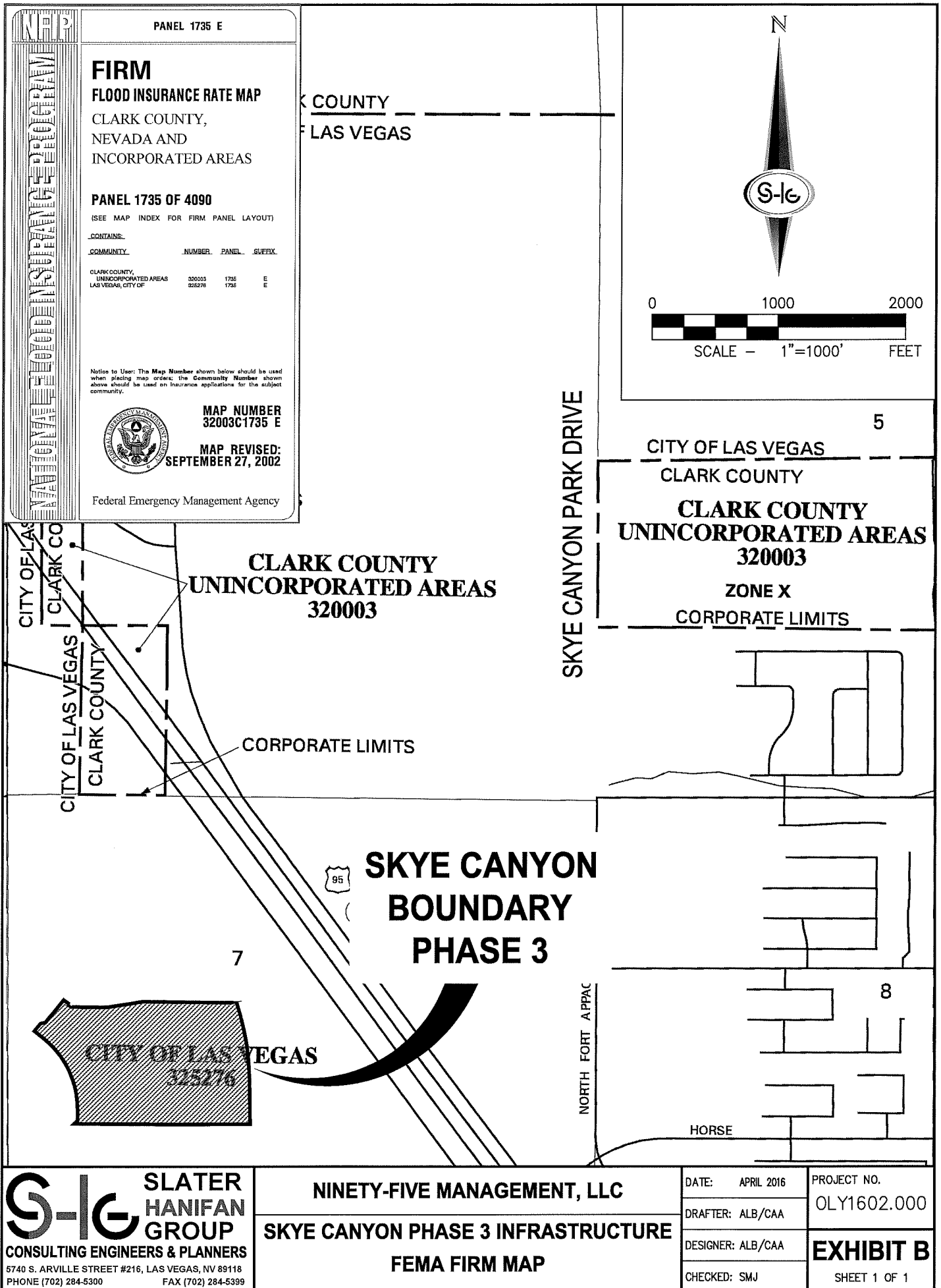


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NINETY-FIVE MANAGEMENT, LLC
SKYE CANYON PHASE 3 INFRASTRUCTURE
LOCATION MAP

DATE: APRIL 2016	PROJECT NO. OLY1602.000
DRAFTER: ALB/CAA	
DESIGNER: ALB/CAA	EXHIBIT A
CHECKED: SMJ	SHEET 1 OF 1

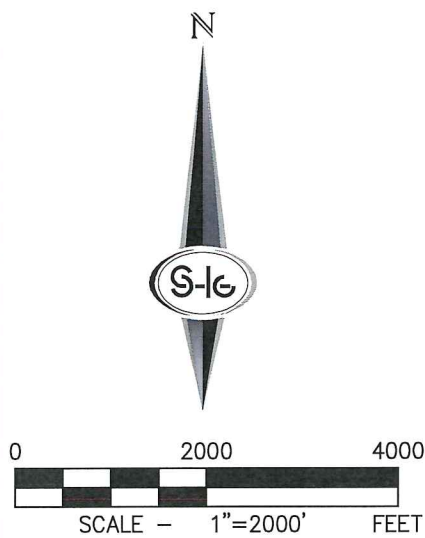
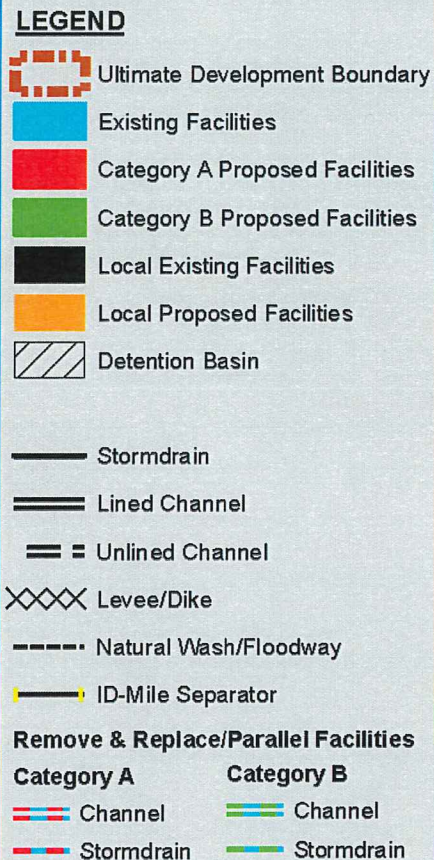
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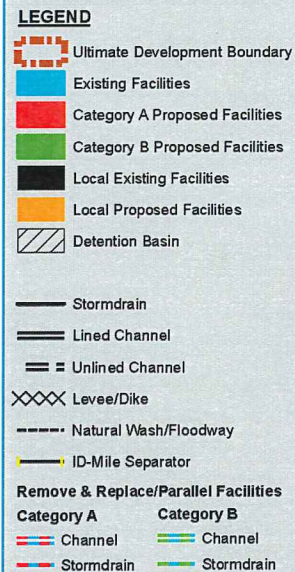
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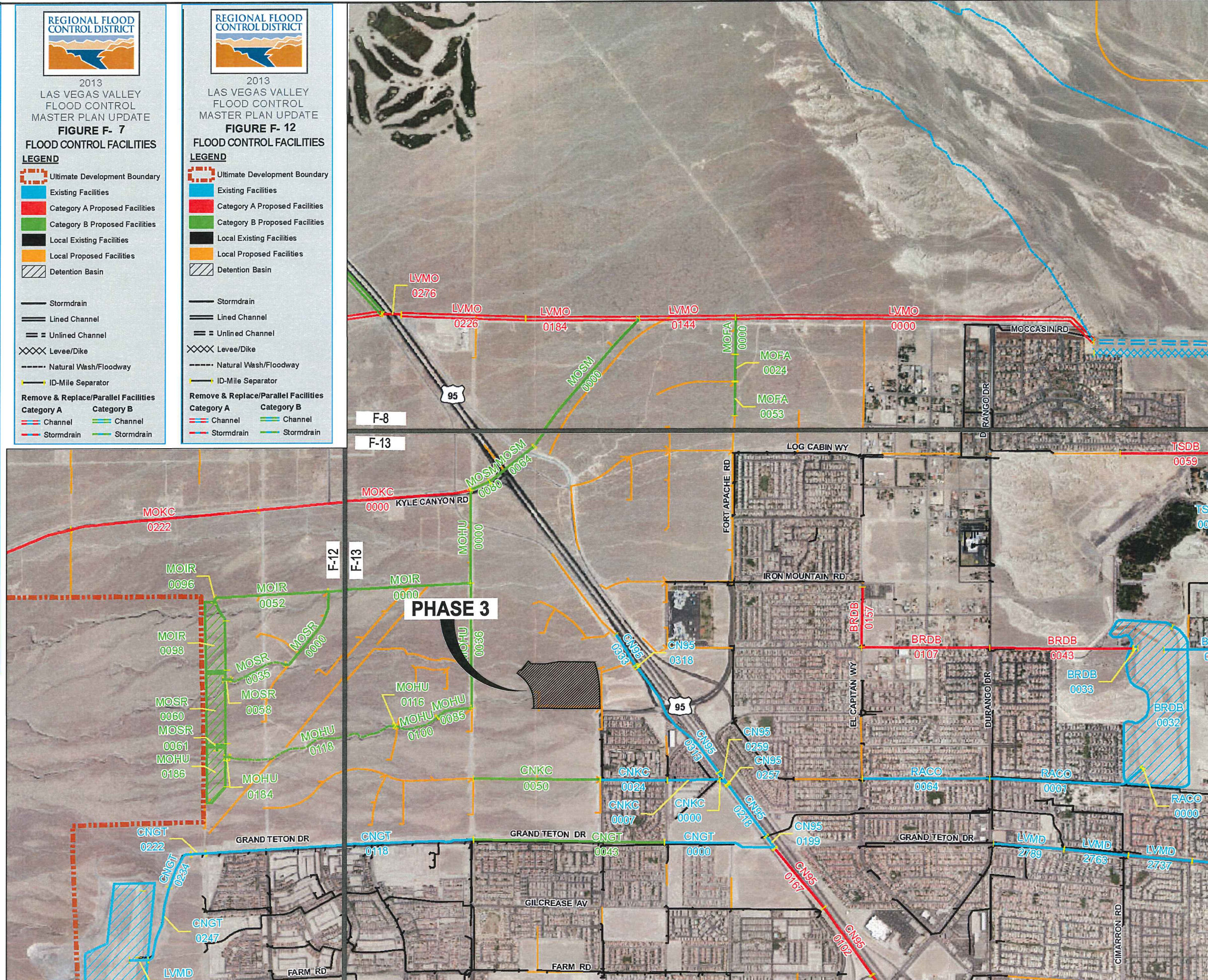
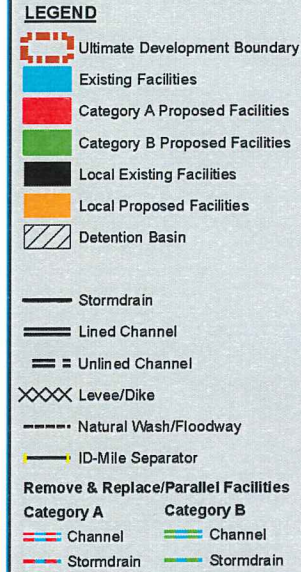
2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F- 13
FLOOD CONTROL FACILITIES



2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F- 7
FLOOD CONTROL FACILITIES



2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FIGURE F- 12
FLOOD CONTROL FACILITIES



NO.	DESCRIPTION	DATE	BY	APP.

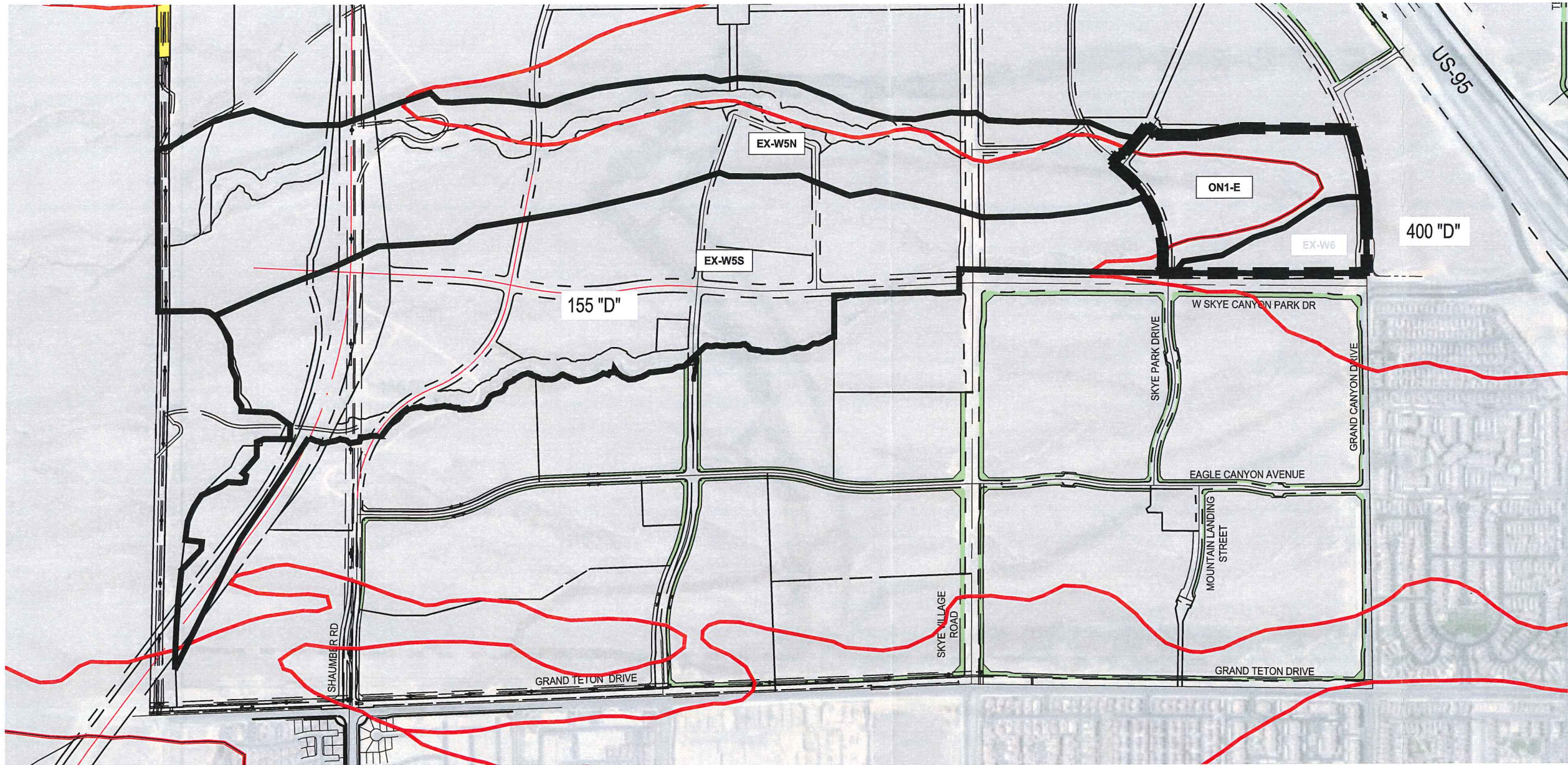
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ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BCHU		BELTWAY CHANNEL - HUALAPAI						
0000	E	12' X 5' RCP	853	501	CBA3-C	WEST3	0.84	1.11
0017	E	8' X 5' RCP	1216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

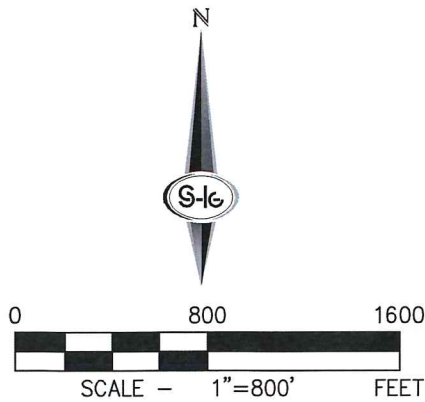
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
EKHU		ELKHORN AND HUALAPAI						
0000	E	6' X 5' RCB Overflow Structure	48	638	CNW26-C	WEST3	0.51	0.91
0001	E	6' X 5' RCP	72	638	CNW26-C	WEST3	0.51	0.91
0003	E	6' X 4'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

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

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LEGEND	
	BASIN BOUNDARY
	BASIN ID
	PROJECT BOUNDARY



NO.	DESCRIPTION	DATE	BY	APP.	DATE

NINETY-FIVE MANAGEMENT, LLC
SKYE CANYON PHASE 3 INFRASTRUCTURE
EXISTING CONDITION SOILS MAP

DATE: APRIL 2016
DRAFTER: ALB/CAA
DESIGNER: ALB/CAA
CHECKED: SMJ
PROJECT NO.
OLY1602.000

WSPD0

155 "D"

WGC3

400 "D"

WSPD3

W SKYE CANYON PARK DR

WSPD0

WSPD3

WGC3

400 "D"

WGRC1A

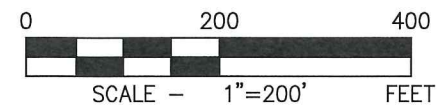
GRAND CANYON DR

W SKYE CANYON PARK DR

BASIN BOUNDARY

BASIN ID

PROJECT BOUNDARY



SLATER
HANIFAN
GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300
FAX (702) 284-5399

[illegible]

NINETY-FIVE MANAGEMENT, LLC

**SKYE CANYON PHASE 3 INFRASTRUCTURE
FUTURE CONDITION SOILS MAP**

DATE: APRIL 2016

DRAFTER: ALB/CAA

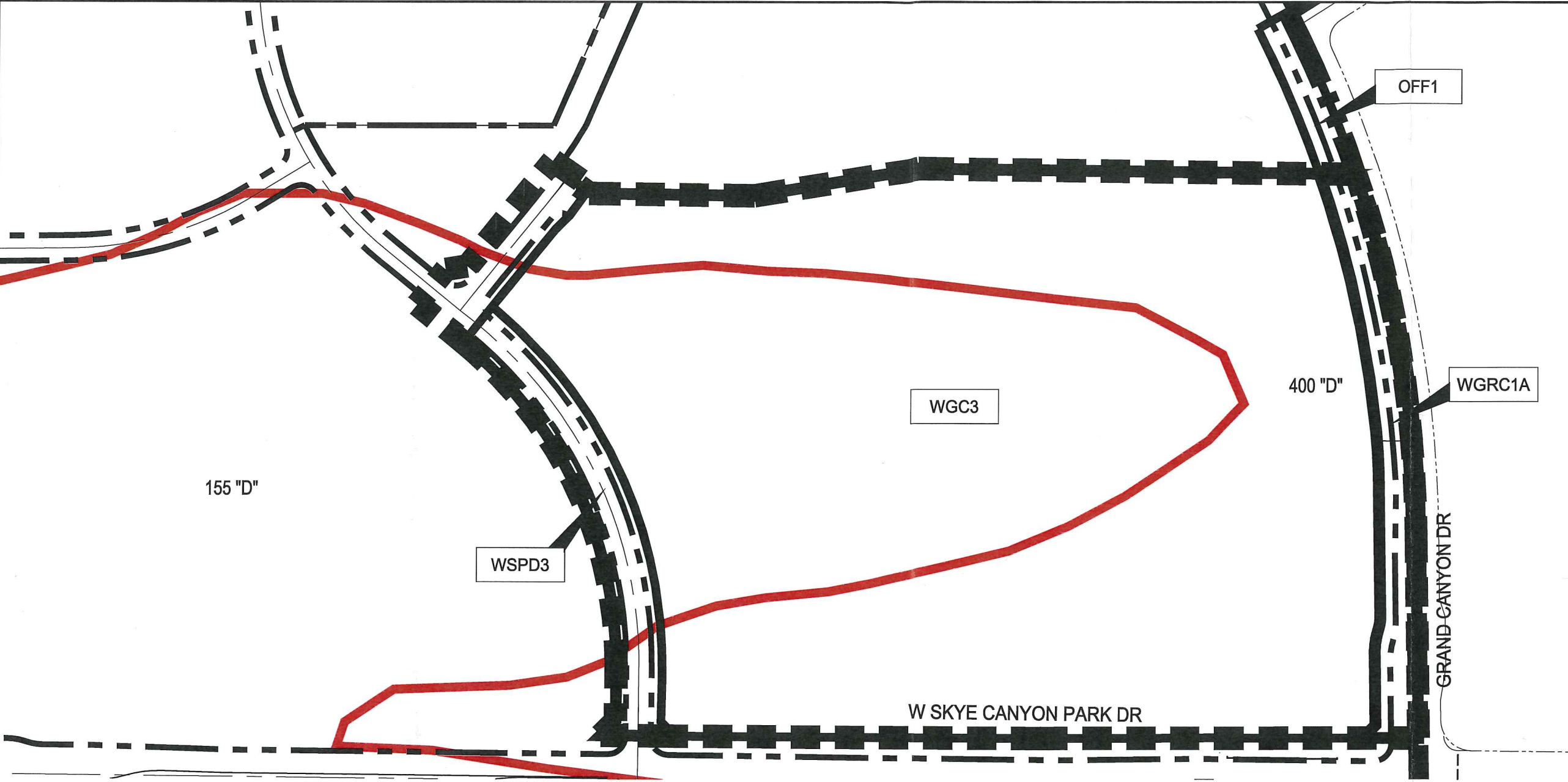
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CHECKED: SMJ

PROJECT NO.
OLY1602.000

EXHIBIT D3
SHEET 3 OF 4

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BASIN BOUNDARY

OFF1

BASIN ID

PROJECT BOUNDARY

N

0

200

400

SCALE

1"=200'

FEET

SLATER

HANIFAN

GROUP

CONSULTING ENGINEERS & PLANNERS

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118

PHONE (702) 284-5300 FAX (702) 284-5389

NO.	DESCRIPTION	DATE	BY	APP. DATE

NINETY-FIVE MANAGEMENT, LLC

SKYE CANYON PHASE 3 INFRASTRUCTURE

ULTIMATE CONDITION SOILS MAP

DATE: APRIL 2016

DRAFTER: ALB/CAA

DESIGNER: ALB/CAA

CHECKED: SMJ

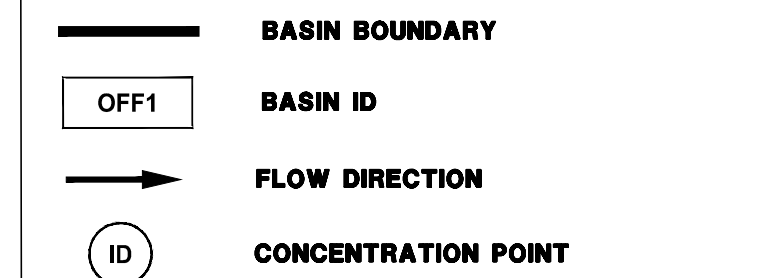
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EXHIBIT D4

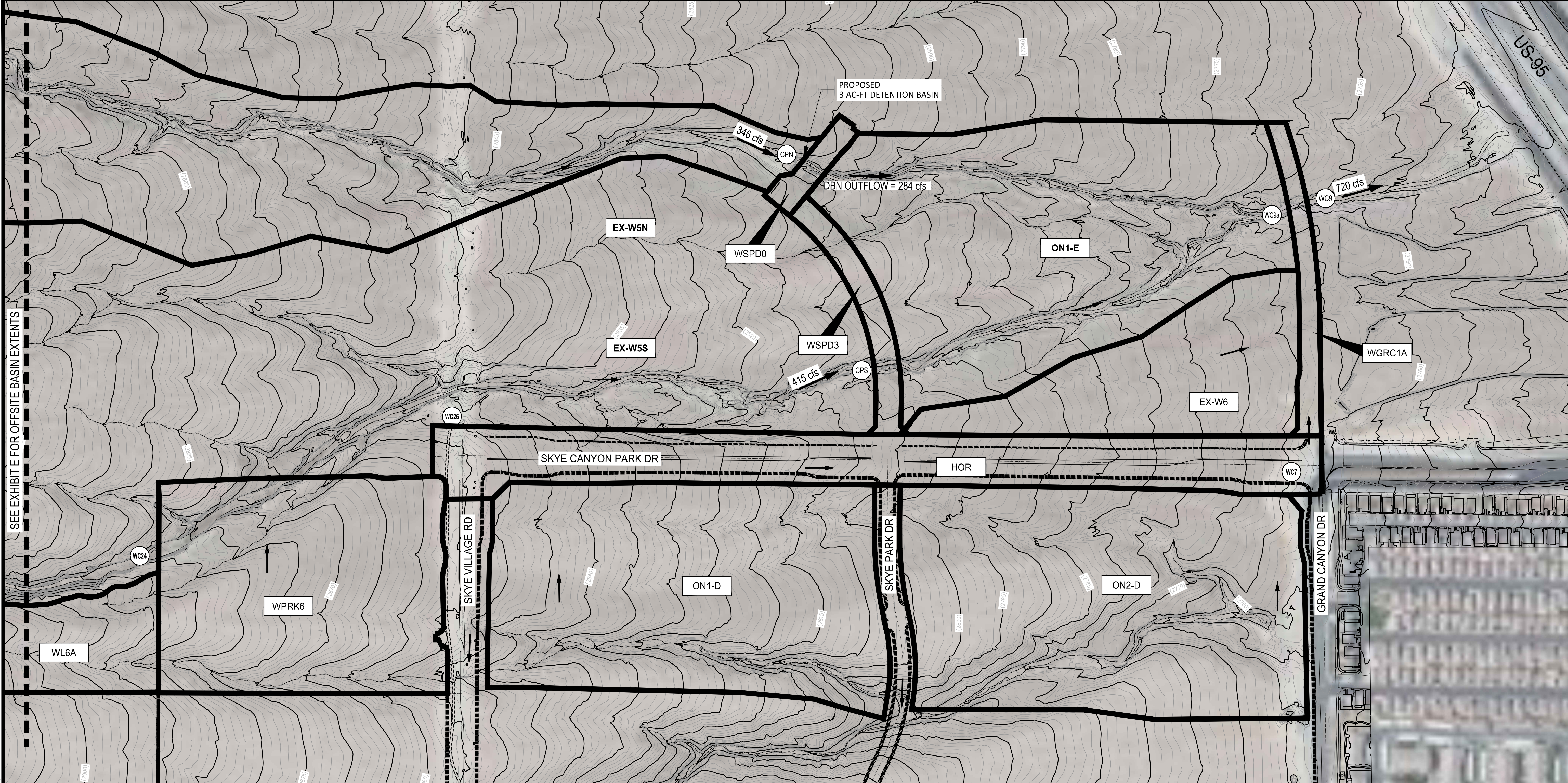
SHEET 4 OF 4

*REFERENCED FROM THE SKYE CANYON MASTER DRAINAGE STUDY.

EXISTING, PROPOSED, AND FUTURE CONDITION
ASSUMES PHASE 1, PHASE 2 AND DETENTION BASIN 1
UPSTREAM OF PHASE 3 DEVELOPMENT BOUNDARY
ARE CONSTRUCTED.

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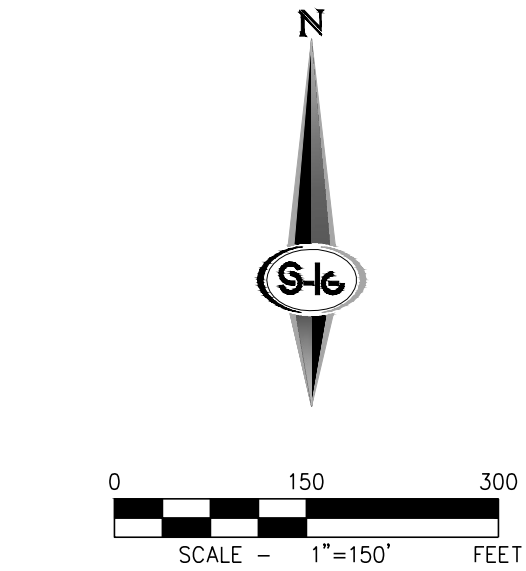
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Basin Flow Rate Summary				
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
WOFF1*	274.6	387	140	
WOFF2*	26.8	54	18	
WOFF3*	16.6	38	14	
WOFF4*	37.2	84	31	
WOFF5*	164.4	236	87	
WOFF6*	25.5	59	22	
ON1	19.4	55	26	
WML2*	27.4	78	37	
WSHA5*	2.4	8	4	
WPF4*	5.7	19	9	
WSHA4*	1.4	6	3	
WL4A*	8.0	23	10	
WL5A*	10.9	32	14	
WL5B*	3.8	12	5	
WEGN2*	2.1	2	1	
WL6A*	6.2	19	8	
WPRK6*	13.2	28	10	
EX-W5S	141.2	221	77	
EX-W5N	91.2	155	57	
WOFF7*	4.4	10	4	
WOFF8*	137.0	230	85	
ON1-D**	17.8	47	21	
ON2-D**	19.3	45	18	
HOR**	10.4	30	14	
WSPD0	0.6	2	1	
WSPD3	1.4	5	2	
ON1-E	20.8	47	18	
WGR1A	1.4	4	2	
EX-W6	7.7	18	7	
*REFERENCED FROM THE SKYE CANYON MASTER DRAINAGE STUDY.				
**REFERENCED FROM THE SKYE CANYON PHASE 1 INFRASTRUCTURE STUDY.				

Concentration Points Summary				
Basin/Concentration Point ID	Area (mi ²)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
CP1	0.50	417	156	
(WOFF1* + WOFF2* + WOFF3*)				
DB1	0.88	735	278	
(CP1 + WOFF4* + WOFF5* + WOFF6* + ON1*)				
RDB1	0.88	70	57	
WC20	0.05	85	41	
(WML2* + WSHA5*)				
WC21	0.06	105	50	
(WC20 + WPF4* + WSHA4*)				
WC22A	0.04	67	30	
(WL4A* + WL5A* + WL5B*)				
WC23	0.04	68	31	
(WC22A + WEGN2*)				
WC24	0.05	87	39	
(WC23 + WL6A*)				
WC26	0.07	113	48	
(WC24 + WPRK6*)				
CPS	1.23	415	200	
(DB1 + WC21 + WOFF7* + EX-W5S)				
CPN	0.36	346	123	
(EX-W5N + WOFF7* + WOFF8*)				
DBN	0.36	284	115	
(Outflow from CPN)				
WC7	0.07	121	53	
(ON1-D** + ON2-D** + HOR**)				
WC9a	1.63	587	266	
(CPS + DBN + WSPD0 + WSPD3 + ON1-E)				
WC9	1.70	720	327	
(WC9a + WC7 + WGR1A + EX-W6)				

NOTE:
EXISTING, PROPOSED, AND FUTURE CONDITION ASSUMES PHASE 1, PHASE 2 AND DETENTION BASIN 1 UPSTREAM OF PHASE 3 DEVELOPMENT BOUNDARY ARE CONSTRUCTED.



LEGEND	
	BASIN BOUNDARY
	BASIN ID
	FLOW DIRECTION
	CONCENTRATION POINT

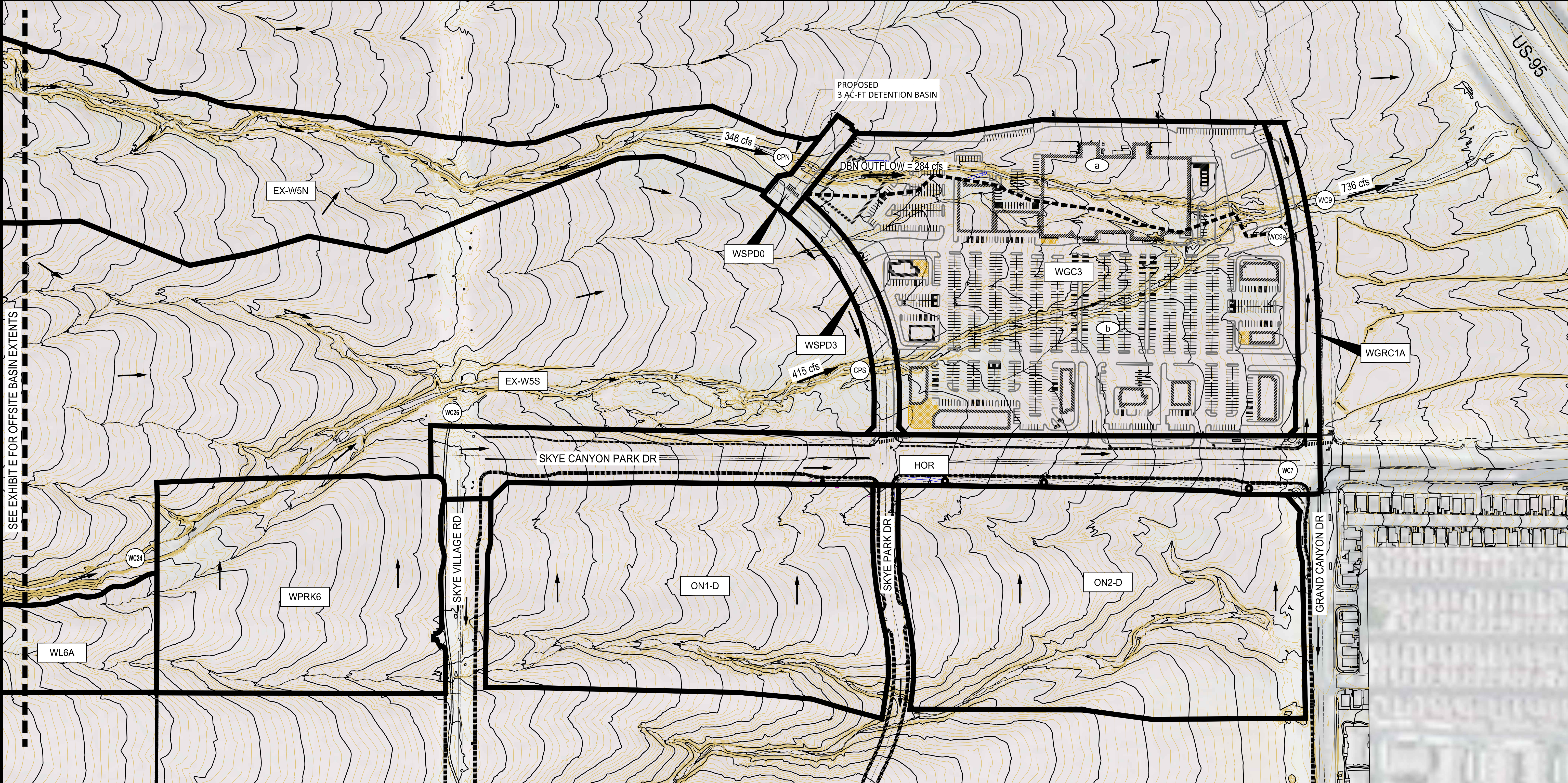
NO.	DESCRIPTION	DATE	BY	APP. DATE

NINETY-FIVE MANAGEMENT, LLC

SKYE CANYON PHASE 3 INFRASTRUCTURE

PROPOSED CONDITION DRAINAGE MAP

DATE:	APRIL 2016
DRAFTER:	ALB/CAA
DESIGNER:	ALB/CAA
CHECKED:	SMJ
PROJECT NO.	OLY1602.000



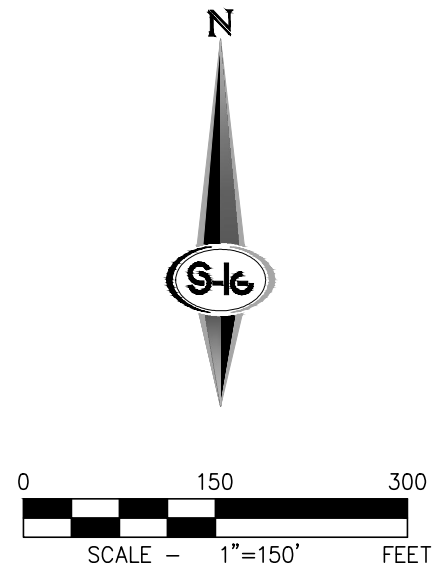
Basin Flow Rate Summary		
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)
WOFF1*	274.6	387
WOFF2*	26.8	54
WOFF3*	16.6	38
WOFF4*	37.2	84
WOFF5*	164.4	236
WOFF6*	25.5	59
ON1	19.4	55
WML2*	27.4	78
WSHA5*	2.4	9
WPF4*	5.7	19
WSHA4*	1.4	6
WL4A*	8.0	23
WL5A*	10.9	32
WL5B*	3.8	12
WEGN2*	2.1	2
WL6A*	6.2	19
WPRK6*	13.2	28
EX-W5S	141.2	221
EX-W5N	91.2	155
WOFF7*	4.4	10
WOFF8*	137.0	230
ON1-D**	17.8	47
ON2-D**	19.3	45
HOR**	10.4	30
WSPD0	0.6	2
WSPD3	1.4	5
WGC3	28.4	89
WGR1A	1.4	4

*REFERENCED FROM THE SKYE CANYON MASTER DRAINAGE STUDY.
**REFERENCED FROM THE SKYE CANYON PHASE 1 INFRASTRUCTURE STUDY.

Concentration Points Summary		
Basin/Concentration Point ID	Area (mi ²)	Q ₁₀₀ (cfs)
CP1	0.50	417
(WOFF1* + WOFF2* + WOFF3*)		
DB1	0.88	735
(CP1 + WOFF4* + WOFF5* + WOFF6* + ON1*)		
RDB1	0.88	70
WC20	0.05	85
(WML2* + WSHA5*)		
WC21	0.06	105
(WC20 + WPF4* + WSHA4*)		
WC22A	0.04	67
(WL4A* + WL5A* + WL5B*)		
WC23	0.04	68
(WC22A + WEGN2*)		
WC24	0.05	87
(WC23 + WL6A*)		
WC26	0.07	113
(WC24 + WPRK6*)		
CPS	1.23	415
(DB1 + WC21 + WC26 + EX-W5S)		
CPN	0.36	346
(EX-W5N + WOFF7* + WOFF8*)		
DBN	0.36	284
(Inflow from CPN)		
WC7	0.07	121
(ON1-D** + ON2-D** + HOR**)		
WC9a	1.64	615
(CPS + DBN + WSPD0 + WSPD3 + WGC3)		
WC9	1.70	736
(WC9a + WC7 + WGR1A + EX-W6)		

NOTE:
EXISTING, PROPOSED, AND FUTURE CONDITION ASSUMES PHASE 1, PHASE 2 AND DETENTION BASIN 1 UPSTREAM OF PHASE 3 DEVELOPMENT BOUNDARY ARE CONSTRUCTED.

100-Yr Prorated Flow Summary			
Future Condition			
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
WGC3	89	28.4	3.1
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
a	28	9.0	3.1
b	61	19.4	3.1
TOTAL	89	28.4	3.1



LEGEND	
	BASIN BOUNDARY
	PRO-RATED SUBBASIN BOUNDARY
	BASIN ID
	FLOW DIRECTION
	CONCENTRATION POINT
	PRO-RATED SUBBASIN ID

NO.	DESCRIPTION	DATE	BY	APP.

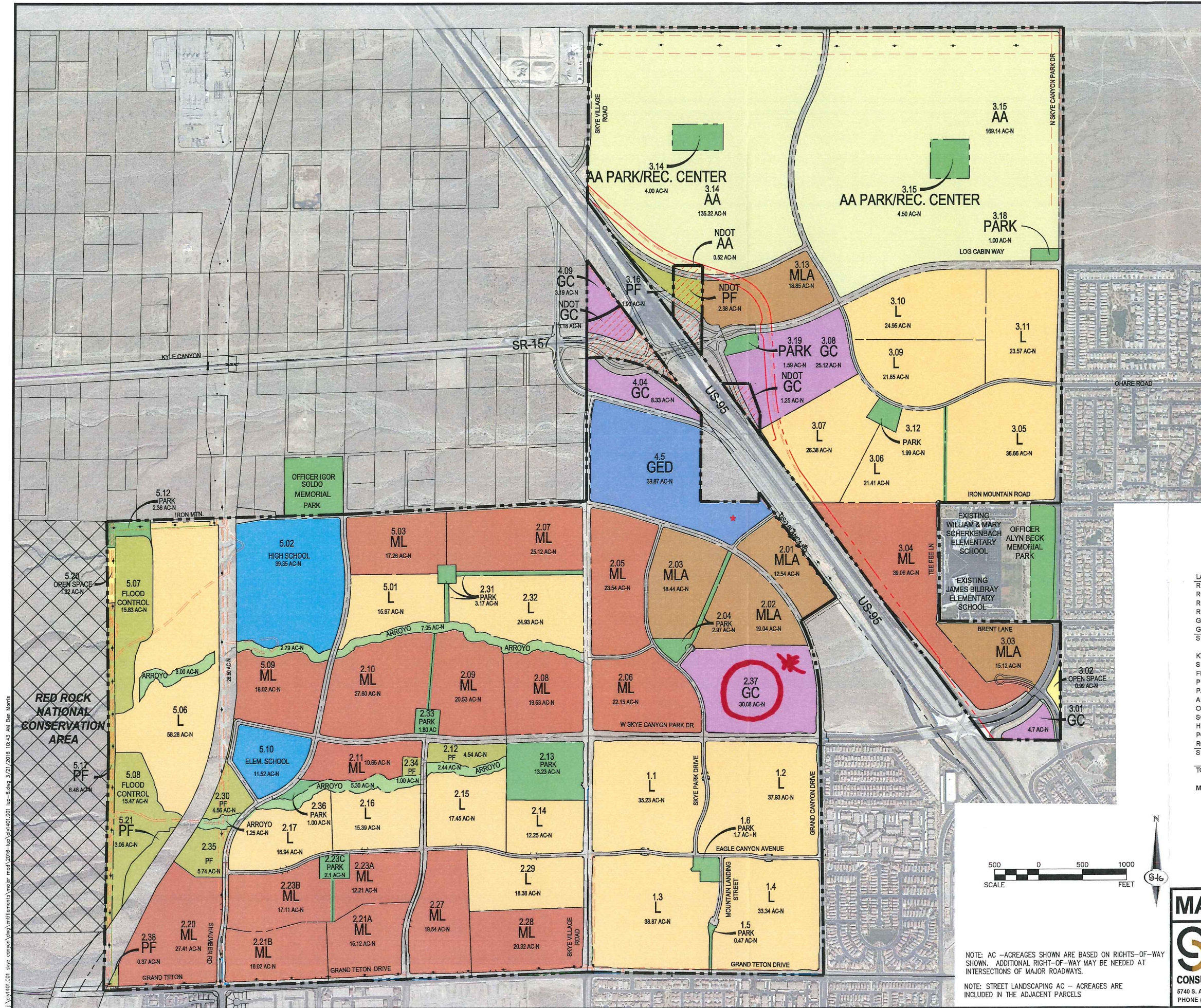
NINETY-FIVE MANAGEMENT, LLC
SKYE CANYON PHASE 3 INFRASTRUCTURE
FUTURE CONDITION DRAINAGE MAP

DATE: APRIL 2016
DRAFTER: ALB/CAA
DESIGNER: ALB/CAA
CHECKED: SMJ
PROJECT NO.
OLY1602.000

APPENDIX B

Hydrologic Data

Master Land Use Plan

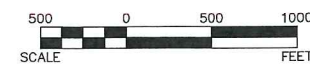


LEGEND

- PROJECT BOUNDARY
- EASEMENT LINE (ESMT)
- EXISTING FRONTAGE ROAD EASEMENT
NEV-043376, N-46063, CC-018234,
CC-018191 & CC-018138
- EXISTING TRANSMISSION POLE
- RIGHT-OF-WAY LINE (BACK-OF-CURB)
- PARCEL PROPERTY LINE
- STREETSCAPE COMMON ELEMENT LINE
- NDOT RIGHT OF WAY AREA - PLANNED LAND USE
OUTSIDE OF PROJECT BOUNDARY
APPROXIMATELY - 17.18 ACRES
- PROPOSED STREET
- ARROYO
- PARK & TRAIL
- SCHOOL
- OPEN SPACE
- PF FLOOD CONTROL & PUBLIC FACILITY
- L RESIDENTIAL "LOW"
- ML RESIDENTIAL "MEDIUM-LOW"
- MLA RESIDENTIAL "MEDIUM-LOW ATTACHED"
- AA RESIDENTIAL "ACTIVE ADULT"
- GC GENERAL COMMERCIAL
- GED GAMING
- 2.5 ACRES RESERVED
FOR RTC TRANSIT CENTER
- AC-N NET ACRES
- AC-G GROSS ACRES

LAND USE	NET ACRES	MAX DENSITY	AVERAGE DENSITY
RESIDENTIAL "LOW"	489.93	15.00	5.49
RESIDENTIAL "MEDIUM-LOW"	340.44	15.00	8.49
RESIDENTIAL "MEDIUM-LOW ATTACHED"	83.99	25.00	17.99
RESIDENTIAL "ACTIVE ADULT"	304.46	15.00	6.50
GENERAL COMMERCIAL	71.42		
GAMING	39.87		
SUBTOTAL	1330.11		
KYLE INTERCHANGE	7.96		
SHEEP MTN. PARKWAY	26.5		
FLOOD CONTROL	31.30		
PUBLIC FACILITY	27.74		
PARK & TRAIL PARCELS	41.92		
ARROYO	21.83		
OPEN SPACE	2.31		
SCHOOL	50.87		
HUALAPAI SUBSTATION	0.00		
POWER EASEMENT	0.00		
ROADS	122.59		
SUBTOTAL	333.02		
TOTAL	1663.13		

MAX RESIDENTIAL UNITS 9,000



NOTE: AC - ACRES SHOWN ARE BASED ON RIGHTS-OF-WAY
SHOWN. ADDITIONAL RIGHT-OF-WAY MAY BE NEEDED AT
INTERSECTIONS OF MAJOR ROADWAYS.

NOTE: STREET LANDSCAPING AC - ACRES ARE
INCLUDED IN THE ADJACENT PARCELS



MASTER LAND USE PLAN

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399



DATE: 3/21/2016

Precipitation

**Precipitation Worksheet
Rainfall Data and Computations**

Project: **Skye Canyon Master Drainage Study**
Date: **3/1/2016**

Data:

Reference

Project is located in: Township: 19 S. Range: 60 E. Section: 7

APN Map

Figure 513*

Rainfall Depth-Duration-Frequency 10-Year, 6-Hour: 1.3 inches

Figure 503*

Rainfall Depth-Duration-Frequency 100-Year, 6-Hour: 2.05 inches

Figure 506*

Precipitation Adjustment Ratios:

10-Year: 1.24

Table 501*

100-Year: 1.43

Table 501*

Six Hour Depth Area Reduction Factors (DARF):

Area (gross acres): 10.0 = 0.0156 square miles

Table 502*

DARF = 1.00

Calculations:

$P_{10} = 1.61$ 10-Year Precipitation (in)

$P_{100} = 2.93$ 100-Year Precipitation (in)

$P_{10}/P_{100} = 0.55$ HEC-1 Multiple Ratio Value

Equations:

$P = (\text{Rainfall}) * (\text{Precipitation Adjustment Ratio}) * (\text{Depth Area Reduction Factor})$

Comments:

Skye Canyon West Basins, East of Skye Village and South of Iron Mountain
Skye Canyon East Basins, South of Iron Mountain

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX HOUR DEPTH-AREA REDUCTION FACTORS

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

- NOTES: 1. A graphical representation of these factors is presented in Figure 514.
2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

<i>Revision</i>	<i>Date</i>

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

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

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

Revision	Date

REFERENCE:

TABLE 503

Curve Number

Soil & Curve Number Computation

Project Name: OLY1602-000 Skye Canyon Phase 3

Date: 4/27/2016

File Name: OLY1602-000 TDS CN Calc.xlsx

By: CWB

Data:

Reference:

Soil Type & Description	A	B	C	D
155 Cave gravelly fine sandy loam, 4 to 15 percent slopes	5%	5%	0%	90%
191 Dalian very cobbly fine sandy loam, 2 to 8 percent slopes	5%	85%	0%	10%
400 Tencee very gravelly fine sandy loam, 2 to 8 percent slopes	0%	10%	0%	90%

Exhibit D
SCS Soil Data

Land Use	A	B	C	D
Desert Shrub (poor)	63	77	85	88
Roadway	98	98	98	98

EXISTING CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
EX-W5N	155	87.5%	Desert Shrub (poor)	5%	5%	0%	90%	63	77	85	88	79.78	75.41
	400	12.5%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	11.42	10.88
TOTAL PERCENT		100.0%										TOTAL AREA 91.20	86.29

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
EX-W5S	155	97.9%	Desert Shrub (poor)	5%	5%	0%	90%	63	77	85	88	138.28	84.42
	400	0.9%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	1.27	0.78
	191	1.2%	Desert Shrub (poor)	5%	85%	0%	10%	63	77	85	88	1.65	0.90
TOTAL PERCENT		100.0%										TOTAL AREA 141.20	85.20

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
ON1	155	100.0%	Newly Graded	5%	5%	0%	90%	77	86	91	94	19.40	92.75
TOTAL PERCENT		100.0%										TOTAL AREA 19.40	92.75

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
ON1-E	155	54.8%	Desert Shrub (poor)	5%	5%	0%	90%	63	77	85	88	12.85	47.24
	400	45.2%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	10.60	39.28
TOTAL PERCENT		100.0%										TOTAL AREA 23.45	86.52

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
EX-W6	400	100.0%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	8.43	86.90
TOTAL PERCENT		100.0%										TOTAL AREA 8.43	86.90

PROPOSED CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
ON1-E	155	55.1%	Desert Shrub (poor)	5%	5%	0%	90%	63	77	85	88	11.44	47.50
	400	44.9%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	9.32	39.01
TOTAL PERCENT		100.0%										TOTAL AREA 20.76	86.51

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
EX-W6	400	100.0%	Desert Shrub (poor)	0%	10%	0%	90%	63	77	85	88	7.65	86.90
TOTAL PERCENT		100.0%										TOTAL AREA 7.65	86.90

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
WSPD0	155	29.7%	Roadway	5%	5%	0%	90%	98	98	98	98	0.19	29.09
	400	29.7%	Roadway	0%	10%	0%	90%	98	98	98	98	0.19	29.09
	400	21.9%	Natural Desert Landscaping	0%	10%	0%	90%	63	77	85	88	0.14	19.01
	155	18.8%	Natural Desert Landscaping	5%	5%	0%	90%	63	77	85	88	0.12	16.16
TOTAL PERCENT		100.0%										TOTAL AREA 0.64	93.36

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA	CALCULATED CN
				A	B	C	D	A	B	C	D	0.55	
WSPD3	155	38.7%	Roadway	5%	5%	0%	90%	98	98	98	98	0.55	37.96
	400	16.9%	Roadway	0%	10%	0%	90%	98	98	98	98	0.24	16.56

Soil & Curve Number Computation

Project Name: OLY1602-000 Skye Canyon Phase 3

Date: 4/27/2016

File Name: OLY1602-000 TDS CN Calc.xlsx

By: CWB

	400	9.9%	Natural Desert Landscaping	0%	10%	0%	90%	63	77	85	88	0.14	8.57
	155	34.5%	Natural Desert Landscaping	5%	5%	0%	90%	63	77	85	88	0.49	29.75
TOTAL PERCENT		100.0%		TOTAL AREA								1.42	92.83

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
WGRC1A	400	57.1%	Roadway	0%	10%	0%	90%	98	98	98	98	0.80	56.00
	400	42.9%	Natural Desert Landscaping	0%	10%	0%	90%	63	77	85	88	0.60	37.24
TOTAL PERCENT		100.0%		TOTAL AREA								1.40	93.24

FUTURE CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
WGC3	155	40.3%	Commercial	5%	5%	0%	90%	89	92	94	95	11.44	38.07
	400	59.7%	Commercial	0%	10%	0%	90%	89	92	94	95	16.97	56.57
TOTAL PERCENT		100.0%		TOTAL AREA								28.41	94.64

ULTIMATE CONDITION

BASIN ID	SOIL TYPE	SUBAREA PERCENT	LAND USE	HYDROLOGIC SOIL GROUP				LAND USE CN				SUBAREA ACRES	CALCULATED CN
				A	B	C	D	A	B	C	D		
OFF1	400	57.9%	Commercial	0%	10%	0%	90%	89	92	94	95	0.22	54.83
	400	42.1%	Commercial	0%	10%	0%	90%	89	92	94	95	0.16	39.87
TOTAL PERCENT		100.0%		TOTAL AREA								0.38	94.70

Lag Time - Standard Form 4 Computations



STANDARD FORM 4

APPENDIX C

HEC-1 Analyses

Existing Condition (100-Yr)

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 22APR16 TIME 14:20:03
*
*****

```

EX

```

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

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X X XXXXXX XXXX X
X X X X XX
X X X X X
XXXXXX XXXX X XXXX
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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

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

1

HEC-1 INPUT

PAGE 1

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*** FREE ***
*DIAGRAM
1 ID SKYE CANYON
2 ID PHASE 3 INFRASTRUCTURE - EXISTING CONDITION
3 ID AFTER PHASE 2 & DETENTION BASIN 1 BUILD-OUT
4 ID
5 ID RETURN PERIOD ----- 100-YEAR
6 ID DISTRIBUTION ----- 6-HOUR SDN3
7 ID PROJECT NO. ----- OLY1602.000
8 ID FILENAME ----- EX.H1
9 ID DATE ----- 4/19/2016
10 ID MODELED BY ----- SMJ
11 ID
12 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
13 ID DRAINAGE AREA (MI^2) DARF
14 ID 0.0-0.50 1.00
15 ID 0.5-1.00 0.98
16 ID 1.0-2.00 0.97
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00 0.98 0.97
*
22 KK WOFF1
23 KM EXISTING OFFSITE DRAINAGE BASIN
24 KM DISCHARGES INTO DETENTION BASIN "DB1"
25 PB 3.00
26 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
27 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
28 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
29 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
30 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
31 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
32 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
33 PC 0.998 0.999 1
34 BA .4291
35 LS 0 86.1
36 UD 0.420
*
37 KK WOFF2
38 KM EXISTING OFFSITE DRAINAGE BASIN
39 KM DISCHARGES INTO DETENTION BASIN "DB1"
40 BA .0419
41 LS 0 84.0
42 UD 0.150
*

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1

HEC-1 INPUT

PAGE 2

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
43 KK WOFF3
44 KM EXISTING OFFSITE DRAINAGE BASIN
45 KM DISCHARGES INTO DETENTION BASIN "DB1"
46 BA .0259
47 LS 0 86.2
48 UD 0.112
*
49 KK CP1
50 KM COMBINE WOFF1, WOFF2, AND WOFF3
51 HC 3
*
52 KK WOFF4

```


EX

```

53 KM EXISTING OFFSITE DRAINAGE BASIN
54 KM DISCHARGES INTO DETENTION BASIN "DB1"
55 BA .0581
56 LS 0 86.2
57 UD 0.136
  *

58 KK WOFF5
59 KM EXISTING OFFSITE DRAINAGE BASIN
60 KM DISCHARGES INTO DETENTION BASIN "DB1"
61 BA .2569
62 LS 0 86.5
63 UD 0.419
  *

64 KK WOFF6
65 KM EXISTING OFFSITE DRAINAGE BASIN
66 KM DISCHARGES INTO DETENTION BASIN "DB1"
67 BA .0399
68 LS 0 86.2
69 UD 0.121
  *

70 KK ON1
71 KM PROPOSED ONSITE DRAINAGE BASIN
72 BA .0303
73 LS 0 92.8
74 UD 0.116
  *

75 KK DB1
76 KM COMBINE CP1, WOFF4, WOFF5, WOFF6 AND ON1
77 HC 5
  *

```

1

HEC-1 INPUT

PAGE 3

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

```

78 KK RDB1
79 KM OUTLET = 24" ORIFICE @ INVERT ELEVATION = 3013.8-FT
80 RS 1 ELEV 3025.5
81 SA 4.68 5.56 5.74 5.92 6.10 7.01 7.46 8.36 9.32 10.68
82 SE 3025.5 3027 3028 3029 3030 3035 3037 3040 3043 3046
83 SQ 49.7 60.6 70.8 74.5 1436.0 3920.5 7136.3
84 SE 3025.5 3030 3035 3037 3040 3043 3046
  *

```

```

85 KK RRDB1
86 KM ROUTE TO CPS
87 RD 6230 0.033 0.035 0 TRAP 15 1
  *

```

```

88 KK WML2
89 KM WEST BASIN, WEST OF SHAUMBER ROAD
90 BA .0428
91 PB 3.00
92 LS 0 93.5
93 UD 0.142
  *

```

```

94 KK WSHA5
95 KM WEST BASIN, SHAUMBER ROAD
96 BA .0037
97 PB 3.00
98 LS 0 98.0
99 UD 0.086
  *

```

```

100 KK WC20
101 KM S OF EAGLE CANYON/SHAUMBER INTERSECTION
102 KM COMBINE WML2, WSHA5
103 HC 2
  *

```

```

104 KK WPF4
105 BA .0090
106 PB 3.00
107 LS 0 94.0
108 UD 0.087
  *

```

```

109 KK WSHA4
110 BA .0022
111 PB 3.00
112 LS 0 98.0
113 UD 0.051
  *

```

1

HEC-1 INPUT

PAGE 4

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

```

114 KK WC21
115 HC 3
  *

```

```

116 KK WL4A
117 KM WEST BASIN, WEST OF EGAN CREST DRIVE
118 BA .0125
119 PB 3.00
120 LS 0 92.0
121 UD 0.106
  *

```

```

122 KK WL5A

```

123	KM	WEST BASIN, WEST OF EGAN CREST DRIVE	EX
124	BA	.0170	
125	PB	3.00	
126	LS	0	92.0
127	UD	0.099	
	*		
128	KK	WL5B	
129	BA	.0059	
130	PB	3.00	
131	LS	0	92.0
132	UD	0.085	
	*		
133	KK	WC22A	
134	HC	3	
	*		
135	KK	WEGN2	
136	KM	WEST BASIN, EGAN CREST DRIVE	
137	BA	.0007	
138	PB	3.00	
139	LS	0	98.0
140	UD	0.050	
	*		
141	KK	WC23	
142	HC	2	
	*		
143	KK	WL6A	
144	KM	WEST BASIN, WEST OF SKYE VILLAGE ROAD	
145	BA	.0096	
146	PB	3.00	
147	LS	0	92.0
148	UD	0.092	
	*		

1

HEC-1 INPUT

PAGE 5

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

149	KK	WC24	
150	HC	2	
	*		
151	KK	WPRK6	
152	KM	WEST BASIN, WEST OF SKYE VILLAGE ROAD	
153	BA	.0207	
154	PB	3.00	
155	LS	0	84.0
156	UD	0.121	
	*		
157	KK	WC26	
158	HC	2	
	*		
159	KK	EX-W5S	
160	PB	3.00	
161	BA	.2206	
162	LS	0	85.2
163	UD	0.319	
	*		
164	KK	CPS	
165	HC	4	
	*		
166	KK	EX-W5N	
167	PB	3.00	
168	BA	.1425	
169	LS	0	86.3
170	UD	0.290	
	*		
171	KK	WOFF7	
172	KM	EXISTING OFFSITE DRAINAGE BASIN	
173	BA	.0068	
174	LS	0	86.2
175	UD	0.100	
	*		
176	KK	WOFF8	
177	KM	EXISTING OFFSITE DRAINAGE BASIN	
178	BA	.2141	
179	LS	0	86.3
180	UD	0.302	
	*		

181	KK	RWOFF8	
182	KM	ROUTE TO CPN	
183	RD	8450 0.027 0.035 0 TRAP 15 3	
	*		

1

HEC-1 INPUT

PAGE 6

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

184	KK	CPN	
185	KM	COMBINATION POINT CPN	
186	HC	3	
	*		
187	KK	ON1-D	
188	KM	PHASE 1, NORTHWEST QUAD ONSITE BASIN	

EX

189	BA	.0278	
190	PB	2.93	
191	LS	0	91.2
192	UD	0.114	
	*		
193	KK	ON2-D	
194	KM	PHASE 1, NORTHEAST QUAD ONSITE BASIN	
195	BA	.0301	
196	PB	2.93	
197	LS	0	88.8
198	UD	0.152	
	*		
199	KK	HOR	
200	KM	PHASE 1, STREET BASIN SKYE CANYON PARK DRIVE	
201	BA	.0163	
202	PB	2.93	
203	LS	0	93.3
204	UD	0.108	
	*		
205	KK	WC7	
206	HC	3	
	*		
207	KK	ON1-E	
208	PB	2.93	
209	BA	.0345	
210	LS	0	86.6
211	UD	0.105	
	*		
212	KK	WC9	
213	KO	3	
214	HC	4	
	*		
215	KK	EX-W6	
216	PB	2.93	
217	BA	.0155	
218	LS	0	86.9
219	UD	0.101	
	*		
220	ZZ		

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

```

22  WOFF1
    .
37  .      WOFF2
    .      .
43  .      .      WOFF3
    .      .      .
49  CPl.....
    .
52  .      WOFF4
    .      .
58  .      .      WOFF5
    .      .      .
64  .      .      .      WOFF6
    .      .      .      .
70  .      .      .      .      ON1
    .      .      .      .      .
75  DB1.....
    V
    V
78  RDB1
    V
    V
85  RRDB1
    .
88  .      WML2
    .      .
94  .      .      WSHA5
    .      .      .
100 .      .      .      WC20.....
    .      .      .      .
104 .      .      .      WPF4
    .      .      .      .
109 .      .      .      .      WSHA4
    .      .      .      .      .
114 .      .      .      .      .      WC21.....
    .      .      .      .      .      .
116 .      .      .      .      .      .      WL4A
    .      .      .      .      .      .      .
  
```


							Ex
HYDROGRAPH AT							
+	WOFF1	.43	1	FLOW TIME	387. 3.83	376. 3.83	370. 3.83
HYDROGRAPH AT							
+	WOFF2	.04	1	FLOW TIME	54. 3.58	53. 3.58	52. 3.58
HYDROGRAPH AT							
+	WOFF3	.03	1	FLOW TIME	38. 3.58	37. 3.58	36. 3.58
3 COMBINED AT							
+	CP1	.50	1	FLOW TIME	430. 3.83	417. 3.83	411. 3.83
HYDROGRAPH AT							
+	WOFF4	.06	1	FLOW TIME	84. 3.58	82. 3.58	81. 3.58
HYDROGRAPH AT							
+	WOFF5	.26	1	FLOW TIME	236. 3.83	229. 3.83	226. 3.83
HYDROGRAPH AT							
+	WOFF6	.04	1	FLOW TIME	59. 3.58	57. 3.58	56. 3.58
HYDROGRAPH AT							
+	ON1	.03	1	FLOW TIME	55. 3.58	54. 3.58	53. 3.58
5 COMBINED AT							
+	DB1	.88	1	FLOW TIME	758. 3.75	735. 3.75	724. 3.75
ROUTED TO							
+	RDB1	.88	1	FLOW TIME	71. 5.58	70. 5.58	70. 5.58
							** PEAK STAGES IN FEET **
							1
							STAGE
							TIME
							3035.07
							5.58
							3034.77
							5.58
							3034.61
							5.58
ROUTED TO							
+	RRDB1	.88	1	FLOW TIME	71. 5.83	70. 5.83	70. 5.83
HYDROGRAPH AT							
+	WML2	.04	1	FLOW TIME	78. 3.58	76. 3.58	75. 3.58
HYDROGRAPH AT							
+	WSHA5	.00	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50
2 COMBINED AT							
+	WC20	.05	1	FLOW TIME	85. 3.58	83. 3.58	82. 3.58
HYDROGRAPH AT							
+	WPF4	.01	1	FLOW TIME	19. 3.50	18. 3.50	18. 3.50
HYDROGRAPH AT							
+	WSHA4	.00	1	FLOW TIME	6. 3.50	5. 3.50	5. 3.50
3 COMBINED AT							
+	WC21	.06	1	FLOW TIME	105. 3.50	102. 3.50	101. 3.50
HYDROGRAPH AT							
+	WL4A	.01	1	FLOW TIME	23. 3.50	22. 3.50	22. 3.50
HYDROGRAPH AT							
+	WL5A	.02	1	FLOW TIME	32. 3.50	31. 3.50	31. 3.50
HYDROGRAPH AT							
+	WL5B	.01	1	FLOW TIME	12. 3.50	11. 3.50	11. 3.50
3 COMBINED AT							
+	WC22A	.04	1	FLOW TIME	67. 3.50	65. 3.50	64. 3.50
HYDROGRAPH AT							
+	WEGN2	.00	1	FLOW TIME	2. 3.50	2. 3.50	2. 3.50
2 COMBINED AT							
+	WC23	.04	1	FLOW TIME	68. 3.50	67. 3.50	66. 3.50
HYDROGRAPH AT							
+	WL6A	.01	1	FLOW TIME	19. 3.50	18. 3.50	18. 3.50
2 COMBINED AT							
+	WC24	.05	1	FLOW TIME	87. 3.50	85. 3.50	84. 3.50
HYDROGRAPH AT							

+		WPRK6	.02	1	FLOW TIME	28. 3.58	27. 3.58	27. 3.58
2 COMBINED AT								
+		WC26	.07	1	FLOW TIME	113. 3.50	110. 3.50	108. 3.50
HYDROGRAPH AT								
+		EX-W5S	.22	1	FLOW TIME	221. 3.75	214. 3.75	211. 3.75
4 COMBINED AT								
+		CPS	1.23	1	FLOW TIME	431. 3.58	420. 3.58	415. 3.58
HYDROGRAPH AT								
+		EX-W5N	.14	1	FLOW TIME	155. 3.75	150. 3.75	148. 3.75
HYDROGRAPH AT								
+		WOFF7	.01	1	FLOW TIME	10. 3.50	10. 3.50	10. 3.50
HYDROGRAPH AT								
+		WOFF8	.21	1	FLOW TIME	230. 3.75	223. 3.75	220. 3.75
ROUTED TO								
+		RWOFF8	.21	1	FLOW TIME	230. 3.92	223. 3.92	219. 4.00
3 COMBINED AT								
+		CPN	.36	1	FLOW TIME	353. 3.92	342. 3.92	337. 3.92
HYDROGRAPH AT								
+		ON1-D	.03	1	FLOW TIME	47. 3.58	46. 3.58	45. 3.58
HYDROGRAPH AT								
+		ON2-D	.03	1	FLOW TIME	45. 3.58	44. 3.58	44. 3.58
HYDROGRAPH AT								
+		HOR	.02	1	FLOW TIME	30. 3.50	29. 3.50	29. 3.50
3 COMBINED AT								
+		WC7	.07	1	FLOW TIME	121. 3.58	118. 3.58	116. 3.58
HYDROGRAPH AT								
+		ON1-E	.03	1	FLOW TIME	50. 3.50	49. 3.50	48. 3.50
4 COMBINED AT								
+		WC9	1.70	1	FLOW TIME	772. 3.75	748. 3.75	737. 3.75
HYDROGRAPH AT								
+		EX-W6	.02	1	FLOW TIME	23. 3.50	23. 3.50	22. 3.50

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.94	350.00	2.48	5.00	70.94	350.00	2.48
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1169E+03 EXCESS= .0000E+00 OUTFLOW= .1169E+03 BASIN STORAGE= .5456E-07 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.33	350.00	2.46	5.00	70.33	350.00	2.46
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1162E+03 EXCESS= .0000E+00 OUTFLOW= .1162E+03 BASIN STORAGE= .5456E-07 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.00	350.00	2.45	5.00	70.00	350.00	2.45
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1158E+03 EXCESS= .0000E+00 OUTFLOW= .1158E+03 BASIN STORAGE= .5456E-07 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RWOFF8	MANE	5.00	229.98	235.00	1.69	5.00	229.98	235.00	1.69
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+02 EXCESS= .0000E+00 OUTFLOW= .1928E+02 BASIN STORAGE= .6223E-02 PERCENT ERROR= -.2									
FOR PLAN = 1	RATIO=	.00							
RWOFF8	MANE	5.00	222.76	235.00	1.64	5.00	222.76	235.00	1.64
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+02 EXCESS= .0000E+00 OUTFLOW= .1869E+02 BASIN STORAGE= .6146E-02 PERCENT ERROR= -.2									

EX

FOR PLAN = 1	RATIO=	.00								
RWOFF8	MANE	5.00	219.15	240.00	1.61	5.00	219.15	240.00	1.61	

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1836E+02 EXCESS= .0000E+00 OUTFLOW= .1840E+02 BASIN STORAGE= .6107E-02 PERCENT ERROR= -.2

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

Proposed Condition (100-Yr 10-Yr)

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 22APR16 TIME 14:25:29
*
*****

```

PRO

```

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

```

```

      X   X XXXXXXX XXXXX      X
      X   X X      X XX
      X   X X      X X
      XXXXXX XXXX X XXXXX X
      X   X X      X X
      X   X X      X X
      X   X XXXXXXX XXXXX      XXX

```

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

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

1 HEC-1 INPUT PAGE 1

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

*** FREE ***
*DIAGRAM
1 ID SKYE CANYON
2 ID PHASE 3 INFRASTRUCTURE - PROPOSED CONDITION
3 ID AFTER COMMERCIAL ONSITES BUILD-OUT
4 ID
5 ID RETURN PERIOD ----- 100-YEAR
6 ID DISTRIBUTION ----- 6-HOUR SDN3
7 ID PROJECT NO. ----- OLY1602.000
8 ID FILENAME ----- PRO.H1
9 ID DATE ----- 4/19/2016
10 ID MODELED BY ----- SMJ
11 ID
12 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
13 ID DRAINAGE AREA (MIA^2) DARF
14 ID 0.0-0.50 1.00
15 ID 0.5-1.00 0.98
16 ID 1.0-2.00 0.97
17 ID 2.0-4.00 0.93
18 ID 10-YEAR 0.55
19 ID
20 IT 5 0 0 300
21 IO 5 0 0
22 IN 5 0 0
23 JR PREC 1.00 0.98 0.97 0.93 0.55
*
24 KK WOFF1
25 KM EXISTING OFFSITE DRAINAGE BASIN
26 KM DISCHARGES INTO DETENTION BASIN "DB1"
27 PB 3.00
28 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
29 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
30 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
31 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
32 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
33 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
34 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
35 PC 0.998 0.999 1
36 BA .4291
37 LS 0 86.1
38 UD 0.420
*
39 KK WOFF2
40 KM EXISTING OFFSITE DRAINAGE BASIN
41 KM DISCHARGES INTO DETENTION BASIN "DB1"
42 BA .0419
43 LS 0 84.0
44 UD 0.150
*

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1 HEC-1 INPUT PAGE 2

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

45 KK WOFF3
46 KM EXISTING OFFSITE DRAINAGE BASIN
47 KM DISCHARGES INTO DETENTION BASIN "DB1"
48 BA .0259
49 LS 0 86.2
50 UD 0.112
*
51 KK CP1
52 KM COMBINE WOFF1, WOFF2, AND WOFF3
53 HC 3
*

```


PRO

54 KK WOFF4
55 KM EXISTING OFFSITE DRAINAGE BASIN
56 KM DISCHARGES INTO DETENTION BASIN "DB1"
57 BA .0581
58 LS 0 86.2
59 UD 0.136
*

60 KK WOFF5
61 KM EXISTING OFFSITE DRAINAGE BASIN
62 KM DISCHARGES INTO DETENTION BASIN "DB1"
63 BA .2569
64 LS 0 86.5
65 UD 0.419
*

66 KK WOFF6
67 KM EXISTING OFFSITE DRAINAGE BASIN
68 KM DISCHARGES INTO DETENTION BASIN "DB1"
69 BA .0399
70 LS 0 86.2
71 UD 0.121
*

72 KK ON1
73 KM PROPOSED ONSITE DRAINAGE BASIN
74 BA .0303
75 LS 0 92.8
76 UD 0.116
*

77 KK DB1
78 KM COMBINE CP1, WOFF4, WOFF5, WOFF6 AND ON1
79 HC 5
*

1

HEC-1 INPUT

PAGE 3

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

80 KK RDB1
81 KM OUTLET = 24" ORIFICE @ INVERT ELEVATION = 3013.8-FT
82 RS 1 ELEV 3025.5
83 SA 4.68 5.56 5.74 5.92 6.10 7.01 7.46 8.36 9.32 10.68
84 SE 3025.5 3027 3028 3029 3030 3035 3037 3040 3043 3046
85 SQ 49.7 60.6 70.8 74.5 1436.0 3920.5 7136.3
86 SE 3025.5 3030 3035 3037 3040 3043 3046
*

87 KK RRDB1
88 KM ROUTE TO CPS
89 RD 6230 0.033 0.040 0 TRAP 15 1
*

90 KK WML2
91 KM WEST BASIN, WEST OF SHAUMBER ROAD
92 BA .0428
93 PB 3.00
94 LS 0 93.5
95 UD 0.142
*

96 KK WSHA5
97 KM WEST BASIN, SHAUMBER ROAD
98 BA .0037
99 PB 3.00
100 LS 0 98.0
101 UD 0.086
*

102 KK WC20
103 KM S OF EAGLE CANYON/SHAUMBER INTERSECTION
104 KM COMBINE WML2, WSHA5
105 HC 2
*

106 KK WPF4
107 BA .0090
108 PB 3.00
109 LS 0 94.0
110 UD 0.087
*

111 KK WSHA4
112 BA .0022
113 PB 3.00
114 LS 0 98.0
115 UD 0.051
*

1

HEC-1 INPUT

PAGE 4

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

116 KK WC21
117 HC 3
*

118 KK WL4A
119 KM WEST BASIN, WEST OF EGAN CREST DRIVE
120 BA .0125
121 PB 3.00
122 LS 0 92.0
123 UD 0.106
*

PRO

124	KK	WL5A	
125	KM	WEST BASIN, WEST OF EGAN CREST DRIVE	
126	BA	.0170	
127	PB	3.00	
128	LS	0	92.0
129	UD	0.099	
	*		
130	KK	WL5B	
131	BA	.0059	
132	PB	3.00	
133	LS	0	92.0
134	UD	0.085	
	*		
135	KK	WC22A	
136	HC	3	
	*		
137	KK	WEGN2	
138	KM	WEST BASIN, EGAN CREST DRIVE	
139	BA	.0007	
140	PB	3.00	
141	LS	0	98.0
142	UD	0.050	
	*		
143	KK	WC23	
144	HC	2	
	*		
145	KK	WL6A	
146	KM	WEST BASIN, WEST OF SKYE VILLAGE ROAD	
147	BA	.0096	
148	PB	3.00	
149	LS	0	92.0
150	UD	0.092	
	*		

1

HEC-1 INPUT

PAGE 5

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

151	KK	WC24	
152	HC	2	
	*		
153	KK	WPRK6	
154	KM	WEST BASIN, WEST OF SKYE VILLAGE ROAD	
155	BA	.0207	
156	PB	3.00	
157	LS	0	84.0
158	UD	0.121	
	*		
159	KK	WC26	
160	HC	2	
	*		
161	KK	EX-W5S	
162	PB	3.00	
163	BA	.2206	
164	LS	0	85.2
165	UD	0.319	
	*		
166	KK	CPS	
167	HC	4	
	*		
168	KK	EX-W5N	
169	PB	3.00	
170	BA	.1425	
171	LS	0	86.3
172	UD	0.290	
	*		
173	KK	WOFF7	
174	KM	EXISTING OFFSITE DRAINAGE BASIN	
175	BA	.0068	
176	LS	0	86.2
177	UD	0.100	
	*		
178	KK	WOFF8	
179	KM	EXISTING OFFSITE DRAINAGE BASIN	
180	BA	.2141	
181	LS	0	86.3
182	UD	0.302	
	*		
183	KK	RWOFF8	
184	KM	ROUTE TO CPN	
185	RD	8450 0.025 0.040 0 TRAP 15 3	
	*		

1

HEC-1 INPUT

PAGE 6

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

186	KK	CPN	
187	KM	COMBINATION POINT CPN	
188	HC	3	
	*		

PRO

189	KK	DBN						
190	KM	OUTLET = 54" ORIFICE @ INVERT ELEVATION = 2995.5-FT						
191	KO	1						
192	RS	1	VOL	-1				
193	SA	0.00	0.06	0.08	0.10	.20	0.32	0.38
194	SE	2795.5	2798	2799	2800	2805	2810	2812
195	SQ	0.00	26.2	87.0	204.8	276.3	288.5	
196	SE	2795.5	2799	2800	2805	2810	2812	
	*							
197	KK	WSPD0						
198	BA	.0010						
199	PB	2.93						
200	LS	0	93.4					
201	UD	0.050						
	*							
202	KK	WSPD3						
203	BA	.0022						
204	PB	2.93						
205	LS	0	92.8					
206	UD	0.056						
	*							
207	KK	ON1-E						
208	PB	2.93						
209	BA	.0324						
210	LS	0	86.5					
211	UD	0.105						
	*							
212	KK	WC9a						
213	HC	5						
	*							
214	KK	ON1-D						
215	KM	PHASE 1, NORTHWEST QUAD ONSITE BASIN						
216	BA	.0278						
217	PB	2.93						
218	LS	0	91.2					
219	UD	0.114						
	*							
220	KK	ON2-D						
221	KM	PHASE 1, NORTHEAST QUAD ONSITE BASIN						
222	BA	.0301						
223	PB	2.93						
224	LS	0	88.8					
225	UD	0.152						
	*							

1

HEC-1 INPUT

PAGE 7

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

226	KK	HOR						
227	KM	PHASE 1, STREET BASIN SKYE CANYON PARK DRIVE						
228	BA	.0163						
229	PB	2.93						
230	LS	0	93.3					
231	UD	0.108						
	*							
232	KK	WC7						
233	HC	3						
	*							
234	KK	WGRC1A						
235	KM	WEST BASIN, GRAND CANYON DRIVE						
236	BA	.0022						
237	PB	2.93						
238	LS	0	93.2					
239	UD	0.095						
	*							
240	KK	EX-W6						
241	PB	2.93						
242	BA	.0120						
243	LS	0	86.9					
244	UD	0.101						
	*							
245	KK	WC9						
246	KO	3						
247	HC	4						
	*							
248	ZZ							

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
LINE	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
24	WOFF1	
.	.	
39	WOFF2	
.	.	
45	WOFF3	
.	.	
51	CP1.....	
.	.	
.	.	

54	.	WOFF4	PRO
60	.	WOFF5	
66	.	WOFF6	
72	.	ON1	
77	DB1		
	V		
80	RDB1		
	V		
87	RRDB1		
90	.	WML2	
96	.	WSHA5	
102	.	WC20	
106	.	WPF4	
111	.	WSHA4	
116	.	WC21	
118	.	WL4A	
124	.	WL5A	
130	.	WL5B	
135	.	WC22A	
137	.	WEGN2	
143	.	WC23	
145	.	WL6A	
151	.	WC24	
153	.	WPRK6	
159	.	WC26	
161	.	EX-W5S	
166	CPS		
168	.	EX-W5N	
173	.	WOFF7	
178	.	WOFF8	
	.	V	
183	.	RWOFF8	
186	.	CPN	
	.	V	
189	.	DBN	
197	.	WSPD0	
202	.	WSPD3	
207	.	ON1-E	
212	WC9a		
214	.	ON1-D	

PRO

220 . . . ON2-D
226 . . . HOR
232 . . . WC7
234 . . . WGRCLA
240 . . . EX-W6
245 . . . WC9

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 22APR16 TIME 14:25:29 *

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

SKYE CANYON
PHASE 3 INFRASTRUCTURE - PROPOSED CONDITION
AFTER COMMERCIAL ONSITES BUILD-OUT

RETURN PERIOD ----- 100-YEAR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1602.000
FILENAME ----- PRO.H1
DATE ----- 4/19/2016
MODELED BY ----- SMJ

SIX HOUR	DEPTH-AREA	REDUCTION	FACTORS
DRAINAGE	AREA (MI^2)	DARF	
0.0-0.50		1.00	
0.5-1.00		0.98	
1.0-2.00		0.97	
2.0-4.00		0.93	
10-YEAR		0.55	

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .98 .97 .93 .55

*** **

*
189 KK * DBN *
*

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

HYDROGRAPH ROUTING DATA

192 RS STORAGE ROUTING

		PRO						
NSTPS ITYP RSVRIC X		1 NUMBER OF SUBREACHES VOL TYPE OF INITIAL CONDITION -1.00 INITIAL CONDITION .00 WORKING R AND D COEFFICIENT						
193 SA	AREA	.0	.1	.1	.1	.2	.3	.4
194 SE	ELEVATION	2795.50	2798.00	2799.00	2800.00	2805.00	2810.00	2812.00
195 SQ	DISCHARGE	0.	26.	87.	205.	276.	289.	
196 SE	ELEVATION	2795.50	2799.00	2800.00	2805.00	2810.00	2812.00	

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.05	.12	.21	.95	2.23	2.93
ELEVATION	2795.50	2798.00	2799.00	2800.00	2805.00	2810.00	2812.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.05	.12	.21	.95	2.23	2.93
OUTFLOW	.00	18.71	26.20	87.00	204.80	276.30	288.50
ELEVATION	2795.50	2798.00	2799.00	2800.00	2805.00	2810.00	2812.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 87.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

HYDROGRAPH AT STATION DBN 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	0.	.0	2795.5	*	1	0820	101	0.	.0	2795.5	*	1	1640	201	0.	.0	2795.5	
1	0005	2	0.	.0	2795.5	*	1	0825	102	0.	.0	2795.5	*	1	1645	202	0.	.0	2795.5	
1	0010	3	0.	.0	2795.5	*	1	0830	103	0.	.0	2795.5	*	1	1650	203	0.	.0	2795.5	
1	0015	4	0.	.0	2795.5	*	1	0835	104	0.	.0	2795.5	*	1	1655	204	0.	.0	2795.5	
1	0020	5	0.	.0	2795.5	*	1	0840	105	0.	.0	2795.5	*	1	1700	205	0.	.0	2795.5	
1	0025	6	0.	.0	2795.5	*	1	0845	106	0.	.0	2795.5	*	1	1705	206	0.	.0	2795.5	
1	0030	7	0.	.0	2795.5	*	1	0850	107	0.	.0	2795.5	*	1	1710	207	0.	.0	2795.5	
1	0035	8	0.	.0	2795.5	*	1	0855	108	0.	.0	2795.5	*	1	1715	208	0.	.0	2795.5	
1	0040	9	0.	.0	2795.6	*	1	0900	109	0.	.0	2795.5	*	1	1720	209	0.	.0	2795.5	
1	0045	10	1.	.0	2795.6	*	1	0905	110	0.	.0	2795.5	*	1	1725	210	0.	.0	2795.5	
1	0050	11	1.	.0	2795.6	*	1	0910	111	0.	.0	2795.5	*	1	1730	211	0.	.0	2795.5	
1	0055	12	1.	.0	2795.6	*	1	0915	112	0.	.0	2795.5	*	1	1735	212	0.	.0	2795.5	
1	0100	13	0.	.0	2795.6	*	1	0920	113	0.	.0	2795.5	*	1	1740	213	0.	.0	2795.5	
1	0105	14	0.	.0	2795.5	*	1	0925	114	0.	.0	2795.5	*	1	1745	214	0.	.0	2795.5	
1	0110	15	0.	.0	2795.5	*	1	0930	115	0.	.0	2795.5	*	1	1750	215	0.	.0	2795.5	
1	0115	16	1.	.0	2795.6	*	1	0935	116	0.	.0	2795.5	*	1	1755	216	0.	.0	2795.5	
1	0120	17	1.	.0	2795.6	*	1	0940	117	0.	.0	2795.5	*	1	1800	217	0.	.0	2795.5	
1	0125	18	2.	.0	2795.7	*	1	0945	118	0.	.0	2795.5	*	1	1805	218	0.	.0	2795.5	
1	0130	19	2.	.0	2795.8	*	1	0950	119	0.	.0	2795.5	*	1	1810	219	0.	.0	2795.5	
1	0135	20	3.	.0	2796.0	*	1	0955	120	0.	.0	2795.5	*	1	1815	220	0.	.0	2795.5	
1	0140	21	5.	.0	2796.1	*	1	1000	121	0.	.0	2795.5	*	1	1820	221	0.	.0	2795.5	
1	0145	22	6.	.0	2796.2	*	1	1005	122	0.	.0	2795.5	*	1	1825	222	0.	.0	2795.5	
1	0150	23	6.	.0	2796.3	*	1	1010	123	0.	.0	2795.5	*	1	1830	223	0.	.0	2795.5	
1	0155	24	6.	.0	2796.3	*	1	1015	124	0.	.0	2795.5	*	1	1835	224	0.	.0	2795.5	
1	0200	25	6.	.0	2796.3	*	1	1020	125	0.	.0	2795.5	*	1	1840	225	0.	.0	2795.5	
1	0205	26	6.	.0	2796.3	*	1	1025	126	0.	.0	2795.5	*	1	1845	226	0.	.0	2795.5	
1	0210	27	6.	.0	2796.3	*	1	1030	127	0.	.0	2795.5	*	1	1850	227	0.	.0	2795.5	
1	0215	28	8.	.0	2796.6	*	1	1035	128	0.	.0	2795.5	*	1	1855	228	0.	.0	2795.5	
1	0220	29	11.	.0	2797.0	*	1	1040	129	0.	.0	2795.5	*	1	1900	229	0.	.0	2795.5	
1	0225	30	15.	.0	2797.4	*	1	1045	130	0.	.0	2795.5	*	1	1905	230	0.	.0	2795.5	
1	0230	31	17.	.0	2797.8	*	1	1050	131	0.	.0	2795.5	*	1	1910	231	0.	.0	2795.5	
1	0235	32	17.	.0	2797.8	*	1	1055	132	0.	.0	2795.5	*	1	1915	232	0.	.0	2795.5	
1	0240	33	16.	.0	2797.7	*	1	1100	133	0.	.0	2795.5	*	1	1920	233	0.	.0	2795.5	
1	0245	34	16.	.0	2797.6	*	1	1105	134	0.	.0	2795.5	*	1	1925	234	0.	.0	2795.5	
1	0250	35	15.	.0	2797.6	*	1	1110	135	0.	.0	2795.5	*	1	1930	235	0.	.0	2795.5	
1	0255	36	17.	.0	2797.7	*	1	1115	136	0.	.0	2795.5	*	1	1935	236	0.	.0	2795.5	
1	0300	37	19.	.1	2798.0	*	1	1120	137	0.	.0	2795.5	*	1	1940	237	0.	.0	2795.5	
1	0305	38	20.	.1	2798.2	*	1	1125	138	0.	.0	2795.5	*	1	1945	238	0.	.0	2795.5	
1	0310	39	24.	.1	2798.7	*	1	1130	139	0.	.0	2795.5	*	1	1950	239	0.	.0	2795.5	
1	0315	40	33.	.1	2799.1	*	1	1135	140	0.	.0	2795.5	*	1	1955	240	0.	.0	2795.5	
1	0320	41	52.	.2	2799.4	*	1	1140	141	0.	.0	2795.5	*	1	2000	241	0.	.0	2795.5	
1	0325	42	76.	.2	2799.8	*	1	1145	142	0.	.0	2795.5	*	1	2005	242	0.	.0	2795.5	
1	0330	43	100.	.3	2800.5	*	1	1150	143	0.	.0	2795.5	*	1	2010	243	0.	.0	2795.5	
1	0335	44	126.	.5	2801.7	*	1	1155	144	0.	.0	2795.5	*	1	2015	244	0.	.0	2795.5	
1	0340	45	156.	.6	2802.9	*	1	1200	145	0.	.0	2795.5	*	1	2020	245	0.	.0	2795.5	
1	0345	46	196.	.9	2804.6	*	1	1205	146	0.	.0	2795.5	*	1	2025	246	0.	.0	2795.5	
1	0350	47	228.	1.4	2806.6	*	1	1210	147	0.	.0	2795.5	*	1	2030	247	0.	.0	2795.5	
1	0355	48	262.	2.0	2809.0	*	1	1215	148	0.	.0	2795.5	*	1	2035	248	0.	.0	2795.5	
1	0400	49	280.	2.4	2810.6	*	1	1220	149	0.	.0	2795.5	*	1	2040	249	0.	.0	2795.5	
1	0405	50	284.	2.7	2811.2	*	1	1225	150	0.	.0	2795.5	*	1	2045	250	0.	.0	2795.5	
1	0410	51	283.	2.6	2811.1	*	1	1230	151	0.	.0	2795.5	*	1	2050	251	0.	.0	2795.5	
1	0415	52	277.	2.3	2810.1	*	1	1235	152	0.	.0	2795.5	*	1	2055	252	0.	.0	2795.5	
1	0420	53	252.	1.8	2808.3	*	1	1240	153	0.	.0	2795.5	*	1	2100	253	0.	.0	2795.5	
1	0425	54	223.	1.3	2806.2	*	1	1245	154	0.	.0	2795.5	*	1	2105	254	0.	.0	2795.5	
1	0430	55	184.	.8	2804.1	*	1	1250	155	0.	.0	2795.5	*	1	2110	255	0.	.0	2795.5	
1	0435	56	140.	.5	2802.2	*	1	1255	156	0.	.0	2795.5	*	1	2115	256	0.	.0	2795.5	
1	0440	57	119.	.4	2801.3	*	1	1300	157	0.	.0	2795.5	*	1	2120	257	0.	.0	2795.5	
1	0445	58	106.	.3	2800.8	*	1	1305	158	0.	.0	2795.5	*	1	2125	258	0.	.0	2795.5	
1	0450	59	98.	.3	2800.5	*	1	1310	159	0.	.0	2795.5	*	1	2130	259	0.	.0	2795.5	
1	0455	60	93.	.2	2800.2	*	1	1315	160	0.	.0	2795.5	*	1	2135	260	0.	.0	2795.5	
1	0500	61	90.	.2	2800.1	*	1	1320	161	0.	.0	2795.5	*	1	2140	261	0.	.0	2795.5	
1	0505	62	90.	.2	2800.1	*	1	1325	162	0.	.0	2795.5	*	1	2145	262	0.	.0	2795.5	
1	0510	63	90.	.2	2800.1	*	1	1330	163	0.	.0	2795.5	*	1	2150	263	0.	.0	2795.5	
1	0515	64	87.	.2	2800.0	*	1	1335	164	0.	.0	2795.5	*	1	2155	264	0.	.0	2795.5	
1	0520	65	78.	.2	2799.8	*	1	1340	165	0.	.0	2795.5	*	1	2200	265	0.	.0	2795.5	
1	0525	66	72.	.2	2799.8	*	1	1345	166	0.	.0	2795.5	*	1	2205	266	0.	.0	2795.5	
1	0530	67	64.	.2	2799.6	*	1	1350	167	0.	.0	2795.5	*	1	2210	267	0.	.0	2795.5	

1	0535	68	56.	.2	2799.5	*	1	1355	168	PRO	.0	2795.5	*	1	2215	268	0.	.0	2795.5
1	0540	69	47.	.2	2799.3	*	1	1400	169	0.	.0	2795.5	*	1	2220	269	0.	.0	2795.5
1	0545	70	40.	.1	2799.2	*	1	1405	170	0.	.0	2795.5	*	1	2225	270	0.	.0	2795.5
1	0550	71	33.	.1	2799.1	*	1	1410	171	0.	.0	2795.5	*	1	2230	271	0.	.0	2795.5
1	0555	72	28.	.1	2799.0	*	1	1415	172	0.	.0	2795.5	*	1	2235	272	0.	.0	2795.5
1	0600	73	25.	.1	2798.9	*	1	1420	173	0.	.0	2795.5	*	1	2240	273	0.	.0	2795.5
1	0605	74	23.	.1	2798.6	*	1	1425	174	0.	.0	2795.5	*	1	2245	274	0.	.0	2795.5
1	0610	75	21.	.1	2798.3	*	1	1430	175	0.	.0	2795.5	*	1	2250	275	0.	.0	2795.5
1	0615	76	17.	.0	2797.8	*	1	1435	176	0.	.0	2795.5	*	1	2255	276	0.	.0	2795.5
1	0620	77	12.	.0	2797.1	*	1	1440	177	0.	.0	2795.5	*	1	2300	277	0.	.0	2795.5
1	0625	78	10.	.0	2796.9	*	1	1445	178	0.	.0	2795.5	*	1	2305	278	0.	.0	2795.5
1	0630	79	9.	.0	2796.7	*	1	1450	179	0.	.0	2795.5	*	1	2310	279	0.	.0	2795.5
1	0635	80	8.	.0	2796.5	*	1	1455	180	0.	.0	2795.5	*	1	2315	280	0.	.0	2795.5
1	0640	81	7.	.0	2796.4	*	1	1500	181	0.	.0	2795.5	*	1	2320	281	0.	.0	2795.5
1	0645	82	6.	.0	2796.3	*	1	1505	182	0.	.0	2795.5	*	1	2325	282	0.	.0	2795.5
1	0650	83	5.	.0	2796.2	*	1	1510	183	0.	.0	2795.5	*	1	2330	283	0.	.0	2795.5
1	0655	84	4.	.0	2796.0	*	1	1515	184	0.	.0	2795.5	*	1	2335	284	0.	.0	2795.5
1	0700	85	3.	.0	2795.9	*	1	1520	185	0.	.0	2795.5	*	1	2340	285	0.	.0	2795.5
1	0705	86	2.	.0	2795.8	*	1	1525	186	0.	.0	2795.5	*	1	2345	286	0.	.0	2795.5
1	0710	87	2.	.0	2795.7	*	1	1530	187	0.	.0	2795.5	*	1	2350	287	0.	.0	2795.5
1	0715	88	1.	.0	2795.7	*	1	1535	188	0.	.0	2795.5	*	1	2355	288	0.	.0	2795.5
1	0720	89	1.	.0	2795.6	*	1	1540	189	0.	.0	2795.5	*	2	0000	289	0.	.0	2795.5
1	0725	90	1.	.0	2795.6	*	1	1545	190	0.	.0	2795.5	*	2	0005	290	0.	.0	2795.5
1	0730	91	1.	.0	2795.6	*	1	1550	191	0.	.0	2795.5	*	2	0010	291	0.	.0	2795.5
1	0735	92	0.	.0	2795.6	*	1	1555	192	0.	.0	2795.5	*	2	0015	292	0.	.0	2795.5
1	0740	93	0.	.0	2795.5	*	1	1600	193	0.	.0	2795.5	*	2	0020	293	0.	.0	2795.5
1	0745	94	0.	.0	2795.5	*	1	1605	194	0.	.0	2795.5	*	2	0025	294	0.	.0	2795.5
1	0750	95	0.	.0	2795.5	*	1	1610	195	0.	.0	2795.5	*	2	0030	295	0.	.0	2795.5
1	0755	96	0.	.0	2795.5	*	1	1615	196	0.	.0	2795.5	*	2	0035	296	0.	.0	2795.5
1	0800	97	0.	.0	2795.5	*	1	1620	197	0.	.0	2795.5	*	2	0040	297	0.	.0	2795.5
1	0805	98	0.	.0	2795.5	*	1	1625	198	0.	.0	2795.5	*	2	0045	298	0.	.0	2795.5
1	0810	99	0.	.0	2795.5	*	1	1630	199	0.	.0	2795.5	*	2	0050	299	0.	.0	2795.5
1	0815	100	0.	.0	2795.5	*	1	1635	200	0.	.0	2795.5	*	2	0055	300	0.	.0	2795.5

PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE	FLOW	24.92-HR
+	(CFS)	(HR)		24-HR	72-HR	
+	284.	4.08	66.	16.	16.	16.
		(CFS)	1.685	1.687	1.687	1.687
		(INCHES)	33.	33.	33.	33.
		(AC-FT)				
PEAK STORAGE	TIME		6-HR	MAXIMUM AVERAGE	STORAGE	24.92-HR
+	(AC-FT)	(HR)		24-HR	72-HR	
+	3.	4.08	0.	0.	0.	0.
PEAK STAGE	TIME		6-HR	MAXIMUM AVERAGE	STAGE	24.92-HR
+	(FEET)	(HR)		24-HR	72-HR	
+	2811.22	4.08	2799.50	2796.50	2796.47	2796.47
CUMULATIVE AREA =			.36 SQ MI			

HYDROGRAPH AT STATION DBN PLAN 1, RATIO = .98

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000	1	0.	0.	.0	2795.5	*	1	0820	101	0.	0.	.0	2795.5	*	1	1640	201	0.	0.	.0	2795.5
1	0005	2	0.	0.	.0	2795.5	*	1	0825	102	0.	0.	.0	2795.5	*	1	1645	202	0.	0.	.0	2795.5
1	0010	3	0.	0.	.0	2795.5	*	1	0830	103	0.	0.	.0	2795.5	*	1	1650	203	0.	0.	.0	2795.5
1	0015	4	0.	0.	.0	2795.5	*	1	0835	104	0.	0.	.0	2795.5	*	1	1655	204	0.	0.	.0	2795.5
1	0020	5	0.	0.	.0	2795.5	*	1	0840	105	0.	0.	.0	2795.5	*	1	1700	205	0.	0.	.0	2795.5
1	0025	6	0.	0.	.0	2795.5	*	1	0845	106	0.	0.	.0	2795.5	*	1	1705	206	0.	0.	.0	2795.5
1	0030	7	0.	0.	.0	2795.5	*	1	0850	107	0.	0.	.0	2795.5	*	1	1710	207	0.	0.	.0	2795.5
1	0035	8	0.	0.	.0	2795.5	*	1	0855	108	0.	0.	.0	2795.5	*	1	1715	208	0.	0.	.0	2795.5
1	0040	9	0.	0.	.0	2795.5	*	1	0900	109	0.	0.	.0	2795.5	*	1	1720	209	0.	0.	.0	2795.5
1	0045	10	0.	0.	.0	2795.6	*	1	0905	110	0.	0.	.0	2795.5	*	1	1725	210	0.	0.	.0	2795.5
1	0050	11	1.	0.	.0	2795.6	*	1	0910	111	0.	0.	.0	2795.5	*	1	1730	211	0.	0.	.0	2795.5
1	0055	12	0.	0.	.0	2795.6	*	1	0915	112	0.	0.	.0	2795.5	*	1	1735	212	0.	0.	.0	2795.5
1	0100	13	0.	0.	.0	2795.5	*	1	0920	113	0.	0.	.0	2795.5	*	1	1740	213	0.	0.	.0	2795.5
1	0105	14	0.	0.	.0	2795.5	*	1	0925	114	0.	0.	.0	2795.5	*	1	1745	214	0.	0.	.0	2795.5
1	0110	15	0.	0.	.0	2795.5	*	1	0930	115	0.	0.	.0	2795.5	*	1	1750	215	0.	0.	.0	2795.5
1	0115	16	0.	0.	.0	2795.6	*	1	0935	116	0.	0.	.0	2795.5	*	1	1755	216	0.	0.	.0	2795.5
1	0120	17	1.	0.	.0	2795.6	*	1	0940	117	0.	0.	.0	2795.5	*	1	1800	217	0.	0.	.0	2795.5
1	0125	18	1.	0.	.0	2795.7	*	1	0945	118	0.	0.	.0	2795.5	*	1	1805	218	0.	0.	.0	2795.5
1	0130	19	2.	0.	.0	2795.8	*	1	0950	119	0.	0.	.0	2795.5	*	1	1810	219	0.	0.	.0	2795.5
1	0135	20	3.	0.	.0	2795.9	*	1	0955	120	0.	0.	.0	2795.5	*	1	1815	220	0.	0.	.0	2795.5
1	0140	21	4.	0.	.0	2796.1	*	1	1000	121	0.	0.	.0	2795.5	*	1	1820	221	0.	0.	.0	2795.5
1	0145	22	5.	0.	.0	2796.2	*	1	1005	122	0.	0.	.0	2795.5	*	1	1825	222	0.	0.	.0	2795.5
1	0150	23	6.	0.	.0	2796.3	*	1	1010	123	0.	0.	.0	2795.5	*	1	1830	223	0.	0.	.0	2795.5
1	0155	24	6.	0.	.0	2796.3	*	1	1015	124	0.	0.	.0	2795.5	*	1	1835	224	0.	0.	.0	2795.5
1	0200	25	6.	0.	.0	2796.2	*	1	1020	125	0.	0.	.0	2795.5	*	1	1840	225	0.	0.	.0	2795.5
1	0205	26	5.	0.	.0	2796.2	*	1	1025	126	0.	0.	.0	2795.5	*	1	1845	226	0.	0.	.0	2795.5
1	0210	27	6.	0.	.0	2796.3	*	1	1030	127	0.	0.	.0	2795.5	*	1	1850	227	0.	0.	.0	2795.5
1	0215	28	7.	0.	.0	2796.5	*	1	1035	128	0.	0.	.0	2795.5	*	1	1855	228	0.	0.	.0	2795.5
1	0220	29	10.	0.	.0	2796.9	*	1	1040	129	0.	0.	.0	2795.5	*	1	1900	229	0.	0.	.0	2795.5
1	0225	30	14.	0.	.0	2797.3	*	1	1045	130	0.	0.	.0	2795.5	*	1	1905	230	0.	0.	.0	2795.5
1	0230	31	16.	0.	.0	2797.6	*	1	1050	131	0.	0.	.0	2795.5	*	1	1910	231	0.	0.	.0	2795.5
1	0235	32	16.	0.	.0	2797.7	*	1	1055	132	0.	0.	.0	2795.5	*	1	1915	232	0.	0.	.0	2795.5
1	0240	33	16.	0.	.0	2797.6	*	1	1100	133	0.	0.	.0	2795.5	*	1	1920	233	0.	0.	.0	2795.5
1	0245	34	15.	0.	.0	2797.5	*	1	1105	134	0.	0.	.0	2795.5	*	1	1925	234	0.	0.	.0	2795.5
1	0250	35	15.	0.	.0	2797.5	*	1	1110	135	0.	0.	.0	2795.5	*	1	1930	235	0.	0.	.0	2795.5
1	0255	36	16.	0.	.0	2797.6	*	1	1115	136	0.	0.	.0	2795.5	*	1	1935	236	0.	0.	.0	2795.5
1	0300	37	18.	0.	.0	2797.9	*	1	1120	137	0.	0.	.0	2795.5	*	1	1940	237	0.	0.	.0	2795.5
1	0305	38	20.	1.	.1	2798.2	*	1	1125	138	0.	0.	.0	2795.5	*	1	1945	238	0.	0.	.0	2795.5
1	0310	39	23.	1.	.1	2798.5	*	1	1130	139	0.	0.	.0	2795.5	*	1	1950	239	0.	0.	.0	2795.5
1	0315	40	30.	1.	.1	2799.1	*	1	1135	140	0.	0.	.0	2795.5	*	1	1955	240	0.	0.	.0	2795.5

1	0320	41	51.	.2	2799.4	*	1	1140	141	PRO	.0	2795.5	*	1	2000	241	0.	.0	2795.5
1	0325	42	73.	.2	2799.8	*	1	1145	142	.0	.0	2795.5	*	1	2005	242	0.	.0	2795.5
1	0330	43	98.	.3	2800.5	*	1	1150	143	.0	.0	2795.5	*	1	2010	243	0.	.0	2795.5
1	0335	44	122.	.4	2801.5	*	1	1155	144	.0	.0	2795.5	*	1	2015	244	0.	.0	2795.5
1	0340	45	150.	.6	2802.7	*	1	1200	145	.0	.0	2795.5	*	1	2020	245	0.	.0	2795.5
1	0345	46	188.	.8	2804.3	*	1	1205	146	.0	.0	2795.5	*	1	2025	246	0.	.0	2795.5
1	0350	47	223.	1.3	2806.3	*	1	1210	147	.0	.0	2795.5	*	1	2030	247	0.	.0	2795.5
1	0355	48	255.	1.8	2808.5	*	1	1215	148	.0	.0	2795.5	*	1	2035	248	0.	.0	2795.5
1	0400	49	277.	2.3	2810.1	*	1	1220	149	.0	.0	2795.5	*	1	2040	249	0.	.0	2795.5
1	0405	50	280.	2.5	2810.7	*	1	1225	150	.0	.0	2795.5	*	1	2045	250	0.	.0	2795.5
1	0410	51	279.	2.4	2810.4	*	1	1230	151	.0	.0	2795.5	*	1	2050	251	0.	.0	2795.5
1	0415	52	267.	2.1	2809.3	*	1	1235	152	.0	.0	2795.5	*	1	2055	252	0.	.0	2795.5
1	0420	53	242.	1.6	2807.6	*	1	1240	153	.0	.0	2795.5	*	1	2100	253	0.	.0	2795.5
1	0425	54	215.	1.1	2805.7	*	1	1245	154	.0	.0	2795.5	*	1	2105	254	0.	.0	2795.5
1	0430	55	170.	.7	2803.5	*	1	1250	155	.0	.0	2795.5	*	1	2110	255	0.	.0	2795.5
1	0435	56	134.	.5	2802.0	*	1	1255	156	.0	.0	2795.5	*	1	2115	256	0.	.0	2795.5
1	0440	57	115.	.4	2801.2	*	1	1300	157	.0	.0	2795.5	*	1	2120	257	0.	.0	2795.5
1	0445	58	103.	.3	2800.7	*	1	1305	158	.0	.0	2795.5	*	1	2125	258	0.	.0	2795.5
1	0450	59	96.	.3	2800.4	*	1	1310	159	.0	.0	2795.5	*	1	2130	259	0.	.0	2795.5
1	0455	60	90.	.2	2800.1	*	1	1315	160	.0	.0	2795.5	*	1	2135	260	0.	.0	2795.5
1	0500	61	88.	.2	2800.0	*	1	1320	161	.0	.0	2795.5	*	1	2140	261	0.	.0	2795.5
1	0505	62	87.	.2	2800.0	*	1	1325	162	.0	.0	2795.5	*	1	2145	262	0.	.0	2795.5
1	0510	63	87.	.2	2800.0	*	1	1330	163	.0	.0	2795.5	*	1	2150	263	0.	.0	2795.5
1	0515	64	83.	.2	2799.9	*	1	1335	164	.0	.0	2795.5	*	1	2155	264	0.	.0	2795.5
1	0520	65	76.	.2	2799.8	*	1	1340	165	.0	.0	2795.5	*	1	2200	265	0.	.0	2795.5
1	0525	66	70.	.2	2799.7	*	1	1345	166	.0	.0	2795.5	*	1	2205	266	0.	.0	2795.5
1	0530	67	63.	.2	2799.6	*	1	1350	167	.0	.0	2795.5	*	1	2210	267	0.	.0	2795.5
1	0535	68	55.	.2	2799.5	*	1	1355	168	.0	.0	2795.5	*	1	2215	268	0.	.0	2795.5
1	0540	69	46.	.1	2799.3	*	1	1400	169	.0	.0	2795.5	*	1	2220	269	0.	.0	2795.5
1	0545	70	39.	.1	2799.2	*	1	1405	170	.0	.0	2795.5	*	1	2225	270	0.	.0	2795.5
1	0550	71	33.	.1	2799.1	*	1	1410	171	.0	.0	2795.5	*	1	2230	271	0.	.0	2795.5
1	0555	72	28.	.1	2799.0	*	1	1415	172	.0	.0	2795.5	*	1	2235	272	0.	.0	2795.5
1	0600	73	25.	.1	2798.9	*	1	1420	173	.0	.0	2795.5	*	1	2240	273	0.	.0	2795.5
1	0605	74	23.	.1	2798.6	*	1	1425	174	.0	.0	2795.5	*	1	2245	274	0.	.0	2795.5
1	0610	75	20.	.1	2798.2	*	1	1430	175	.0	.0	2795.5	*	1	2250	275	0.	.0	2795.5
1	0615	76	16.	.0	2797.7	*	1	1435	176	.0	.0	2795.5	*	1	2255	276	0.	.0	2795.5
1	0620	77	12.	.0	2797.1	*	1	1440	177	.0	.0	2795.5	*	1	2300	277	0.	.0	2795.5
1	0625	78	10.	.0	2796.8	*	1	1445	178	.0	.0	2795.5	*	1	2305	278	0.	.0	2795.5
1	0630	79	9.	.0	2796.6	*	1	1450	179	.0	.0	2795.5	*	1	2310	279	0.	.0	2795.5
1	0635	80	7.	.0	2796.5	*	1	1455	180	.0	.0	2795.5	*	1	2315	280	0.	.0	2795.5
1	0640	81	7.	.0	2796.4	*	1	1500	181	.0	.0	2795.5	*	1	2320	281	0.	.0	2795.5
1	0645	82	6.	.0	2796.3	*	1	1505	182	.0	.0	2795.5	*	1	2325	282	0.	.0	2795.5
1	0650	83	5.	.0	2796.1	*	1	1510	183	.0	.0	2795.5	*	1	2330	283	0.	.0	2795.5
1	0655	84	4.	.0	2796.0	*	1	1515	184	.0	.0	2795.5	*	1	2335	284	0.	.0	2795.5
1	0700	85	3.	.0	2795.9	*	1	1520	185	.0	.0	2795.5	*	1	2340	285	0.	.0	2795.5
1	0705	86	2.	.0	2795.8	*	1	1525	186	.0	.0	2795.5	*	1	2345	286	0.	.0	2795.5
1	0710	87	2.	.0	2795.7	*	1	1530	187	.0	.0	2795.5	*	1	2350	287	0.	.0	2795.5
1	0715	88	1.	.0	2795.7	*	1	1535	188	.0	.0	2795.5	*	1	2355	288	0.	.0	2795.5
1	0720	89	1.	.0	2795.6	*	1	1540	189	.0	.0	2795.5	*	2	0000	289	0.	.0	2795.5
1	0725	90	1.	.0	2795.6	*	1	1545	190	.0	.0	2795.5	*	2	0005	290	0.	.0	2795.5
1	0730	91	1.	.0	2795.6	*	1	1550	191	.0	.0	2795.5	*	2	0010	291	0.	.0	2795.5
1	0735	92	0.	.0	2795.6	*	1	1555	192	.0	.0	2795.5	*	2	0015	292	0.	.0	2795.5
1	0740	93	0.	.0	2795.5	*	1	1600	193	.0	.0	2795.5	*	2	0020	293	0.	.0	2795.5
1	0745	94	0.	.0	2795.5	*	1	1605	194	.0	.0	2795.5	*	2	0025	294	0.	.0	2795.5
1	0750	95	0.	.0	2795.5	*	1	1610	195	.0	.0	2795.5	*	2	0030	295	0.	.0	2795.5
1	0755	96	0.	.0	2795.5	*	1	1615	196	.0	.0	2795.5	*	2	0035	296	0.	.0	2795.5
1	0800	97	0.	.0	2795.5	*	1	1620	197	.0	.0	2795.5	*	2	0040	297	0.	.0	2795.5
1	0805	98	0.	.0	2795.5	*	1	1625	198	.0	.0	2795.5	*	2	0045	298	0.	.0	2795.5
1	0810	99	0.	.0	2795.5	*	1	1630	199	.0	.0	2795.5	*	2	0050	299	0.	.0	2795.5
1	0815	100	0.	.0	2795.5	*	1	1635	200	.0	.0	2795.5	*	2	0055	300	0.	.0	2795.5

PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE FLOW	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
+	280.	4.08	(CFS)	64.	16.	15.	15.
			(INCHES)	1.633	1.636	1.636	1.636
			(AC-FT)	32.	32.	32.	32.
PEAK STORAGE	TIME		6-HR	MAXIMUM AVERAGE STORAGE	24-HR	72-HR	24.92-HR
+	(AC-FT)	(HR)					
+	2.	4.08		0.	0.	0.	0.
PEAK STAGE	TIME		6-HR	MAXIMUM AVERAGE STAGE	24-HR	72-HR	24.92-HR
+	(FEET)	(HR)					
+	2810.65	4.08		2799.37	2796.47	2796.43	2796.43
CUMULATIVE AREA =				.36 SQ MI			

HYDROGRAPH AT STATION DBN PLAN 1, RATIO = .97

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2795.5	*	1		0820	101	0.	.0	2795.5	*	1		1640	201	0.	.0	2795.5
1		0005	2	0.	.0	2795.5	*	1		0825	102	0.	.0	2795.5	*	1		1645	202	0.	.0	2795.5
1		0010	3	0.	.0	2795.5	*	1		0830	103	0.	.0	2795.5	*	1		1650	203	0.	.0	2795.5
1		0015	4	0.	.0	2795.5	*	1		0835	104	0.	.0	2795.5	*	1		1655	204	0.	.0	2795.5
1		0020	5	0.	.0	2795.5	*	1		0840	105	0.	.0	2795.5	*	1		1700	205	0.	.0	2795.5
1		0025	6	0.	.0	2795.5	*	1		0845	106	0.	.0	2795.5	*	1		1705	206	0.	.0	2795.5
1		0030	7	0.	.0	2795.5	*	1		0850	107	0.	.0	2795.5	*	1		1710	207	0.	.0	2795.5
1		0035	8	0.	.0	2795.5	*	1		0855	108	0.	.0	2795.5	*	1		1715	208	0.	.0	2795.5
1		0040	9	0.	.0	2795.5	*	1		0900	109	0.	.0	2795.5	*	1		1720	209	0.	.0	2795.5
1		0045	10	0.	.0	2795.6	*	1		0905	110	0.	.0	2795.5	*	1		1725	210	0.	.0	2795.5
1		0050	11	0.	.0	2795.6	*	1		0910	111	0.	.0	2795.5	*	1		1730	211	0.	.0	2795.5
1		0055	12	0.	.0	2795.6	*	1		0915	112	0.	.0	2795.5	*	1		1735	212	0.	.0	2795.5
1		0100	13	0.	.0	2795.5	*	1		0920	113	0.	.0	2795.5	*	1		1740	213	0.	.0	2795.5

1	0105	14	0.	.0	2795.5	*	1	0925	114	0.	.0	2795.5	*	1	1745	214	0.	.0	2795.5
1	0110	15	0.	.0	2795.5	*	1	0930	115	0.	.0	2795.5	*	1	1750	215	0.	.0	2795.5
1	0115	16	0.	.0	2795.5	*	1	0935	116	0.	.0	2795.5	*	1	1755	216	0.	.0	2795.5
1	0120	17	0.	.0	2795.5	*	1	0940	117	0.	.0	2795.5	*	1	1800	217	0.	.0	2795.5
1	0125	18	0.	.0	2795.5	*	1	0945	118	0.	.0	2795.5	*	1	1805	218	0.	.0	2795.5
1	0130	19	0.	.0	2795.5	*	1	0950	119	0.	.0	2795.5	*	1	1810	219	0.	.0	2795.5
1	0135	20	0.	.0	2795.5	*	1	0955	120	0.	.0	2795.5	*	1	1815	220	0.	.0	2795.5
1	0140	21	0.	.0	2795.5	*	1	1000	121	0.	.0	2795.5	*	1	1820	221	0.	.0	2795.5
1	0145	22	0.	.0	2795.5	*	1	1005	122	0.	.0	2795.5	*	1	1825	222	0.	.0	2795.5
1	0150	23	0.	.0	2795.5	*	1	1010	123	0.	.0	2795.5	*	1	1830	223	0.	.0	2795.5
1	0155	24	0.	.0	2795.5	*	1	1015	124	0.	.0	2795.5	*	1	1835	224	0.	.0	2795.5
1	0200	25	0.	.0	2795.5	*	1	1020	125	0.	.0	2795.5	*	1	1840	225	0.	.0	2795.5
1	0205	26	0.	.0	2795.5	*	1	1025	126	0.	.0	2795.5	*	1	1845	226	0.	.0	2795.5
1	0210	27	0.	.0	2795.5	*	1	1030	127	0.	.0	2795.5	*	1	1850	227	0.	.0	2795.5
1	0215	28	0.	.0	2795.5	*	1	1035	128	0.	.0	2795.5	*	1	1855	228	0.	.0	2795.5
1	0220	29	0.	.0	2795.5	*	1	1040	129	0.	.0	2795.5	*	1	1900	229	0.	.0	2795.5
1	0225	30	0.	.0	2795.5	*	1	1045	130	0.	.0	2795.5	*	1	1905	230	0.	.0	2795.5
1	0230	31	0.	.0	2795.5	*	1	1050	131	0.	.0	2795.5	*	1	1910	231	0.	.0	2795.5
1	0235	32	0.	.0	2795.5	*	1	1055	132	0.	.0	2795.5	*	1	1915	232	0.	.0	2795.5
1	0240	33	0.	.0	2795.5	*	1	1100	133	0.	.0	2795.5	*	1	1920	233	0.	.0	2795.5
1	0245	34	0.	.0	2795.5	*	1	1105	134	0.	.0	2795.5	*	1	1925	234	0.	.0	2795.5
1	0250	35	0.	.0	2795.5	*	1	1110	135	0.	.0	2795.5	*	1	1930	235	0.	.0	2795.5
1	0300	36	0.	.0	2795.5	*	1	1115	136	0.	.0	2795.5	*	1	1935	236	0.	.0	2795.5
1	0305	37	0.	.0	2795.5	*	1	1120	137	0.	.0	2795.5	*	1	1940	237	0.	.0	2795.5
1	0310	38	0.	.0	2795.5	*	1	1125	138	0.	.0	2795.5	*	1	1945	238	0.	.0	2795.5
1	0315	39	0.	.0	2795.5	*	1	1130	139	0.	.0	2795.5	*	1	1950	239	0.	.0	2795.5
1	0320	40	0.	.0	2795.5	*	1	1135	140	0.	.0	2795.5	*	1	1955	240	0.	.0	2795.5
1	0325	41	0.	.0	2795.5	*	1	1140	141	0.	.0	2795.5	*	1	2000	241	0.	.0	2795.5
1	0330	42	0.	.0	2795.5	*	1	1145	142	0.	.0	2795.5	*	1	2005	242	0.	.0	2795.5
1	0335	43	0.	.0	2795.5	*	1	1150	143	0.	.0	2795.5	*	1	2010	243	0.	.0	2795.5
1	0340	44	0.	.0	2795.5	*	1	1155	144	0.	.0	2795.5	*	1	2015	244	0.	.0	2795.5
1	0345	45	0.	.0	2795.5	*	1	1200	145	0.	.0	2795.5	*	1	2020	245	0.	.0	2795.5
1	0350	46	0.	.0	2795.5	*	1	1205	146	0.	.0	2795.5	*	1	2025	246	0.	.0	2795.5
1	0355	47	0.	.0	2795.5	*	1	1210	147	0.	.0	2795.5	*	1	2030	247	0.	.0	2795.5
1	0400	48	0.	.0	2795.5	*	1	1215	148	0.	.0	2795.5	*	1	2035	248	0.	.0	2795.5
1	0405	49	0.	.0	2795.5	*	1	1220	149	0.	.0	2795.5	*	1	2040	249	0.	.0	2795.5
1	0410	50	0.	.0	2795.5	*	1	1225	150	0.	.0	2795.5	*	1	2045	250	0.	.0	2795.5
1	0415	51	0.	.0	2795.5	*	1	1230	151	0.	.0	2795.5	*	1	2050	251	0.	.0	2795.5
1	0420	52	0.	.0	2795.5	*	1	1235	152	0.	.0	2795.5	*	1	2055	252	0.	.0	2795.5
1	0425	53	0.	.0	2795.5	*	1	1240	153	0.	.0	2795.5	*	1	2100	253	0.	.0	2795.5
1	0430	54	0.	.0	2795.5	*	1	1245	154	0.	.0	2795.5	*	1	2105	254	0.	.0	2795.5
1	0435	55	0.	.0	2795.5	*	1	1250	155	0.	.0	2795.5	*	1	2110	255	0.	.0	2795.5
1	0440	56	0.	.0	2795.5	*	1	1255	156	0.	.0	2795.5	*	1	2115	256	0.	.0	2795.5
1	0445	57	0.	.0	2795.5	*	1	1300	157	0.	.0	2795.5	*	1	2120	257	0.	.0	2795.5
1	0450	58	0.	.0	2795.5	*	1	1305	158	0.	.0	2795.5	*	1	2125	258	0.	.0	2795.5
1	0455	59	0.	.0	2795.5	*	1	1310	159	0.	.0	2795.5	*	1	2130	259	0.	.0	2795.5
1	0500	60	0.	.0	2795.5	*	1	1315	160	0.	.0	2795.5	*	1	2135	260	0.	.0	2795.5
1	0505	61	0.	.0	2795.5	*	1	1320	161	0.	.0	2795.5	*	1	2140	261	0.	.0	2795.5
1	0510	62	0.	.0	2795.5	*	1	1325	162	0.	.0	2795.5	*	1	2145	262	0.	.0	2795.5
1	0515	63	0.	.0	2795.5	*	1	1330	163	0.	.0	2795.5	*	1	2150	263	0.	.0	2795.5
1	0520	64	0.	.0	2795.5	*	1	1335	164	0.	.0	2795.5	*	1	2155	264	0.	.0	2795.5
1	0525	65	0.	.0	2795.5	*	1	1340	165	0.	.0	2795.5	*	1	2200	265	0.	.0	2795.5
1	0530	66	0.	.0	2795.5	*	1	1345	166	0.	.0	2795.5	*	1	2205	266	0.	.0	2795.5
1	0535	67	0.	.0	2795.5	*	1	1350	167	0.	.0	2795.5	*	1	2210	267	0.	.0	2795.5
1	0540	68	0.	.0	2795.5	*	1	1355	168	0.	.0	2795.5	*	1	2215	268	0.	.0	2795.5
1	0545	69	0.	.0	2795.5	*	1	1400	169	0.	.0	2795.5	*	1	2220	269	0.	.0	2795.5
1	0550	70	0.	.0	2795.5	*	1	1405	170	0.	.0	2795.5	*	1	2225	270	0.	.0	2795.5
1	0555	71	0.	.0	2795.5	*	1	1410	171	0.	.0	2795.5	*	1	2230	271	0.	.0	2795.5
1	0600	72	0.	.0	2795.5	*	1	1415	172	0.	.0	2795.5	*	1	2235	272	0.	.0	2795.5
1	0605	73	0.	.0	2795.5	*	1	1420	173	0.	.0	2795.5	*	1	2240	273	0.	.0	2795.5
1	0610	74	0.	.0	2795.5	*	1	1425	174	0.	.0	2795.5	*	1	2245	274	0.	.0	2795.5
1	0615	75	0.	.0	2795.5	*	1	1430	175	0.	.0	2795.5	*	1	2250	275	0.	.0	2795.5
1	0620	76	0.	.0	2795.5	*	1	1435	176	0.	.0	2795.5	*	1	2255	276	0.	.0	2795.5
1	0625	77	0.	.0	2795.5	*	1	1440	177	0.	.0	2795.5	*	1	2300	277	0.	.0	2795.5
1	0630	78	0.	.0	2795.5	*	1	1445	178	0.	.0	2795.5	*	1	2305	278	0.	.0	2795.5
1	0635	79	0.	.0	2795.5	*	1	1450	179	0.	.0	2795.5	*	1	2310	279	0.	.0	2795.5
1	0640	80	0.	.0	2795.5	*	1	1455	180	0.	.0	2795.5	*	1	2315	280	0.	.0	2795.5
1	0645	81	0.	.0	2795.5	*	1	1500	181	0.	.0	2795.5	*	1	2320	281	0.	.0	2795.5
1	0650	82	0.	.0	2795.5	*	1	1505	182	0.	.0	2795.5	*	1	2325	282	0.	.0	2795.5
1	0655	83	0.	.0	2795.5	*	1	1510	183	0.	.0	2795.5	*	1	2330	283	0.	.0	2795.5
1	0700	84	0.	.0	2795.5	*	1	1515	184	0.	.0	2795.5	*	1	2335	284	0.	.0	2795.5
1	0705	85	0.	.0	2795.5	*	1	1520	185	0.	.0	2795.5	*	1	2340	285	0.	.0	2795.5
1	0710	86	0.	.0	2795.5	*	1	1525	186	0.	.0	2795.5	*	1	2345	286	0.	.0	2795.5
1	0715	87	0.	.0	2795.5	*	1	1530	187	0.	.0	2795.5	*	1	2350	287	0.	.0	2795.5
1	0720	88	0.	.0	2795.5	*	1	1535	188	0.	.0	2795.5	*	1	2355	288	0.	.0	2795.5
1	0725	89	0.	.0	2795.5	*	1	1540	189	0.	.0	2795.5	*	1	0000	289	0.	.0	2795.5
1	0730	90	0.	.0	2795.5	*	1	1545	190	0.	.0	2795.5	*	1	0005	290	0.	.0	2795.5
1	0735	91	0.	.0	2795.5	*	1	1550	191	0.	.0	2795.5	*	1	0010	291	0.	.0	2795.5
1	0740	92	0.	.0	2795.5	*	1	1555	192	0.	.0	2795.5	*	1	0015	292	0.	.0	2795.5
1	0745	93	0.	.0	2795.5	*	1	1600	193	0.	.0	2795.5	*	1	0020	293	0.	.0	2795.5
1	0750	94	0.	.0	2795.5	*	1	1605	194	0.	.0	2795.5	*	1	0025	294	0.	.0	2795.5
1	0755	95	0.	.0	2795.5	*	1	1610	195	0.	.0	2795.5	*	1	0030	295			

2810.39 4.08 2799.31 2796.45 2796.42 PRO 2796.42

CUMULATIVE AREA = .36 SQ MI

HYDROGRAPH AT STATION DBN
PLAN 1, RATIO = .93

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2795.5	*	1		0820	101	0.	.0	2795.5	*	1		1640	201	0.	.0	2795.5
1		0005	2	0.	.0	2795.5	*	1		0825	102	0.	.0	2795.5	*	1		1645	202	0.	.0	2795.5
1		0010	3	0.	.0	2795.5	*	1		0830	103	0.	.0	2795.5	*	1		1650	203	0.	.0	2795.5
1		0015	4	0.	.0	2795.5	*	1		0835	104	0.	.0	2795.5	*	1		1655	204	0.	.0	2795.5
1		0020	5	0.	.0	2795.5	*	1		0840	105	0.	.0	2795.5	*	1		1700	205	0.	.0	2795.5
1		0025	6	0.	.0	2795.5	*	1		0845	106	0.	.0	2795.5	*	1		1705	206	0.	.0	2795.5
1		0030	7	0.	.0	2795.5	*	1		0850	107	0.	.0	2795.5	*	1		1710	207	0.	.0	2795.5
1		0035	8	0.	.0	2795.5	*	1		0855	108	0.	.0	2795.5	*	1		1715	208	0.	.0	2795.5
1		0040	9	0.	.0	2795.5	*	1		0900	109	0.	.0	2795.5	*	1		1720	209	0.	.0	2795.5
1		0045	10	0.	.0	2795.5	*	1		0905	110	0.	.0	2795.5	*	1		1725	210	0.	.0	2795.5
1		0050	11	0.	.0	2795.5	*	1		0910	111	0.	.0	2795.5	*	1		1730	211	0.	.0	2795.5
1		0055	12	0.	.0	2795.5	*	1		0915	112	0.	.0	2795.5	*	1		1735	212	0.	.0	2795.5
1		0100	13	0.	.0	2795.5	*	1		0920	113	0.	.0	2795.5	*	1		1740	213	0.	.0	2795.5
1		0105	14	0.	.0	2795.5	*	1		0925	114	0.	.0	2795.5	*	1		1745	214	0.	.0	2795.5
1		0110	15	0.	.0	2795.5	*	1		0930	115	0.	.0	2795.5	*	1		1750	215	0.	.0	2795.5
1		0115	16	0.	.0	2795.5	*	1		0935	116	0.	.0	2795.5	*	1		1755	216	0.	.0	2795.5
1		0120	17	1.	.0	2795.6	*	1		0940	117	0.	.0	2795.5	*	1		1800	217	0.	.0	2795.5
1		0125	18	1.	.0	2795.6	*	1		0945	118	0.	.0	2795.5	*	1		1805	218	0.	.0	2795.5
1		0130	19	1.	.0	2795.7	*	1		0950	119	0.	.0	2795.5	*	1		1810	219	0.	.0	2795.5
1		0135	20	2.	.0	2795.8	*	1		0955	120	0.	.0	2795.5	*	1		1815	220	0.	.0	2795.5
1		0140	21	3.	.0	2795.9	*	1		1000	121	0.	.0	2795.5	*	1		1820	221	0.	.0	2795.5
1		0145	22	4.	.0	2796.0	*	1		1005	122	0.	.0	2795.5	*	1		1825	222	0.	.0	2795.5
1		0150	23	5.	.0	2796.1	*	1		1010	123	0.	.0	2795.5	*	1		1830	223	0.	.0	2795.5
1		0155	24	5.	.0	2796.1	*	1		1015	124	0.	.0	2795.5	*	1		1835	224	0.	.0	2795.5
1		0200	25	5.	.0	2796.1	*	1		1020	125	0.	.0	2795.5	*	1		1840	225	0.	.0	2795.5
1		0205	26	4.	.0	2796.1	*	1		1025	126	0.	.0	2795.5	*	1		1845	226	0.	.0	2795.5
1		0210	27	5.	.0	2796.1	*	1		1030	127	0.	.0	2795.5	*	1		1850	227	0.	.0	2795.5
1		0215	28	6.	.0	2796.3	*	1		1035	128	0.	.0	2795.5	*	1		1855	228	0.	.0	2795.5
1		0220	29	8.	.0	2796.6	*	1		1040	129	0.	.0	2795.5	*	1		1900	229	0.	.0	2795.5
1		0225	30	11.	.0	2797.0	*	1		1045	130	0.	.0	2795.5	*	1		1905	230	0.	.0	2795.5
1		0230	31	14.	.0	2797.3	*	1		1050	131	0.	.0	2795.5	*	1		1910	231	0.	.0	2795.5
1		0235	32	14.	.0	2797.4	*	1		1055	132	0.	.0	2795.5	*	1		1915	232	0.	.0	2795.5
1		0240	33	14.	.0	2797.3	*	1		1100	133	0.	.0	2795.5	*	1		1920	233	0.	.0	2795.5
1		0245	34	13.	.0	2797.2	*	1		1105	134	0.	.0	2795.5	*	1		1925	234	0.	.0	2795.5
1		0250	35	13.	.0	2797.2	*	1		1110	135	0.	.0	2795.5	*	1		1930	235	0.	.0	2795.5
1		0255	36	14.	.0	2797.3	*	1		1115	136	0.	.0	2795.5	*	1		1935	236	0.	.0	2795.5
1		0300	37	16.	.0	2797.6	*	1		1120	137	0.	.0	2795.5	*	1		1940	237	0.	.0	2795.5
1		0305	38	19.	.0	2798.0	*	1		1125	138	0.	.0	2795.5	*	1		1945	238	0.	.0	2795.5
1		0310	39	21.	.1	2798.3	*	1		1130	139	0.	.0	2795.5	*	1		1950	239	0.	.0	2795.5
1		0315	40	25.	.1	2798.8	*	1		1135	140	0.	.0	2795.5	*	1		1955	240	0.	.0	2795.5
1		0320	41	44.	.1	2799.3	*	1		1140	141	0.	.0	2795.5	*	1		2000	241	0.	.0	2795.5
1		0325	42	67.	.2	2799.7	*	1		1145	142	0.	.0	2795.5	*	1		2005	242	0.	.0	2795.5
1		0330	43	93.	.2	2800.2	*	1		1150	143	0.	.0	2795.5	*	1		2010	243	0.	.0	2795.5
1		0335	44	113.	.4	2801.1	*	1		1155	144	0.	.0	2795.5	*	1		2015	244	0.	.0	2795.5
1		0340	45	137.	.5	2802.1	*	1		1200	145	0.	.0	2795.5	*	1		2020	245	0.	.0	2795.5
1		0345	46	168.	.7	2803.4	*	1		1205	146	0.	.0	2795.5	*	1		2025	246	0.	.0	2795.5
1		0350	47	211.	1.1	2805.5	*	1		1210	147	0.	.0	2795.5	*	1		2030	247	0.	.0	2795.5
1		0355	48	237.	1.5	2807.3	*	1		1215	148	0.	.0	2795.5	*	1		2035	248	0.	.0	2795.5
1		0400	49	259.	1.9	2808.8	*	1		1220	149	0.	.0	2795.5	*	1		2040	249	0.	.0	2795.5
1		0405	50	267.	2.1	2809.3	*	1		1225	150	0.	.0	2795.5	*	1		2045	250	0.	.0	2795.5
1		0410	51	261.	2.0	2808.9	*	1		1230	151	0.	.0	2795.5	*	1		2050	251	0.	.0	2795.5
1		0415	52	246.	1.7	2807.8	*	1		1235	152	0.	.0	2795.5	*	1		2055	252	0.	.0	2795.5
1		0420	53	224.	1.3	2806.3	*	1		1240	153	0.	.0	2795.5	*	1		2100	253	0.	.0	2795.5
1		0425	54	193.	.9	2804.5	*	1		1245	154	0.	.0	2795.5	*	1		2105	254	0.	.0	2795.5
1		0430	55	146.	.6	2802.5	*	1		1250	155	0.	.0	2795.5	*	1		2110	255	0.	.0	2795.5
1		0435	56	122.	.4	2801.5	*	1		1255	156	0.	.0	2795.5	*	1		2115	256	0.	.0	2795.5
1		0440	57	107.	.3	2800.9	*	1		1300	157	0.	.0	2795.5	*	1		2120	257	0.	.0	2795.5
1		0445	58	97.	.3	2800.4	*	1		1305	158	0.	.0	2795.5	*	1		2125	258	0.	.0	2795.5
1		0450	59	90.	.2	2800.1	*	1		1310	159	0.	.0	2795.5	*	1		2130	259	0.	.0	2795.5
1		0455	60	83.	.2	2799.9	*	1		1315	160	0.	.0	2795.5	*	1		2135	260	0.	.0	2795.5
1		0500	61	80.	.2	2799.9	*	1		1320	161	0.	.0	2795.5	*	1		2140	261	0.	.0	2795.5
1		0505	62	81.	.2	2799.9	*	1		1325	162	0.	.0	2795.5	*	1		2145	262	0.	.0	2795.5
1		0510	63	81.	.2	2799.9	*	1		1330	163	0.	.0	2795.5	*	1		2150	263	0.	.0	2795.5
1		0515	64	78.	.2	2799.8	*	1		1335	164	0.	.0	2795.5	*	1		2155	264	0.	.0	2795.5
1		0520	65	72.	.2	2799.7	*	1		1340	165	0.	.0	2795.5	*	1		2200	265	0.	.0	2795.5
1		0525	66	66.	.2	2799.7	*	1		1345	166	0.	.0	2795.5	*	1		2205	266	0.	.0	2795.5
1		0530	67	59.	.2	2799.5	*	1		1350	167	0.	.0	2795.5	*	1		2210	267	0.	.0	2795.5
1		0535	68	52.	.2	2799.4	*	1		1355	168	0.	.0	2795.5	*	1		2215	268	0.	.0	2795.5
1		0540	69	44.	.2	2799.3	*	1		1400	169	0.	.0	2795.5	*	1		2220	269	0.	.0	2795.5
1		0545	70	37.	.1	2799.2	*	1		1405	170	0.	.0	2795.5	*	1		2225	270	0.	.0	2795.5
1		0550	71	31.	.1	2799.1	*	1		1410	171	0.	.0	2795.5	*	1		2230	271	0.	.0	2795.5
1		0555	72	26.	.1	2799.0	*	1		1415	172	0.	.0	2795.5	*	1		2235	272	0.	.0	2795.5
1		0600	73	25.	.1	2798.8	*	1		1420	173	0.	.0	2795.5	*	1		2240	273	0.	.0	2795.5
1		0605	74	22.	.1	2798.5	*	1		1425	174	0.	.0	2795.5	*	1		2245	274	0.	.0	2795.5
1		0610	75	20.	.1	2798.1	*</															

1	0740	93	0.	.0	2795.5	*	1	1600	193	0.	.0	2795.5	*	2	0020	293	0.	.0	2795.5
1	0745	94	0.	.0	2795.5	*	1	1605	194	0.	.0	2795.5	*	2	0025	294	0.	.0	2795.5
1	0750	95	0.	.0	2795.5	*	1	1610	195	0.	.0	2795.5	*	2	0030	295	0.	.0	2795.5
1	0755	96	0.	.0	2795.5	*	1	1615	196	0.	.0	2795.5	*	2	0035	296	0.	.0	2795.5
1	0800	97	0.	.0	2795.5	*	1	1620	197	0.	.0	2795.5	*	2	0040	297	0.	.0	2795.5
1	0805	98	0.	.0	2795.5	*	1	1625	198	0.	.0	2795.5	*	2	0045	298	0.	.0	2795.5
1	0810	99	0.	.0	2795.5	*	1	1630	199	0.	.0	2795.5	*	2	0050	299	0.	.0	2795.5
1	0815	100	0.	.0	2795.5	*	1	1635	200	0.	.0	2795.5	*	2	0055	300	0.	.0	2795.5

PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE FLOW	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)					
+	267.	4.08	(CFS)	59.	15.	14.	14.
			(INCHES)	1.506	1.508	1.508	1.508
			(AC-FT)	29.	29.	29.	29.

PEAK STORAGE	TIME		6-HR	MAXIMUM AVERAGE STORAGE	24-HR	72-HR	24.92-HR
+	(AC-FT)	(HR)					
+	2.	4.08		0.	0.	0.	0.

PEAK STAGE	TIME		6-HR	MAXIMUM AVERAGE STAGE	24-HR	72-HR	24.92-HR
+	(FEET)	(HR)					
+	2809.32	4.08		2799.07	2796.40	2796.36	2796.36

CUMULATIVE AREA = .36 SQ MI

HYDROGRAPH AT STATION DBN PLAN 1, RATIO = .55

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	2795.5	*	1		0820	101	0.	.0	2795.5	*	1		1640	201	0.	.0	2795.5
1		0005	2	0.	.0	2795.5	*	1		0825	102	0.	.0	2795.5	*	1		1645	202	0.	.0	2795.5
1		0010	3	0.	.0	2795.5	*	1		0830	103	0.	.0	2795.5	*	1		1650	203	0.	.0	2795.5
1		0015	4	0.	.0	2795.5	*	1		0835	104	0.	.0	2795.5	*	1		1655	204	0.	.0	2795.5
1		0020	5	0.	.0	2795.5	*	1		0840	105	0.	.0	2795.5	*	1		1700	205	0.	.0	2795.5
1		0025	6	0.	.0	2795.5	*	1		0845	106	0.	.0	2795.5	*	1		1705	206	0.	.0	2795.5
1		0030	7	0.	.0	2795.5	*	1		0850	107	0.	.0	2795.5	*	1		1710	207	0.	.0	2795.5
1		0035	8	0.	.0	2795.5	*	1		0855	108	0.	.0	2795.5	*	1		1715	208	0.	.0	2795.5
1		0040	9	0.	.0	2795.5	*	1		0900	109	0.	.0	2795.5	*	1		1720	209	0.	.0	2795.5
1		0045	10	0.	.0	2795.5	*	1		0905	110	0.	.0	2795.5	*	1		1725	210	0.	.0	2795.5
1		0050	11	0.	.0	2795.5	*	1		0910	111	0.	.0	2795.5	*	1		1730	211	0.	.0	2795.5
1		0055	12	0.	.0	2795.5	*	1		0915	112	0.	.0	2795.5	*	1		1735	212	0.	.0	2795.5
1		0100	13	0.	.0	2795.5	*	1		0920	113	0.	.0	2795.5	*	1		1740	213	0.	.0	2795.5
1		0105	14	0.	.0	2795.5	*	1		0925	114	0.	.0	2795.5	*	1		1745	214	0.	.0	2795.5
1		0110	15	0.	.0	2795.5	*	1		0930	115	0.	.0	2795.5	*	1		1750	215	0.	.0	2795.5
1		0115	16	0.	.0	2795.5	*	1		0935	116	0.	.0	2795.5	*	1		1755	216	0.	.0	2795.5
1		0120	17	0.	.0	2795.5	*	1		0940	117	0.	.0	2795.5	*	1		1800	217	0.	.0	2795.5
1		0125	18	0.	.0	2795.5	*	1		0945	118	0.	.0	2795.5	*	1		1805	218	0.	.0	2795.5
1		0130	19	0.	.0	2795.5	*	1		0950	119	0.	.0	2795.5	*	1		1810	219	0.	.0	2795.5
1		0135	20	0.	.0	2795.5	*	1		0955	120	0.	.0	2795.5	*	1		1815	220	0.	.0	2795.5
1		0140	21	0.	.0	2795.5	*	1		1000	121	0.	.0	2795.5	*	1		1820	221	0.	.0	2795.5
1		0145	22	0.	.0	2795.5	*	1		1005	122	0.	.0	2795.5	*	1		1825	222	0.	.0	2795.5
1		0150	23	0.	.0	2795.5	*	1		1010	123	0.	.0	2795.5	*	1		1830	223	0.	.0	2795.5
1		0155	24	0.	.0	2795.5	*	1		1015	124	0.	.0	2795.5	*	1		1835	224	0.	.0	2795.5
1		0200	25	0.	.0	2795.5	*	1		1020	125	0.	.0	2795.5	*	1		1840	225	0.	.0	2795.5
1		0205	26	0.	.0	2795.5	*	1		1025	126	0.	.0	2795.5	*	1		1845	226	0.	.0	2795.5
1		0210	27	0.	.0	2795.5	*	1		1030	127	0.	.0	2795.5	*	1		1850	227	0.	.0	2795.5
1		0215	28	0.	.0	2795.5	*	1		1035	128	0.	.0	2795.5	*	1		1855	228	0.	.0	2795.5
1		0220	29	0.	.0	2795.5	*	1		1040	129	0.	.0	2795.5	*	1		1900	229	0.	.0	2795.5
1		0225	30	1.	.0	2795.6	*	1		1045	130	0.	.0	2795.5	*	1		1905	230	0.	.0	2795.5
1		0230	31	1.	.0	2795.6	*	1		1050	131	0.	.0	2795.5	*	1		1910	231	0.	.0	2795.5
1		0235	32	1.	.0	2795.6	*	1		1055	132	0.	.0	2795.5	*	1		1915	232	0.	.0	2795.5
1		0240	33	1.	.0	2795.7	*	1		1100	133	0.	.0	2795.5	*	1		1920	233	0.	.0	2795.5
1		0245	34	1.	.0	2795.7	*	1		1105	134	0.	.0	2795.5	*	1		1925	234	0.	.0	2795.5
1		0250	35	1.	.0	2795.7	*	1		1110	135	0.	.0	2795.5	*	1		1930	235	0.	.0	2795.5
1		0255	36	2.	.0	2795.7	*	1		1115	136	0.	.0	2795.5	*	1		1935	236	0.	.0	2795.5
1		0300	37	2.	.0	2795.7	*	1		1120	137	0.	.0	2795.5	*	1		1940	237	0.	.0	2795.5
1		0305	38	2.	.0	2795.8	*	1		1125	138	0.	.0	2795.5	*	1		1945	238	0.	.0	2795.5
1		0310	39	3.	.0	2795.9	*	1		1130	139	0.	.0	2795.5	*	1		1950	239	0.	.0	2795.5
1		0315	40	5.	.0	2796.2	*	1		1135	140	0.	.0	2795.5	*	1		1955	240	0.	.0	2795.5
1		0320	41	10.	.0	2796.8	*	1		1140	141	0.	.0	2795.5	*	1		2000	241	0.	.0	2795.5
1		0325	42	18.	.0	2797.9	*	1		1145	142	0.	.0	2795.5	*	1		2005	242	0.	.0	2795.5
1		0330	43	24.	.1	2798.7	*	1		1150	143	0.	.0	2795.5	*	1		2010	243	0.	.0	2795.5
1		0335	44	46.	.1	2799.3	*	1		1155	144	0.	.0	2795.5	*	1		2015	244	0.	.0	2795.5
1		0340	45	57.	.2	2799.5	*	1		1200	145	0.	.0	2795.5	*	1		2020	245	0.	.0	2795.5
1		0345	46	62.	.2	2799.6	*	1		1205	146	0.	.0	2795.5	*	1		2025	246	0.	.0	2795.5
1		0350	47	59.	.2	2799.5	*	1		1210	147	0.	.0	2795.5	*	1		2030	247	0.	.0	2795.5
1		0355	48	67.	.2	2799.7	*	1		1215	148	0.	.0	2795.5	*	1		2035	248	0.	.0	2795.5
1		0400	49	98.	.3	2800.5	*	1		1220	149	0.	.0	2795.5	*	1		2040	249	0.	.0	2795.5
1		0405	50	115.	.4	2801.2	*	1		1225	150	0.	.0	2795.5	*	1		2045	250	0.	.0	2795.5
1		0410	51	113.	.4	2801.1	*	1		1230	151	0.	.0	2795.5	*	1		2050	251	0.	.0	2795.5
1		0415	52	105.	.3	2800.7	*	1		1235	152	0.	.0	2795.5	*	1		2055	252	0.	.0	2795.5
1		0420	53	93.	.2	2800.2	*	1		1240	153	0.	.0	2795.5	*	1		2100	253	0.	.0	2795.5
1		0425	54	73.	.2	2799.8	*	1		1245	154	0.	.0	2795.5	*	1		2105	254	0.	.0	2795.5
1		0430	55	62.	.2	2799.6	*	1		1250	155	0.	.0	2795.5	*	1		2110	255	0.	.0	2795.5
1		0435	56	55.	.2	2799.5	*	1		1255	156	0.	.0	2795.5	*	1		2115	256	0.	.0	2795.5
1		0440	57	52.	.2	2799.4	*	1		1300	157	0.	.0	2795.5	*	1		2120	257	0.	.0	2795.5
1		0445	58	48.	.2	2799.4	*	1		1305	158	0.	.0	2795.5	*	1		2125	258	0.	.0	2795.5
1		0450	59	44.	.1	2799.3	*	1		1310	159	0.	.0	2795.5	*	1		2130	259	0.	.0	2795.5
1		0455	60	41.	.1	2799.2	*	1		1315	160	0.	.0	2795.5	*	1		2135	260	0.	.0	2795.5
1		0500	61	38.	.1	2799.2	*	1		1320	161	0.	.0	2795.5	*	1		2140	261	0.	.0	2795.5
1		0505	62	36.	.1	2799.2	*	1		1325	162	0.	.0	2795.5	*	1		2145	262	0.	.0	2795.5
1		0510	63	35.	.1	2799.2	*	1		1330	163	0.	.0	2795.5	*	1		2150	263	0.	.0	2795.5
1		0515	64	36.	.1	2799.2	*	1		1335	164	0.	.0	2795.5	*	1		2155	264	0.	.0	2795.5
1		0520	65	35.	.1	2799.1	*	1		1340	165	0.	.0	2795.5	*	1		2200	265	0.	.0	2795.5

[illegible]

PEAK FLOW	TIME		6-HR	MAXIMUM AVERAGE FLOW	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)						
+ 115.	4.08	(CFS)	24.	6.	6.	6.	6.
		(INCHES)	.610	.610	.610	.610	.610
		(AC-FT)	12.	12.	12.	12.	12.
PEAK STORAGE	TIME		6-HR	MAXIMUM AVERAGE STORAGE	24-HR	72-HR	24.92-HR
+ (AC-FT)	(HR)						
+ 0.	4.08		0.	0.	0.	0.	0.
PEAK STAGE	TIME		6-HR	MAXIMUM AVERAGE STAGE	24-HR	72-HR	24.92-HR
+ (FEET)	(HR)						
+ 2801.18	4.08		2797.41	2795.98	2795.96	2795.96	2795.96
		CUMULATIVE AREA =		.36 SQ MI			

```

*****
*                                     *
245 KK                               WC9 *
*                                     *
*****

```

HYDROGRAPH AT STATION WC9
FOR PLAN 1, RATIO = 1.00

HYDROGRAPH AT STATION WC9
FOR PLAN 1, RATIO = .98

(INCHES) 1.150 2.056 2.097 PRO 2.097
(AC-FT) 105. 188. 192. 192.

CUMULATIVE AREA = 1.71 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WC9
FOR PLAN 1, RATIO = .97

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR	AVERAGE 72-HR	24.92-HR
+ 720.	3.58	210.	94.	92.	92.
		(INCHES) 1.137	2.039	2.080	2.080
		(AC-FT) 104.	186.	190.	190.

CUMULATIVE AREA = 1.71 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WC9
FOR PLAN 1, RATIO = .93

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR	AVERAGE 72-HR	24.92-HR
+ 681.	3.58	200.	91.	89.	89.
		(INCHES) 1.084	1.974	2.015	2.015
		(AC-FT) 99.	180.	184.	184.

CUMULATIVE AREA = 1.71 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION WC9
FOR PLAN 1, RATIO = .55

PEAK FLOW (CFS)	TIME (HR)	6-HR (CFS)	MAXIMUM 24-HR	AVERAGE 72-HR	24.92-HR
+ 327.	3.58	113.	66.	65.	65.
		(INCHES) .610	1.425	1.466	1.466
		(AC-FT) 56.	130.	134.	134.

CUMULATIVE AREA = 1.71 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 1.00	RATIO 2 .98	RATIO 3 .97	RATIO 4 .93	RATIO 5 .55
HYDROGRAPH AT	WOFF1	.43	1 FLOW	387.	376.	370.	347.	140.
+			TIME	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT	WOFF2	.04	1 FLOW	54.	53.	52.	48.	18.
+			TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	WOFF3	.03	1 FLOW	38.	37.	36.	34.	14.
+			TIME	3.58	3.58	3.58	3.58	3.58
3 COMBINED AT	CP1	.50	1 FLOW	430.	417.	411.	386.	156.
+			TIME	3.83	3.83	3.83	3.83	3.83
HYDROGRAPH AT	WOFF4	.06	1 FLOW	84.	82.	81.	76.	31.
+			TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	WOFF5	.26	1 FLOW	236.	229.	226.	212.	87.
+			TIME	3.83	3.83	3.83	3.83	3.92
HYDROGRAPH AT	WOFF6	.04	1 FLOW	59.	57.	56.	53.	22.
+			TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT	ON1	.03	1 FLOW	55.	54.	53.	50.	26.
+			TIME	3.58	3.58	3.58	3.58	3.58
5 COMBINED AT	DB1	.88	1 FLOW	758.	735.	724.	679.	278.
+			TIME	3.75	3.75	3.75	3.75	3.83
ROUTED TO	RDB1	.88	1 FLOW	71.	70.	70.	69.	57.
+			TIME	5.58	5.58	5.58	5.58	5.42

** PEAK STAGES IN FEET **
1 STAGE 3035.07 3034.77 3034.61 3033.99 3028.50
Page 14

				TIME	5.58	5.58 ^{PRO}	5.58	5.58	5.42
ROUTED TO									
+	RRDB1	.88	1	FLOW TIME	71. 5.83	70. 5.83	70. 5.83	69. 5.83	57. 5.58
HYDROGRAPH AT									
+	WML2	.04	1	FLOW TIME	78. 3.58	76. 3.58	75. 3.58	72. 3.58	37. 3.58
HYDROGRAPH AT									
+	WSHA5	.00	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50	8. 3.50	4. 3.50
2 COMBINED AT									
+	WC20	.05	1	FLOW TIME	85. 3.58	83. 3.58	82. 3.58	78. 3.58	41. 3.58
HYDROGRAPH AT									
+	WPF4	.01	1	FLOW TIME	19. 3.50	18. 3.50	18. 3.50	17. 3.50	9. 3.50
HYDROGRAPH AT									
+	WSHA4	.00	1	FLOW TIME	6. 3.50	5. 3.50	5. 3.50	5. 3.50	3. 3.50
3 COMBINED AT									
+	WC21	.06	1	FLOW TIME	105. 3.50	102. 3.50	101. 3.50	96. 3.50	50. 3.58
HYDROGRAPH AT									
+	WL4A	.01	1	FLOW TIME	23. 3.50	22. 3.50	22. 3.50	21. 3.50	10. 3.50
HYDROGRAPH AT									
+	WL5A	.02	1	FLOW TIME	32. 3.50	31. 3.50	31. 3.50	29. 3.50	14. 3.50
HYDROGRAPH AT									
+	WL5B	.01	1	FLOW TIME	12. 3.50	11. 3.50	11. 3.50	11. 3.50	5. 3.50
3 COMBINED AT									
+	WC22A	.04	1	FLOW TIME	67. 3.50	65. 3.50	64. 3.50	61. 3.50	30. 3.50
HYDROGRAPH AT									
+	WEGN2	.00	1	FLOW TIME	2. 3.50	2. 3.50	2. 3.50	2. 3.50	1. 3.50
2 COMBINED AT									
+	WC23	.04	1	FLOW TIME	68. 3.50	67. 3.50	66. 3.50	62. 3.50	31. 3.50
HYDROGRAPH AT									
+	WL6A	.01	1	FLOW TIME	19. 3.50	18. 3.50	18. 3.50	17. 3.50	8. 3.50
2 COMBINED AT									
+	WC24	.05	1	FLOW TIME	87. 3.50	85. 3.50	84. 3.50	79. 3.50	39. 3.50
HYDROGRAPH AT									
+	WPRK6	.02	1	FLOW TIME	28. 3.58	27. 3.58	27. 3.58	25. 3.58	10. 3.58
2 COMBINED AT									
+	WC26	.07	1	FLOW TIME	113. 3.50	110. 3.50	108. 3.50	103. 3.50	48. 3.50
HYDROGRAPH AT									
+	EX-W5S	.22	1	FLOW TIME	221. 3.75	214. 3.75	211. 3.75	198. 3.75	77. 3.75
4 COMBINED AT									
+	CPS	1.23	1	FLOW TIME	431. 3.58	420. 3.58	415. 3.58	393. 3.58	200. 3.58
HYDROGRAPH AT									
+	EX-W5N	.14	1	FLOW TIME	155. 3.75	150. 3.75	148. 3.75	139. 3.75	57. 3.75
HYDROGRAPH AT									
+	WOFF7	.01	1	FLOW TIME	10. 3.50	10. 3.50	10. 3.50	9. 3.50	4. 3.50
HYDROGRAPH AT									
+	WOFF8	.21	1	FLOW TIME	230. 3.75	223. 3.75	220. 3.75	206. 3.75	85. 3.75
ROUTED TO									
+	RWOFF8	.21	1	FLOW TIME	232. 4.00	226. 4.00	222. 4.00	209. 4.00	88. 4.08
3 COMBINED AT									
+	CPN	.36	1	FLOW TIME	346. 3.92	335. 3.92	330. 3.92	308. 3.92	123. 4.00
ROUTED TO									
+	DBN	.36	1	FLOW TIME	284. 4.08	280. 4.08	279. 4.08	267. 4.08	115. 4.08
** PEAK STAGES IN FEET **									
1	STAGE	2811.22	2810.65	2810.39	2809.32	2801.18			
	TIME	4.08	4.08	4.08	4.08	4.08			

PRO									
HYDROGRAPH AT									
+	WSPD0	.00	1	FLOW	2.	2.	2.	1.	
				TIME	3.50	3.50	3.50	3.50	
HYDROGRAPH AT									
+	WSPD3	.00	1	FLOW	5.	5.	5.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT									
+	ON1-E	.03	1	FLOW	47.	46.	45.	42.	18.
				TIME	3.50	3.50	3.50	3.50	3.58
5 COMBINED AT									
+	WC9a	1.63	1	FLOW	615.	596.	587.	552.	266.
				TIME	3.75	3.75	3.75	3.58	3.58
HYDROGRAPH AT									
+	ON1-D	.03	1	FLOW	47.	46.	45.	43.	21.
				TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT									
+	ON2-D	.03	1	FLOW	45.	44.	44.	41.	18.
				TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT									
+	HOR	.02	1	FLOW	30.	29.	29.	27.	14.
				TIME	3.50	3.50	3.50	3.50	3.50
3 COMBINED AT									
+	WC7	.07	1	FLOW	121.	118.	116.	110.	53.
				TIME	3.58	3.58	3.58	3.58	3.58
HYDROGRAPH AT									
+	WGRC1A	.00	1	FLOW	4.	4.	4.	4.	2.
				TIME	3.50	3.50	3.50	3.50	3.50
HYDROGRAPH AT									
+	EX-W6	.01	1	FLOW	18.	18.	17.	16.	7.
				TIME	3.50	3.50	3.50	3.50	3.50
4 COMBINED AT									
+	WC9	1.71	1	FLOW	749.	730.	720.	681.	327.
				TIME	3.58	3.58	3.58	3.58	3.58

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

FROM IS DIRECT PROFIT METHOD BASE							INTERPOLATED TO COMPUTATION INTERVAL		
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.94	350.00	2.48	5.00	70.94	350.00	2.48
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1169E+03 EXCESS= .0000E+00 OUTFLOW= .1169E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.33	350.00	2.46	5.00	70.33	350.00	2.46
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1162E+03 EXCESS= .0000E+00 OUTFLOW= .1162E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	70.01	350.00	2.45	5.00	70.01	350.00	2.45
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1158E+03 EXCESS= .0000E+00 OUTFLOW= .1158E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	68.75	350.00	2.43	5.00	68.75	350.00	2.43
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1144E+03 EXCESS= .0000E+00 OUTFLOW= .1144E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RRDB1	MANE	5.00	56.98	335.00	2.22	5.00	56.98	335.00	2.22
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1049E+03 EXCESS= .0000E+00 OUTFLOW= .1049E+03 BASIN STORAGE= .5830E-07 PERCENT ERROR= .0									
FOR PLAN = 1	RATIO=	.00							
RWOFF8	MANE	5.00	232.41	240.00	1.69	5.00	232.41	240.00	1.69
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+02 EXCESS= .0000E+00 OUTFLOW= .1929E+02 BASIN STORAGE= .9233E-02 PERCENT ERROR= -.3									
FOR PLAN = 1	RATIO=	.00							
RWOFF8	MANE	5.00	225.71	240.00	1.64	5.00	225.71	240.00	1.64
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+02 EXCESS= .0000E+00 OUTFLOW= .1870E+02 BASIN STORAGE= .9124E-02 PERCENT ERROR= -.3									
FOR PLAN = 1	RATIO=	.00							
RWOFF8	MANE	5.00	222.35	240.00	1.61	5.00	222.35	240.00	1.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1836E+02 EXCESS= .0000E+00 ^{PRO}OUTFLOW= .1840E+02 BASIN STORAGE= .9069E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 208.87 240.00 1.51 5.00 208.87 240.00 1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1719E+02 EXCESS= .0000E+00 OUTFLOW= .1724E+02 BASIN STORAGE= .8456E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 87.84 245.00 .61 5.00 87.84 245.00 .61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6943E+01 EXCESS= .0000E+00 OUTFLOW= .6987E+01 BASIN STORAGE= .6803E-02 PERCENT ERROR= -.7

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

Future Condition (100-Yr)

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 22APR16 TIME 14:23:25
*
*****

Fut

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

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X X XXXXXX XXXX X
X X X X XX
X X X X X
XXXXXX XXXX X XXXXX
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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

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

1 HEC-1 INPUT PAGE 1

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

*** FREE ***

*DIAGRAM
1 ID SKYE CANYON
2 ID PHASE 3 INFRASTRUCTURE - FUTURE CONDITION
3 ID AFTER COMMERCIAL ONSITES BUILD-OUT
4 ID
5 ID RETURN PERIOD ----- 100-YEAR
6 ID DISTRIBUTION ----- 6-HOUR SDN3
7 ID PROJECT NO. ----- OLY1602.000
8 ID FILENAME ----- FUT.H1
9 ID DATE ----- 4/19/2016
10 ID MODELED BY ----- SMJ
11 ID
12 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
13 ID DRAINAGE AREA (MI^2) DARF
14 ID 0.0-0.50 1.00
15 ID 0.5-1.00 0.98
16 ID 1.0-2.00 0.97
17 ID 2.0-4.00 0.93
18 ID
19 IT 5 0 0 300
20 IO 5 0 0
21 IN 5 0 0
22 JR PREC 1.00 0.98 0.97 0.93
*

23 KK WOFF1
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 .4291
36 LS 0 86.1
37 UD 0.420
*

38 KK WOFF2
39 KM EXISTING OFFSITE DRAINAGE BASIN
40 KM DISCHARGES INTO DETENTION BASIN "DB1"
41 BA .0419
42 LS 0 84.0
43 UD 0.150
*

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1 HEC-1 INPUT PAGE 2

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

44 KK WOFF3
45 KM EXISTING OFFSITE DRAINAGE BASIN
46 KM DISCHARGES INTO DETENTION BASIN "DB1"
47 BA .0259
48 LS 0 86.2
49 UD 0.112
*

50 KK CP1
51 KM COMBINE WOFF1, WOFF2, AND WOFF3
52 HC 3
*

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Fut

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53 KK WOFF4
54 KM EXISTING OFFSITE DRAINAGE BASIN
55 KM DISCHARGES INTO DETENTION BASIN "DB1"
56 BA .0581
57 LS 0 86.2
58 UD 0.136
  *

59 KK WOFF5
60 KM EXISTING OFFSITE DRAINAGE BASIN
61 KM DISCHARGES INTO DETENTION BASIN "DB1"
62 BA .2569
63 LS 0 86.5
64 UD 0.419
  *

65 KK WOFF6
66 KM EXISTING OFFSITE DRAINAGE BASIN
67 KM DISCHARGES INTO DETENTION BASIN "DB1"
68 BA .0399
69 LS 0 86.2
70 UD 0.121
  *

71 KK ON1
72 KM PROPOSED ONSITE DRAINAGE BASIN
73 BA .0303
74 LS 0 92.8
75 UD 0.116
  *

76 KK DB1
77 KM COMBINE CP1, WOFF4, WOFF5, WOFF6 AND ON1
78 HC 5
  *

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HEC-1 INPUT

PAGE 3

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

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79 KK RDB1
80 KM OUTLET = 24" ORIFICE @ INVERT ELEVATION = 3013.8-FT
81 RS 1 ELEV 3025.5
82 SA 4.68 5.56 5.74 5.92 6.10 7.01 7.46 8.36 9.32 10.68
83 SE 3025.5 3027 3028 3029 3030 3035 3037 3040 3043 3046
84 SQ 49.7 60.6 70.8 74.5 1436.0 3920.5 7136.3
85 SE 3025.5 3030 3035 3037 3040 3043 3046
  *

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86 KK RRDB1
87 KM ROUTE TO CPS
88 RD 6230 0.033 0.040 0 TRAP 15 1
  *

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89 KK WML2
90 KM WEST BASIN, WEST OF SHAUMBER ROAD
91 BA .0428
92 PB 3.00
93 LS 0 93.5
94 UD 0.142
  *

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95 KK WSHA5
96 KM WEST BASIN, SHAUMBER ROAD
97 BA .0037
98 PB 3.00
99 LS 0 98.0
100 UD 0.086
  *

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101 KK WC20
102 KM S OF EAGLE CANYON/SHAUMBER INTERSECTION
103 KM COMBINE WML2, WSHA5
104 HC 2
  *

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105 KK WPF4
106 BA .0090
107 PB 3.00
108 LS 0 94.0
109 UD 0.087
  *

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110 KK WSHA4
111 BA .0022
112 PB 3.00
113 LS 0 98.0
114 UD 0.051
  *

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1

HEC-1 INPUT

PAGE 4

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

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115 KK WC21
116 HC 3
  *

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117 KK WL4A
118 KM WEST BASIN, WEST OF EGAN CREST DRIVE
119 BA .0125
120 PB 3.00
121 LS 0 92.0
122 UD 0.106
  *

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PAGE 5

1

PAGE 6

Page 3

189	KM	Fut OUTLET = 54" ORIFICE @ INVERT ELEVATION = 2995.5-FT						
190	KO	1						
191	RS	1	VOL	-1				
192	SA	0.00	0.06	0.08	0.10	.20	0.32	0.38
193	SE	2795.5	2798	2799	2800	2805	2810	2812
194	SQ	0.00	26.2	87.0	204.8	276.3	288.5	
195	SE	2795.5	2799	2800	2805	2810	2812	
	*							

196	KK	WSPD0	
197	BA	.0010	
198	PB	2.93	
199	LS	0	93.4
200	UD	0.050	
	*		

201	KK	WSPD3	
202	BA	.0022	
203	PB	2.93	
204	LS	0	92.8
205	UD	0.056	
	*		

206	KK	WGC3	
207	KM	WEST BASIN, WEST OF GRAND CANYON DRIVE	
208	BA	.0444	
209	PB	2.93	
210	LS	0	94.6
211	UD	0.095	
	*		

212	KK	WC9a	
213	HC	5	
	*		

214	KK	ON1-D	
215	KM	PHASE 1, NORTHWEST QUAD ONSITE BASIN	
216	BA	.0278	
217	PB	2.93	
218	LS	0	91.2
219	UD	0.114	
	*		

1 HEC-1 INPUT PAGE 7

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

220	KK	ON2-D	
221	KM	PHASE 1, NORTHEAST QUAD ONSITE BASIN	
222	BA	.0301	
223	PB	2.93	
224	LS	0	88.8
225	UD	0.152	
	*		
226	KK	HOR	
227	KM	PHASE 1, STREET BASIN SKYE CANYON PARK DRIVE	
228	BA	.0163	
229	PB	2.93	
230	LS	0	93.3
231	UD	0.108	
	*		

232	KK	WC7	
233	HC	3	
	*		

234	KK	WGRCL1A	
235	KM	WEST BASIN, GRAND CANYON DRIVE	
236	BA	.0022	
237	PB	2.93	
238	LS	0	93.2
239	UD	0.095	
	*		

240	KK	WC9	
241	KO	3	
242	HC	3	
	*		

243	ZZ		
-----	----	--	--

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

```

23  WOFF1
    .
38  .      WOFF2
    .      .
44  .      .      WOFF3
    .      .      .
50  CP1.....
    .
53  .      WOFF4
    .      .
59  .      .      WOFF5
    .      .      .
65  .      .      .      WOFF6
  
```

					Fut
71	.	.	.	.	ON1
76	DB1	.	.	.	.
	V	.	.	.	.
79	RDB1	.	.	.	.
	V	.	.	.	.
86	RRDB1	.	.	.	.
	.	.	.	.	.
89	.	WML2	.	.	.
	.	.	.	.	.
95	.	.	WSHA5	.	.
	.	.	.	.	.
101	.	WC20	.	.	.
	.	.	.	.	.
105	.	.	WPF4	.	.
	.	.	.	.	.
110	.	.	.	WSHA4	.
	.	.	.	.	.
115	.	WC21	.	.	.
	.	.	.	.	.
117	.	.	WL4A	.	.
	.	.	.	.	.
123	.	.	.	WL5A	.
	.	.	.	.	.
129	.	.	.	.	WL5B
	.	.	.	.	.
134	.	.	WC22A	.	.
	.	.	.	.	.
136	.	.	.	WEGN2	.
	.	.	.	.	.
142	.	.	WC23	.	.
	.	.	.	.	.
144	.	.	.	WL6A	.
	.	.	.	.	.
150	.	.	WC24	.	.
	.	.	.	.	.
152	.	.	.	WPRK6	.
	.	.	.	.	.
158	.	.	WC26	.	.
	.	.	.	.	.
160	.	.	.	EX-W5S	.
	.	.	.	.	.
165	CPS	.	.	.	.
	.	.	.	.	.
167	.	EX-W5N	.	.	.
	.	.	.	.	.
172	.	.	WOFF7	.	.
	.	.	.	.	.
177	.	.	.	WOFF8	.
	.	.	.	V	.
	.	.	.	V	.
182	.	.	.	RWOFF8	.
	.	.	.	.	.
185	.	CPN	.	.	.
	.	V	.	.	.
188	.	DBN	.	.	.
	.	.	.	.	.
196	.	.	WSPD0	.	.
	.	.	.	.	.
201	.	.	.	WSPD3	.
	.	.	.	.	.
206	.	.	.	.	WGC3
	.	.	.	.	.
212	WC9a	.	.	.	.
	.	.	.	.	.
214	.	ON1-D	.	.	.
	.	.	.	.	.
220	.	.	ON2-D	.	.
	.	.	.	.	.
226	.	.	.	HOR	.
	.	.	.	.	.

Fut

232 . WC7.....
234 . WGRCLA
240 WC9.....

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 22APR16 TIME 14:23:25 *

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

SKYE CANYON
PHASE 3 INFRASTRUCTURE - FUTURE CONDITION
AFTER COMMERCIAL ONSITES BUILD-OUT

RETURN PERIOD ----- 100-YEAR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1602.000
FILENAME ----- FUT.H1
DATE ----- 4/19/2016
MODELED BY ----- SMJ

SIX HOUR DEPTH-AREA REDUCTION FACTORS
DRAINAGE AREA (MI^2) DARF
0.0-0.50 1.00
0.5-1.00 0.98
1.0-2.00 0.97
2.0-4.00 0.93

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 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 2 0 ENDING DATE
NDTIME 0055 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .98 .97 .93

*** **

* DBN *

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

HYDROGRAPH ROUTING DATA

191 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP VOL TYPE OF INITIAL CONDITION
RSVRIC -1.00 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

192 SA AREA .0 .1 .1 .1 .2 .3 .4
193 SE ELEVATION 2795.50 2798.00 2799.00 2800.00 2805.00 2810.00 2812.00
194 SQ DISCHARGE 0. 26. 87. 205. 276. 289.

195 SE ELEVATION 2795.50 2799.00 2800.00 2805.00^{Fut} 2810.00 2812.00

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.05	.12	.21	.95	2.23	2.93
ELEVATION	2795.50	2798.00	2799.00	2800.00	2805.00	2810.00	2812.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.05	.12	.21	.95	2.23	2.93
OUTFLOW	.00	18.71	26.20	87.00	204.80	276.30	288.50
ELEVATION	2795.50	2798.00	2799.00	2800.00	2805.00	2810.00	2812.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 87.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

HYDROGRAPH AT STATION DBN
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	0.	.0	2795.5	*	1		0820	101	0.	.0	2795.5	*	1		1640	201	0.	.0	2795.5
1		0005	2	0.	.0	2795.5	*	1		0825	102	0.	.0	2795.5	*	1		1645	202	0.	.0	2795.5
1		0010	3	0.	.0	2795.5	*	1		0830	103	0.	.0	2795.5	*	1		1650	203	0.	.0	2795.5
1		0015	4	0.	.0	2795.5	*	1		0835	104	0.	.0	2795.5	*	1		1655	204	0.	.0	2795.5
1		0020	5	0.	.0	2795.5	*	1		0840	105	0.	.0	2795.5	*	1		1700	205	0.	.0	2795.5
1		0025	6	0.	.0	2795.5	*	1		0845	106	0.	.0	2795.5	*	1		1705	206	0.	.0	2795.5
1		0030	7	0.	.0	2795.5	*	1		0850	107	0.	.0	2795.5	*	1		1710	207	0.	.0	2795.5
1		0035	8	0.	.0	2795.5	*	1		0855	108	0.	.0	2795.5	*	1		1715	208	0.	.0	2795.5
1		0040	9	0.	.0	2795.6	*	1		0900	109	0.	.0	2795.5	*	1		1720	209	0.	.0	2795.5
1		0045	10	1.	.0	2795.6	*	1		0905	110	0.	.0	2795.5	*	1		1725	210	0.	.0	2795.5
1		0050	11	1.	.0	2795.6	*	1		0910	111	0.	.0	2795.5	*	1		1730	211	0.	.0	2795.5
1		0055	12	1.	.0	2795.6	*	1		0915	112	0.	.0	2795.5	*	1		1735	212	0.	.0	2795.5
1		0100	13	0.	.0	2795.6	*	1		0920	113	0.	.0	2795.5	*	1		1740	213	0.	.0	2795.5
1		0105	14	0.	.0	2795.5	*	1		0925	114	0.	.0	2795.5	*	1		1745	214	0.	.0	2795.5
1		0110	15	0.	.0	2795.5	*	1		0930	115	0.	.0	2795.5	*	1		1750	215	0.	.0	2795.5
1		0115	16	1.	.0	2795.6	*	1		0935	116	0.	.0	2795.5	*	1		1755	216	0.	.0	2795.5
1		0120	17	1.	.0	2795.6	*	1		0940	117	0.	.0	2795.5	*	1		1800	217	0.	.0	2795.5
1		0125	18	2.	.0	2795.7	*	1		0945	118	0.	.0	2795.5	*	1		1805	218	0.	.0	2795.5
1		0130	19	2.	.0	2795.8	*	1		0950	119	0.	.0	2795.5	*	1		1810	219	0.	.0	2795.5
1		0135	20	3.	.0	2796.0	*	1		0955	120	0.	.0	2795.5	*	1		1815	220	0.	.0	2795.5
1		0140	21	5.	.0	2796.1	*	1		1000	121	0.	.0	2795.5	*	1		1820	221	0.	.0	2795.5
1		0145	22	6.	.0	2796.2	*	1		1005	122	0.	.0	2795.5	*	1		1825	222	0.	.0	2795.5
1		0150	23	6.	.0	2796.3	*	1		1010	123	0.	.0	2795.5	*	1		1830	223	0.	.0	2795.5
1		0155	24	6.	.0	2796.3	*	1		1015	124	0.	.0	2795.5	*	1		1835	224	0.	.0	2795.5
1		0200	25	6.	.0	2796.3	*	1		1020	125	0.	.0	2795.5	*	1		1840	225	0.	.0	2795.5
1		0205	26	6.	.0	2796.3	*	1		1025	126	0.	.0	2795.5	*	1		1845	226	0.	.0	2795.5
1		0210	27	6.	.0	2796.3	*	1		1030	127	0.	.0	2795.5	*	1		1850	227	0.	.0	2795.5
1		0215	28	8.	.0	2796.6	*	1		1035	128	0.	.0	2795.5	*	1		1855	228	0.	.0	2795.5
1		0220	29	11.	.0	2797.0	*	1		1040	129	0.	.0	2795.5	*	1		1900	229	0.	.0	2795.5
1		0225	30	15.	.0	2797.4	*	1		1045	130	0.	.0	2795.5	*	1		1905	230	0.	.0	2795.5
1		0230	31	17.	.0	2797.8	*	1		1050	131	0.	.0	2795.5	*	1		1910	231	0.	.0	2795.5
1		0235	32	17.	.0	2797.8	*	1		1055	132	0.	.0	2795.5	*	1		1915	232	0.	.0	2795.5
1		0240	33	16.	.0	2797.7	*	1		1100	133	0.	.0	2795.5	*	1		1920	233	0.	.0	2795.5
1		0245	34	16.	.0	2797.6	*	1		1105	134	0.	.0	2795.5	*	1		1925	234	0.	.0	2795.5
1		0250	35	15.	.0	2797.6	*	1		1110	135	0.	.0	2795.5	*	1		1930	235	0.	.0	2795.5
1		0255	36	17.	.0	2797.7	*	1		1115	136	0.	.0	2795.5	*	1		1935	236	0.	.0	2795.5
1		0300	37	19.	.1	2798.0	*	1		1120	137	0.	.0	2795.5	*	1		1940	237	0.	.0	2795.5
1		0305	38	20.	.1	2798.2	*	1		1125	138	0.	.0	2795.5	*	1		1945	238	0.	.0	2795.5
1		0310	39	24.	.1	2798.7	*	1		1130	139	0.	.0	2795.5	*	1		1950	239	0.	.0	2795.5
1		0315	40	33.	.1	2799.1	*	1		1135	140	0.	.0	2795.5	*	1		1955	240	0.	.0	2795.5
1		0320	41	52.	.2	2799.4	*	1		1140	141	0.	.0	2795.5	*	1		2000	241	0.	.0	2795.5
1		0325	42	76.	.2	2799.8	*	1		1145	142	0.	.0	2795.5	*	1		2005	242	0.	.0	2795.5
1		0330	43	100.	.3	2800.5	*	1		1150	143	0.	.0	2795.5	*	1		2010	243	0.	.0	2795.5
1		0335	44	126.	.5	2801.7	*	1		1155	144	0.	.0	2795.5	*	1		2015	244	0.	.0	2795.5
1		0340	45	156.	.6	2802.9	*	1		1200	145	0.	.0	2795.5	*	1		2020	245	0.	.0	2795.5
1		0345	46	196.	.9	2804.6	*	1		1205	146	0.	.0	2795.5	*	1		2025	246	0.	.0	2795.5
1		0350	47	228.	1.4	2806.6	*	1		1210	147	0.	.0	2795.5	*	1		2030	247	0.	.0	2795.5
1		0355	48	262.	2.0	2809.0	*	1		1215	148	0.	.0	2795.5	*	1		2035	248	0.	.0	2795.5
1		0400	49	280.	2.4	2810.6	*	1		1220	149	0.	.0	2795.5	*	1		2040	249	0.	.0	2795.5
1		0405	50	284.	2.7	2811.2	*	1		1225	150	0.	.0	2795.5	*	1		2045	250	0.	.0	2795.5
1		0410	51	283.	2.6	2811.1	*	1		1230	151	0.	.0	2795.5	*	1		2050	251	0.	.0	2795.5
1		0415	52	277.	2.3	2810.1	*	1		1235	152	0.	.0	2795.5	*	1		2055	252	0.	.0	2795.5
1		0420	53	252.	1.8	2808.3	*	1		1240	153	0.	.0	2795.5	*	1		2100	253	0.	.0	2795.5
1		0425	54	223.	1.3	2806.2	*	1		1245	154	0.	.0	2795.5	*	1		2105	254	0.	.0	2795.5
1		0430	55	184.	.8	2804.1	*	1		1250	155	0.	.0	2795.5	*	1		2110	255	0.	.0	2795.5
1		0435	56	140.	.5	2802.2	*	1		1255	156	0.	.0	2795.5	*	1		2115	256	0.	.0	2795.5
1		0440	57	119.	.4	2801.3	*	1		1300	157	0.	.0	2795.5	*	1		2120	257	0.	.0	2795.5
1		0445	58	106.	.3	2800.8	*	1		1305	158	0.	.0	2795.5	*	1		2125	258	0.	.0	2795.5
1		0450	59	98.	.2	2800.5	*	1		1310	159	0.	.0	2795.5	*	1		2130	259	0.	.0	2795.5
1		0455	60	93.	.2	2800.2	*	1		1315	160	0.	.0	2795.5	*	1		2135	260	0.	.0	2795.5
1		0500	61	90.	.2	2800.1	*	1		1320	161	0.	.0	2795.5	*	1		2140	261	0.	.0	2795.5
1		0505	62	90.	.2	2800.1	*	1		1325	162	0.	.0	2795.5	*	1		2145	262	0.	.0	2795.5
1		0510	63	90.	.2	2800.1	*	1		1330	163	0.	.0	2795.5	*	1		2150	263	0.	.0	2795.5
1		0515	64	87.	.2	2800.0	*	1		1335	164	0.	.0	2795.5	*	1		2155	264	0.	.0	2795.5
1		0520	65	78.	.2	2799.8	*	1		1340	165	0.	.0	2795.5	*	1		2200	265	0.	.0	2795.5
1		0525	66	72.	.2	2799.8	*	1		1345	166	0.	.0	2795.5	*	1		2205	266	0.	.0	2795.5
1		0530	67	64.	.2	2799.6	*	1		1350	167	0.	.0	2795.5	*	1		2210	267	0.	.0	2795.5
1		0535	68	56.	.2	2799.5	*	1		1355	168	0.	.0	2795.5	*	1		2215	268	0.	.0	2795.5
1		0540	69	47.	.2	2799.3	*	1		1400	169	0.	.0	2795.5	*	1		2220	269	0.	.0	2795.5
1		0545	70	40.	.1	2799.2	*	1		1405	170	0.	.0	279								

[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	5
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2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861	1860	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840	1839	1838	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825	1824	1823	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813	1812	1811	1810	1809	1808	1807	1806	1805	1804	1803	1802	1801	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791	1790	1789	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776	1775	1774	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764	1763	1762	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752	1751	1750	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740	1739	1738	1737	1736	1735	1734	1733	1732	1731	1730	1729	1728	1727	1726	1725	1724	1723	1722	1721	1720	1719	1718	1717	1716	1715	1714	1713	1712	1711	1710	1709	1708	1707	1706	1705	1704	1703	1702	1701	1700	1699	1698	1697	1696	1695	1694	1693	1692	1691	1690	1689	1688	1687	1686	1685	1684	1683	1682	1681	1680	1679	1678	1677	1676	1675	1674	1673	1672	1671	1670	1669	1668	1667	1666	1665	1664	1663	1662	1661	1660	1659	1658	1657	1656	1655	1654	1653	1652	1651	1650	1649	1648	1647	1646	1645	1644	1643	1642	1641	1640	1639	1638	1637	1636	1635	1634	1633	1632	1631	1630	1629	1628	1627	1626	1625	1624	1623	1622	1621	1620	1619	1618	1617	1616	1615	1614	1613	1612	1611	1610	1609	1608	1607	1606	1605	1604	1603	1602	1601	1600	1599	1598	1597	1596	1595	1594	1593	1592	1591	1590	1589	1588	1587	1586	1585	1584	1583	1582	1581	1580	1579	1578	1577	1576	1575	1574	1573	1572	1571	1570	1569	1568	1567	1566	1565	1564	1563	1562	1561	1560	1559	1558	1557	1556	1555	1554	1553	1552	1551	1550	1549	1548	1547	1546	1545	1544	1543	1542	1541	1540	1539	1538	1537	1536	1535	1534	1533	1532	1531	1530	1529	1528	1527	1526	1525	1524	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1512	1511	1510	1509	1508	1507	1506	1505	1504	1503	1502	1501	1500	1499	1498	1497	1496	1495	1494	1493	1492	1491	1490	1489	1488	1487	1486	1485	1484	1483	1482	1481	1480	1479	1478	1477	1476	1475	1474	1473	1472	1471	1470	1469	1468	1467	1466	1465	1464	1463	1462	1461	1460	1459	1458	1457	1456	1455	1454	1453	1452	1451	1450	1449	1448	1447	1446	1445	1444	1443	1442	1441	1440	1439	1438	1437	1436	1435	1434	1433	1432	1431	1430	1429	1428	1427	1426	1425	1424	1423	1422	1421	1420	1419	1418	1417	1416	1415	1414	1413	1412	1411	1410	1409	1408	1407	1406	1405	1404	1403	1402	1401	1400	1399	1398	1397	1396	1395	1394	1393	1392	1391	1390	1389	1388	1387	1386	1385	1384	1383	1382	1381	1380	1379	1378	1377	1376	1375	1374	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1363	1362	1361	1360	1359	1358	1357	1356	1355	1354	1353	1352	1351	1350	1349	1348	1347	1346	1345	1344	1343	1342	1341	1340	1339	1338	1337	1336	1335	1334	1333	1332	1331	1330	1329	1328	1327	1326	1325	1324	1323	1322	1321	1320	1319	1318	1317	1316	1315	1314	1313	1312	1311	1310	1309	1308	1307	1306	1305	1304	1303	1302	1301	1300	1299	1298	1297	1296	1295	1294	1293	1292	1291	1290	1289	1288	1287	1286	1285	1284	1283	1282	1281	1280	1279	1278	1277	1276	1275	1274	1273	1272	1271	1270	1269	1268	1267	1266	1265	1264	1263	1262	1261	1260	1259	1258	1257	1256	1255	1254	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201	1200	1199	1198	1197	1196	1195	1194	1193	1192	1191	1190	1189	1188	1187	1186	1185	1184	1183	1182	1181	1180	1179	1178	1177	1176	1175	1174	1173	1172	1171	1170	1169	1168	1167	1166	1165	1164	1163	1162	1161	1160	1159	1158	1157	1156	1155	1154	1153	1152	1151	1150	1149	1148	1147	1146	1145	1144	1143	1142	1141	1140	1139	1138	1137	1136	1135	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028	1027	1026	1025	1024	1023	1022	1021	1020	1019	1018	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1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840.

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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 | * | DA | MON | HRMN | ORD | OUTFLOW | STORAGE | STAGE | * |
| 1 | | 0000 | 1 | 0. | .0 | 2795.5 | * | 1 | | 0820 | 101 | 0. | .0 | 2795.5 | * | 1 | | 1640 | 201 | 0. | .0 | 2795.5 | * | 1 | | 1640 | 201 | 0. | .0 | 2795.5 | * |
| 1 | | 0005 | 2 | 0. | .0 | 2795.5 | * | 1 | | 0825 | 102 | 0. | .0 | 2795.5 | * | 1 | | 1645 | 202 | 0. | .0 | 2795.5 | * | 1 | | 1645 | 202 | 0. | .0 | 2795.5 | * |
| 1 | | 0010 | 3 | 0. | .0 | 2795.5 | * | 1 | | 0830 | 103 | 0. | .0 | 2795.5 | * | 1 | | 1650 | 203 | 0. | .0 | 2795.5 | * | 1 | | 1650 | 203 | 0. | .0 | 2795.5 | * |
| 1 | | 0015 | 4 | 0. | .0 | 2795.5 | * | 1 | | 0835 | 104 | 0. | .0 | 2795.5 | * | 1 | | 1655 | 204 | 0. | .0 | 2795.5 | * | 1 | | 1655 | 204 | 0. | .0 | 2795.5 | * |
| 1 | | 0020 | 5 | 0. | .0 | 2795.5 | * | 1 | | 0840 | 105 | 0. | .0 | 2795.5 | * | 1 | | 1700 | 205 | 0. | .0 | 2795.5 | * | 1 | | 1700 | 205 | 0. | .0 | 2795.5 | * |
| 1 | | 0025 | 6 | 0. | .0 | 2795.5 | * | 1 | | 0845 | 106 | 0. | .0 | 2795.5 | * | 1 | | 1705 | 206 | 0. | .0 | 2795.5 | * | 1 | | 1705 | 206 | 0. | .0 | 2795.5 | * |
| 1 | | 0030 | 7 | 0. | .0 | 2795.5 | * | 1 | | 0850 | 107 | 0. | .0 | 2795.5 | * | 1 | | 1710 | 207 | 0. | .0 | 2795.5 | * | 1 | | 1710 | 207 | 0. | .0 | 2795.5 | * |
| 1 | | 0035 | 8 | 0. | .0 | 2795.5 | * | 1 | | 0855 | 108 | 0. | .0 | 2795.5 | * | 1 | | 1715 | 208 | 0. | .0 | 2795.5 | * | 1 | | 1715 | 208 | 0. | .0 | 2795.5 | * |
| 1 | | 0040 | 9 | 0. | .0 | 2795.5 | * | 1 | | 0900 | 109 | 0. | .0 | 2795.5 | * | 1 | | 1720 | 209 | 0. | .0 | 2795.5 | * | 1 | | 1720 | 209 | 0. | .0 | 2795.5 | * |
| 1 | | 0045 | 10 | 0. | .0 | 2795.5 | * | 1 | | 0905 | 110 | 0. | .0 | 2795.5 | * | 1 | | 1725 | 210 | 0. | .0 | 2795.5 | * | 1 | | 1725 | 210 | 0. | .0 | 2795.5 | * |
| 1 | | 0050 | 11 | 0. | .0 | 2795.5 | * | 1 | | 0910 | 111 | 0. | .0 | 2795.5 | * | 1 | | 1730 | 211 | 0. | .0 | 2795.5 | * | 1 | | 1730 | 211 | 0. | .0 | 2795.5 | * |
| 1 | | 0055 | 12 | 0. | .0 | 2795.5 | * | 1 | | 0915 | 112 | 0. | .0 | 2795.5 | * | 1 | | 1735 | 212 | 0. | .0 | 2795.5 | * | 1 | | 1735 | 212 | 0. | .0 | 2795.5 | * |
| 1 | | 0100 | 13 | 0. | .0 | 2795.5 | * | 1 | | 0920 | 113 | 0. | .0 | 2795.5 | * | 1 | | 1740 | 213 | 0. | .0 | 2795.5 | * | 1 | | 1740 | 213 | 0. | .0 | 2795.5 | * |
| 1 | | 0105 | 14 | 0. | .0 | 2795.5 | * | 1 | | 0925 | 114 | 0. | .0 | 2795.5 | * | 1 | | 1745 | 214 | 0. | .0 | 2795.5 | * | 1 | | 1745 | 214 | 0. | .0 | 2795.5 | * |
| 1 | | 0110 | 15 | 0. | .0 | 2795.5 | * | 1 | | 0930 | 115 | 0. | .0 | 2795.5 | * | 1 | | 1750 | 215 | 0. | .0 | 2795.5 | * | 1 | | 1750 | 215 | 0. | .0 | 2795.5 | * |
| 1 | | 0115 | 16 | 0. | .0 | 2795.5 | * | 1 | | 0935 | 116 | 0. | .0 | 2795.5 | * | 1 | | 1755 | 216 | 0. | .0 | 2795.5 | * | 1 | | 1755 | 216 | 0. | .0 | 2795.5 | * |
| 1 | | 0120 | 17 | 1. | .0 | 2795.6 | * | 1 | | 0940 | 117 | 0. | .0 | 2795.5 | * | 1 | | 1800 | 217 | 0. | .0 | 2795.5 | * | 1 | | 1800 | 217 | 0. | .0 | 2795.5 | * |
| 1 | | 0125 | 18 | 1. | .0 | 2795.6 | * | 1 | | 0945 | 118 | 0. | .0 | 2795.5 | * | 1 | | 1805 | 218 | 0. | .0 | 2795.5 | * | 1 | | 1805 | 218 | 0. | .0 | 2795.5 | * |
| 1 | | 0130 | 19 | 1. | .0 | 2795.7 | * | 1 | | 0950 | 119 | 0. | .0 | 2795.5 | * | 1 | | 1810 | 219 | 0. | .0 | 2795.5 | * | 1 | | 1810 | 219 | 0. | .0 | 2795.5 | * |
| 1 | | 0135 | 20 | 2. | .0 | 2795.8 | * | 1 | | 0955 | 120 | 0. | .0 | 2795.5 | * | 1 | | 1815 | 220 | 0. | .0 | 2795.5 | * | 1 | | 1815 | 220 | 0. | .0 | 2795.5 | * |
| 1 | | 0140 | 21 | 3. | .0 | 2795.9 | * | 1 | | 1000 | 121 | 0. | .0 | 2795.5 | * | 1 | | 1820 | 221 | 0. | .0 | 2795.5 | * | 1 | | 1820 | 221 | 0. | .0 | 2795.5 | * |
| 1 | | 0145 | 22 | 4. | .0 | 2796.0 | * | 1 | | 1005 | 122 | 0. | .0 | 2795.5 | * | 1 | | 1825 | 222 | 0. | .0 | 2795.5 | * | 1 | | 1825 | 222 | 0. | .0 | 2795.5 | * |
| 1 | | 0150 | 23 | 5. | .0 | 2796.1 | * | 1 | | 1010 | 123 | 0. | .0 | 2795.5 | * | 1 | | 1830 | 223 | 0. | .0 | 2795.5 | * | 1 | | 1830 | 223 | 0. | .0 | 2795.5 | * |
| 1 | | 0155 | 24 | 5. | .0 | 2796.1 | * | 1 | | 1015 | 124 | 0. | .0 | 2795.5 | * | 1 | | 1835 | 224 | 0. | .0 | 2795.5 | * | 1 | | 1835 | 224 | 0. | .0 | 2795.5 | * |
| 1 | | 0200 | 25 | 5. | .0 | 2796.1 | * | 1 | | 1020 | 125 | 0. | .0 | 2795.5 | * | 1 | | 1840 | 225 | 0. | .0 | 2795.5 | * | 1 | | 1840 | 225 | 0. | .0 | 2795.5 | * |
| 1 | | 0205 | 26 | 4. | .0 | 2796.1 | * | 1 | | 1025 | 126 | 0. | .0 | 2795.5 | * | 1 | | 1845 | 226 | 0. | .0 | 2795.5 | * | 1 | | 1845 | 226 | 0. | .0 | 2795.5 | * |
| 1 | | 0210 | 27 | 5. | .0 | 2796.1 | * | 1 | | 1030 | 127 | 0. | .0 | 2795.5 | * | 1 | | 1850 | 227 | 0. | .0 | 2795.5 | * | 1 | | 1850 | 227 | 0. | .0 | 2795.5 | * |
| 1 | | 0215 | 28 | 6. | .0 | 2796.3 | * | 1 | | 1035 | 128 | 0. | .0 | 2795.5 | * | 1 | | 1855 | 228 | 0. | .0 | 2795.5 | * | 1 | | 1855 | 228 | 0. | .0 | 2795.5 | * |
| 1 | | 0220 | 29 | 8. | .0 | 2796.6 | * | 1 | | 1040 | 129 | 0. | .0 | 2795.5 | * | 1 | | 1900 | 229 | 0. | .0 | 2795.5 | * | 1 | | 1900 | 229 | 0. | .0 | 2795.5 | * |
| 1 | | 0225 | 30 | 11. | .0 | 2797.0 | * | 1 | | 1045 | 130 | 0. | .0 | 2795.5 | * | 1 | | 1905 | 230 | 0. | .0 | 2795.5 | * | 1 | | 1905 | 230 | 0. | .0 | 2795.5 | * |
| 1 | | 0230 | 31 | 14. | .0 | 2797.3 | * | 1 | | 1050 | 131 | 0. | .0 | 2795.5 | * | 1 | | 1910 | 231 | 0. | .0 | 2795.5 | * | 1 | | 1910 | 231 | 0. | .0 | 2795.5 | * |
| 1 | | 0235 | 32 | 14. | .0 | 2797.4 | * | 1 | | 1055 | 132 | 0. | .0 | 2795.5 | * | 1 | | 1915 | 232 | 0. | .0 | 2795.5 | * | 1 | | 1915 | 232 | 0. | .0 | 2795.5 | * |
| 1 | | 0240 | 33 | 14. | .0 | 2797.3 | * | 1 | | 1100 | 133 | 0. | .0 | 2795.5 | * | 1 | | 1920 | 233 | 0. | .0 | 2795.5 | * | 1 | | 1920 | 233 | 0. | .0 | 2795.5 | * |
| 1 | | 0245 | 34 | 13. | .0 | 2797.2 | * | 1 | | 1105 | 134 | 0. | .0 | 2795.5 | * | 1 | | 1925 | 234 | 0. | .0 | 2795.5 | * | 1 | | 1925 | 234 | 0. | .0 | 2795.5 | * |
| 1 | | 0250 | 35 | 13. | .0 | 2797.2 | * | 1 | | 1110 | 135 | 0. | .0 | 2795.5 | * | 1 | | 1930 | 235 | 0. | .0 | 2795.5 | * | 1 | | 1930 | 235 | 0. | .0 | 2795.5 | * |
| 1 | | 0255 | 36 | 14. | .0 | 2797.3 | * | 1 | | 1115 | 136 | 0. | .0 | 2795.5 | * | 1 | | 1935 | 236 | 0. | .0 | 2795.5 | * | 1 | | 1935 | 236 | 0. | .0 | 2795.5 | * |
| 1 | | 0300 | 37 | 16. | .0 | 2797.6 | * | 1 | | 1120 | 137 | 0. | .0 | 2795.5 | * | 1 | | 1940 | 237 | 0. | .0 | 2795.5 | * | 1 | | 1940 | 237 | 0. | .0 | 2795.5 | * |
| 1 | | 0305 | 38 | 19. | .0 | 2798.0 | * | 1 | | 1125 | 138 | 0. | .0 | 2795.5 | * | 1 | | 1945 | 238 | 0. | .0 | 2795.5 | * | 1 | | 1945 | 238 | 0. | .0 | 2795.5 | * |
| 1 | | 0310 | 39 | 21. | .0 | 2798.3 | * | 1 | | 1130 | 139 | 0. | .0 | 2795.5 | * | 1 | | 1950 | 239 | 0. | .0 | 2795.5 | * | 1 | | 1950 | 239 | 0. | .0 | 2795.5 | * |
| 1 | | 0315 | 40 | 25. | .0 | 2798.8 | * | 1 | | 1135 | 140 | 0. | .0 | 2795.5 | * | 1 | | 1955 | 240 | 0. | .0 | 2795.5 | * | 1 | | 1955 | 240 | 0. | .0 | 2795.5 | * |
| 1 | | 0320 | 41 | 44. | .0 | 2799.3 | * | 1 | | 1140 | 141 | 0. | .0 | 2795.5 | * | 1 | | 2000 | 241 | 0. | .0 | 2795.5 | * | 1 | | 2000 | 241 | 0. | .0 | 2795.5 | * |
| 1 | | 0325 | 42 | 67. | .0 | 2799.7 | * | 1 | | 1145 | 142 | 0. | .0 | 2795.5 | * | 1 | | 2005 | 242 | 0. | .0 | 2795.5 | * | 1 | | 2005 | 242 | 0. | .0 | 2795.5 | * |
| 1 | | 0330 | 43 | 93. | .0 | 2800.2 | * | 1 | | 1150 | 143 | 0. | .0 | 2795.5 | * | 1 | | 2010 | 243 | 0. | .0 | 2795.5 | * | 1 | | 2010 | 243 | 0. | .0 | 2795.5 | * |
| 1 | | 0335 | 44 | 113. | .0 | 2801.1 | * | 1 | | 1155 | 144 | 0. | .0 | 2795.5 | * | 1 | | 2015 | 244 | 0. | .0 | 2795.5 | * | 1 | | 2015 | 244 | 0. | .0 | 2795.5 | * |
| 1 | | 0340 | 45 | 137. | .0 | 2802.1 | * | 1 | | 1200 | 145 | 0. | .0 | 2795.5 | * | 1 | | 2020 | 245 | 0. | .0 | 2795.5 | * | 1 | | 2020 | 245 | 0. | .0 | 2795.5 | * |
| 1 | | 0345 | 46 | 168. | .0 | 2803.4 | * | 1 | | 1205 | 146 | 0. | .0 | 2795.5 | * | 1 | | 2025 | 246 | 0. | .0 | 2795.5 | * | 1 | | 2025 | 246 | 0. | .0 | 2795.5 | * |
| 1 | | 0350 | 47 | 211. | 1.1 | 2805.5 | | | | | | | | | | | | | | | | | | | | | | | | | |

| PEAK FLOW | TIME | | 6-HR | MAXIMUM AVERAGE FLOW | 24-HR | 72-HR | Fut
24.92-HR |
|-----------|------|----------|-------|----------------------|-------|-------|-----------------|
| + (CFS) | (HR) | (CFS) | | | | | |
| + 267. | 4.08 | | 59. | 15. | 14. | 14. | |
| | | (INCHES) | 1.506 | 1.508 | 1.508 | 1.508 | |
| | | (AC-FT) | 29. | 29. | 29. | 29. | |

| PEAK STORAGE | TIME | | 6-HR | MAXIMUM AVERAGE STORAGE | 24-HR | 72-HR | 24.92-HR |
|--------------|------|--|------|-------------------------|-------|-------|----------|
| + (AC-FT) | (HR) | | | | | | |
| + 2. | 4.08 | | 0. | 0. | 0. | 0. | |

| PEAK STAGE | TIME | | 6-HR | MAXIMUM AVERAGE STAGE | 24-HR | 72-HR | 24.92-HR |
|------------|------|--|---------|-----------------------|---------|---------|----------|
| + (FEET) | (HR) | | | | | | |
| + 2809.32 | 4.08 | | 2799.07 | 2796.40 | 2796.36 | 2796.36 | |

CUMULATIVE AREA = .36 SQ MI

*** **

 *
 240 KK * WC9 *
 *

241 KO OUTPUT CONTROL VARIABLES
 IPRNT 3 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

242 HC HYDROGRAPH COMBINATION
 ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

HYDROGRAPH AT STATION WC9
 FOR PLAN 1, RATIO = 1.00

| PEAK FLOW | TIME | | 6-HR | MAXIMUM AVERAGE FLOW | 24-HR | 72-HR | 24.92-HR |
|-----------|------|----------|-------|----------------------|-------|-------|----------|
| + (CFS) | (HR) | (CFS) | | | | | |
| + 765. | 3.58 | | 220. | 97. | 95. | 95. | |
| | | (INCHES) | 1.192 | 2.107 | 2.148 | 2.148 | |
| | | (AC-FT) | 109. | 193. | 196. | 196. | |

CUMULATIVE AREA = 1.71 SQ MI

*** **

HYDROGRAPH AT STATION WC9
 FOR PLAN 1, RATIO = .98

| PEAK FLOW | TIME | | 6-HR | MAXIMUM AVERAGE FLOW | 24-HR | 72-HR | 24.92-HR |
|-----------|------|----------|-------|----------------------|-------|-------|----------|
| + (CFS) | (HR) | (CFS) | | | | | |
| + 745. | 3.58 | | 215. | 96. | 94. | 94. | |
| | | (INCHES) | 1.165 | 2.073 | 2.115 | 2.115 | |
| | | (AC-FT) | 107. | 190. | 193. | 193. | |

CUMULATIVE AREA = 1.71 SQ MI

*** **

HYDROGRAPH AT STATION WC9
 FOR PLAN 1, RATIO = .97

| PEAK FLOW | TIME | | 6-HR | MAXIMUM AVERAGE FLOW | 24-HR | 72-HR | 24.92-HR |
|-----------|------|----------|-------|----------------------|-------|-------|----------|
| + (CFS) | (HR) | (CFS) | | | | | |
| + 736. | 3.58 | | 212. | 95. | 93. | 93. | |
| | | (INCHES) | 1.152 | 2.057 | 2.098 | 2.098 | |
| | | (AC-FT) | 105. | 188. | 192. | 192. | |

CUMULATIVE AREA = 1.71 SQ MI

*** **

HYDROGRAPH AT STATION WC9
 FOR PLAN 1, RATIO = .93

| PEAK FLOW | TIME | | 6-HR | MAXIMUM AVERAGE FLOW | 24-HR | 72-HR | 24.92-HR |
|-----------|------|----------|-------|----------------------|-------|-------|----------|
| + (CFS) | (HR) | (CFS) | | | | | |
| + 697. | 3.58 | | 203. | 92. | 90. | 90. | |
| | | (INCHES) | 1.099 | 1.991 | 2.032 | 2.032 | |
| | | (AC-FT) | 100. | 182. | 186. | 186. | |

CUMULATIVE AREA = 1.71 SQ MI

Fut

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

| OPERATION | STATION | AREA | PLAN | RATIOS APPLIED TO PRECIPITATION | | | |
|--------------------|---------|------|----------------|---------------------------------|-----------------|-----------------|-----------------|
| | | | | RATIO 1
1.00 | RATIO 2
.98 | RATIO 3
.97 | RATIO 4
.93 |
| HYDROGRAPH AT
+ | WOFF1 | .43 | 1 FLOW
TIME | 387.
3.83 | 376.
3.83 | 370.
3.83 | 347.
3.83 |
| HYDROGRAPH AT
+ | WOFF2 | .04 | 1 FLOW
TIME | 54.
3.58 | 53.
3.58 | 52.
3.58 | 48.
3.58 |
| HYDROGRAPH AT
+ | WOFF3 | .03 | 1 FLOW
TIME | 38.
3.58 | 37.
3.58 | 36.
3.58 | 34.
3.58 |
| 3 COMBINED AT
+ | CP1 | .50 | 1 FLOW
TIME | 430.
3.83 | 417.
3.83 | 411.
3.83 | 386.
3.83 |
| HYDROGRAPH AT
+ | WOFF4 | .06 | 1 FLOW
TIME | 84.
3.58 | 82.
3.58 | 81.
3.58 | 76.
3.58 |
| HYDROGRAPH AT
+ | WOFF5 | .26 | 1 FLOW
TIME | 236.
3.83 | 229.
3.83 | 226.
3.83 | 212.
3.83 |
| HYDROGRAPH AT
+ | WOFF6 | .04 | 1 FLOW
TIME | 59.
3.58 | 57.
3.58 | 56.
3.58 | 53.
3.58 |
| HYDROGRAPH AT
+ | ON1 | .03 | 1 FLOW
TIME | 55.
3.58 | 54.
3.58 | 53.
3.58 | 50.
3.58 |
| 5 COMBINED AT
+ | DB1 | .88 | 1 FLOW
TIME | 758.
3.75 | 735.
3.75 | 724.
3.75 | 679.
3.75 |
| ROUTED TO
+ | RDB1 | .88 | 1 FLOW
TIME | 71.
5.58 | 70.
5.58 | 70.
5.58 | 69.
5.58 |
| | | | | ** PEAK STAGES IN FEET ** | | | |
| 1 | | | | STAGE
TIME | 3035.07
5.58 | 3034.77
5.58 | 3034.61
5.58 |
| | | | | | | 3033.99
5.58 | |
| ROUTED TO
+ | RRDB1 | .88 | 1 FLOW
TIME | 71.
5.83 | 70.
5.83 | 70.
5.83 | 69.
5.83 |
| HYDROGRAPH AT
+ | WML2 | .04 | 1 FLOW
TIME | 78.
3.58 | 76.
3.58 | 75.
3.58 | 72.
3.58 |
| HYDROGRAPH AT
+ | WSHA5 | .00 | 1 FLOW
TIME | 8.
3.50 | 8.
3.50 | 8.
3.50 | 8.
3.50 |
| 2 COMBINED AT
+ | WC20 | .05 | 1 FLOW
TIME | 85.
3.58 | 83.
3.58 | 82.
3.58 | 78.
3.58 |
| HYDROGRAPH AT
+ | WPF4 | .01 | 1 FLOW
TIME | 19.
3.50 | 18.
3.50 | 18.
3.50 | 17.
3.50 |
| HYDROGRAPH AT
+ | WSHA4 | .00 | 1 FLOW
TIME | 6.
3.50 | 5.
3.50 | 5.
3.50 | 5.
3.50 |
| 3 COMBINED AT
+ | WC21 | .06 | 1 FLOW
TIME | 105.
3.50 | 102.
3.50 | 101.
3.50 | 96.
3.50 |
| HYDROGRAPH AT
+ | WL4A | .01 | 1 FLOW
TIME | 23.
3.50 | 22.
3.50 | 22.
3.50 | 21.
3.50 |
| HYDROGRAPH AT
+ | WL5A | .02 | 1 FLOW
TIME | 32.
3.50 | 31.
3.50 | 31.
3.50 | 29.
3.50 |
| HYDROGRAPH AT
+ | WL5B | .01 | 1 FLOW
TIME | 12.
3.50 | 11.
3.50 | 11.
3.50 | 11.
3.50 |
| 3 COMBINED AT
+ | WC22A | .04 | 1 FLOW
TIME | 67.
3.50 | 65.
3.50 | 64.
3.50 | 61.
3.50 |
| HYDROGRAPH AT
+ | WEGN2 | .00 | 1 FLOW
TIME | 2.
3.50 | 2.
3.50 | 2.
3.50 | 2.
3.50 |
| 2 COMBINED AT
+ | WC23 | .04 | 1 FLOW
TIME | 68.
3.50 | 67.
3.50 | 66.
3.50 | 62.
3.50 |

| | | | | Fut | | | | |
|---------------|---------------|------|---|---------------------------|--------------|--------------|--------------|--------------|
| HYDROGRAPH AT | | | | | | | | |
| + | WL6A | .01 | 1 | FLOW
TIME | 19.
3.50 | 18.
3.50 | 18.
3.50 | 17.
3.50 |
| + | 2 COMBINED AT | | | | | | | |
| + | WC24 | .05 | 1 | FLOW
TIME | 87.
3.50 | 85.
3.50 | 84.
3.50 | 79.
3.50 |
| HYDROGRAPH AT | | | | | | | | |
| + | WPRK6 | .02 | 1 | FLOW
TIME | 28.
3.58 | 27.
3.58 | 27.
3.58 | 25.
3.58 |
| + | 2 COMBINED AT | | | | | | | |
| + | WC26 | .07 | 1 | FLOW
TIME | 113.
3.50 | 110.
3.50 | 108.
3.50 | 103.
3.50 |
| HYDROGRAPH AT | | | | | | | | |
| + | EX-W5S | .22 | 1 | FLOW
TIME | 221.
3.75 | 214.
3.75 | 211.
3.75 | 198.
3.75 |
| + | 4 COMBINED AT | | | | | | | |
| + | CPS | 1.23 | 1 | FLOW
TIME | 431.
3.58 | 420.
3.58 | 415.
3.58 | 393.
3.58 |
| HYDROGRAPH AT | | | | | | | | |
| + | EX-W5N | .14 | 1 | FLOW
TIME | 155.
3.75 | 150.
3.75 | 148.
3.75 | 139.
3.75 |
| HYDROGRAPH AT | | | | | | | | |
| + | WOFF7 | .01 | 1 | FLOW
TIME | 10.
3.50 | 10.
3.50 | 10.
3.50 | 9.
3.50 |
| HYDROGRAPH AT | | | | | | | | |
| + | WOFF8 | .21 | 1 | FLOW
TIME | 230.
3.75 | 223.
3.75 | 220.
3.75 | 206.
3.75 |
| ROUTED TO | | | | | | | | |
| + | RWOFF8 | .21 | 1 | FLOW
TIME | 232.
4.00 | 226.
4.00 | 222.
4.00 | 209.
4.00 |
| + | 3 COMBINED AT | | | | | | | |
| + | CPN | .36 | 1 | FLOW
TIME | 346.
3.92 | 335.
3.92 | 330.
3.92 | 308.
3.92 |
| ROUTED TO | | | | | | | | |
| + | DBN | .36 | 1 | FLOW
TIME | 284.
4.08 | 280.
4.08 | 279.
4.08 | 267.
4.08 |
| | | | | ** PEAK STAGES IN FEET ** | | | | |
| | | | | 1 | STAGE | 2811.22 | 2810.65 | 2810.39 |
| | | | | | TIME | 4.08 | 4.08 | 4.08 |
| HYDROGRAPH AT | | | | | | | | |
| + | WSPD0 | .00 | 1 | FLOW
TIME | 2.
3.50 | 2.
3.50 | 2.
3.50 | 2.
3.50 |
| HYDROGRAPH AT | | | | | | | | |
| + | WSPD3 | .00 | 1 | FLOW
TIME | 5.
3.50 | 5.
3.50 | 5.
3.50 | 4.
3.50 |
| HYDROGRAPH AT | | | | | | | | |
| + | WGC3 | .04 | 1 | FLOW
TIME | 89.
3.50 | 87.
3.50 | 86.
3.50 | 82.
3.50 |
| + | 5 COMBINED AT | | | | | | | |
| + | WC9a | 1.64 | 1 | FLOW
TIME | 640.
3.58 | 624.
3.58 | 615.
3.58 | 583.
3.58 |
| HYDROGRAPH AT | | | | | | | | |
| + | ON1-D | .03 | 1 | FLOW
TIME | 47.
3.58 | 46.
3.58 | 45.
3.58 | 43.
3.58 |
| HYDROGRAPH AT | | | | | | | | |
| + | ON2-D | .03 | 1 | FLOW
TIME | 45.
3.58 | 44.
3.58 | 44.
3.58 | 41.
3.58 |
| HYDROGRAPH AT | | | | | | | | |
| + | HOR | .02 | 1 | FLOW
TIME | 30.
3.50 | 29.
3.50 | 29.
3.50 | 27.
3.50 |
| + | 3 COMBINED AT | | | | | | | |
| + | WC7 | .07 | 1 | FLOW
TIME | 121.
3.58 | 118.
3.58 | 116.
3.58 | 110.
3.58 |
| HYDROGRAPH AT | | | | | | | | |
| + | WGRC1A | .00 | 1 | FLOW
TIME | 4.
3.50 | 4.
3.50 | 4.
3.50 | 4.
3.50 |
| + | 3 COMBINED AT | | | | | | | |
| 1 | WC9 | 1.71 | 1 | FLOW
TIME | 765.
3.58 | 745.
3.58 | 736.
3.58 | 697.
3.58 |

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

| ISTAQ | ELEMENT | DT | PEAK | TIME TO
PEAK | VOLUME | DT | INTERPOLATED TO
COMPUTATION INTERVAL | | VOLUME |
|--------------|---------|-------|-------|-----------------|--------|-------|---|-----------------|--------|
| | | | | | | | PEAK | TIME TO
PEAK | |
| | | (MIN) | (CFS) | (MIN) | (IN) | (MIN) | (CFS) | (MIN) | (IN) |
| FOR PLAN = 1 | RATIO= | .00 | | | | | | | |
| RRDB1 | MANE | 5.00 | 70.94 | 350.00 | 2.48 | 5.00 | 70.94 | 350.00 | 2.48 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1169E+03 EXCESS= .0000E+00 OUTFLOW= .1169E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0
Page 14

Fut

FOR PLAN = 1 RATIO= .00
RRDB1 MANE 5.00 70.33 350.00 2.46 5.00 70.33 350.00 2.46

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

FOR PLAN = 1 RATIO= .00
RRDB1 MANE 5.00 70.01 350.00 2.45 5.00 70.01 350.00 2.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1158E+03 EXCESS= .0000E+00 OUTFLOW= .1158E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RRDB1 MANE 5.00 68.75 350.00 2.43 5.00 68.75 350.00 2.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1144E+03 EXCESS= .0000E+00 OUTFLOW= .1144E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 232.41 240.00 1.69 5.00 232.41 240.00 1.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1924E+02 EXCESS= .0000E+00 OUTFLOW= .1929E+02 BASIN STORAGE= .9233E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 225.71 240.00 1.64 5.00 225.71 240.00 1.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1865E+02 EXCESS= .0000E+00 OUTFLOW= .1870E+02 BASIN STORAGE= .9124E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 222.35 240.00 1.61 5.00 222.35 240.00 1.61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1836E+02 EXCESS= .0000E+00 OUTFLOW= .1840E+02 BASIN STORAGE= .9069E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
RWOFF8 MANE 5.00 208.87 240.00 1.51 5.00 208.87 240.00 1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1719E+02 EXCESS= .0000E+00 OUTFLOW= .1724E+02 BASIN STORAGE= .8456E-02 PERCENT ERROR= -.3

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

Ultimate Condition (100-Yr & 10-Yr)

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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 22APR16 TIME 15:24:01 *
*****

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ULT

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

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

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

1 HEC-1 INPUT PAGE 1

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
*** FREE ***
*DIAGRAM
1 ID SKYE CANYON
2 ID PHASE 3 INFRASTRUCTURE - ULTIMATE CONDITION
3 ID SKY CANYON MASTER PLAN DEVELOPED
4 ID
5 ID
6 ID RETURN PERIOD ----- 100-YEAR
7 ID DISTRIBUTION ----- 6-HOUR SDN3
8 ID PROJECT NO. ----- OLY1602.001
9 ID FILENAME ----- ULT.H1
10 ID DATE ----- 4/19/2016
11 ID MODELED BY ----- SMJ/ALB
12 ID
13 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
14 ID DRAINAGE AREA (MI^2) DARF
15 ID 0.0-0.50 1.00
16 ID 10-Year 0.55
17 ID
18 IT 5 0 0 300
19 IO 5 0 0
20 IN 5 0 0
21 JR PREC 1.00 0.55

22 KK WML16
23 KM WEST BASIN, WEST OF SKYE PARK DRIVE
24 PB 2.93
25 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
26 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
27 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
28 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
29 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
30 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
31 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
32 PC 0.998 0.999 1
33 BA .0346
34 LS 0 95.0
35 UD 0.118
*

36 KK WSPD3
37 KM WEST BASIN, SKYE PARK DRIVE
38 BA .0022
39 PB 2.93
40 LS 0 92.8
41 UD 0.056
*

42 KK WC6
43 KM N OF SKYE CANYON PARK/SKYE PARK INTERSECTION
44 KM COMBINE WML16, WSPD3
45 HC 2
*

```

1 HEC-1 INPUT PAGE 2

```

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

46 KK WML15B
47 KM WEST BASIN, WEST OF SKYE PARK DRIVE
48 BA .0175
49 PB 2.93
50 LS 0 95.0
51 UD 0.102
*

52 KK WSPD2

```


53 KM WEST BASIN, SKYE PARK DRIVE
54 BA .0012
55 PB 2.93
56 LS 0 98.0
57 UD 0.050
*
58 KK WC8
59 KM COMBINE WML15B, WSPD2
60 HC 2
*
61 KK WGC3
62 KM WEST BASIN, WEST OF GRAND CANYON DRIVE
63 BA .0444
64 PB 2.93
65 LS 0 94.6
66 UD 0.095
*
67 KK WC9a
68 KM COMBINE WGC3, WC6, & WC8
69 HC 3
*
70 KK ON1-D
71 KM PHASE 1, NORTHWEST QUAD ONSITE BASIN
72 BA .0278
73 PB 2.93
74 LS 0 91.2
75 UD 0.114
*
76 KK ON2-D
77 KM PHASE 1, NORTHEAST QUAD ONSITE BASIN
78 BA .0301
79 PB 2.93
80 LS 0 88.8
81 UD 0.152
*

ULT

1

HEC-1 INPUT

PAGE 3

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

82 KK HOR
83 KM PHASE 1, STREET BASIN SKYE CANYON PARK DRIVE
84 BA .0163
85 PB 2.93
86 LS 0 93.3
87 UD 0.108
*
88 KK WC7
89 KM W OF SKYE CANYON PARK/GRAND CANYON INTERSECTION
90 KM COMBINE ON1-D, ON2-D, HOR
91 HC 3
*
92 KK WGRCL1A
93 KM WEST BASIN, GRAND CANYON DRIVE
94 BA .0022
95 PB 2.93
96 LS 0 93.2
97 UD 0.095
*
98 KK OFF1
99 BA .0006
100 PB 2.93
101 LS 0 94.7
102 UD 0.050
*
103 KK WC9
104 KM FAR N OF SKYE CANYON PARK/GRAND CANYON INTERSECTION
105 KM COMBINE WC7, WC9a, WGRCL1A
106 HC 4
*
107 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
22 WML16
. .
36 . WSPD3
. .
42 WC6.....
. .
46 . WML15B
. .
52 . WSPD2
. .
58 . WC8.....
. .
61 . WGC3

| | | | | | | ULT |
|---|---------------|-----|---|--------------|--------------|--------------|
| + | WSPD3 | .00 | 1 | FLOW
TIME | 5.
3.50 | 2.
3.50 |
| + | 2 COMBINED AT | | | | | |
| + | WC6 | .04 | 1 | FLOW
TIME | 69.
3.50 | 34.
3.50 |
| + | HYDROGRAPH AT | | | | | |
| + | WML15B | .02 | 1 | FLOW
TIME | 34.
3.50 | 17.
3.50 |
| + | HYDROGRAPH AT | | | | | |
| + | WSPD2 | .00 | 1 | FLOW
TIME | 3.
3.50 | 2.
3.50 |
| + | 2 COMBINED AT | | | | | |
| + | WC8 | .02 | 1 | FLOW
TIME | 37.
3.50 | 19.
3.50 |
| + | HYDROGRAPH AT | | | | | |
| + | WGC3 | .04 | 1 | FLOW
TIME | 89.
3.50 | 43.
3.50 |
| + | 3 COMBINED AT | | | | | |
| + | WC9a | .10 | 1 | FLOW
TIME | 195.
3.50 | 96.
3.50 |
| + | HYDROGRAPH AT | | | | | |
| + | ON1-D | .03 | 1 | FLOW
TIME | 47.
3.58 | 21.
3.58 |
| + | HYDROGRAPH AT | | | | | |
| + | ON2-D | .03 | 1 | FLOW
TIME | 45.
3.58 | 18.
3.58 |
| + | HYDROGRAPH AT | | | | | |
| + | HOR | .02 | 1 | FLOW
TIME | 30.
3.50 | 14.
3.50 |
| + | 3 COMBINED AT | | | | | |
| + | WC7 | .07 | 1 | FLOW
TIME | 121.
3.58 | 53.
3.58 |
| + | HYDROGRAPH AT | | | | | |
| + | WGRC1A | .00 | 1 | FLOW
TIME | 4.
3.50 | 2.
3.50 |
| + | HYDROGRAPH AT | | | | | |
| + | OFF1 | .00 | 1 | FLOW
TIME | 1.
3.50 | 1.
3.50 |
| + | 4 COMBINED AT | | | | | |
| + | WC9 | .18 | 1 | FLOW
TIME | 317.
3.50 | 148.
3.50 |

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

APPENDIX D

Surface Flow Hydraulic Computations

Street Flows

Section SP1 - Flow in Sky Park Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|--------------------------------------|
| Worksheet | Section SP1 - Flow in Sky Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|-----------|
| Channel Slope | 1.90 % |
| Discharge | 37.50 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 | 0.016 |
| Water Surface Elevation | 0.54 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 8.6 ft ² |
| Wetted Perimeter | 42.65 ft |
| Top Width | 41.66 ft |
| Actual Depth | 0.54 ft |
| Critical Elevation | 0.63 ft |
| Critical Slope | 0.59 % |
| Velocity | 4.39 ft/s |
| Velocity Head | 0.30 ft |
| Specific Energy | 0.84 ft |
| Froude Number | 1.71 |
| Flow Type | Supercritical |

Calculation Messages:
 Water elevation exceeds lowest end station by 0.41596261e-1 ft.
 Flow is divided.

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+43.0 | 0.016 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |
| 0+41.0 | 0.17 |
| 0+41.0 | 0.13 |
| 0+42.4 | 0.00 |
| 0+42.5 | 0.48 |

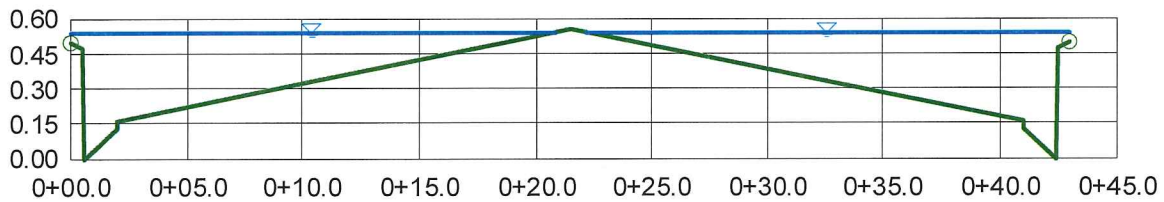
Section SP1 - Flow in Sky Park Drive
Worksheet for Irregular Channel

| Natural Channel Points | |
|------------------------|-------------------|
| Station
(ft) | Elevation
(ft) |
| 0+43.0 | 0.50 |

Section SP1 - Flow in Sky Park Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|--------------------------------------|
| Worksheet | Section SP1 - Flow in Sky Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 1.90 % |
| Water Surface Elevation | 0.54 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 37.50 cfs |



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Section SP2 - Flow in Sky Park Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|--------------------------------------|
| Worksheet | Section SP2 - Flow in Sky Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|-----------|
| Channel Slope | 1.90 % |
| Discharge | 25.00 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 | 0.016 |
| Water Surface Elevation | 0.48 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 6.2 ft ² |
| Wetted Perimeter | 35.71 ft |
| Top Width | 34.81 ft |
| Actual Depth | 0.48 ft |
| Critical Elevation | 0.56 ft |
| Critical Slope | 0.64 % |
| Velocity | 4.00 ft/s |
| Velocity Head | 0.25 ft |
| Specific Energy | 0.73 ft |
| Froude Number | 1.67 |
| Flow Type | Supercritical |

Calculation Messages:
Flow is divided.

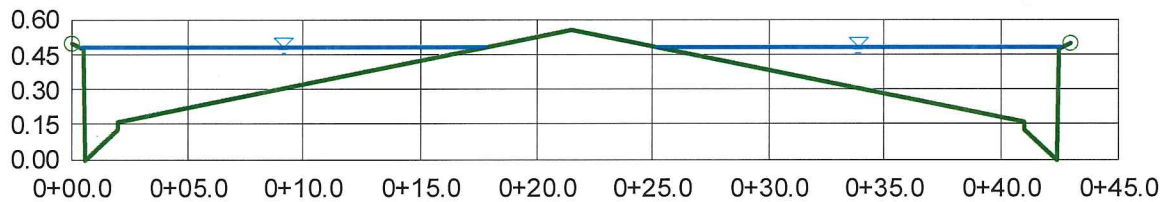
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+43.0 | 0.016 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |
| 0+41.0 | 0.17 |
| 0+41.0 | 0.13 |
| 0+42.4 | 0.00 |
| 0+42.5 | 0.48 |
| 0+43.0 | 0.50 |

Section SP2 - Flow in Sky Park Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|--------------------------------------|
| Worksheet | Section SP2 - Flow in Sky Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 1.90 % |
| Water Surface Elevation | 0.48 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 25.00 cfs |



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Section SP3 - Flow Split in Skye Park Drive @ Street D

Worksheet for Irregular Channel

| Project Description | |
|---------------------|--|
| Worksheet | Section SP3 - Flow Split in Skye Park Drive @ Street D |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|----------|
| Channel Slope | 1.90 % |
| Discharge | 6.50 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 | 0.016 |
| Water Surface Elevation | 0.40 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 1.9 ft ² |
| Wetted Perimeter | 13.72 ft |
| Top Width | 13.33 ft |
| Actual Depth | 0.40 ft |
| Critical Elevation | 0.46 ft |
| Critical Slope | 0.70 % |
| Velocity | 3.42 ft/s |
| Velocity Head | 0.18 ft |
| Specific Energy | 0.58 ft |
| Froude Number | 1.60 |
| Flow Type | Supercritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+21.5 | 0.016 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |

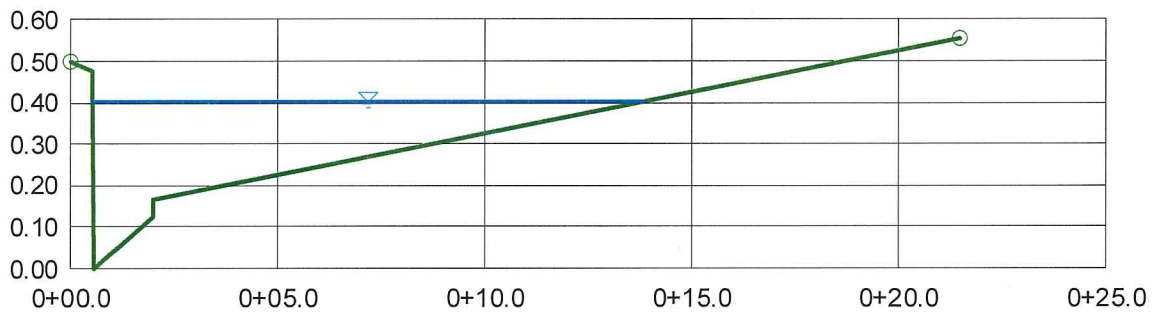
Notes: Flow split considers the flow in the Street SP3.

By balancing the flow depth between Sections D2 and SP3.

Section SP3 - Flow Split in Skye Park Drive @ Street D Cross Section for Irregular Channel

| Project Description | |
|---------------------|--|
| Worksheet | Section SP3 - Flow Split in Skye Park Drive @ Street D |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 1.90 % |
| Water Surface Elevation | 0.40 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 6.50 cfs |



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Section SP4 - Flow in Skye Park Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|---------------------------------------|
| Worksheet | Section SP4 - Flow in Skye Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|----------|
| Channel Slope | 0.60 % |
| Discharge | 2.50 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 | 0.016 |
| Water Surface Elevation | 0.36 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 1.4 ft ² |
| Wetted Perimeter | 11.75 ft |
| Top Width | 11.40 ft |
| Actual Depth | 0.36 ft |
| Critical Elevation | 0.35 ft |
| Critical Slope | 0.79 % |
| Velocity | 1.76 ft/s |
| Velocity Head | 0.05 ft |
| Specific Energy | 0.41 ft |
| Froude Number | 0.88 |
| Flow Type | Subcritical |

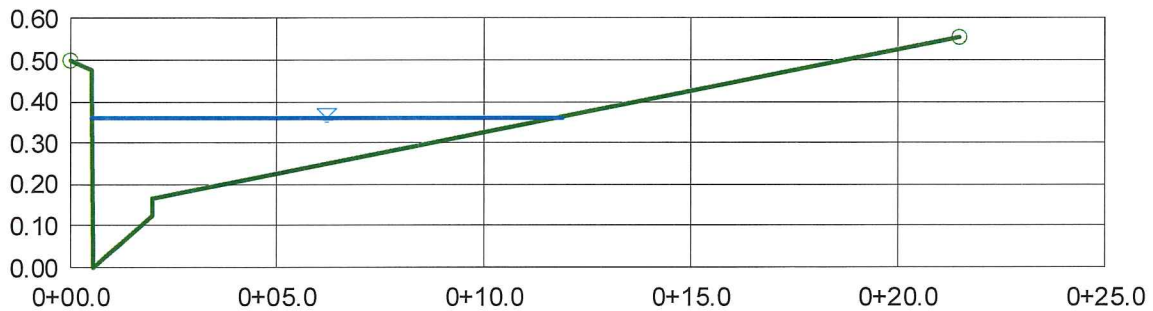
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+21.5 | 0.016 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |

Section SP4 - Flow in Skye Park Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|---------------------------------------|
| Worksheet | Section SP4 - Flow in Skye Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 0.60 % |
| Water Surface Elevation | 0.36 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 2.50 cfs |



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Section D1 - Flow in Street D

Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------------------|
| Worksheet | Section D1 - Flow in Street D |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|----------|
| Channel Slope | 2.00 % |
| Discharge | 2.00 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 | 0.016 |
| Water Surface Elevation | 0.25 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 0.9 ft ² |
| Wetted Perimeter | 11.54 ft |
| Top Width | 11.03 ft |
| Actual Depth | 0.25 ft |
| Critical Elevation | 0.27 ft |
| Critical Slope | 0.89 % |
| Velocity | 2.33 ft/s |
| Velocity Head | 0.08 ft |
| Specific Energy | 0.33 ft |
| Froude Number | 1.47 |
| Flow Type | Supercritical |

Calculation Messages:
Flow is divided.

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+43.0 | 0.016 |

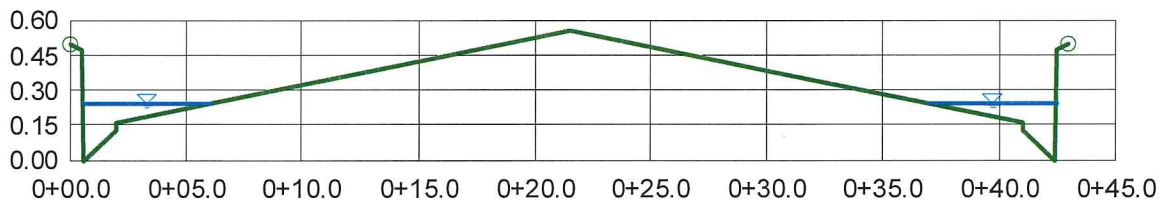
| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |
| 0+41.0 | 0.17 |
| 0+41.0 | 0.13 |
| 0+42.4 | 0.00 |
| 0+42.5 | 0.48 |
| 0+43.0 | 0.50 |

Section D1 - Flow in Street D

Cross Section for Irregular Channel

| Project Description | |
|---------------------|-------------------------------|
| Worksheet | Section D1 - Flow in Street D |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 2.00 % |
| Water Surface Elevation | 0.25 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 2.00 cfs |



V:10.0
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NTS

Section D2 - Flow Split in Street D @ Skye Park Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|---|
| Worksheet | Section D2 - Flow Split in Street D @ Skye Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|-----------|
| Channel Slope | 2.00 % |
| Discharge | 12.00 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 | 0.016 |
| Water Surface Elevation | 0.39 ft |
| Elevation Range | 0.00 to 0.56 |
| Flow Area | 3.5 ft ² |
| Wetted Perimeter | 26.29 ft |
| Top Width | 25.54 ft |
| Actual Depth | 0.39 ft |
| Critical Elevation | 0.45 ft |
| Critical Slope | 0.70 % |
| Velocity | 3.43 ft/s |
| Velocity Head | 0.18 ft |
| Specific Energy | 0.57 ft |
| Froude Number | 1.63 |
| Flow Type | Supercritical |

Calculation Messages:
Flow is divided.

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+43.0 | 0.016 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+21.5 | 0.56 |
| 0+41.0 | 0.17 |
| 0+41.0 | 0.13 |
| 0+42.4 | 0.00 |
| 0+42.5 | 0.48 |
| 0+43.0 | 0.50 |

Section D2 - Flow Split in Street D @ Skye Park Drive

Worksheet for Irregular Channel

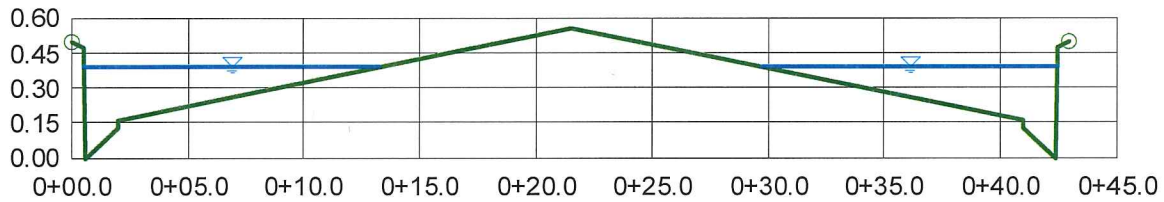
Notes: Flow split considers the flow in the Street D

By balancing the flow depth between Sections D2 and SP3.

Section D2 - Flow Split in Street D @ Skye Park Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|---|
| Worksheet | Section D2 - Flow Split in Street D @ Skye Park Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 2.00 % |
| Water Surface Elevation | 0.39 ft |
| Elevation Range | 0.00 to 0.56 |
| Discharge | 12.00 cfs |



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Section GC2 - (10-Year) Flow in Half Street Section Grand Canyon Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|--|
| Worksheet | Section GC2 - (10-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|----------|
| Channel Slope | 0.50 % |
| Discharge | 2.00 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 | 0.016 |
| Water Surface Elevation | 0.34 ft |
| Elevation Range | 0.00 to 1.08 |
| Flow Area | 1.2 ft ² |
| Wetted Perimeter | 10.71 ft |
| Top Width | 10.38 ft |
| Actual Depth | 0.34 ft |
| Critical Elevation | 0.33 ft |
| Critical Slope | 0.76 % |
| Velocity | 1.65 ft/s |
| Velocity Head | 0.04 ft |
| Specific Energy | 0.39 ft |
| Froude Number | 0.85 |
| Flow Type | Subcritical |

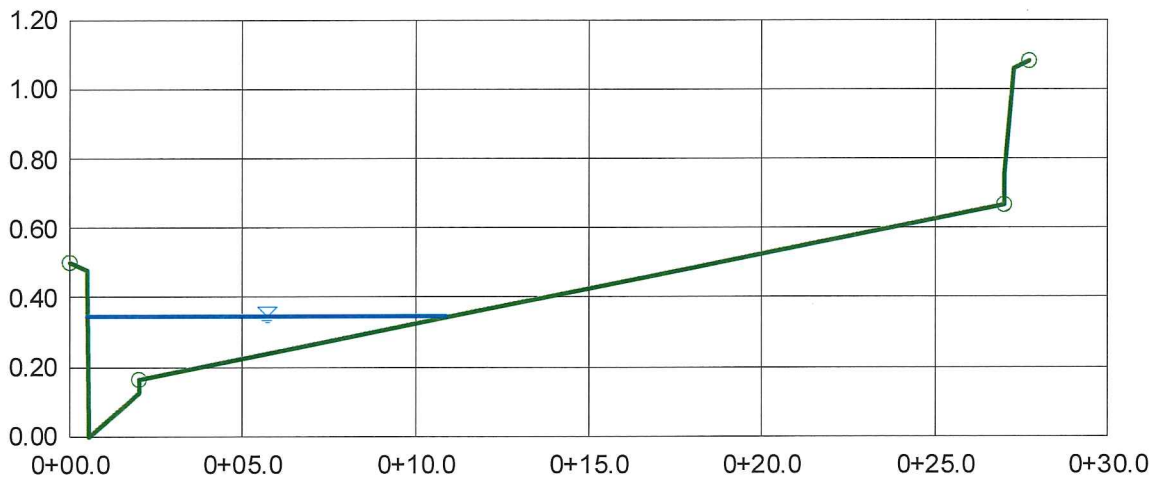
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+02.0 | 0.013 |
| 0+02.0 | 0+27.0 | 0.016 |
| 0+27.0 | 0+27.7 | 0.013 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+27.0 | 0.67 |
| 0+27.0 | 0.75 |
| 0+27.3 | 1.06 |
| 0+27.7 | 1.08 |

Section GC2 - (10-Year) Flow in Half Street Section Grand Canyon Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|--|
| Worksheet | Section GC2 - (10-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.016 |
| Channel Slope | 0.50 % |
| Water Surface Elevation | 0.34 ft |
| Elevation Range | 0.00 to 1.08 |
| Discharge | 2.00 cfs |



V:10.0
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NTS

Section GC2 - (100-Year) Flow in Half Street Section Grand Canyon Drive

Worksheet for Irregular Channel

| Project Description | |
|---------------------|---|
| Worksheet | Section GC2 - (100-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|----------|
| Channel Slope | 0.50 % |
| Discharge | 3.00 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 | 0.013 |
| Water Surface Elevation | 0.37 ft |
| Elevation Range | 0.00 to 1.08 |
| Flow Area | 1.5 ft ² |
| Wetted Perimeter | 12.16 ft |
| Top Width | 11.80 ft |
| Actual Depth | 0.37 ft |
| Critical Elevation | 0.37 ft |
| Critical Slope | 0.54 % |
| Velocity | 1.96 ft/s |
| Velocity Head | 0.06 ft |
| Specific Energy | 0.43 ft |
| Froude Number | 0.96 |
| Flow Type | Subcritical |

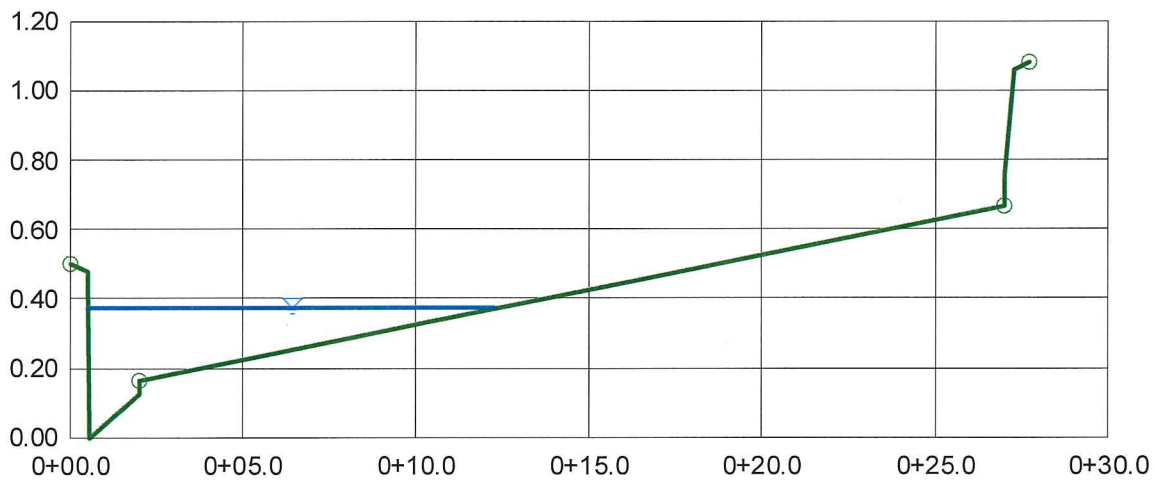
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+02.0 | 0.013 |
| 0+02.0 | 0+27.0 | 0.016 |
| 0+27.0 | 0+27.7 | 0.013 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+27.0 | 0.67 |
| 0+27.0 | 0.75 |
| 0+27.3 | 1.06 |
| 0+27.7 | 1.08 |

Section GC2 - (100-Year) Flow in Half Street Section Grand Canyon Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|---|
| Worksheet | Section GC2 - (100-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.013 |
| Channel Slope | 0.50 % |
| Water Surface Elevation | 0.37 ft |
| Elevation Range | 0.00 to 1.08 |
| Discharge | 3.00 cfs |



V:10.0
H:1
NTS

Section GC1 - (10-Year) Flow in Half Street Section Grand Canyon Drive **Worksheet for Irregular Channel**

| | |
|---------------------|--|
| Project Description | |
| Worksheet | Section GC1 - (10-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| | |
|---------------|----------|
| Input Data | |
| Channel Slope | 0.50 % |
| Discharge | 4.00 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 | 0.014 |
| Water Surface Elevation | 0.41 ft |
| Elevation Range | 0.00 to 1.08 |
| Flow Area | 1.9 ft² |
| Wetted Perimeter | 13.83 ft |
| Top Width | 13.44 ft |
| Actual Depth | 0.41 ft |
| Critical Elevation | 0.40 ft |
| Critical Slope | 0.55 % |
| Velocity | 2.06 ft/s |
| Velocity Head | 0.07 ft |
| Specific Energy | 0.47 ft |
| Froude Number | 0.95 |
| Flow Type | Subcritical |

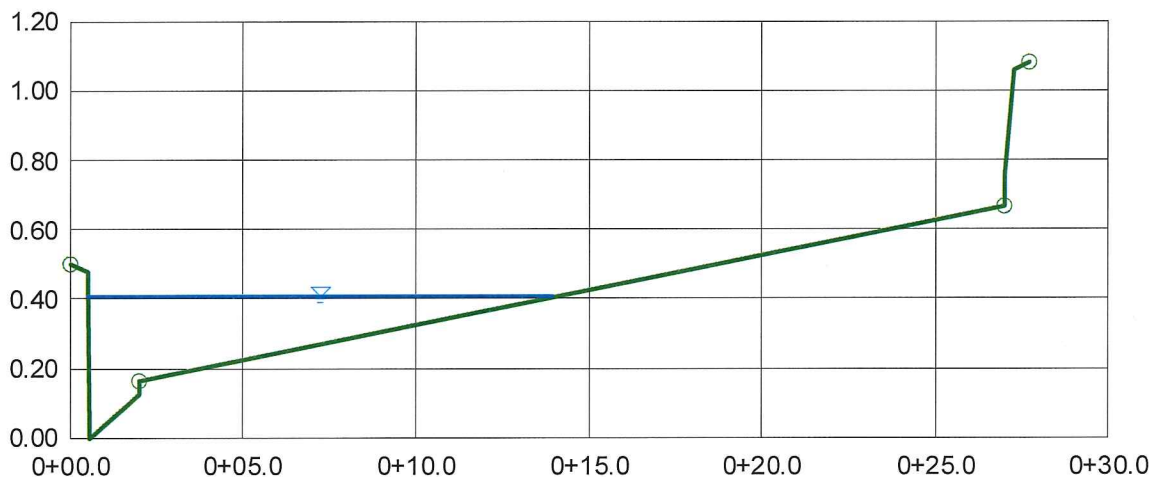
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+02.0 | 0.013 |
| 0+02.0 | 0+27.0 | 0.016 |
| 0+27.0 | 0+27.7 | 0.013 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+27.0 | 0.67 |
| 0+27.0 | 0.75 |
| 0+27.3 | 1.06 |
| 0+27.7 | 1.08 |

Section GC1 - (10-Year) Flow in Half Street Section Grand Canyon Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|--|
| Worksheet | Section GC1 - (10-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.014 |
| Channel Slope | 0.50 % |
| Water Surface Elevation | 0.41 ft |
| Elevation Range | 0.00 to 1.08 |
| Discharge | 4.00 cfs |



V:10.0
H:1
NTS

Section GC1 - (100-Year) Flow in Half Street Section Grand Canyon Drive **Worksheet for Irregular Channel**

| Project Description | |
|---------------------|---|
| Worksheet | Section GC1 - (100-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|---------------|-----------|
| Channel Slope | 0.50 % |
| Discharge | 16.00 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 | 0.015 |
| Water Surface Elevation | 0.62 ft |
| Elevation Range | 0.00 to 1.08 |
| Flow Area | 6.0 ft² |
| Wetted Perimeter | 25.06 ft |
| Top Width | 24.49 ft |
| Actual Depth | 0.62 ft |
| Critical Elevation | 0.61 ft |
| Critical Slope | 0.56 % |
| Velocity | 2.67 ft/s |
| Velocity Head | 0.11 ft |
| Specific Energy | 0.73 ft |
| Froude Number | 0.95 |
| Flow Type | Subcritical |

Calculation Messages:
Water elevation exceeds lowest end station by 0.11922783 ft.

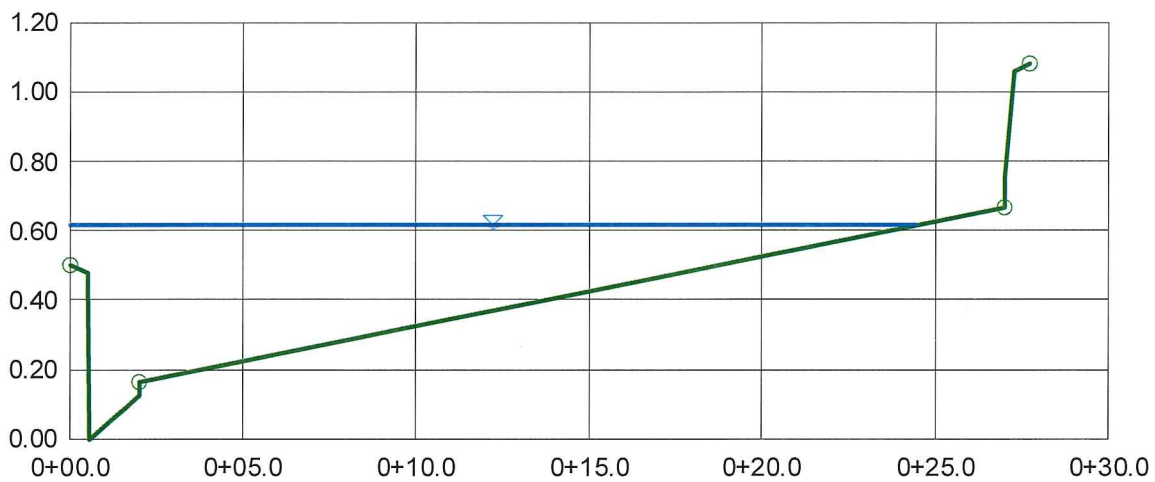
| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00.0 | 0+02.0 | 0.013 |
| 0+02.0 | 0+27.0 | 0.016 |
| 0+27.0 | 0+27.7 | 0.013 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00.0 | 0.50 |
| 0+00.5 | 0.48 |
| 0+00.6 | 0.00 |
| 0+02.0 | 0.13 |
| 0+02.0 | 0.17 |
| 0+27.0 | 0.67 |
| 0+27.0 | 0.75 |
| 0+27.3 | 1.06 |
| 0+27.7 | 1.08 |

Section GC1 - (100-Year) Flow in Half Street Section Grand Canyon Drive Cross Section for Irregular Channel

| Project Description | |
|---------------------|---|
| Worksheet | Section GC1 - (100-Year) Flow in Half Street Section Grand Canyon Drive |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|-------------------------|--------------|
| Mannings Coefficient | 0.015 |
| Channel Slope | 0.50 % |
| Water Surface Elevation | 0.62 ft |
| Elevation Range | 0.00 to 1.08 |
| Discharge | 16.00 cfs |



V:10.0
H:1
NTS

Drop Inlets

| | | |
|---------------------------------------|--|--|
| Project Name: | SKYE CANYON PHASE 3 | 
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS |
| By: | CWB | |
| Date: | 4/28/16 | |
| Notes: | | |
| Facility ID: | GC8 | |
| Drainage Condition | Proposed | |
| Design Flow (cfs) | 18.0 | |
| Inlet Type: | Type CM2 (Sump) | |
| Inlet Length: | 7.5-ft | |
| Number of Grates: | 2 | |
| Input: | Variable: | Input: |
| Depth at Inlet (ft) | D | 0.83 |
| Grate Width (ft) | W | 1.50 |
| Length of Grate (ft) | L_g | 5.00 |
| Length of Curb Opening (ft) | L_c | 7.50 |
| Height of Curb Opening (ft) | H | 0.50 |
| Weir Coef. - Curb Opening | W_c | 2.3 |
| Weir Coef. - Grate | W_g | 3.0 |
| Orifice Coef. | O_c | 0.67 |
| Grate Coef. | G_c | 0.60 |
| Clogging Factor - Grate (%) | CF_g | 50 |
| Clogging Factor - Curb (%) | CF_c | 50 |
| Output (Grate): | Equation: | Output (Grate): |
| Effective Weir Length (ft) | $2*W+L_g$ | 8.00 |
| Adjusted Effective Weir Length (ft) | $2*(1-CF_g/100)*W+(1-CF_g/100)*L_g$ | 4.00 |
| Grate Open Area (sf) | $W*L_g$ | 7.50 |
| Adjusted Grate Open Area (sf) | Grate Open Area * $G_c*(1-CF_g/100)$ | 2.25 |
| Controlling Flow Type (weir/orifice) | If $D < 1.792*(Adj. Grate Open Area/Adj. Eff. Length)$
use weir, else orifice | weir |
| Intercepted Flow (cfs) | weir: $W_g*(Adj. Eff. Weir Length)*D^{1.5}$
orifice: $O_c*(Adj. Grate Open Area)*(64.4*D)^{0.5}$ | 9.1 |
| Output (Curb): | Equation: | Output (Curb): |
| Effective Weir Length (ft) | $L+1.8*W$ | 10.20 |
| Adjusted Effective Weir Length (ft) | $L+1.8*(1-CF_c/100)*W$ | 8.91 |
| Curb Open Area (sf) | $L*H$ | 3.75 |
| Adjusted Curb Open Area (sf) | Curb Open Area * $(1-CF_c/100)$ | 1.88 |
| Controlling Flow Type (weir/orifice) | If $D < H$, weir, else orifice | orifice |
| Intercepted Flow (cfs) | weir: $W_c*(Adj. Eff. Weir Length)*D^{1.5}$
orifice: $O_c*(Adj. Curb Open Area)*(64.4*(D-H/2))^{0.5}$ | 9.16 |
| Output (Total): | Equation: | Output (Total): |
| Capacity Intercepted Flow (cfs) | Intercepted (Grate) + Intercepted (Curb) | 18.2 |
| Actual Collected Flow = 18 cfs | | |

| | | | | | |
|--|--|--|--|--|--|
| Project Name: | | SKYE CANYON PHASE 3 | | 
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS | |
| By: | | CWB | | | |
| Date: | | 4/28/2016 | | | |
| Notes: | | | | | |
| Facility ID: | | GC12 | | | |
| Drainage Condition: | | Proposed | | | |
| Inlet Type: | | Type CM2 (Continuous Grade) | | | |
| Inlet Length: | | 7.5-ft | | | |
| Number of Grates | | 2 | | | |
| Input: | | Variable: | | Input: | |
| Street Flow (cfs) | | Q | | 7.0 | |
| Longitudinal Slope (ft/ft) | | S _o | | 0.0050 | |
| Manning's Coefficient | | n | | 0.016 | |
| Street Flow Velocity (fps) | | V | | 4.80 | |
| Street Flow Depth (ft) | | D | | 0.42 | |
| Street Cross Slope (ft/ft) | | S _x | | 0.02 | |
| Grate Width (ft) | | W | | 1.5 | |
| Grate Depression (in) | | D _g | | 2.0 | |
| Length of Grate (ft) | | L _g | | 5.0 | |
| Length of Curb Opening (ft) | | L _c | | 7.50 | |
| Clogging Factor - Grate (%) | | CF _g | | 50% | |
| Clogging Factor - Curb (%) | | CF _c | | 50% | |
| Effective Grate Length (ft) | | L _{ge} | | 2.5 | |
| Effective Curb Opening Length (ft) | | L _{ce} | | 3.75 | |
| Output (Grate): | | Equation: | | Output (Grate): | |
| ¹ R _f - Frontal Flow Factor | | 1-0.09*(V-V _x) if V>V _x ; else Frontal Flow Factor=1 | | 1.00 | |
| ² V _o - Splash Over Velocity (fps) | | V _x =p+q*L _g -r*L _{ge} ² +sy*L _{ge} ³ ; where
p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate) | | 6.58 | |
| ¹ E - Grate Flow Ratio | | Frontal Flow/Side Flow | | 0.29 | |
| ² Q _w - Frontal Flow (cfs) | | Q _w = Q[1-(1-(W/T)) ^{2.67}] | | 2.00 | |
| ¹ Q _s - Side Flow (cfs) | | Q _s = Q-Q _w | | 5.0 | |
| ¹ T - Side Flow Spread (ft) | | (D-D _g)/S _x | | 12.67 | |
| ¹ R _s - Side Flow Factor | | 1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3})) | | 0.06 | |
| ¹ Q _{gi} - Intercepted Flow (cfs) | | (R _f *E+R _s *(1-E))*Q | | 2.3 | |
| Output (Curb): | | Equation: | | Output (Curb): | |
| ¹ S _e - Equivalent Cross Slope (ft/ft) | | S _x +S _g *E | | 0.052 | |
| Q _{sx} - Remaining Flow After Grate Interception (cfs) | | Q-Q _{gi} | | 4.694 | |
| S _g - Gutter Cross Slope (ft/ft) | | D _g /W | | 0.111 | |
| ¹ L _t - Effective Interception Length (ft) | | 0.60*Q _{sx} ^{0.42} *S _o ^{0.30} *(1/n*S _e) ^{0.6} | | 16.56 | |
| ¹ Q _{ci} - Intercepted Flow (cfs) | | (1-(1-L _{ce} /L _t) ^{1.0})*Q _{sx}
or Q _{sx} if L _t is less than L _{ce} | | 1.7 | |
| Output (Combination): | | Equation: | | Output (Combination): | |
| Total Intercepted Flow (cfs) | | Intercepted (Grate) + Intercepted (Curb) | | 4 | |
| Bypass Flow (cfs) | | Street Flow - Total Intercepted Flow | | 3 | |

¹ Formula referenced from the CCRFCD Manual

² Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

| | | | | |
|--|--|--|------------------------------|--|
| Project Name: | | SKYE CANYON PHASE 3 | | 
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS |
| By: | | CWB | | |
| Date: | | 4/28/2016 | | |
| Notes: | | | | |
| Facility ID: | | D2 & D4 | | |
| Drainage Condition: | | Ultimate | | |
| Inlet Type: | | Type CM2 (Continuous Grade) | | |
| Inlet Length: | | 20.-ft | | |
| Number of Grates | | 7 | | |
| Input: | | Variable: | Input: | |
| Street Flow (cfs) | | Q | 6.0 | |
| Longitudinal Slope (ft/ft) | | S _o | 0.0200 | |
| Manning's Coefficient | | n | 0.016 | |
| Street Flow Velocity (fps) | | V | 3.40 | |
| Street Flow Depth (ft) | | D | 0.39 | |
| Street Cross Slope (ft/ft) | | S _x | 0.02 | |
| Grate Width (ft) | | W | 1.5 | |
| Grate Depression (in) | | D _g | 2.0 | |
| Length of Grate (ft) | | L _g | 17.5 | |
| Length of Curb Opening (ft) | | L _c | 20.00 | |
| Clogging Factor - Grate (%) | | CF _g | 50% | |
| Clogging Factor - Curb (%) | | CF _c | 50% | |
| Effective Grate Length (ft) | | L _{ge} | 8.8 | |
| Effective Curb Opening Length (ft) | | L _{ce} | 10.00 | |
| Output (Grate): | | Equation: | Output (Grate): | |
| ¹ R _f - Frontal Flow Factor | | 1-0.09*(V-V _x) if V>V _x ; else Frontal Flow Factor=1 | 1.00 | |
| ² V _o - Splash Over Velocity (fps) | | V _x =p+q*L _g -r*L _{ge} ² +sy*L _{ge} ³ ; where
p=0.30,q=4.85,r=1.31,sy=0.15 (for Vane Grate) | 42.93 | |
| ¹ E - Grate Flow Ratio | | Frontal Flow/Side Flow | 0.32 | |
| ² Q _w - Frontal Flow (cfs) | | Q _w = Q[1-(1-(W/T)) ^{2.67}] | 1.92 | |
| ¹ Q _s - Side Flow (cfs) | | Q _s = Q-Q _w | 4.1 | |
| T - Side Flow Spread (ft) | | (D-D _g)/S _x | 11.17 | |
| ¹ R _s - Side Flow Factor | | 1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3})) | 0.68 | |
| ¹ Q _{gi} - Intercepted Flow (cfs) | | (R _f *E+R _s *(1-E))*Q | 4.7 | |
| Output (Curb): | | Equation: | Output (Curb): | |
| ¹ S _e - Equivalent Cross Slope (ft/ft) | | S _x +S _g *E | 0.056 | |
| Q _{sx} - Remaining Flow After Grate Interception (cfs) | | Q-Q _{gi} | 1.291 | |
| S _g - Gutter Cross Slope (ft/ft) | | D _g /W | 0.111 | |
| ¹ L _t - Effective Interception Length (ft) | | 0.60*Q _{sx} ^{0.42} *S _o ^{0.30} *(1/n*S _e) ^{0.6} | 13.99 | |
| ¹ Q _{ci} - Intercepted Flow (cfs) | | (1-(1-L _{ce} /L _t) ^{1.8})*Q _{sx}
or Q _{sx} if L _t is less than L _{ce} | 1.2 | |
| Output (Combination): | | Equation: | Output (Combination): | |
| Total Intercepted Flow (cfs) | | Intercepted (Grate) + Intercepted (Curb) | 6 | |
| Bypass Flow (cfs) | | Street Flow - Total Intercepted Flow | 0 | |

¹ Formula referenced from the CCRFCD Manual
² Formula referenced from FHWA Urban Drainage Design Manual (HEC-22)

| | | | |
|--------------------------------------|--|------------------------|--|
| Project Name: | SKYE CANYON PHASE 3 | | 
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS |
| By: | AJH | | |
| Date: | 4/28/2016 | | |
| Notes: | | | |
| Facility ID: | SPD1a & SPD1b | | |
| Drainage Condition | Ultimate | | |
| Design Flow (cfs) | 40 / 2 = Approximately 19cfs to Each SDDI | | |
| Inlet Type: | Type CM2 (Sump) | | |
| Inlet Length: | 10.-ft | | |
| Number of Grates: | 3 | | |
| Input: | Variable: | Input: | |
| Depth at Inlet (ft) | D | 0.83 | |
| Grate Width (ft) | W | 1.50 | |
| Length of Grate (ft) | L_g | 7.50 | |
| Length of Curb Opening (ft) | L_c | 10.00 | |
| Height of Curb Opening (ft) | H | 0.50 | |
| Weir Coef. - Curb Opening | W_c | 2.3 | |
| Weir Coef. - Grate | W_g | 3.0 | |
| Orifice Coef. | O_c | 0.67 | |
| Grate Coef. | G_c | 0.60 | |
| Clogging Factor - Grate (%) | CF_g | 50 | |
| Clogging Factor - Curb (%) | CF_c | 50 | |
| Output (Grate): | Equation: | Output (Grate): | |
| Effective Weir Length (ft) | $2*W+L_g$ | 10.50 | |
| Adjusted Effective Weir Length (ft) | $2*(1-CF_g/100)*W+(1-CF_g/100)*L_g$ | 5.25 | |
| Grate Open Area (sf) | $W*L_g$ | 11.25 | |
| Adjusted Grate Open Area (sf) | Grate Open Area * $G_c*(1-CF_g/100)$ | 3.38 | |
| Controlling Flow Type (weir/orifice) | If $D < 1.792*(Adj. \text{ Grate Open Area}/Adj. \text{ Eff. Length})$
use weir, else orifice | weir | |
| Intercepted Flow (cfs) | weir: $W_g*(Adj. \text{ Eff. Weir Length})*D^{1.5}$
orifice: $O_c*(Adj. \text{ Grate Open Area})*(64.4*D)^{0.5}$ | 11.9 | |
| Output (Curb): | Equation: | Output (Curb): | |
| Effective Weir Length (ft) | $L+1.8*W$ | 12.70 | |
| Adjusted Effective Weir Length (ft) | $L+1.8*(1-CF_c/100)*W$ | 11.41 | |
| Curb Open Area (sf) | $L*H$ | 5.00 | |
| Adjusted Curb Open Area (sf) | Curb Open Area * $(1-CF_c/100)$ | 2.50 | |
| Controlling Flow Type (weir/orifice) | If $D < H$, weir, else orifice | orifice | |
| Intercepted Flow (cfs) | weir: $W_c*(Adj. \text{ Eff. Weir Length})*D^{1.5}$
orifice: $O_c*(Adj. \text{ Curb Open Area})*(64.4*(D-H/2))^{0.5}$ | 12.22 | |
| Output (Total): | Equation: | Output (Total): | |
| Capacity Intercepted Flow (cfs) | Intercepted (Grate) + Intercepted (Curb) | 24.1 | |

APPENDIX E

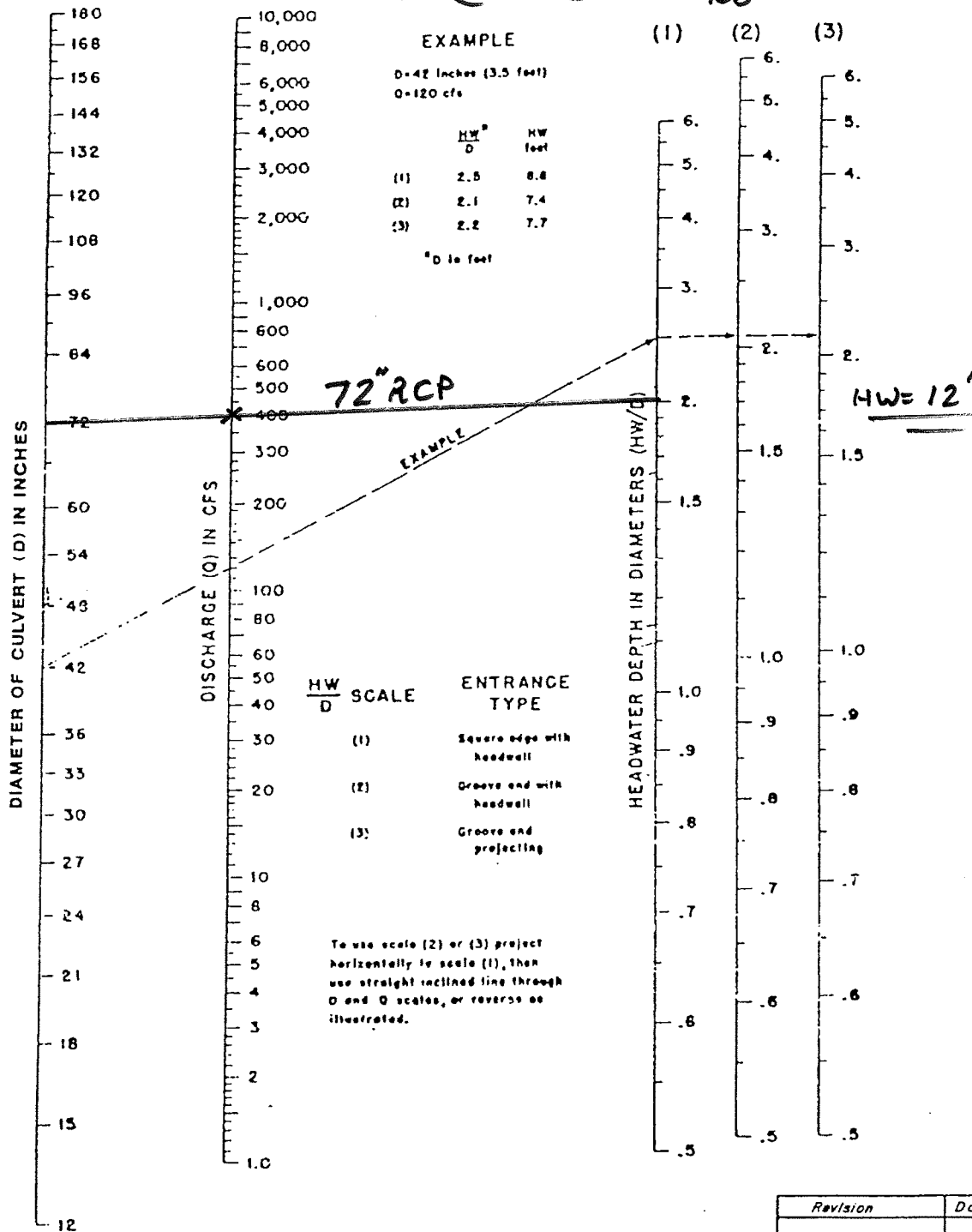
Skye Park Storm Drain Hydraulic Design

Inlet Control Nomograph & Flowmaster Normal Depth

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

CULVEAT @ CPS $\Rightarrow Q_{100} = 415 \text{ cfs}$



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

WRC
ENGINEERING

REFERENCE:

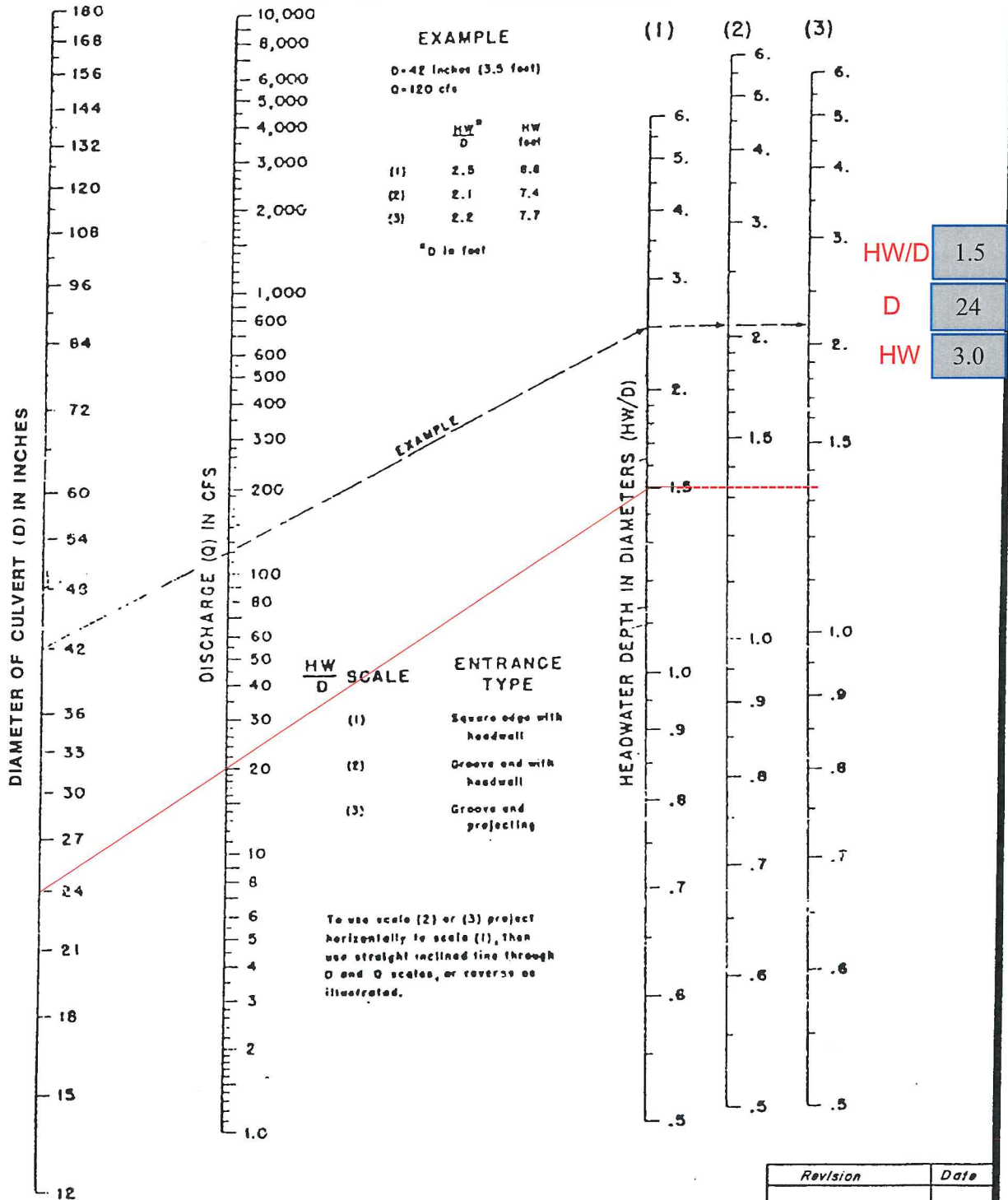
USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

SPD1a & SPD2b: Q=20 CFS



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

WRC
ENGINEERING

REFERENCE:

USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

Skye Park Culvert Crossing Worksheet for Circular Channel

| Project Description | |
|---------------------|----------------------------------|
| Worksheet | CPS Culvert Crossing @ Skye Park |
| Flow Element | Circular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.013 |
| Channel Slope | 1.9 % |
| Diameter | 72.0 in |
| Discharge | 420.00 cfs |

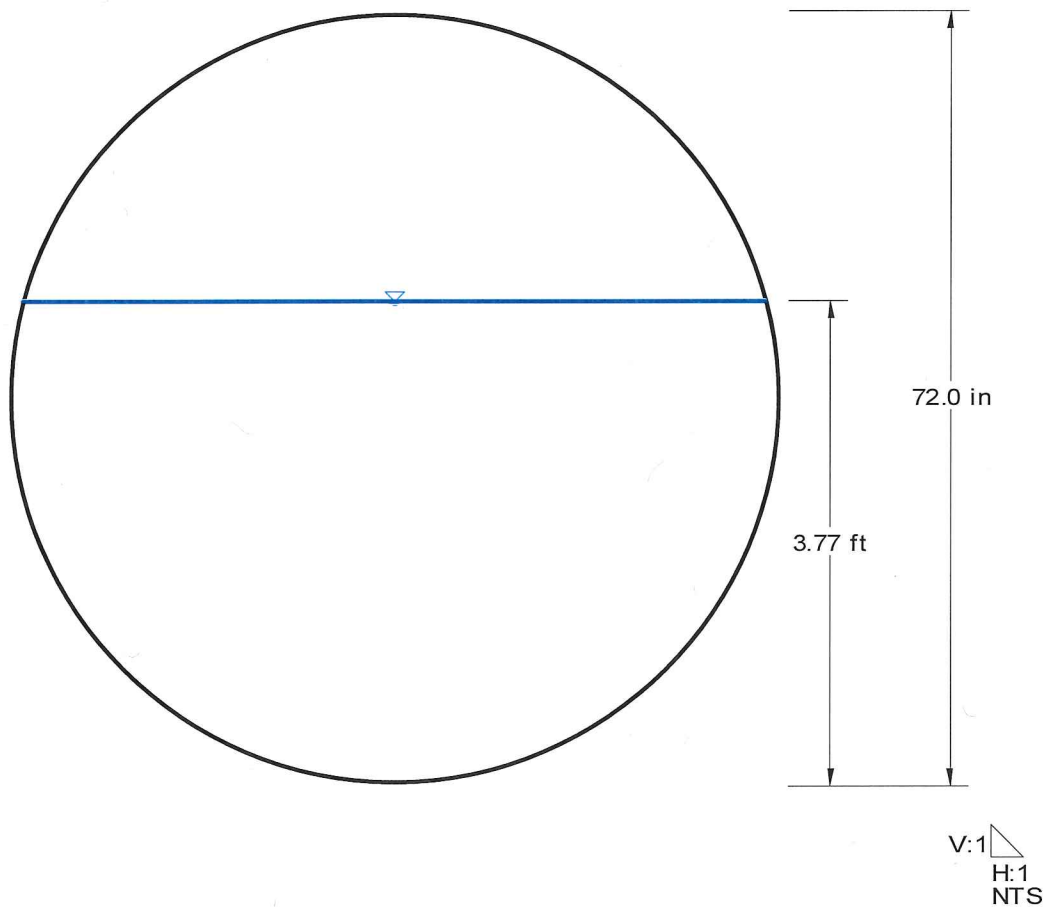
| Results | |
|-------------------|----------------------|
| Depth | 3.77 ft |
| Flow Area | 18.7 ft ² |
| Wetted Perimeter | 10.98 ft |
| Top Width | 0.00 ft |
| Critical Depth | 5.42 ft |
| Percent Full | 62.8 % |
| Critical Slope | 0.9 % |
| Velocity | 22.47 ft/s |
| Velocity Head | 7.84 ft |
| Specific Energy | 11.61 ft |
| Froude Number | 2.21 |
| Maximum Discharge | 627.93 cfs |
| Discharge Full | 583.73 cfs |
| Slope Full | 1.0 % |
| Flow Type | Supercritical |

Skye Park Culvert Crossing

Cross Section for Circular Channel

| Project Description | |
|---------------------|----------------------------------|
| Worksheet | CPS Culvert Crossing @ Skye Park |
| Flow Element | Circular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.013 |
| Channel Slope | 1.9 % |
| Depth | 3.77 ft |
| Diameter | 72.0 in |
| Discharge | 420.00 cfs |



Pipe Culvert Outlet Protection Computation

FACILITY DESCRIPTION

Project Name: **Skye Canyon - Phase 3**

Date: 4/27/2016

File Name: OLY1602-000 TDS Outlet Protect Calc_SPD4.3

By: CWB

RIP-RAP SIZING FOR FACILITY SPD4

Equations:

$$(d_{50}/D) \cdot (Y_t/D)^{1.2} / (Q/D^{2.5}) = 0.023$$

Equation 760*

$$D_a = 1/2(D + Y_n) \text{ (used in place of } D \text{ if } Fr > 1)$$

Equation 762*

$$L = (1/(2 \tan q)) \cdot (A_t/Y_t - W)$$

Equation 764*

$$A_t = Q/V$$

Equation 765*

Known Information:

Q = 420

Flow (cfs)

D = 6.0

Diameter of Pipe (ft)

q = 20

Expansion angle of the culvert flow (typ=20°)

V = 6

Allowable downstream velocity (typ=5 ft/s)

Fr = 2.2

Froude Number (0 if full)

Y_n = 3.8

Normal Depth of flow in Pipe Culvert (ft)*

* Not necessary if Fr < 1 (Enter 0 if unknown)

Y_t = 3.9

Tailwater Depth (Enter 0.4D if unknown)

Riprap Erosion Protection Check (Figure 712):

Applicable only if $Q/D^{2.5} \leq 6$

$$Q/D^{2.5} = 4.76$$

← See Figure 712 for Recommended Riprap Type

$$Q/D^{1.5} = 28.58$$

$$Y_t/D = 0.80$$

Solve For:

$$D_{50} = 1.49$$

Average Size Riprap (ft)

$$D_{50} = 18$$

Average Size Riprap (in)

$$A_t = 68.9$$

Req'd Area of flow at allowable velocity (ft²)

$$Y_t = 3.90$$

Tailwater Depth (ft)

$$D_a = 4.9$$

only used if Fr >= 1

$$L = 16.0$$

Length of Protection (ft)

$$*L = 24.0$$

*For: D < 3.5-ft, L_{min} = 3D. For: D >= 3.5-ft, L_{min} >= 4D. L_{max(required)} = 10D

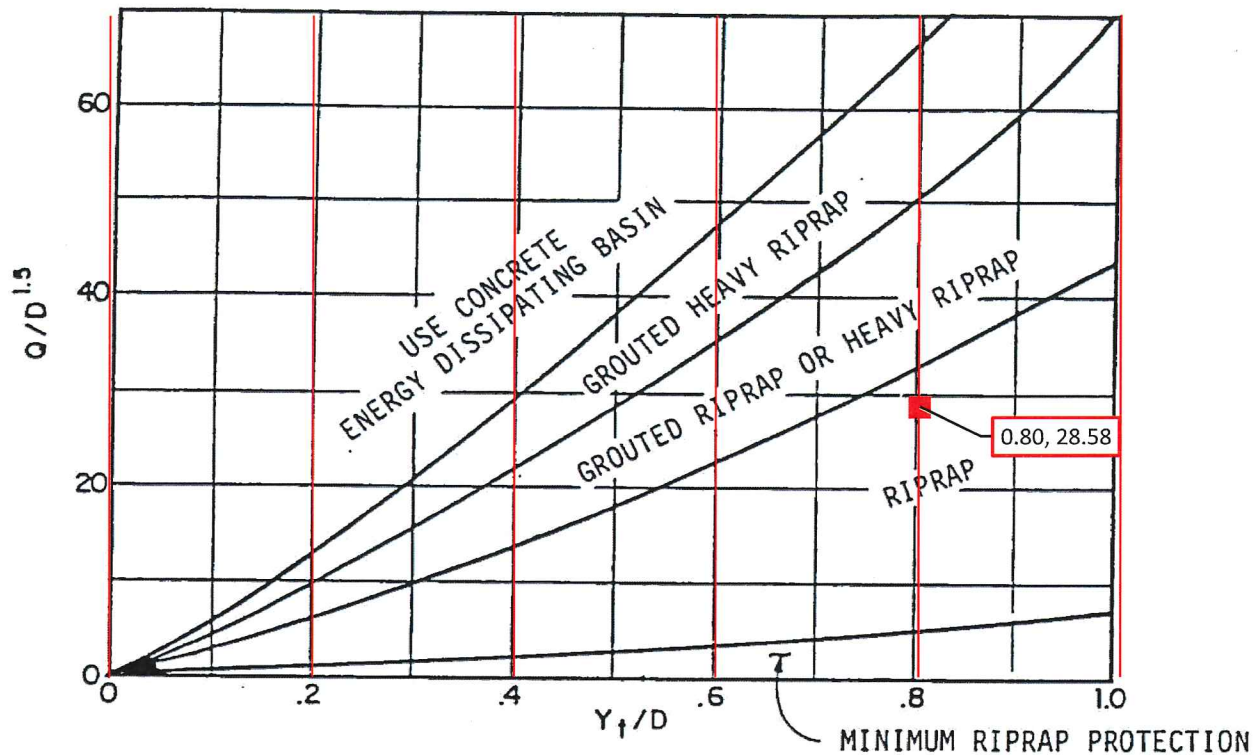
Notes:

Provide D₅₀ = 18-inch riprap for a length of 24-ft

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

RIPRAP EROSION PROTECTION AT CIRCULAR CONDUIT OUTLET

OUTLET PROTECTION FOR FACILITY SPD4



Notes:

1. Use H_a instead of H whenever culvert has supercritical flow in the barrel.
2. Minimum Riprap Protection: Use Riprap for a distance of $3H$ downstream for 18" to 36" equivalent round pipe size and $4D$ downstream for 42" and larger equivalent round pipe size.

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

Outlet Protection - Facility SPD4

Worksheet for Trapezoidal Channel

| Project Description | |
|---------------------|-----------------------------------|
| Worksheet | Outlet Protection - Facility SPD4 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.042 |
| Channel Slope | 1.0 % |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 6.00 ft |
| Discharge | 420.00 cfs |

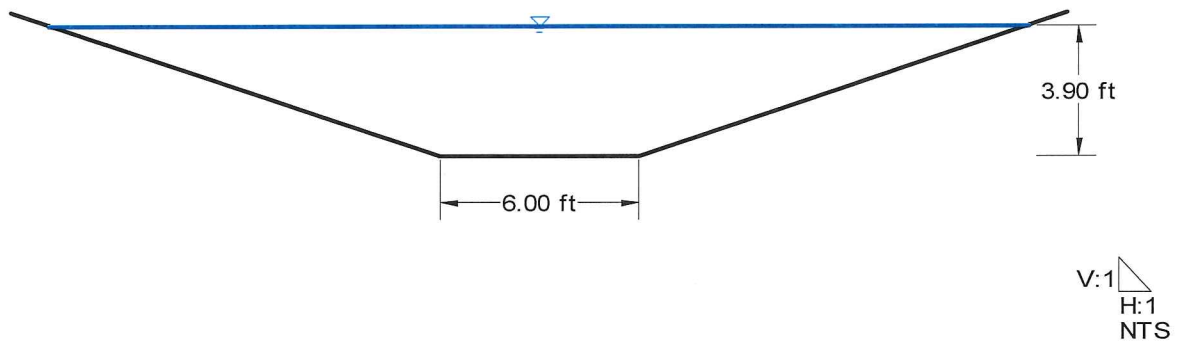
| Results | |
|------------------|----------------------|
| Depth | 3.90 ft |
| Flow Area | 69.1 ft ² |
| Wetted Perimeter | 30.68 ft |
| Top Width | 29.41 ft |
| Critical Depth | 3.28 ft |
| Critical Slope | 2.1 % |
| Velocity | 6.08 ft/s |
| Velocity Head | 0.57 ft |
| Specific Energy | 4.48 ft |
| Froude Number | 0.70 |
| Flow Type | Subcritical |

Outlet Protection - Facility SPD4

Cross Section for Trapezoidal Channel

| Project Description | |
|---------------------|-----------------------------------|
| Worksheet | Outlet Protection - Facility SPD4 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.042 |
| Channel Slope | 1.0 % |
| Depth | 3.90 ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 6.00 ft |
| Discharge | 420.00 cfs |



WSPG for Street Storm Drain

LAT2

T1 SKYE CANYON PHASE 3
T2 STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT
T3 24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)
SO 1000.00 2792.35 30 2794.85
R 1081.00 2793.97 30 .013
JX 1081.00 2793.97 30 24 .013 20.00 2793.97 -21.0 60.0 1
R 1118.00 2798.20 24 .013
SH 1118.00 2798.20 24
CD 24 4 1 .000 2.000 .000 .000 .000 .00
CD 30 4 1 .000 2.500 .000 .000 .000 .00
CD 54 4 1 .000 4.500 .000 .000 .000 .00
CD 60 4 1 .000 5.000 .000 .000 .000 .00
CD 66 4 1 .000 5.500 .000 .000 .000 .00
CD 72 4 1 .000 6.000 .000 .000 .000 .00
CD 84 4 1 .000 7.000 .000 .000 .000 .00
Q 20.0 .0

FILE: LAT2.WSW LAT2
W S P G W - EDIT LISTING - Version 14.06 Date: 4-27-2016 Time: 1:13:39
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING
CARD SECT CHN NO OF AVE PIER HEIGHT 1 BASE ZL ZR INV Y(1) Y(2) Y(3) Y(4) Y(5) Y(6) Y(7) Y(8) Y(9) Y(10)
CODE NO TYPE PIER/PIP WIDTH DIAMETER WIDTH DROP

CD 24 4 1 2.000
CD 30 4 1 2.500
CD 54 4 1 4.500
CD 60 4 1 5.000
CD 66 4 1 5.500
CD 72 4 1 6.000
CD 84 4 1 7.000

PAGE NO 1

HEADING LINE NO 1 IS - WATER SURFACE PROFILE - TITLE CARD LISTING
HEADING LINE NO 2 IS - SKYE CANYON PHASE 3
HEADING LINE NO 3 IS - STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT
24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)

PAGE NO 2

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT W S ELEV
1000.000 2792.350 30 2794.850
ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1081.000 2793.970 30 .013 .000 .000 60.000 1
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
1081.000 2793.970 30 24 0 .013 20.000 .000 2793.970 .000 -21.000 .000
RADIUS .000
ANGLE .000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

W S P G W
ELEMENT NO 4 IS A REACH * * *
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1118.000 2798.200 24 .013 .000 .000 .000 0
ELEMENT NO 5 IS A SYSTEM HEADWORKS * * *
U/S DATA STATION INVERT SECT W S ELEV
1118.000 2798.200 24 .000

SKYE CANYON PHASE 3
 STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT
 24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1000.000 | 2792.350 | 1.609 | 2793.959 | 40.00 | 11.98 | 2.23 | 2796.19 | .00 | 2.13 | 2.39 | 2.500 | .000 | .00 | 1 .0 |
| 2.322 | .0200 | | | | | .0171 | .04 | 1.61 | 1.79 | 1.53 | .013 | .00 | .00 | PIPE |
| 1002.322 | 2792.397 | 1.611 | 2794.008 | 40.00 | 11.96 | 2.22 | 2796.23 | .00 | 2.13 | 2.39 | 2.500 | .000 | .00 | 1 .0 |
| 34.210 | .0200 | | | | | .0161 | .55 | 1.61 | 1.78 | 1.53 | .013 | .00 | .00 | PIPE |
| 1036.532 | 2793.081 | 1.679 | 2794.760 | 40.00 | 11.40 | 2.02 | 2796.78 | .00 | 2.13 | 2.35 | 2.500 | .000 | .00 | 1 .0 |
| 19.256 | .0200 | | | | | .0143 | .28 | 1.68 | 1.64 | 1.53 | .013 | .00 | .00 | PIPE |
| 1055.789 | 2793.466 | 1.753 | 2795.219 | 40.00 | 10.87 | 1.84 | 2797.05 | .00 | 2.13 | 2.29 | 2.500 | .000 | .00 | 1 .0 |
| 12.020 | .0200 | | | | | .0128 | .15 | 1.75 | 1.51 | 1.53 | .013 | .00 | .00 | PIPE |
| 1067.809 | 2793.706 | 1.833 | 2795.539 | 40.00 | 10.37 | 1.67 | 2797.21 | .00 | 2.13 | 2.21 | 2.500 | .000 | .00 | 1 .0 |
| 7.562 | .0200 | | | | | .0114 | .09 | 1.83 | 1.38 | 1.53 | .013 | .00 | .00 | PIPE |
| 1075.371 | 2793.857 | 1.920 | 2795.778 | 40.00 | 9.88 | 1.52 | 2797.29 | .00 | 2.13 | 2.11 | 2.500 | .000 | .00 | 1 .0 |
| 4.222 | .0200 | | | | | .0103 | .04 | 1.92 | 1.26 | 1.53 | .013 | .00 | .00 | PIPE |
| 1079.592 | 2793.942 | 2.017 | 2795.959 | 40.00 | 9.42 | 1.38 | 2797.34 | .00 | 2.13 | 1.97 | 2.500 | .000 | .00 | 1 .0 |
| 1.408 | .0200 | | | | | .0094 | .01 | 2.02 | 1.13 | 1.53 | .013 | .00 | .00 | PIPE |
| 1081.000 | 2793.970 | 2.129 | 2796.098 | 40.00 | 8.98 | 1.25 | 2797.35 | .00 | 2.13 | 1.78 | 2.500 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0057 | .00 | 2.13 | 1.00 | | .013 | .00 | .00 | PIPE |
| 1081.000 | 2793.970 | 3.183 | 2797.153 | 20.00 | 4.07 | .26 | 2797.41 | .00 | 1.52 | .00 | 2.500 | .000 | .00 | 1 .0 |
| 1081.000 | 2793.970 | .810 | 2794.779 | 20.00 | 16.77 | 4.37 | 2799.15 | .00 | 1.61 | 1.96 | 2.000 | .000 | .00 | 1 .0 |
| 1.220 | .1143 | | | | | .0651 | .08 | .81 | 3.79 | .70 | .013 | .00 | .00 | PIPE |

SKYE CANYON PHASE 3
 STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT
 24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1082.221 | 2794.109 | .814 | 2794.923 | 20.00 | 16.64 | 4.30 | 2799.22 | .00 | 1.61 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 6.705 | .1143 | | | | | .0605 | .41 | .81 | 3.75 | .70 | .013 | .00 | .00 | PIPE |
| 1088.925 | 2794.876 | .844 | 2795.720 | 20.00 | 15.86 | 3.91 | 2799.63 | .00 | 1.61 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 5.301 | .1143 | | | | | .0531 | .28 | .84 | 3.50 | .70 | .013 | .00 | .00 | PIPE |
| 1094.226 | 2795.482 | .875 | 2796.357 | 20.00 | 15.13 | 3.55 | 2799.91 | .00 | 1.61 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 4.302 | .1143 | | | | | .0467 | .20 | .88 | 3.27 | .70 | .013 | .00 | .00 | PIPE |
| 1098.528 | 2795.974 | .907 | 2796.881 | 20.00 | 14.42 | 3.23 | 2800.11 | .00 | 1.61 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 3.543 | .1143 | | | | | .0410 | .15 | .91 | 3.05 | .70 | .013 | .00 | .00 | PIPE |
| 1102.071 | 2796.379 | .941 | 2797.320 | 20.00 | 13.75 | 2.94 | 2800.26 | .00 | 1.61 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 2.953 | .1143 | | | | | .0361 | .11 | .94 | 2.84 | .70 | .013 | .00 | .00 | PIPE |
| 1105.023 | 2796.716 | .977 | 2797.693 | 20.00 | 13.11 | 2.67 | 2800.36 | .00 | 1.61 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 2.492 | .1143 | | | | | .0318 | .08 | .98 | 2.65 | .70 | .013 | .00 | .00 | PIPE |
| 1107.515 | 2797.001 | 1.014 | 2798.015 | 20.00 | 12.50 | 2.43 | 2800.44 | .00 | 1.61 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 2.104 | .1143 | | | | | .0280 | .06 | 1.01 | 2.46 | .70 | .013 | .00 | .00 | PIPE |
| 1109.619 | 2797.242 | 1.053 | 2798.295 | 20.00 | 11.92 | 2.21 | 2800.50 | .00 | 1.61 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 1.780 | .1143 | | | | | .0247 | .04 | 1.05 | 2.29 | .70 | .013 | .00 | .00 | PIPE |
| 1111.399 | 2797.445 | 1.094 | 2798.539 | 20.00 | 11.36 | 2.01 | 2800.54 | .00 | 1.61 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 1.505 | .1143 | | | | | .0218 | .03 | 1.09 | 2.13 | .70 | .013 | .00 | .00 | PIPE |

SKYE CANYON PHASE 3
 STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT
 24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | LAT2 Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|----------|-------------|------------|------------|---------|-----------|----------|---------------------|------------|----------------|----------------|----------------|-----------------|-------|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** |
| 1112.905 | 2797.617 | 1.137 | 2798.755 | 20.00 | 10.84 | 1.82 | 2800.58 | .00 | 1.61 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 1.260 | .1143 | | | | | .0192 | .02 | 1.14 | 1.98 | .70 | .013 | .00 | .00 | PIPE |
| 1114.164 | 2797.761 | 1.183 | 2798.945 | 20.00 | 10.33 | 1.66 | 2800.60 | .00 | 1.61 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 1.055 | .1143 | | | | | .0170 | .02 | 1.18 | 1.83 | .70 | .013 | .00 | .00 | PIPE |
| 1115.219 | 2797.882 | 1.231 | 2799.113 | 20.00 | 9.85 | 1.51 | 2800.62 | .00 | 1.61 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| .856 | .1143 | | | | | .0151 | .01 | 1.23 | 1.70 | .70 | .013 | .00 | .00 | PIPE |
| 1116.076 | 2797.980 | 1.283 | 2799.263 | 20.00 | 9.39 | 1.37 | 2800.63 | .00 | 1.61 | 1.92 | 2.000 | .000 | .00 | 1 .0 |
| .699 | .1143 | | | | | .0134 | .01 | 1.28 | 1.57 | .70 | .013 | .00 | .00 | PIPE |
| 1116.774 | 2798.060 | 1.337 | 2799.397 | 20.00 | 8.96 | 1.25 | 2800.64 | .00 | 1.61 | 1.88 | 2.000 | .000 | .00 | 1 .0 |
| .529 | .1143 | | | | | .0119 | .01 | 1.34 | 1.45 | .70 | .013 | .00 | .00 | PIPE |
| 1117.304 | 2798.120 | 1.396 | 2799.516 | 20.00 | 8.54 | 1.13 | 2800.65 | .00 | 1.61 | 1.84 | 2.000 | .000 | .00 | 1 .0 |
| .385 | .1143 | | | | | .0106 | .00 | 1.40 | 1.33 | .70 | .013 | .00 | .00 | PIPE |
| 1117.689 | 2798.164 | 1.459 | 2799.623 | 20.00 | 8.14 | 1.03 | 2800.65 | .00 | 1.61 | 1.78 | 2.000 | .000 | .00 | 1 .0 |
| .234 | .1143 | | | | | .0095 | .00 | 1.46 | 1.22 | .70 | .013 | .00 | .00 | PIPE |
| 1117.923 | 2798.191 | 1.528 | 2799.719 | 20.00 | 7.76 | .94 | 2800.65 | .00 | 1.61 | 1.70 | 2.000 | .000 | .00 | 1 .0 |
| .077 | .1143 | | | | | .0086 | .00 | 1.53 | 1.11 | .70 | .013 | .00 | .00 | PIPE |
| 1118.000 | 2798.200 | 1.606 | 2799.806 | 20.00 | 7.40 | .85 | 2800.66 | .00 | 1.61 | 1.59 | 2.000 | .000 | .00 | 1 .0 |

9
7

SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT SKYE PARK DRIVE LOW POINT

24" - 30" RCP DISCHARGING INTO TO 72" RCP (ULTIMATE CONDITION)

| | | | | | | | |
|---------|----|---|---|---|---|--|---|
| 1000.00 | .I | W | C | H | E | | R |
| 1002.15 | . | | | | | | |
| 1004.29 | .I | W | C | H | E | | R |
| 1006.44 | . | | | | | | |
| 1008.58 | . | | | | | | |
| 1010.73 | . | | | | | | |
| 1012.87 | . | | | | | | |
| 1015.02 | . | | | | | | |
| 1017.16 | . | | | | | | |
| 1019.31 | . | | | | | | |
| 1021.45 | . | | | | | | |
| 1023.60 | . | | | | | | |
| 1025.75 | . | | | | | | |
| 1027.89 | . | | | | | | |
| 1030.04 | . | | | | | | |
| 1032.18 | . | | | | | | |
| 1034.33 | . | | | | | | |

| | | | | | | | | |
|---------|---|---|---|---|---|------|-----|------|
| 1036.47 | . | | | | | LAT2 | | . |
| 1038.62 | . | I | | W | C | H | E | . R |
| 1040.76 | . | | | | | | | . |
| 1042.91 | . | | | | | | | . |
| 1045.05 | . | | | | | | | . |
| 1047.20 | . | | | | | | | . |
| 1049.35 | . | | | | | | | . |
| 1051.49 | . | | | | | | | . |
| 1053.64 | . | | | | | | | . |
| 1055.78 | . | | | | | | | . |
| 1057.93 | . | I | | W | C | H | E | . R |
| 1060.07 | . | | | | | | | . |
| 1062.22 | . | | | | | | | . |
| 1064.36 | . | | | | | | | . |
| 1066.51 | . | | | | | | | . |
| 1068.65 | . | I | | W | C | H | E | . R |
| 1070.80 | . | | | | | | | . |
| 1072.95 | . | | | | | | | . |
| 1075.09 | . | | | | | | | . |
| 1077.24 | . | I | | W | C | H | E | . R |
| 1079.38 | . | | | | | | | . |
| 1081.53 | . | I | | W | C | H | E | . R |
| 1083.67 | . | I | | W | C | H | E | . JX |
| 1085.82 | . | I | | C | | H | W E | . JX |
| 1087.96 | . | I | W | C | H | | E | . R |
| 1090.11 | . | I | W | C | H | | E | . R |
| 1092.25 | . | | I | W | C | H | E | . R |
| 1094.40 | . | | I | W | C | H | E | . R |
| 1096.55 | . | | | | | | | . |
| 1098.69 | . | | I | W | C | H | E | . R |
| 1100.84 | . | | | | | | | . |
| 1102.98 | . | | I | W | C | H | E | . R |
| 1105.13 | . | | I | W | C | H | E | . R |
| 1107.27 | . | | | | | | | . |
| 1109.42 | . | | I | W | C | H | E | . R |
| 1111.56 | . | | I | W | C | H | E | . R |

| | | | | | | | | | | | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---|---|---|---|---|---|
| 1113.71 | . | | | | | | I | | W | C | H | | E | . | R | |
| 1115.85 | . | | | | | | I | | | W | C | H | | E | . | R |
| 1118.00 | . | | | | | | I | | | W | C | H | | E | . | R |
| 2792.350 | 2793.181 | 2794.011 | 2794.842 | 2795.672 | 2796.503 | 2797.333 | 2798.164 | 2798.995 | 2799.825 | 2800.656 | | | | | | |

1. GLOSSARY

- Page 4

Emergency Overflow – Culvert Crossing

Skye Park Culvert Crossing - Emergency Overflow Weir Into Overflow Channel

Worksheet for Generic Weir

| Project Description | |
|---------------------|---|
| Worksheet | Skye Park Culvert - Emergency Overflow Weir |
| Type | Generic Weir |
| Solve For | Headwater Elevation |

| Input Data | |
|-----------------------|------------|
| Discharge | 415.00 cfs |
| Crest Elevation | 0.00 ft |
| Discharge Coefficient | 3.00 US |
| Crest Length | 30.00 ft |

| Results | |
|------------------------------|----------------------|
| Headwater Elevation | 2.77 ft |
| Headwater Height Above Crest | 2.77 ft |
| Flow Area | 83.1 ft ² |
| Velocity | 4.99 ft/s |
| Wetted Perimeter | 35.54 ft |
| Top Width | 30.00 ft |

Skye Park - Emergency Overflow Ditch Conveyance Worksheet for Trapezoidal Channel

| Project Description | |
|---------------------|----------------------------|
| Worksheet | Skye Park - Overflow Ditch |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.025 |
| Channel Slope | 0.5 % |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 30.00 ft |
| Discharge | 415.00 cfs |

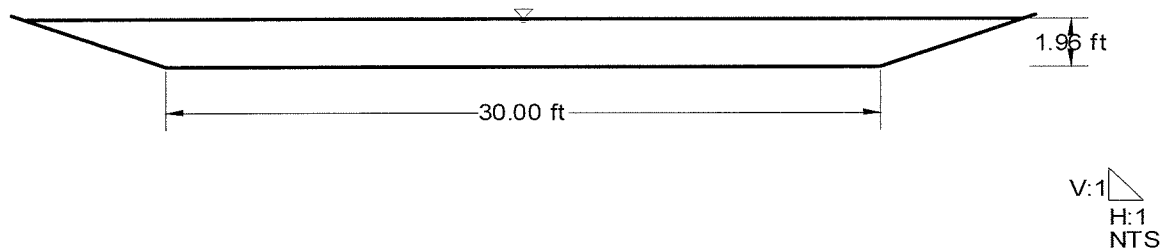
| Results | |
|------------------|----------------------|
| Depth | 1.96 ft |
| Flow Area | 70.4 ft ² |
| Wetted Perimeter | 42.41 ft |
| Top Width | 41.77 ft |
| Critical Depth | 1.71 ft |
| Critical Slope | 0.8 % |
| Velocity | 5.89 ft/s |
| Velocity Head | 0.54 ft |
| Specific Energy | 2.50 ft |
| Froude Number | 0.80 |
| Flow Type | Subcritical |

Skye Park - Emergency Overflow Ditch Conveyance

Cross Section for Trapezoidal Channel

| Project Description | |
|---------------------|----------------------------|
| Worksheet | Skye Park - Overflow Ditch |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.025 |
| Channel Slope | 0.5 % |
| Depth | 1.96 ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 30.00 ft |
| Discharge | 415.00 cfs |

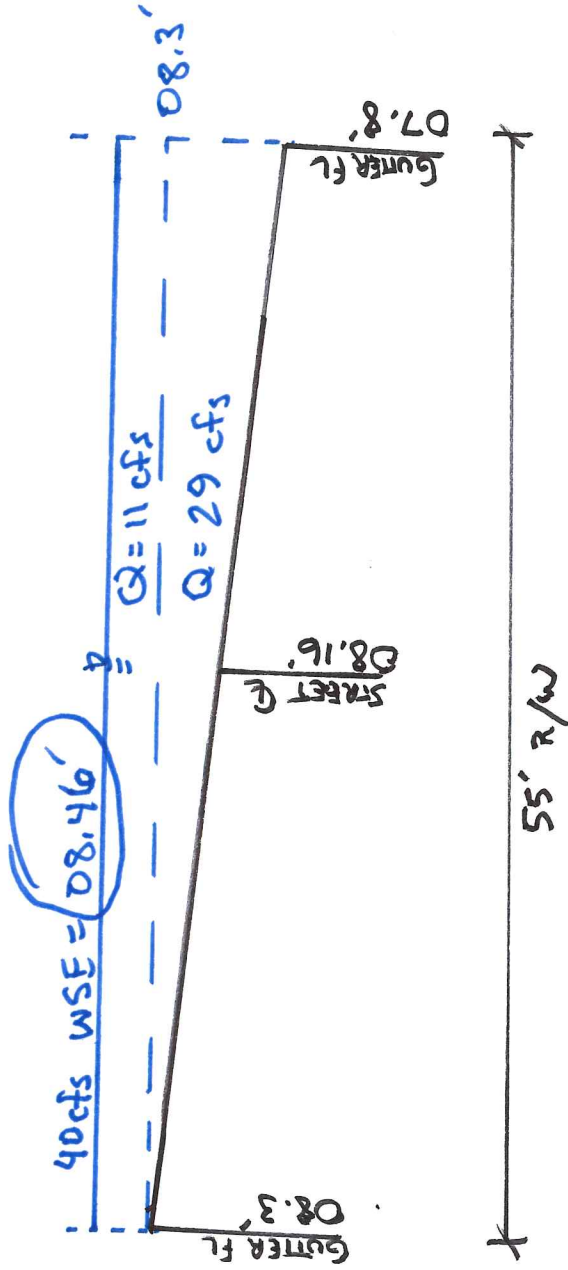


Emergency Overflow – Drop Inlet Clogging

SKYE PARK DRIVE - SAG DIS EMERGENCY OVERFLOW

Q @ LP DIS = 40 cfs (EXHIBIT I)

HP @ STA. 80+50 APPROX $\Rightarrow$ WEIR CREST FOR EMERGENCY OVERFLOW
 WEIR EQUATION: $Q = (3) L H^{3/2}$ (RECT.); $Q = 1/2 (3) L H^{3/2}$ (TRIANG.)



APPENDIX F

Street “D” Storm Drain Hydraulic Design

Detention Basin Outfall Stage-Discharge

Table
Rating Table for Circular Orifice

| Project Description | |
|---------------------|------------------------|
| Worksheet | Orifice CPN - Street D |
| Type | Circular Orifice |
| Solve For | Discharge |

| Input Data | |
|-----------------------|-------------|
| Centroid Elevation | 2,797.75 ft |
| Tailwater Elevation | 2,798.90 ft |
| Discharge Coefficient | 0.65 |
| Diameter | 54.0 in |

| Attribute | Minimum | Maximum | Increment |
|--------------------------|----------|----------|-----------|
| Headwater Elevation (ft) | 2,796.00 | 2,812.00 | 1.00 |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|--------------------------|-----------------|-----------------|
| 2,796.00 | N/A | N/A |
| 2,797.00 | N/A | N/A |
| 2,798.00 | N/A | N/A |
| 2,799.00 | 26.22 | 1.65 |
| 2,800.00 | 86.97 | 5.47 |
| 2,801.00 | 120.17 | 7.56 |
| 2,802.00 | 146.01 | 9.18 |
| 2,803.00 | 167.91 | 10.56 |
| 2,804.00 | 187.28 | 11.78 |
| 2,805.00 | 204.81 | 12.88 |
| 2,806.00 | 220.97 | 13.89 |
| 2,807.00 | 236.01 | 14.84 |
| 2,808.00 | 250.16 | 15.73 |
| 2,809.00 | 263.55 | 16.57 |
| 2,810.00 | 276.28 | 17.37 |
| 2,811.00 | 288.46 | 18.14 |
| 2,812.00 | 300.15 | 18.87 |

Skye Park Culvert Crossing Worksheet for Circular Channel

| Project Description | |
|---------------------|---------------------------------|
| Worksheet | CPN Culvert Crossing @ Street D |
| Flow Element | Circular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.013 |
| Channel Slope | 2.0 % |
| Diameter | 60.0 in |
| Discharge | 284.00 cfs |

| Results | |
|-------------------|----------------------|
| Depth | 3.32 ft |
| Flow Area | 13.9 ft ² |
| Wetted Perimeter | 9.53 ft |
| Top Width | 0.00 ft |
| Critical Depth | 4.60 ft |
| Percent Full | 66.5 % |
| Critical Slope | 1.0 % |
| Velocity | 20.49 ft/s |
| Velocity Head | 6.52 ft |
| Specific Energy | 9.85 ft |
| Froude Number | 2.11 |
| Maximum Discharge | 391.20 cfs |
| Discharge Full | 363.67 cfs |
| Slope Full | 1.2 % |
| Flow Type | Supercritical |

Pipe Culvert Outlet Protection Computation

FACILITY DESCRIPTION

Project Name: **Skye Canyon - Phase 3**

Date: 4/27/2016

File Name: OLY1602-000 TDS Outlet Protect Calc.xlsx

By: CWB

RIP-RAP SIZING FOR FACILITY D5

Equations:

$$(d_{50}/D) \cdot (Y_t/D)^{1.2} / (Q/D^{2.5}) = 0.023$$

Equation 760*

$$D_a = 1/2(D + Y_n) \text{ (used in place of } D \text{ if } Fr > 1)$$

Equation 762*

$$L = (1/(2 \tan q)) (A_t/Y_t - W)$$

Equation 764*

$$A_t = Q/V$$

Equation 765*

Known Information:

Q = 291

Flow (cfs)

D = 5.0

Diameter of Pipe (ft)

q = 20

Expansion angle of the culvert flow (typ=20°)

V = 6

Allowable downstream velocity (typ=5 ft/s)

Fr = 1.3

Froude Number (0 if full)

Y_n = 4.2

Normal Depth of flow in Pipe Culvert (ft)*

* Not necessary if Fr < 1 (Enter 0 if unknown)

Y_t = 3.5

Tailwater Depth (Enter 0.4D if unknown)

Riprap Erosion Protection Check (Figure 712):

Applicable only if $Q/D^{2.5} \leq 6$

$$Q/D^{2.5} = 5.20$$

← See Figure 712 for Recommended Riprap Type

$$Q/D^{1.5} = 26.01$$

$$Y_t/D = 0.76$$

Solve For:

$$D_{50} = 1.05$$

Average Size Riprap (ft)

$$D_{50} = 13$$

Average Size Riprap (in)

$$A_t = 48.5$$

Req'd Area of flow at allowable velocity (ft²)

$$Y_t = 3.48$$

Tailwater Depth (ft)

$$D_a = 4.6$$

only used if Fr >= 1

$$L = 12.3$$

Length of Protection (ft)

$$*L = 20.0$$

*For: D < 3.5-ft, L_{min} = 3D. For: D >= 3.5-ft, L_{min} >= 4D. L_{max(required)} = 10D

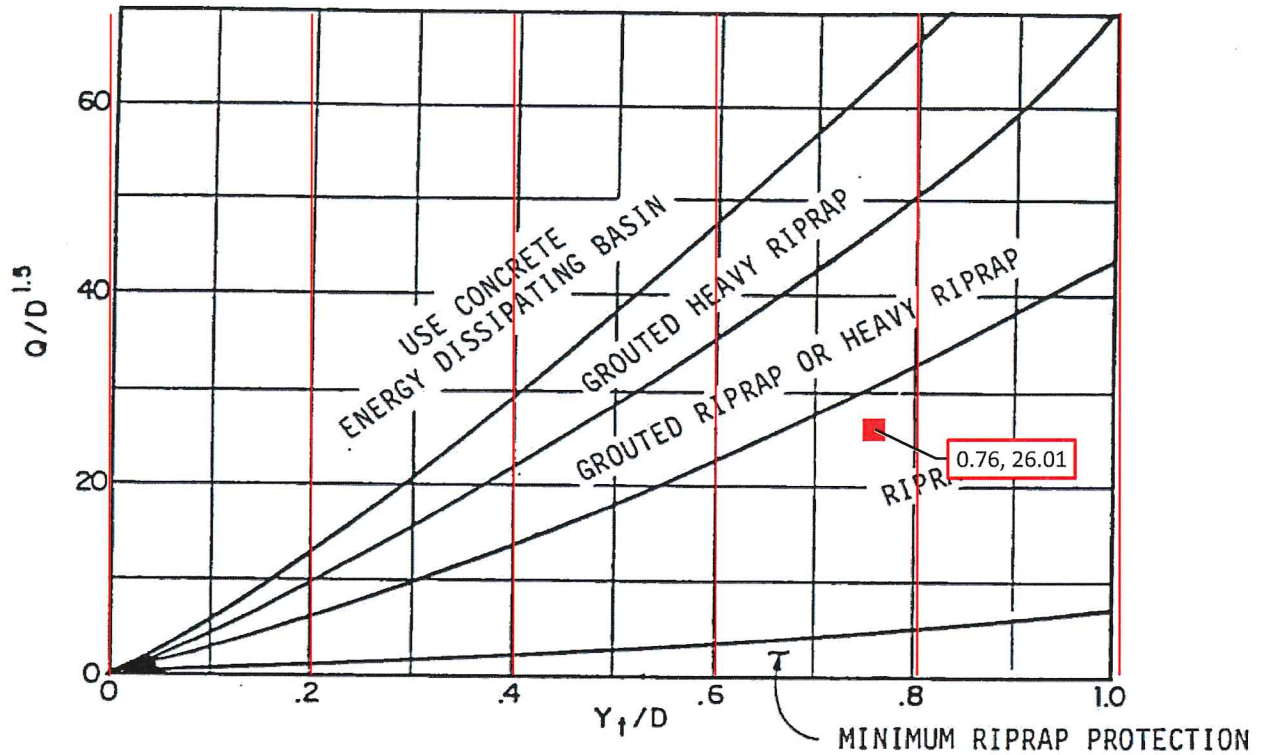
Notes:

Provide D₅₀ = 14-inch riprap for a length of 20-ft

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

RIPRAP EROSION PROTECTION AT CIRCULAR CONDUIT OUTLET

OUTLET PROTECTION FOR FACILITY D5



Notes:

1. Use H_a instead of H whenever culvert has supercritical flow in the barrel.
2. Minimum Riprap Protection: Use Riprap for a distance of $3H$ downstream for 18" to 36" equivalent round pipe size and $4D$ downstream for 42" and larger equivalent round pipe size.

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

Outlet Protection - Facility D5

Worksheet for Trapezoidal Channel

| Project Description | |
|---------------------|---------------------------------|
| Worksheet | Outlet Protection - Facility D5 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.041 |
| Channel Slope | 1.0 % |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 5.00 ft |
| Discharge | 290.80 cfs |

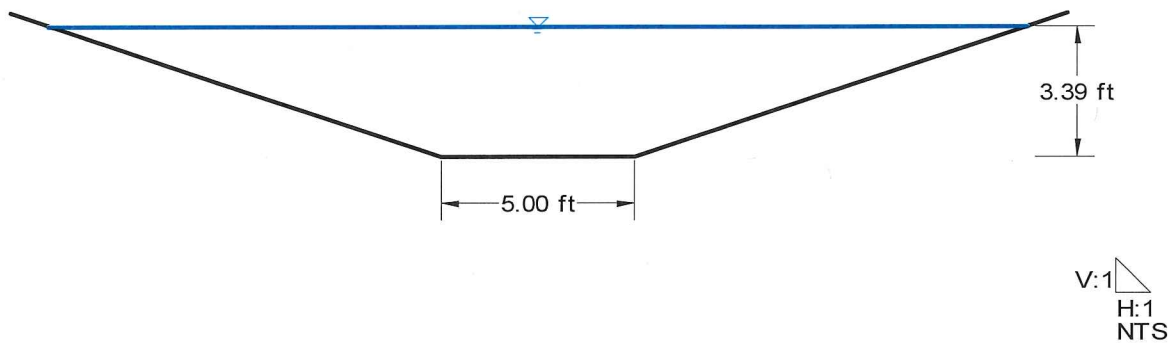
| Results | |
|------------------|-------------|
| Depth | 3.39 ft |
| Flow Area | 51.5 ft² |
| Wetted Perimeter | 26.45 ft |
| Top Width | 25.35 ft |
| Critical Depth | 2.86 ft |
| Critical Slope | 2.1 % |
| Velocity | 5.65 ft/s |
| Velocity Head | 0.50 ft |
| Specific Energy | 3.89 ft |
| Froude Number | 0.70 |
| Flow Type | Subcritical |

Outlet Protection - Facility D5

Cross Section for Trapezoidal Channel

| Project Description | |
|---------------------|---------------------------------|
| Worksheet | Outlet Protection - Facility D5 |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.041 |
| Channel Slope | 1.0 % |
| Depth | 3.39 ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 5.00 ft |
| Discharge | 290.80 cfs |



Emergency Overflow – Culvert Crossing & DB Spillway

Street D Culvert/DB - Emergency Overflow Weir Into Overflow Channel **Worksheet for Generic Weir**

| Project Description | |
|---------------------|--|
| Worksheet | Street D Culvert - Emergency Overflow Weir |
| Type | Generic Weir |
| Solve For | Headwater Elevation |

| Input Data | |
|-----------------------|------------|
| Discharge | 346.00 cfs |
| Crest Elevation | 0.00 ft |
| Discharge Coefficient | 3.00 US |
| Crest Length | 25.00 ft |

| Results | |
|------------------------------|-----------|
| Headwater Elevation | 2.77 ft |
| Headwater Height Above Crest | 2.77 ft |
| Flow Area | 69.3 ft² |
| Velocity | 4.99 ft/s |
| Wetted Perimeter | 30.54 ft |
| Top Width | 25.00 ft |

Street D - Emergency Overflow Ditch Conveyance Worksheet for Trapezoidal Channel

| Project Description | |
|---------------------|---------------------------|
| Worksheet | Street D - Overflow Ditch |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

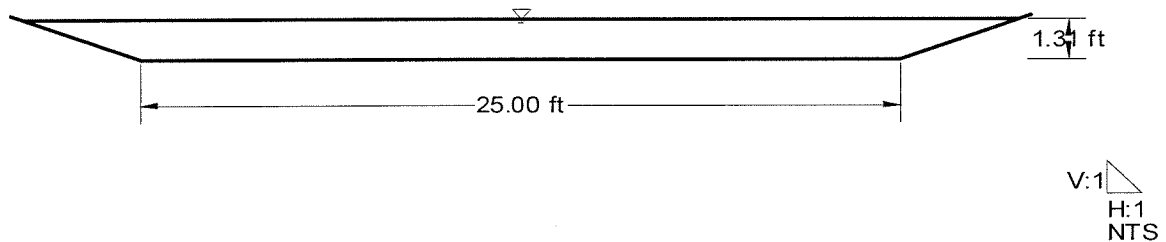
| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.025 |
| Channel Slope | 2.0 % |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 25.00 ft |
| Discharge | 346.00 cfs |

| Results | |
|------------------|----------------------|
| Depth | 1.31 ft |
| Flow Area | 37.8 ft ² |
| Wetted Perimeter | 33.27 ft |
| Top Width | 32.84 ft |
| Critical Depth | 1.69 ft |
| Critical Slope | 0.8 % |
| Velocity | 9.15 ft/s |
| Velocity Head | 1.30 ft |
| Specific Energy | 2.61 ft |
| Froude Number | 1.50 |
| Flow Type | Supercritical |

Street D - Emergency Overflow Ditch Conveyance **Cross Section for Trapezoidal Channel**

| Project Description | |
|---------------------|---------------------------|
| Worksheet | Street D - Overflow Ditch |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.025 |
| Channel Slope | 2.0 % |
| Depth | 1.31 ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 25.00 ft |
| Discharge | 346.00 cfs |



APPENDIX G

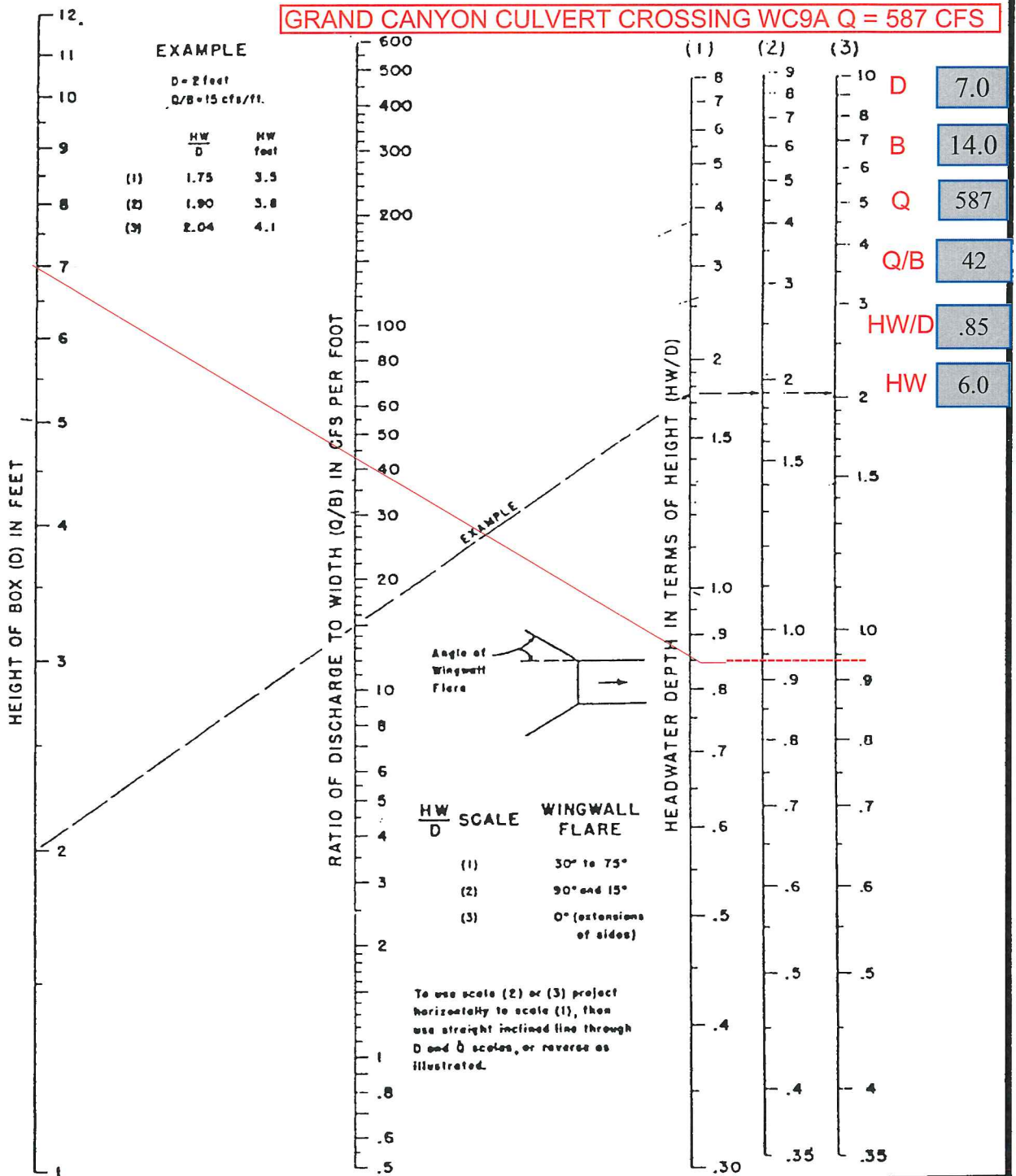
Grand Canyon Storm Drain Hydraulic Design

Inlet Control Nomograph

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL BOX CULVERT

GRAND CANYON CULVERT CROSSING WC9A Q = 587 CFS



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

WSPG for Culvert Crossing

Existing Wash @ WC9 Discharge

Worksheet for Trapezoidal Channel

| Project Description | |
|---------------------|------------------------------|
| Worksheet | Existing Wash @ GC Discharge |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|------------|
| Mannings Coefficient | 0.035 |
| Channel Slope | 2.4 % |
| Left Side Slope | 1.00 H : V |
| Right Side Slope | 1.00 H : V |
| Bottom Width | 20.00 ft |
| Discharge | 736.00 cfs |

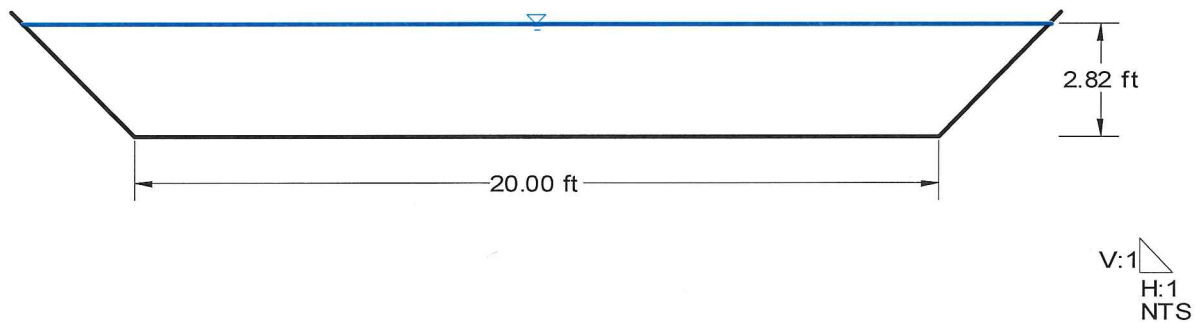
| Results | |
|------------------|----------------------|
| Depth | 2.82 ft |
| Flow Area | 64.3 ft ² |
| Wetted Perimeter | 27.97 ft |
| Top Width | 25.63 ft |
| Critical Depth | 3.28 ft |
| Critical Slope | 1.4 % |
| Velocity | 11.45 ft/s |
| Velocity Head | 2.04 ft |
| Specific Energy | 4.85 ft |
| Froude Number | 1.28 |
| Flow Type | Supercritical |

Existing Wash @ WC9 Discharge

Cross Section for Trapezoidal Channel

| Project Description | |
|---------------------|------------------------------|
| Worksheet | Existing Wash @ GC Discharge |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Section Data | |
|----------------------|------------|
| Mannings Coefficient | 0.035 |
| Channel Slope | 2.4 % |
| Depth | 2.82 ft |
| Left Side Slope | 1.00 H : V |
| Right Side Slope | 1.00 H : V |
| Bottom Width | 20.00 ft |
| Discharge | 736.00 cfs |



| T1 SKYE CANYON PHASE 3 | | | | | | | | | | FUT | |
|--|---------|---------|----|----|------|-------|--------|-------|---------|-----|-------|
| T2 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING) | | | | | | | | | | | |
| T3 14' W X 5' H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION) | | | | | | | | | | | |
| SO | 999.00 | 2748.98 | 1 | | | | | | 2751.8 | | |
| R | 1000.00 | 2749.00 | 1 | | .035 | | | | | | |
| JX | 1017.00 | 2749.18 | 4 | 2 | .042 | 121.0 | | | 2749.18 | | 0.1 |
| WX | 1017.00 | 2749.18 | 3 | | | | | | | | |
| R | 1033.50 | 2749.23 | 3 | | .013 | | | | | | |
| JX | 1033.50 | 2749.23 | 3 | 66 | .013 | 134.0 | | | 2749.23 | | 45.0 |
| R | 1067.00 | 2749.36 | 3 | | .013 | | | | | | -45.0 |
| TS | 1074.00 | 2749.36 | 66 | | .013 | | | | | | |
| R | 1084.00 | 2749.57 | 66 | | .013 | | | | | | 0.0 |
| R | 1120.00 | 2750.28 | 66 | | .013 | | | | | | 0.0 |
| R | 1179.00 | 2752.05 | 66 | | .013 | | | | | | -37.0 |
| R | 2355.00 | 2787.32 | 66 | | .013 | | | | | | 0.0 |
| SH | 2355.00 | 2787.32 | 66 | | | | | | | | |
| CD | 1 | 1 | 0 | | .000 | 4.000 | 20.000 | 1.000 | 1.000 | .00 | |
| CD | 2 | 3 | 0 | | .000 | 5.000 | 6.000 | .000 | .000 | .00 | |
| CD | 3 | 3 | 0 | | .000 | 5.000 | 14.000 | .000 | .000 | .00 | |
| CD | 4 | 1 | 0 | | .000 | 5.000 | 20.000 | 3.000 | 3.000 | .00 | |
| CD | 54 | 4 | 1 | | .000 | 4.500 | .000 | .000 | .000 | .00 | |
| CD | 60 | 4 | 1 | | .000 | 5.000 | .000 | .000 | .000 | .00 | |
| CD | 66 | 4 | 1 | | .000 | 5.500 | .000 | .000 | .000 | .00 | |
| CD | 72 | 4 | 1 | | .000 | 6.000 | .000 | .000 | .000 | .00 | |
| Q | | 481.0 | .0 | | | | | | | | |

FILE: FUT.WSW

FUT
W S P G W - EDIT LISTING - Version 14.06

Date: 4-27-2016 Time: 11: 0:26

PAGE 1

| CARD CODE | SECT NO | CHN TYPE | NO OF PIER | AVE PIP WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|-----------|---------|----------|------------|---------------|-------------------|------------|-------|-------|----------|------|------|------|------|------|------|------|------|------|-------|
| CD | 1 | 1 | 0 | .000 | 4.000 | 20.000 | 1.000 | 1.000 | .00 | | | | | | | | | | |
| CD | 2 | 3 | 0 | .000 | 5.000 | 6.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 3 | 3 | 0 | .000 | 5.000 | 14.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 4 | 1 | 0 | .000 | 5.000 | 14.000 | 3.000 | 3.000 | .00 | | | | | | | | | | |
| CD | 54 | 4 | 1 | | 4.500 | | | | | | | | | | | | | | |
| CD | 60 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |
| CD | 66 | 4 | 1 | | 5.500 | | | | | | | | | | | | | | |
| CD | 72 | 4 | 1 | | 6.000 | | | | | | | | | | | | | | |

W S P G W

PAGE NO 1

HEADING LINE NO 1 IS - WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 2 IS - SKYE CANYON PHASE 3

HEADING LINE NO 3 IS - STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)

14'W x 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

W S P G W

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

| ELEMENT NO | IS A | STATION | INVERT | SECT | W S ELEV | RADIUS | ANGLE | ANG PT | MAN H |
|------------|-----------------------|----------|----------|------|----------|--------|-------|---------|-------|
| 1 | IS A SYSTEM OUTLET | 999.000 | 2748.980 | 1 | 2751.800 | | | | |
| 2 | IS A REACH | 1000.000 | 2749.000 | 1 | | .000 | .000 | .000 | 0 |
| 3 | IS A JUNCTION | 1017.000 | 2749.180 | 4 | | .000 | .000 | .000 | .100 |
| 4 | IS A WALL EXIT | 1017.000 | 2749.180 | 3 | | | | | |
| 5 | IS A REACH | 1033.500 | 2749.230 | 3 | | .000 | .000 | .000 | 0 |
| 6 | IS A JUNCTION | 1033.500 | 2749.230 | 3 | | .000 | .000 | .000 | .000 |
| 7 | IS A REACH | 1067.000 | 2749.360 | 3 | | .000 | .000 | -45.000 | 0 |
| 8 | IS A TRANSITION | 1074.000 | 2749.360 | 66 | | .000 | .000 | | |
| 9 | IS A REACH | 1084.000 | 2749.570 | 66 | | .000 | .000 | .000 | 0 |
| 10 | IS A REACH | 1120.000 | 2750.280 | 66 | | .000 | .000 | .000 | 0 |
| 11 | IS A REACH | 1179.000 | 2752.050 | 66 | | .000 | .000 | -37.000 | 0 |
| 12 | IS A REACH | 2355.000 | 2787.320 | 66 | | .000 | .000 | .000 | 0 |
| 13 | IS A SYSTEM HEADWORKS | 2355.000 | 2787.320 | 66 | | | | | |

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

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

W S P G W

PAGE NO 3

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14' W x 5' H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|------|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 999.000 | 2748.980 | 2.403 | 2751.383 | 736.00 | 13.67 | 2.90 | 2754.29 | .00 | 3.28 | 24.81 | 4.000 | 20.000 | 1.00 | 0 .0 |
| 1.000 | .0200 | | | | | .0413 | .04 | 2.40 | 1.64 | 2.97 | .035 | .00 | 1.00 | TRAP |
| 1000.000 | 2749.000 | 2.390 | 2751.390 | 736.00 | 13.76 | 2.94 | 2754.33 | .00 | 3.28 | 24.78 | 4.000 | 20.000 | 1.00 | 0 .0 |
| JUNCT STR | .0106 | | | | | .2236 | 3.80 | 2.39 | 1.65 | | .042 | .00 | 1.00 | TRAP |
| 1017.000 | 2749.180 | 1.415 | 2750.595 | 615.00 | 23.82 | 8.81 | 2759.40 | .00 | 3.11 | 22.49 | 5.000 | 14.000 | 3.00 | 0 .0 |
| WALL EXIT | | | | | | | | | | | | | | |
| 1017.000 | 2749.180 | 1.868 | 2751.048 | 615.00 | 23.52 | 8.59 | 2759.64 | .00 | 3.91 | 14.00 | 5.000 | 14.000 | .00 | 0 .0 |
| 16.500 | .0030 | | | | | .0262 | .43 | 1.87 | 3.03 | 3.82 | .013 | .00 | .00 | BOX |
| 1033.500 | 2749.230 | 1.823 | 2751.053 | 615.00 | 24.10 | 9.02 | 2760.07 | .00 | 3.91 | 14.00 | 5.000 | 14.000 | .00 | 0 .0 |
| JUNCT STR | .0000 | | | | | .0383 | .00 | 1.82 | 3.15 | | .013 | .00 | .00 | BOX |
| 1033.500 | 2749.230 | 1.282 | 2750.512 | 481.00 | 26.80 | 11.16 | 2761.67 | .00 | 3.32 | 14.00 | 5.000 | 14.000 | .00 | 0 .0 |
| 12.891 | .0039 | | | | | .0517 | .67 | 1.28 | 4.17 | 2.96 | .013 | .00 | .00 | BOX |
| 1046.391 | 2749.280 | 1.246 | 2750.526 | 481.00 | 27.58 | 11.81 | 2762.34 | .00 | 3.32 | 14.00 | 5.000 | 14.000 | .00 | 0 .0 |
| 20.609 | .0039 | | | | | .0584 | 1.20 | 1.25 | 4.35 | 2.96 | .013 | .00 | .00 | BOX |
| 1067.000 | 2749.360 | 1.188 | 2750.548 | 481.00 | 28.93 | 12.99 | 2763.54 | .00 | 3.32 | 14.00 | 5.000 | 14.000 | .00 | 0 .0 |
| TRANS STR | .0000 | | | | | .0456 | .32 | 1.19 | 4.68 | | .013 | .00 | .00 | BOX |
| 1074.000 | 2749.360 | 3.896 | 2753.256 | 481.00 | 26.73 | 11.09 | 2764.35 | .00 | 5.35 | 5.00 | 5.500 | .000 | .00 | 1 .0 |
| 10.000 | .0210 | | | | | .0285 | .29 | 3.90 | 2.48 | 4.45 | .013 | .00 | .00 | PIPE |

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14' W x 5' H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1084.000 | 2749.570 | 3.881 | 2753.452 | 481.00 | 26.84 | 11.18 | 2764.64 | .00 | 5.35 | 5.01 | 5.500 | .000 | .00 | 1 .0 |
| 36.000 | .0197 | | | | | .0293 | 1.05 | 3.88 | 2.50 | 4.61 | .013 | .00 | .00 | PIPE |
| 1120.000 | 2750.280 | 3.818 | 2754.098 | 481.00 | 27.33 | 11.60 | 2765.69 | .00 | 5.35 | 5.07 | 5.500 | .000 | .00 | 1 .0 |
| 59.000 | .0300 | | | | | .0299 | 1.77 | 3.82 | 2.58 | 3.81 | .013 | .00 | .00 | PIPE |
| 1179.000 | 2752.050 | 3.818 | 2755.868 | 481.00 | 27.32 | 11.59 | 2767.46 | .00 | 5.35 | 5.07 | 5.500 | .000 | .00 | 1 .0 |
| 402.742 | .0300 | | | | | .0297 | 11.96 | 3.82 | 2.58 | 3.81 | .013 | .00 | .00 | PIPE |
| 1581.742 | 2764.129 | 3.838 | 2767.967 | 481.00 | 27.17 | 11.46 | 2779.43 | .00 | 5.35 | 5.05 | 5.500 | .000 | .00 | 1 .0 |
| 419.484 | .0300 | | | | | .0279 | 11.71 | 3.84 | 2.56 | 3.81 | .013 | .00 | .00 | PIPE |
| 2001.226 | 2776.710 | 4.012 | 2780.722 | 481.00 | 25.90 | 10.42 | 2791.14 | .00 | 5.35 | 4.89 | 5.500 | .000 | .00 | 1 .0 |
| 151.798 | .0300 | | | | | .0250 | 3.80 | 4.01 | 2.34 | 3.81 | .013 | .00 | .00 | PIPE |
| 2153.025 | 2781.262 | 4.202 | 2785.465 | 481.00 | 24.70 | 9.47 | 2794.93 | .00 | 5.35 | 4.67 | 5.500 | .000 | .00 | 1 .0 |
| 87.083 | .0300 | | | | | .0225 | 1.96 | 4.20 | 2.13 | 3.81 | .013 | .00 | .00 | PIPE |
| 2240.107 | 2783.874 | 4.411 | 2788.285 | 481.00 | 23.55 | 8.61 | 2796.89 | .00 | 5.35 | 4.38 | 5.500 | .000 | .00 | 1 .0 |
| 56.788 | .0300 | | | | | .0204 | 1.16 | 4.41 | 1.92 | 3.81 | .013 | .00 | .00 | PIPE |
| 2296.895 | 2785.577 | 4.650 | 2790.228 | 481.00 | 22.45 | 7.83 | 2798.05 | .00 | 5.35 | 3.98 | 5.500 | .000 | .00 | 1 .0 |
| 38.176 | .0300 | | | | | .0188 | .72 | 4.65 | 1.70 | 3.81 | .013 | .00 | .00 | PIPE |
| 2335.071 | 2786.722 | 4.934 | 2791.656 | 481.00 | 21.41 | 7.12 | 2798.77 | .00 | 5.35 | 3.34 | 5.500 | .000 | .00 | 1 .0 |
| 19.929 | .0300 | | | | | .0181 | .36 | 4.93 | 1.45 | 3.81 | .013 | .00 | .00 | PIPE |

SKYE CANYON PHASE 3
STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)
14' W x 5' H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|----|----------------|
|---------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|----|----------------|

| L/Elem | Ch Slope | | | | | | SF Ave | FUT HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
|----------|----------|-------|----------|--------|-------|------|---------|--------|---------|----------|---------|------|--------|-----|---------|
| 2355.000 | 2787.320 | 5.345 | 2792.665 | 481.00 | 20.41 | 6.47 | 2799.13 | .00 | 5.35 | 1.82 | 5.500 | .000 | .00 | 1 | .0 |
| - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - | - - |

SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (CULVERT CROSSING)

14'W X 5'H RCB DISCHARGING TO NATURAL WASH (FUTURE CONDITION)

| | | | | | | | | | | | | | | | |
|---------|-------------|---|----|----|---|---|--|---|----|---|--|--|--|--|----|
| 999.00 | .I | W | CH | E | | | | | | | | | | | R |
| 1026.67 | .I | W | C | H | E | | | | | | | | | | JX |
| 1054.35 | .IYYWYYCYYH | | | | E | | | | | | | | | | WX |
| 1082.02 | .I | W | C | H | E | | | | | | | | | | R |
| 1109.69 | .I | W | C | H | E | | | | | | | | | | JX |
| 1137.37 | .I | W | C | H | E | | | | | | | | | | R |
| 1165.04 | .I | W | C | H | E | | | | | | | | | | R |
| 1192.71 | .I | W | C | H | E | | | | | | | | | | TX |
| 1220.39 | .I | | W | H | E | | | | | | | | | | R |
| 1248.06 | .I | | W | CH | E | | | | | | | | | | R |
| 1275.73 | .I | | W | H | E | | | | | | | | | | R |
| 1303.41 | .I | | W | CH | E | | | | | | | | | | R |
| 1331.08 | . | | | | | | | | | | | | | | . |
| 1358.76 | . | | | | | | | | | | | | | | . |
| 1386.43 | . | | | | | | | | | | | | | | . |
| 1414.10 | . | | | | | | | | | | | | | | . |
| 1441.78 | . | | | | | | | | | | | | | | . |
| 1469.45 | . | | | | | | | | | | | | | | . |
| 1497.12 | . | | | | | | | | | | | | | | . |
| 1524.80 | . | | | | | | | | | | | | | | . |
| 1552.47 | . | | | | | | | | | | | | | | . |
| 1580.14 | . | | | | | | | | | | | | | | . |
| 1607.82 | . | | | | | I | | W | CH | E | | | | | R |
| 1635.49 | . | | | | | | | | | | | | | | . |
| 1663.16 | . | | | | | | | | | | | | | | . |
| 1690.84 | . | | | | | | | | | | | | | | . |
| 1718.51 | . | | | | | | | | | | | | | | . |
| 1746.18 | . | | | | | | | | | | | | | | . |
| 1773.86 | . | | | | | | | | | | | | | | . |

[illegible]

1. GLOSSARY

- ```

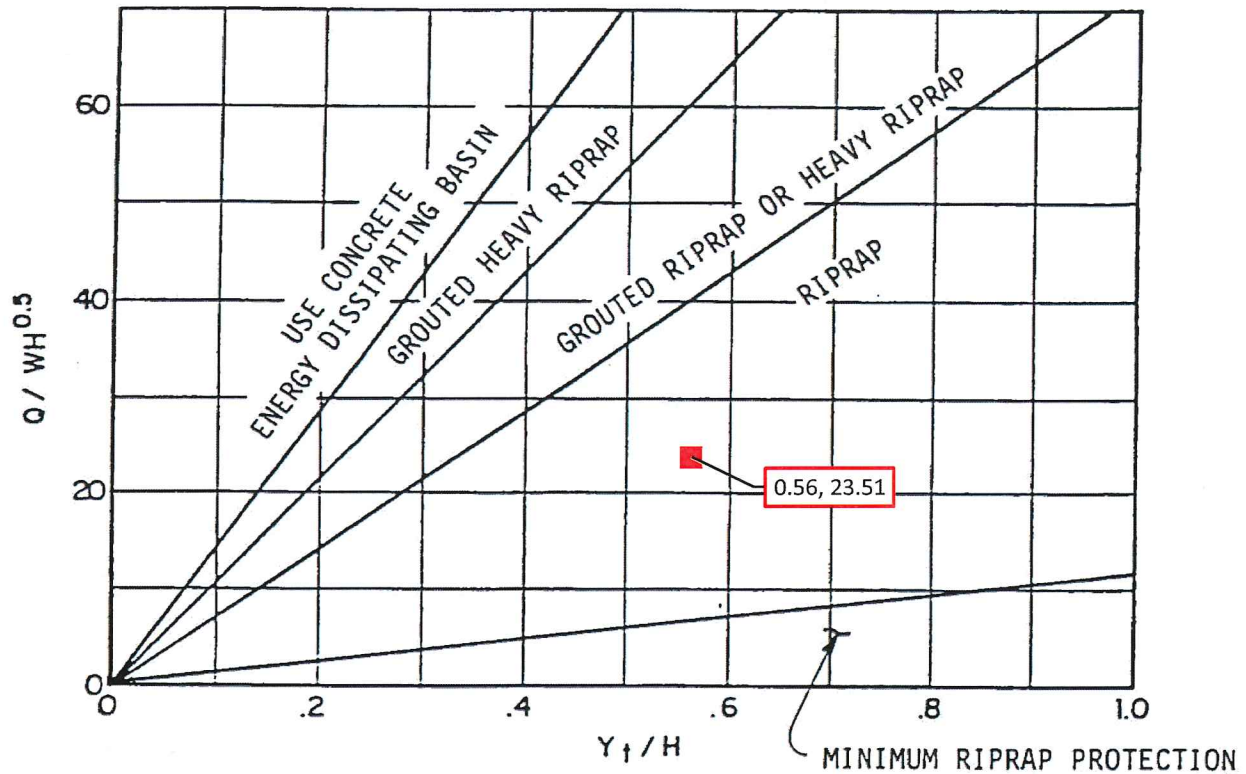
I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
S = SUPER-ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

```

Page 3



# RIPRAP EROSION PROTECTION AT RECTANGULAR CONDUIT OUTLET



Notes:

1. Use  $H_a$  instead of  $H$  whenever culvert has supercritical flow in the barrel.
2. Minimum Riprap Protection: Use Riprap for a distance of  $3H$  downstream for 18" to 36" equivalent round pipe size and  $4D$  downstream for 42" and larger equivalent round pipe size.

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

Project Name: **Skye Canyon - Phase 3**

Date: **2/29/2016**

File Name: **OLY1602-000 TDS Outlet Protect Calc.xlsx**

By: **SMJ**

**Equations:**

|                                                            |                              |                |
|------------------------------------------------------------|------------------------------|----------------|
| $(d_{50}/H) \cdot (Y_t/H) / (Q/WH^{1.5}) = 0.0014$         | (for $(Q/WH^{1.5}) < 4$ )    | Equation 761a* |
| $(d_{50}/H) \cdot (Y_t/H)^2 / (Q/WH^{1.5})^{2.5} = 0.0019$ | (for $(Q/WH^{1.5}) \geq 4$ ) | Equation 761b* |
| $D_a = 1/2(D + Y_n)$ (used in place of D if $Fr > 1$ )     |                              | Equation 762*  |
| $L = (1/(2 \tan q))(A_t/Y_t - W)$                          |                              | Equation 764*  |
| $A_t = Q/V$                                                |                              | Equation 765*  |

**Known Information:**

|                       |                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------|
| Q = 736               | Flow (cfs)                                                                          |
| H = 5                 | RCB Height                                                                          |
| W = 14.0              | RCB Width                                                                           |
| q = 20                | Expansion angle of the RCB flow (typ=20°)                                           |
| V = 11.5              | Allowable downstream velocity ( <b>Referenced from Existing Wash Normal Depth</b> ) |
| Fr = 3.03             | Froude Number (0 if full)                                                           |
| Y <sub>n</sub> = 3.82 | Normal Depth of flow in RCB (ft)* ( <b>Referenced from WSPGW Analysis</b> )         |
|                       | * Not necessary if Fr < 1 (Enter 0 if unknown)                                      |
| Y <sub>t</sub> = 2.8  | Tailwater Depth (Enter 0.4H if unknown)                                             |

**Riprap Erosion Protection Check (Figure 713):**

Applicable only if  $Q/WH^{1.5} \leq 8$

$Q/WH^{1.5} = 4.70$

←

**See Figure 713 for Recommended Riprap Type**

$Q/WH^{0.5} = 23.51$

$Y_t/H = 0.56$

**Solve For:**

$Q/WH^{1.5} = 4.70$

$D_{50} = 0.548$  Average Size Riprap (ft) (for  $(Q/WH^{1.5}) < 4$ )

$D_{50} = 1.573$  Average Size Riprap (ft) (for  $(Q/WH^{1.5}) \geq 4$ )

**$D_{50} = 1.6$  Average Size Riprap (ft)**

**$D_{50} = 19$  Average Size Riprap (in)**

$A_t = 64.3$  Req'd Area of flow at allowable velocity (ft<sup>2</sup>)

$Y_t = 2.82$  Tailwater depth (ft)

$H_a = 4.41$  only used if  $Fr \geq 1$

**$L = 12.1$  Length of Protection (ft)**

**\* $L = 20.0$  \*For:  $D < 3.5$ -ft,  $L_{min} = 3H$ . For:  $D \geq 3.5$ -ft,  $L_{min} \geq 4H$ .  $L_{max(required)} = 10H$**

D = Equivalent round pipe size

**Notes:**

Provide  $D_{50} = 18$ -inch riprap for a length of 20-ft

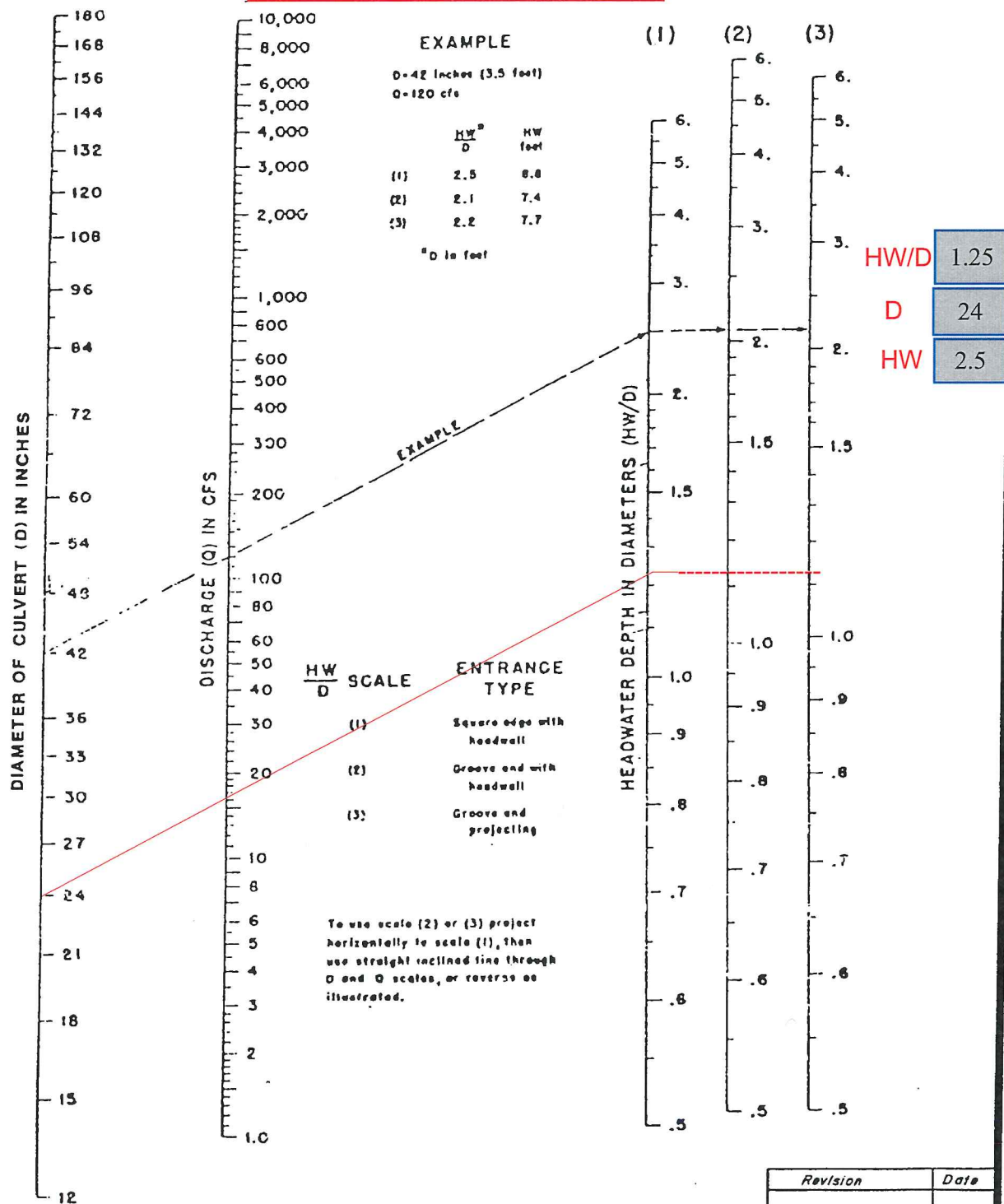
\* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

## WSPG for North Storm Drain

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## NOMOGRAPH - INLET CONTROL RCP

GC8: Q=18 CFS





LAT1

T1 SKYE CANYON PHASE 3  
T2 STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)  
T3 66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

|    |         |         |    |      |       |        |       |         |       |   |
|----|---------|---------|----|------|-------|--------|-------|---------|-------|---|
| SO | 1000.00 | 2749.23 | 3  |      |       |        |       | 2751.05 |       |   |
| TS | 1027.00 | 2749.46 | 66 | .013 |       |        |       |         | -43.0 | 1 |
| JX | 1027.00 | 2749.46 | 66 | 24   | .013  | 4.0    |       | 2749.46 | -40.0 |   |
| R  | 1109.00 | 2749.87 | 66 | .013 |       |        |       |         | -3.0  | 1 |
| R  | 1223.00 | 2750.44 | 66 | .013 |       |        |       |         | -72.0 | 1 |
| R  | 1263.00 | 2751.24 | 66 | .013 |       |        |       |         | 0.0   | 1 |
| R  | 1951.00 | 2771.19 | 66 | .013 |       |        |       |         | -10.0 | 1 |
| JX | 1951.00 | 2771.19 | 66 | 30   | .013  | 28.0   |       | 2771.19 | -45.0 |   |
| R  | 2248.00 | 2779.81 | 66 | .013 |       |        |       |         | 10.0  | 1 |
| R  | 2489.00 | 2786.79 | 66 | .013 |       |        |       |         | -45.0 | 1 |
| R  | 2653.00 | 2792.79 | 66 | .013 |       |        |       |         | 0.0   | 1 |
| SH | 2653.00 | 2792.79 | 66 |      |       |        |       |         |       |   |
| CD | 1       | 1       | 0  | .000 | 4.000 | 24.000 | 1.000 | 1.000   | .00   |   |
| CD | 2       | 3       | 0  | .000 | 5.000 | 7.000  | .000  | .000    | .00   |   |
| CD | 3       | 3       | 0  | .000 | 5.000 | 14.000 | .000  | .000    | .00   |   |
| CD | 4       | 1       | 0  | .000 | 5.000 | 14.000 | 3.000 | 0.000   | .00   |   |
| CD | 18      | 4       | 1  | .000 | 1.500 | .000   | .000  | .000    | .00   |   |
| CD | 24      | 4       | 1  | .000 | 2.000 | .000   | .000  | .000    | .00   |   |
| CD | 30      | 4       | 1  | .000 | 2.500 | .000   | .000  | .000    | .00   |   |
| CD | 54      | 4       | 1  | .000 | 4.500 | .000   | .000  | .000    | .00   |   |
| CD | 60      | 4       | 1  | .000 | 5.000 | .000   | .000  | .000    | .00   |   |
| CD | 66      | 4       | 1  | .000 | 5.500 | .000   | .000  | .000    | .00   |   |
| CD | 72      | 4       | 1  | .000 | 6.000 | .000   | .000  | .000    | .00   |   |
| Q  |         | 286.0   | .0 |      |       |        |       |         |       |   |

PAGE NO 1

SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)

66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

PAGE NO 2

PAGE NO 3

FILE: LAT1.WSW

LAT1  
W S P G W - CIVILDESIGN Version 14.06  
Program Package Serial Number: 1704  
WATER SURFACE PROFILE LISTING

PAGE 1

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SKYE CANYON PHASE 3  
STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)  
66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

| Station   | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem    | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1000.000  | 2749.230    | 1.066      | 2750.296   | 318.00  | 21.32     | 7.06     | 2757.35        | .00        | 2.52           | 14.00          | 5.000          | 14.000          | .00 | 0 .0           |
| TRANS STR | .0085       |            |            |         |           | .0260    | .70            | 1.07       | 3.64           |                | .013           | .00             | .00 | BOX            |
| 1027.000  | 2749.460    | 3.785      | 2753.245   | 318.00  | 18.24     | 5.17     | 2758.41        | .00        | 4.87           | 5.10           | 5.500          | .000            | .00 | 1 .0           |
| JUNCT STR | .0000       |            |            |         |           | .0138    | .00            | 3.78       | 1.74           |                | .013           | .00             | .00 | PIPE           |
| 1027.000  | 2749.460    | 3.665      | 2753.125   | 314.00  | 18.67     | 5.41     | 2758.54        | .00        | 4.85           | 5.19           | 5.500          | .000            | .00 | 1 .0           |
| 5.885     | .0050       |            |            |         |           | .0144    | .08            | 3.67       | 1.83           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1032.885  | 2749.490    | 3.642      | 2753.132   | 314.00  | 18.80     | 5.49     | 2758.62        | .00        | 4.85           | 5.20           | 5.500          | .000            | .00 | 1 .0           |
| 38.527    | .0050       |            |            |         |           | .0154    | .59            | 3.64       | 1.85           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1071.412  | 2749.682    | 3.494      | 2753.176   | 314.00  | 19.72     | 6.04     | 2759.22        | .00        | 4.85           | 5.29           | 5.500          | .000            | .00 | 1 .0           |
| 37.588    | .0050       |            |            |         |           | .0174    | .65            | 3.49       | 2.00           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1109.000  | 2749.870    | 3.355      | 2753.225   | 314.00  | 20.68     | 6.64     | 2759.87        | .00        | 4.85           | 5.37           | 5.500          | .000            | .00 | 1 .0           |
| 8.823     | .0050       |            |            |         |           | .0187    | .16            | 3.36       | 2.17           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1117.823  | 2749.914    | 3.323      | 2753.237   | 314.00  | 20.92     | 6.79     | 2760.03        | .00        | 4.85           | 5.38           | 5.500          | .000            | .00 | 1 .0           |
| 36.250    | .0050       |            |            |         |           | .0202    | .73            | 3.32       | 2.21           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1154.072  | 2750.095    | 3.194      | 2753.290   | 314.00  | 21.94     | 7.47     | 2760.76        | .00        | 4.85           | 5.43           | 5.500          | .000            | .00 | 1 .0           |
| 35.068    | .0050       |            |            |         |           | .0228    | .80            | 3.19       | 2.38           | 5.50           | .013           | .00             | .00 | PIPE           |
| 1189.140  | 2750.271    | 3.072      | 2753.343   | 314.00  | 23.01     | 8.22     | 2761.56        | .00        | 4.85           | 5.46           | 5.500          | .000            | .00 | 1 .0           |
| 33.860    | .0050       |            |            |         |           | .0259    | .88            | 3.07       | 2.56           | 5.50           | .013           | .00             | .00 | PIPE           |

FILE: LAT1.WSW

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Program Package Serial Number: 1704  
WATER SURFACE PROFILE LISTING

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SKYE CANYON PHASE 3  
STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)  
66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

| Station   | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|-----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem    | Ch Slope    |            |            |         |           | SF Ave   | HF             | SE Dpth    | Froude N       | Norm Dp        | "N"            | X-Fall          | ZR  | Type Ch        |
| 1223.000  | 2750.440    | 2.956      | 2753.396   | 314.00  | 24.13     | 9.04     | 2762.44        | .00        | 4.85           | 5.48           | 5.500          | .000            | .00 | 1 .0           |
| 40.000    | .0200       |            |            |         |           | .0282    | 1.13           | 2.96       | 2.76           | 3.27           | .013           | .00             | .00 | PIPE           |
| 1263.000  | 2751.240    | 2.908      | 2754.148   | 314.00  | 24.63     | 9.42     | 2763.57        | .00        | 4.85           | 5.49           | 5.500          | .000            | .00 | 1 .0           |
| 12.822    | .0290       |            |            |         |           | .0290    | .37            | 2.91       | 2.85           | 2.91           | .013           | .00             | .00 | PIPE           |
| 1275.822  | 2751.612    | 2.908      | 2754.520   | 314.00  | 24.63     | 9.42     | 2763.94        | .00        | 4.85           | 5.49           | 5.500          | .000            | .00 | 1 .0           |
| 434.512   | .0290       |            |            |         |           | .0276    | 12.00          | 2.91       | 2.85           | 2.91           | .013           | .00             | .00 | PIPE           |
| 1710.334  | 2764.211    | 2.997      | 2767.208   | 314.00  | 23.72     | 8.73     | 2775.94        | .00        | 4.85           | 5.48           | 5.500          | .000            | .00 | 1 .0           |
| 157.525   | .0290       |            |            |         |           | .0247    | 3.89           | 3.00       | 2.69           | 2.91           | .013           | .00             | .00 | PIPE           |
| 1867.859  | 2768.779    | 3.115      | 2771.894   | 314.00  | 22.61     | 7.94     | 2779.83        | .00        | 4.85           | 5.45           | 5.500          | .000            | .00 | 1 .0           |
| 83.141    | .0290       |            |            |         |           | .0218    | 1.81           | 3.12       | 2.50           | 2.91           | .013           | .00             | .00 | PIPE           |
| 1951.000  | 2771.190    | 3.241      | 2774.431   | 314.00  | 21.56     | 7.22     | 2781.65        | .00        | 4.85           | 5.41           | 5.500          | .000            | .00 | 1 .0           |
| JUNCT STR | .0000       |            |            |         |           | .0246    | .00            | 3.24       | 2.32           |                | .013           | .00             | .00 | PIPE           |
| 1951.000  | 2771.190    | 2.757      | 2773.947   | 286.00  | 24.00     | 8.94     | 2782.89        | .00        | 4.68           | 5.50           | 5.500          | .000            | .00 | 1 .0           |
| 297.000   | .0290       |            |            |         |           | .0281    | 8.34           | 2.76       | 2.87           | 2.75           | .013           | .00             | .00 | PIPE           |
| 2248.000  | 2779.810    | 2.796      | 2782.606   | 286.00  | 23.57     | 8.63     | 2791.23        | .00        | 4.68           | 5.50           | 5.500          | .000            | .00 | 1 .0           |
| 62.539    | .0290       |            |            |         |           | .0271    | 1.70           | 2.80       | 2.80           | 2.75           | .013           | .00             | .00 | PIPE           |
| 2310.539  | 2781.621    | 2.813      | 2784.434   | 286.00  | 23.38     | 8.49     | 2792.92        | .00        | 4.68           | 5.50           | 5.500          | .000            | .00 | 1 .0           |
| 178.461   | .0290       |            |            |         |           | .0253    | 4.51           | 2.81       | 2.76           | 2.75           | .013           | .00             | .00 | PIPE           |

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W S P G W - CIVILDESIGN Version 14.06  
Program Package Serial Number: 1704  
WATER SURFACE PROFILE LISTING

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SKYE CANYON PHASE 3  
STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)  
66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|----|----------------|
|---------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|----|----------------|

| L/Elem   | Ch Slope | ***** | *****    | *****  | ***** | SF Ave | LAT1 HF | SE Dpth | Froude N | Norm Dp | "N"   | X-Fall | ZR  | Type Ch |
|----------|----------|-------|----------|--------|-------|--------|---------|---------|----------|---------|-------|--------|-----|---------|
| 2489.000 | 2786.790 | 2.923 | 2789.713 | 286.00 | 22.30 | 7.72   | 2797.43 | .00     | 4.68     | 5.49    | 5.500 | .000   | .00 | 1 .0    |
| 35.944   | .0366    | -     | -        | -      | -     | .0225  | .81     | 2.92    | 2.57     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2524.944 | 2788.105 | 3.020 | 2791.125 | 286.00 | 21.40 | 7.11   | 2798.24 | .00     | 4.68     | 5.47    | 5.500 | .000   | .00 | 1 .0    |
| 31.804   | .0366    | -     | -        | -      | -     | .0200  | .64     | 3.02    | 2.41     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2556.748 | 2789.269 | 3.139 | 2792.408 | 286.00 | 20.40 | 6.46   | 2798.87 | .00     | 4.68     | 5.44    | 5.500 | .000   | .00 | 1 .0    |
| 24.359   | .0366    | -     | -        | -      | -     | .0177  | .43     | 3.14    | 2.24     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2581.107 | 2790.160 | 3.266 | 2793.426 | 286.00 | 19.45 | 5.88   | 2799.30 | .00     | 4.68     | 5.40    | 5.500 | .000   | .00 | 1 .0    |
| 19.155   | .0366    | -     | -        | -      | -     | .0156  | .30     | 3.27    | 2.08     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2600.262 | 2790.860 | 3.399 | 2794.260 | 286.00 | 18.55 | 5.34   | 2799.60 | .00     | 4.68     | 5.34    | 5.500 | .000   | .00 | 1 .0    |
| 15.121   | .0366    | -     | -        | -      | -     | .0139  | .21     | 3.40    | 1.92     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2615.383 | 2791.414 | 3.541 | 2794.955 | 286.00 | 17.69 | 4.86   | 2799.81 | .00     | 4.68     | 5.27    | 5.500 | .000   | .00 | 1 .0    |
| 11.964   | .0366    | -     | -        | -      | -     | .0123  | .15     | 3.54    | 1.78     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2627.347 | 2791.851 | 3.692 | 2795.543 | 286.00 | 16.86 | 4.42   | 2799.96 | .00     | 4.68     | 5.17    | 5.500 | .000   | .00 | 1 .0    |
| 9.336    | .0366    | -     | -        | -      | -     | .0109  | .10     | 3.69    | 1.64     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2636.683 | 2792.193 | 3.854 | 2796.047 | 286.00 | 16.08 | 4.01   | 2800.06 | .00     | 4.68     | 5.04    | 5.500 | .000   | .00 | 1 .0    |
| 7.044    | .0366    | -     | -        | -      | -     | .0098  | .07     | 3.85    | 1.51     | 2.57    | .013  | .00    | .00 | PIPE    |
| 2643.727 | 2792.451 | 4.030 | 2796.481 | 286.00 | 15.33 | 3.65   | 2800.13 | .00     | 4.68     | 4.87    | 5.500 | .000   | .00 | 1 .0    |
| 5.056    | .0366    | -     | -        | -      | -     | .0087  | .04     | 4.03    | 1.38     | 2.57    | .013  | .00    | .00 | PIPE    |

‡ FILE: LAT1.WSW  
 W S P G W - CIVILDESIGN Version 14.06  
 Program Package Serial Number: 1704  
 WATER SURFACE PROFILE LISTING  
 Date: 4-28-2016 Time: 8:32: 8  
 SKYE CANYON PHASE 3  
 STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)  
 66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

| Station  | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL  | No Wth Prs/Pip |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| 2648.783 | 2792.636    | 4.221      | 2796.857   | 286.00  | 14.62     | 3.32     | 2800.17        | .00        | 4.68           | 4.65           | 5.500          | .000            | .00 | 1 .0           |
| 3.121    | .0366       | -          | -          | -       | -         | .0079    | .02            | 4.22       | 1.26           | 2.57           | .013           | .00             | .00 | PIPE           |
| 2651.904 | 2792.750    | 4.433      | 2797.183   | 286.00  | 13.94     | 3.02     | 2800.20        | .00        | 4.68           | 4.35           | 5.500          | .000            | .00 | 1 .0           |
| 1.096    | .0366       | -          | -          | -       | -         | .0072    | .01            | 4.43       | 1.13           | 2.57           | .013           | .00             | .00 | PIPE           |
| 2653.000 | 2792.790    | 4.676      | 2797.466   | 286.00  | 13.29     | 2.74     | 2800.21        | .00        | 4.68           | 3.93           | 5.500          | .000            | .00 | 1 .0           |

SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT GRAND CANYON LOWPOINT (NORTH STORM DRAIN)

66" RCP IN GRAND CANYON DISCHARGING INTO 14'X5' RCB (FUTURE CONDITION)

|         |         |   |     |   |  |  |  |  |  |  |  |  |  |    |
|---------|---------|---|-----|---|--|--|--|--|--|--|--|--|--|----|
| 1000.00 | . I W C | H | E   |   |  |  |  |  |  |  |  |  |  | TX |
| 1028.02 | . I     | W | CH  | E |  |  |  |  |  |  |  |  |  | JX |
| 1056.03 | . I     | W | C H | E |  |  |  |  |  |  |  |  |  | R  |
| 1084.05 | . I     | W | CH  | E |  |  |  |  |  |  |  |  |  | R  |
| 1112.07 | . I     | W | CH  | E |  |  |  |  |  |  |  |  |  | R  |
| 1140.08 | . I     | W | C H | E |  |  |  |  |  |  |  |  |  | R  |
| 1168.10 | . I     | W | C H | E |  |  |  |  |  |  |  |  |  | R  |
| 1196.12 | . I     | W | CH  | E |  |  |  |  |  |  |  |  |  | R  |
| 1224.14 | . I     | W | CH  | E |  |  |  |  |  |  |  |  |  | R  |
| 1252.15 | . I     | W | C H | E |  |  |  |  |  |  |  |  |  | R  |



|         |   |   |   |    |    |      |   |    |
|---------|---|---|---|----|----|------|---|----|
| 1280.17 | . | I | W | CH | E  | LAT1 | . | R  |
| 1308.19 | . | I | W | CH | E  |      | . | R  |
| 1336.20 | . |   |   |    |    |      | . |    |
| 1364.22 | . |   |   |    |    |      | . |    |
| 1392.24 | . |   |   |    |    |      | . |    |
| 1420.25 | . |   |   |    |    |      | . |    |
| 1448.27 | . |   |   |    |    |      | . |    |
| 1476.29 | . |   |   |    |    |      | . |    |
| 1504.31 | . |   |   |    |    |      | . |    |
| 1532.32 | . |   |   |    |    |      | . |    |
| 1560.34 | . |   |   |    |    |      | . |    |
| 1588.36 | . |   |   |    |    |      | . |    |
| 1616.37 | . |   |   |    |    |      | . |    |
| 1644.39 | . |   |   |    |    |      | . |    |
| 1672.41 | . |   |   |    |    |      | . |    |
| 1700.42 | . |   |   |    |    |      | . |    |
| 1728.44 | . |   | I | W  | C  | H    | E | R  |
| 1756.46 | . |   |   |    |    |      | . |    |
| 1784.47 | . |   |   |    |    |      | . |    |
| 1812.49 | . |   |   |    |    |      | . |    |
| 1840.51 | . |   |   |    |    |      | . |    |
| 1868.53 | . |   | I | W  | C  | H    | E | R  |
| 1896.54 | . |   |   |    |    |      | . |    |
| 1924.56 | . |   |   |    |    |      | . |    |
| 1952.58 | . |   | I | W  | CH | E    | . | JX |
| 1980.59 | . |   | I | W  | CH | E    | . | R  |
| 2008.61 | . |   |   |    |    |      | . |    |
| 2036.63 | . |   |   |    |    |      | . |    |
| 2064.64 | . |   |   |    |    |      | . |    |
| 2092.66 | . |   |   |    |    |      | . |    |
| 2120.68 | . |   |   |    |    |      | . |    |
| 2148.69 | . |   |   |    |    |      | . |    |
| 2176.71 | . |   |   |    |    |      | . |    |
| 2204.73 | . |   |   |    |    |      | . |    |
| 2232.75 | . |   |   |    |    |      | . |    |
| 2260.76 | . |   |   |    |    |      | . | R  |

[illegible]

## 1. GLOSSARY

- ```

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

```

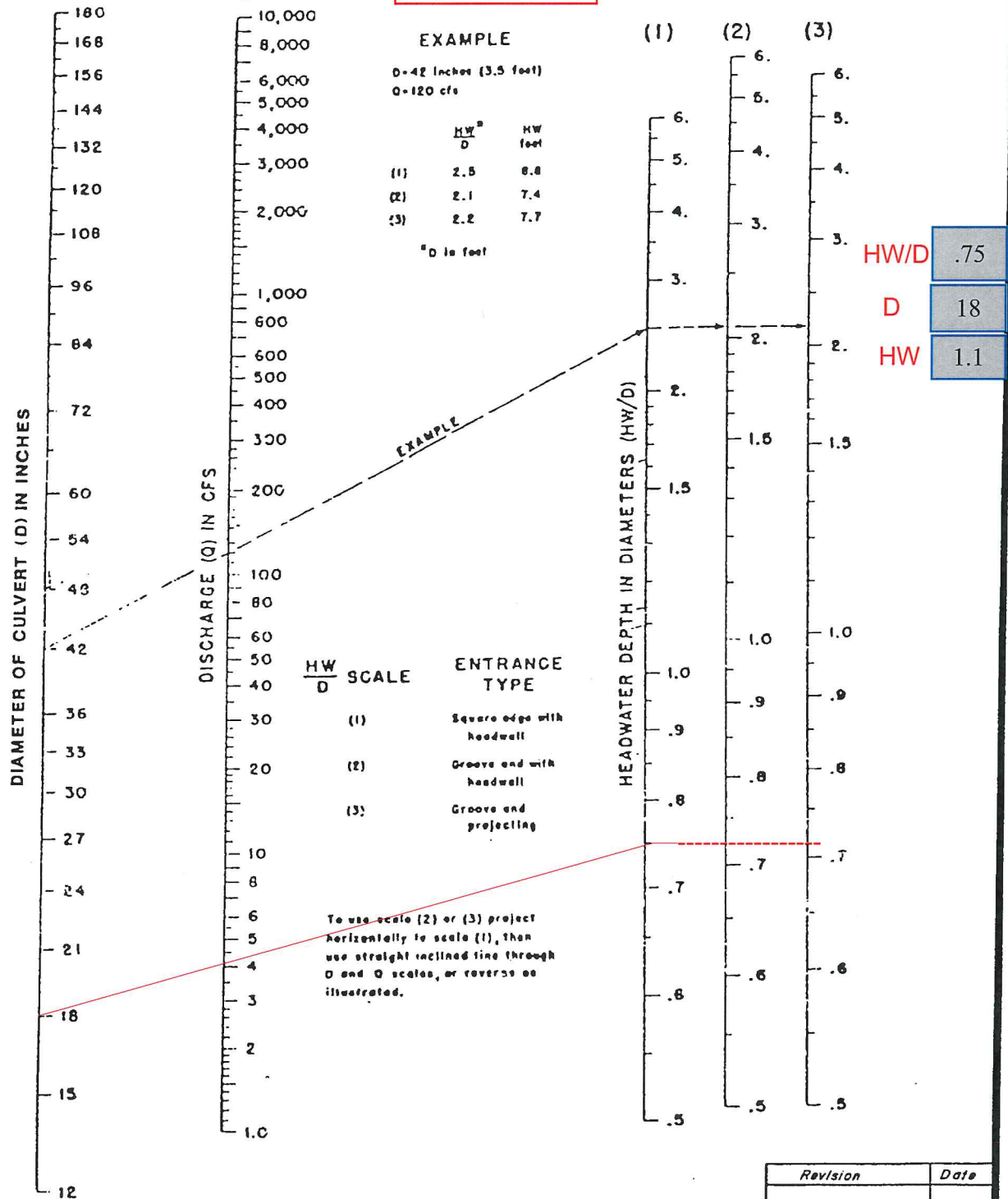
Page 4

WSPG for South Storm Drain

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

GC12: Q=4 CFS



PROP

T1 SKYE CANYON PHASE 3
T2 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (SOUTH STORM DRAIN)
T3 6'W X 5'H EX RCB DISCHARGING TO NATURAL WASH (PROP CONDITION)

| | | | | | | | | | | | | |
|----|----------|----------|----|------|-------|--------|-------|---------|---------|---------|------|---|
| SO | 1017.00 | 2749.18 | 2 | | | | | | 2750.60 | | | |
| R | 1017.00 | 2749.18 | 2 | .013 | | | | | | 0.0 | | |
| R | 1042.500 | 2749.310 | 2 | .013 | | | | | | -97.403 | .000 | 0 |
| R | 1089.50 | 2749.70 | 2 | .013 | | | | | | | 0.0 | |
| R | 1137.96 | 2749.94 | 2 | .013 | | | | | | | 0.0 | |
| JX | 1137.96 | 2749.94 | 2 | 18 | .013 | 4.0 | | 2749.94 | | 45.0 | | |
| R | 1733.36 | 2752.92 | 2 | .013 | | | | | | | 0.0 | |
| SH | 1733.36 | 2752.92 | 2 | | | | | | | | | |
| CD | 1 | 1 | 0 | .000 | 4.000 | 20.000 | 1.000 | 1.000 | .00 | | | |
| CD | 2 | 3 | 0 | .000 | 5.000 | 6.000 | .000 | .000 | .00 | | | |
| CD | 3 | 3 | 0 | .000 | 5.000 | 14.000 | .000 | .000 | .00 | | | |
| CD | 4 | 1 | 0 | .000 | 5.000 | 14.000 | 3.000 | 3.000 | .00 | | | |
| CD | 18 | 4 | 1 | .000 | 1.500 | .000 | .000 | .000 | .00 | | | |
| CD | 54 | 4 | 1 | .000 | 4.500 | .000 | .000 | .000 | .00 | | | |
| CD | 60 | 4 | 1 | .000 | 5.000 | .000 | .000 | .000 | .00 | | | |
| CD | 66 | 4 | 1 | .000 | 5.500 | .000 | .000 | .000 | .00 | | | |
| CD | 72 | 4 | 1 | .000 | 6.000 | .000 | .000 | .000 | .00 | | | |
| Q | | 121.000 | .0 | | | | | | | | | |

FILE: PROP.WSW

PROP
W S P G W - EDIT LISTING - Version 14.06

Date: 4-27-2016 Time: 1:41: 5

| CARD
CODE | SECT
NO | CHN
TYPE | NO OF
PIER/PIP | AVE
WIDTH | PIER
WIDTH | WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING | | ZL | ZR | INV
DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|--------------|------------|-------------|-------------------|--------------|---------------|--|---------------|-------|-----|-------------|------|------|------|------|------|------|------|------|------|-------|
| | | | | | | HEIGHT 1
DIAMETER | BASE
WIDTH | | | | | | | | | | | | | |
| CD | 1 | 1 | 0 | .000 | 4.000 | 20.000 | 1.000 | 1.000 | .00 | | | | | | | | | | | |
| CD | 2 | 3 | 0 | .000 | 5.000 | 6.000 | .000 | .000 | .00 | | | | | | | | | | | |
| CD | 3 | 3 | 0 | .000 | 5.000 | 14.000 | .000 | .000 | .00 | | | | | | | | | | | |
| CD | 4 | 1 | 0 | .000 | 5.000 | 14.000 | 3.000 | 3.000 | .00 | | | | | | | | | | | |
| CD | 18 | 4 | 1 | | 1.500 | | | | | | | | | | | | | | | |
| CD | 54 | 4 | 1 | | 4.500 | | | | | | | | | | | | | | | |
| CD | 60 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | | |
| CD | 66 | 4 | 1 | | 5.500 | | | | | | | | | | | | | | | |
| CD | 72 | 4 | 1 | | 6.000 | | | | | | | | | | | | | | | |

PAGE NO 1

HEADING LINE NO 1 IS - WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 2 IS - SKYE CANYON PHASE 3

HEADING LINE NO 3 IS - STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (SOUTH STORM DRAIN)

6'W X 5'H EX RCB DISCHARGING TO NATURAL WASH (PROP CONDITION)

PAGE NO 2

| ELEMENT NO | IS | A | SYSTEM OUTLET | W S P G W | | SECT | W S ELEV | RADIUS | ANGLE | ANG PT | MAN H |
|--------------|----|---|------------------|---|----------|------|----------|--------|---------|--------|-------|
| | | | | STATION | INVERT | | | | | | |
| ELEMENT NO 1 | IS | A | SYSTEM OUTLET | 1017.000 | 2749.180 | 2 | 2750.600 | | | | |
| ELEMENT NO 2 | IS | A | REACH | 1017.000 | 2749.180 | 2 | | .000 | .000 | .000 | 0 |
| ELEMENT NO 3 | IS | A | REACH | 1042.500 | 2749.310 | 2 | | 15.000 | -97.403 | .000 | 0 |
| ELEMENT NO 4 | IS | A | REACH | 1089.500 | 2749.700 | 2 | | .000 | .000 | .000 | 0 |
| ELEMENT NO 5 | IS | A | REACH | 1137.960 | 2749.940 | 2 | | .000 | .000 | .000 | 0 |
| ELEMENT NO 6 | IS | A | JUNCTION | 1137.960 | 2749.940 | 2 | | .000 | .000 | .000 | 0 |
| | | | | LAT-1 | LAT-2 | | | | | | |
| | | | | 18 | 0 | | | | | | |
| | | | | Q3 | Q4 | | | | | | |
| | | | | 4.000 | .000 | | | | | | |
| | | | | INVERT-3 | INVERT-4 | | | | | | |
| | | | | 2749.940 | .000 | | | | | | |
| | | | | PHI 3 | PHI 4 | | | | | | |
| | | | | 45.000 | .000 | | | | | | |
| | | | | RADIUS | ANGLE | | | | | | |
| | | | | .000 | .000 | | | | | | |
| | | | | THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING | | | | | | | |
| | | | | THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING | | | | | | | |
| ELEMENT NO 7 | IS | A | REACH | 1733.360 | 2752.920 | 2 | | .000 | .000 | .000 | 0 |
| ELEMENT NO 8 | IS | A | SYSTEM HEADWORKS | 1733.360 | 2752.920 | 2 | | .000 | .000 | .000 | 0 |

SKYE CANYON PHASE 3
 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (SOUTH STORM DRAIN)
 6'W x 5'H EX RCB DISCHARGING TO NATURAL WASH (PROP CONDITION)

| ***** | | | | | | | | | | | | | | | ***** | | | | | | | | | | | | | | |
|------------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-------|----------------|---------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip | | | | | | | | | | | | | | | |
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch | | | | | | | | | | | | | | | |
| ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | ***** | | | | | | | | | | | | | | | |
| 1017.000 | 2749.180 | 2.034 | 2751.214 | 125.00 | 10.24 | 1.63 | 2752.84 | 1.30 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 25.500 | .0051 | | | | | .0064 | .16 | 3.34 | 1.27 | 2.18 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1042.500 | 2749.310 | 1.983 | 2751.293 | 125.00 | 10.51 | 1.71 | 2753.01 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 14.975 | .0083 | | | | | .0065 | .10 | 1.98 | 1.32 | 1.84 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1057.475 | 2749.434 | 2.022 | 2751.457 | 125.00 | 10.30 | 1.65 | 2753.10 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 21.520 | .0083 | | | | | .0059 | .13 | 2.02 | 1.28 | 1.84 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1078.995 | 2749.613 | 2.121 | 2751.734 | 125.00 | 9.82 | 1.50 | 2753.23 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 10.505 | .0083 | | | | | .0052 | .05 | 2.12 | 1.19 | 1.84 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1089.500 | 2749.700 | 2.225 | 2751.925 | 125.00 | 9.37 | 1.36 | 2753.29 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 35.484 | .0050 | | | | | .0047 | .17 | 2.22 | 1.11 | 2.21 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1124.984 | 2749.876 | 2.268 | 2752.144 | 125.00 | 9.18 | 1.31 | 2753.45 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 12.975 | .0050 | | | | | .0043 | .06 | 2.27 | 1.07 | 2.21 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1137.960 | 2749.940 | 2.380 | 2752.320 | 125.00 | 8.75 | 1.19 | 2753.51 | .00 | 2.38 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| JUNCT STR | .0000 | | | | | .0024 | .00 | 2.38 | 1.00 | | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1137.960 | 2749.940 | 2.826 | 2752.766 | 121.00 | 7.14 | .79 | 2753.56 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 21.150 | .0050 | | | | | .0024 | .05 | 2.83 | .75 | 2.15 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| 1159.110 | 2750.046 | 2.695 | 2752.740 | 121.00 | 7.48 | .87 | 2753.61 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 | | | | | | | | | | | | | | | |
| 18.015 | .0050 | | | | | .0027 | .05 | 2.69 | .80 | 2.15 | .013 | .00 | .00 | BOX | | | | | | | | | | | | | | | |
| % FILE: PROP.WSW | | | | | | | | | | | | | | | W S P G W - CIVILDESIGN Version 14.06 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | PAGE | | | | | | | | | | | | | | |

SKYE CANYON PHASE 3
 STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (SOUTH STORM DRAIN)
 6'W x 5'H EX RCB DISCHARGING TO NATURAL WASH (PROP CONDITION)

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|----------------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1177.125 | 2750.136 | 2.569 | 2752.705 | 121.00 | 7.85 | .96 | 2753.66 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |
| 6.653 | .0050 | | | | | .0031 | .02 | 2.57 | .86 | 2.15 | .013 | .00 | .00 | BOX |
| 1183.778 | 2750.169 | 2.520 | 2752.689 | 121.00 | 8.00 | .99 | 2753.68 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |
| 1183.778 | 2750.169 | 2.147 | 2752.316 | 121.00 | 9.39 | 1.37 | 2753.69 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |
| 467.752 | .0050 | | | | | .0050 | 2.34 | 2.15 | 1.13 | 2.15 | .013 | .00 | .00 | BOX |
| 1651.530 | 2752.510 | 2.147 | 2754.657 | 121.00 | 9.39 | 1.37 | 2756.03 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |
| 70.470 | .0050 | | | | | .0048 | .34 | 2.15 | 1.13 | 2.15 | .013 | .00 | .00 | BOX |
| 1722.000 | 2752.863 | 2.220 | 2755.083 | 121.00 | 9.09 | 1.28 | 2756.36 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |
| 11.360 | .0050 | | | | | .0043 | .05 | 2.22 | 1.07 | 2.15 | .013 | .00 | .00 | BOX |
| 1733.360 | 2752.920 | 2.329 | 2755.249 | 121.00 | 8.66 | 1.16 | 2756.41 | .00 | 2.33 | 6.00 | 5.000 | 6.000 | .00 | 0 .0 |

SKYE CANYON PHASE 3

STORM DRAIN SYSTEM AT GRAND CANYON LOW POINT (SOUTH STORM DRAIN)

6'W x 5'H EX RCB DISCHARGING TO NATURAL WASH (PROP CONDITION)

1017.00 .I W C S E H . R
 1031.62 .
 1046.24 . I W C E H . R

| | | | | PROP | | |
|---------|---|---|-----|------|---|------|
| 1060.86 | . | I | W C | E | H | . R |
| 1075.48 | . | | | | | . |
| 1090.10 | . | I | W C | E | H | . R |
| 1104.72 | . | I | W C | E | H | . R |
| 1119.34 | . | | | | | . |
| 1133.96 | . | I | W C | E | H | . R |
| 1148.58 | . | I | W | E | H | . JX |
| 1163.20 | . | I | C W | E | H | . R |
| 1177.82 | . | I | C W | E | H | . R |
| 1192.44 | . | I | C W | E | H | . R |
| 1207.05 | . | I | C W | E | H | . R |
| 1221.67 | . | I | W C | E | H | . R |
| 1236.29 | . | | | | | . |
| 1250.91 | . | | | | | . |
| 1265.53 | . | | | | | . |
| 1280.15 | . | | | | | . |
| 1294.77 | . | | | | | . |
| 1309.39 | . | | | | | . |
| 1324.01 | . | | | | | . |
| 1338.63 | . | | | | | . |
| 1353.25 | . | | | | | . |
| 1367.87 | . | | | | | . |
| 1382.49 | . | | | | | . |
| 1397.11 | . | | | | | . |
| 1411.73 | . | | | | | . |
| 1426.35 | . | | | | | . |
| 1440.97 | . | | | | | . |
| 1455.59 | . | | | | | . |
| 1470.21 | . | | | | | . |
| 1484.83 | . | | | | | . |
| 1499.45 | . | | | | | . |
| 1514.07 | . | | | | | . |
| 1528.69 | . | | | | | . |
| 1543.31 | . | | | | | . |
| 1557.92 | . | | | | | . |

2749.180 2750.054 2750.928 2751.802 2752.676 2753.550 2754.424 2755.298 2756.172 2757.046 2757.920

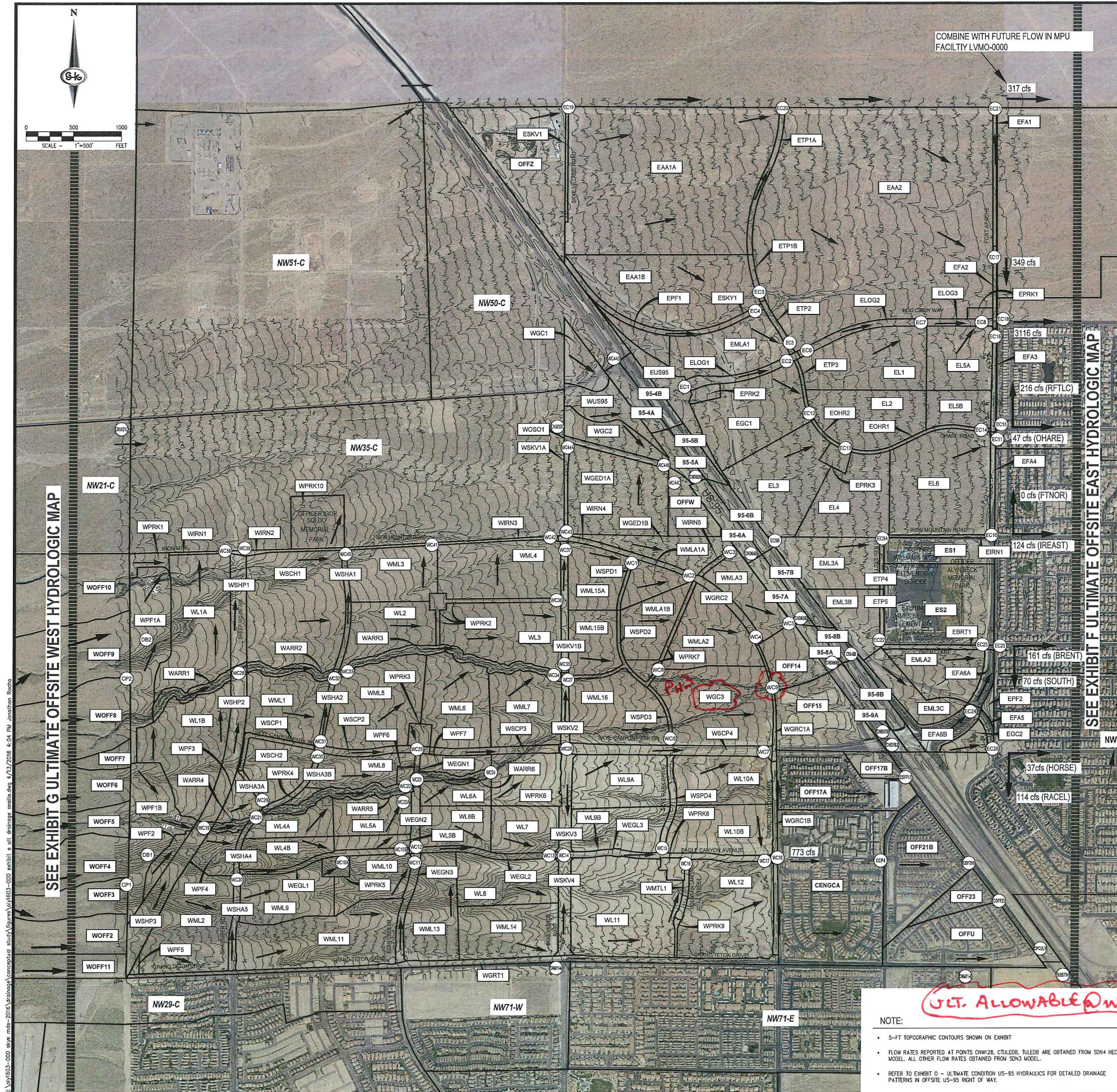
1. GLOSSARY

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

APPENDIX H

Reference Material

Master Drainage Study Update #3 for Skye Canyon
by SHG



| Ultimate Condition Flow Rate Summary
Sky Canyon East Basins | | | | |
|--|-----------|-----------------------|-----------------------|------------------------|
| Basin/Concentration Point ID | Area (ac) | Q ₁₀ (cfs) | Q ₅₀ (cfs) | Q ₁₀₀ (cfs) |
| WARR1 | 0.2 | 1 | 1 | 1 |
| WARR2 | 0.2 | 1 | 1 | 1 |
| WARR3 | 0.2 | 1 | 1 | 1 |
| WARR4 | 0.2 | 1 | 1 | 1 |
| WARR5 | 0.2 | 1 | 1 | 1 |
| WARR6 | 0.2 | 1 | 1 | 1 |
| WARR7 | 0.2 | 1 | 1 | 1 |
| WARR8 | 0.2 | 1 | 1 | 1 |
| WARR9 | 0.2 | 1 | 1 | 1 |
| WARR10 | 0.2 | 1 | 1 | 1 |
| WARR11 | 0.2 | 1 | 1 | 1 |
| WARR12 | 0.2 | 1 | 1 | 1 |
| WARR13 | 0.2 | 1 | 1 | 1 |
| WARR14 | 0.2 | 1 | 1 | 1 |
| WARR15 | 0.2 | 1 | 1 | 1 |
| WARR16 | 0.2 | 1 | 1 | 1 |
| WARR17 | 0.2 | 1 | 1 | 1 |
| WARR18 | 0.2 | 1 | 1 | 1 |
| WARR19 | 0.2 | 1 | 1 | 1 |
| WARR20 | 0.2 | 1 | 1 | 1 |
| WARR21 | 0.2 | 1 | 1 | 1 |
| WARR22 | 0.2 | 1 | 1 | 1 |
| WARR23 | 0.2 | 1 | 1 | 1 |
| WARR24 | 0.2 | 1 | 1 | 1 |
| WARR25 | 0.2 | 1 | 1 | 1 |
| WARR26 | 0.2 | 1 | 1 | 1 |
| WARR27 | 0.2 | 1 | 1 | 1 |
| WARR28 | 0.2 | 1 | 1 | 1 |
| WARR29 | 0.2 | 1 | 1 | 1 |
| WARR30 | 0.2 | 1 | 1 | 1 |
| WARR31 | 0.2 | 1 | 1 | 1 |
| WARR32 | 0.2 | 1 | 1 | 1 |
| WARR33 | 0.2 | 1 | 1 | 1 |
| WARR34 | 0.2 | 1 | 1 | 1 |
| WARR35 | 0.2 | 1 | 1 | 1 |
| WARR36 | 0.2 | 1 | 1 | 1 |
| WARR37 | 0.2 | 1 | 1 | 1 |
| WARR38 | 0.2 | 1 | 1 | 1 |
| WARR39 | 0.2 | 1 | 1 | 1 |
| WARR40 | 0.2 | 1 | 1 | 1 |
| WARR41 | 0.2 | 1 | 1 | 1 |
| WARR42 | 0.2 | 1 | 1 | 1 |
| WARR43 | 0.2 | 1 | 1 | 1 |
| WARR44 | 0.2 | 1 | 1 | 1 |
| WARR45 | 0.2 | 1 | 1 | 1 |
| WARR46 | 0.2 | 1 | 1 | 1 |
| WARR47 | 0.2 | 1 | 1 | 1 |
| WARR48 | 0.2 | 1 | 1 | 1 |
| WARR49 | 0.2 | 1 | 1 | 1 |
| WARR50 | 0.2 | 1 | 1 | 1 |
| WARR51 | 0.2 | 1 | 1 | 1 |
| WARR52 | 0.2 | 1 | 1 | 1 |
| WARR53 | 0.2 | 1 | 1 | 1 |
| WARR54 | 0.2 | 1 | 1 | 1 |
| WARR55 | 0.2 | 1 | 1 | 1 |
| WARR56 | 0.2 | 1 | 1 | 1 |
| WARR57 | 0.2 | 1 | 1 | 1 |
| WARR58 | 0.2 | 1 | 1 | 1 |
| WARR59 | 0.2 | 1 | 1 | 1 |
| WARR60 | 0.2 | 1 | 1 | 1 |
| WARR61 | 0.2 | 1 | 1 | 1 |
| WARR62 | 0.2 | 1 | 1 | 1 |
| WARR63 | 0.2 | 1 | 1 | 1 |
| WARR64 | 0.2 | 1 | 1 | 1 |
| WARR65 | 0.2 | 1 | 1 | 1 |
| WARR66 | 0.2 | 1 | 1 | 1 |
| WARR67 | 0.2 | 1 | 1 | 1 |
| WARR68 | 0.2 | 1 | 1 | 1 |
| WARR69 | 0.2 | 1 | 1 | 1 |
| WARR70 | 0.2 | 1 | 1 | 1 |
| WARR71 | 0.2 | 1 | 1 | 1 |
| WARR72 | 0.2 | 1 | 1 | 1 |
| WARR73 | 0.2 | 1 | 1 | 1 |
| WARR74 | 0.2 | 1 | 1 | 1 |
| WARR75 | 0.2 | 1 | 1 | 1 |
| WARR76 | 0.2 | 1 | 1 | 1 |
| WARR77 | 0.2 | 1 | 1 | 1 |
| WARR78 | 0.2 | 1 | 1 | 1 |
| WARR79 | 0.2 | 1 | 1 | 1 |
| WARR80 | 0.2 | 1 | 1 | 1 |
| WARR81 | 0.2 | 1 | 1 | 1 |
| WARR82 | 0.2 | 1 | 1 | 1 |
| WARR83 | 0.2 | 1 | 1 | 1 |
| WARR84 | 0.2 | 1 | 1 | 1 |
| WARR85 | 0.2 | 1 | 1 | 1 |
| WARR86 | 0.2 | 1 | 1 | 1 |
| WARR87 | 0.2 | 1 | 1 | 1 |
| WARR88 | 0.2 | 1 | 1 | 1 |
| WARR89 | 0.2 | 1 | 1 | 1 |
| WARR90 | 0.2 | 1 | 1 | 1 |
| WARR91 | 0.2 | 1 | 1 | 1 |
| WARR92 | 0.2 | 1 | 1 | 1 |
| WARR93 | 0.2 | 1 | 1 | 1 |
| WARR94 | 0.2 | 1 | 1 | 1 |
| WARR95 | 0.2 | 1 | 1 | 1 |
| WARR96 | 0.2 | 1 | 1 | 1 |
| WARR97 | 0.2 | 1 | 1 | 1 |
| WARR98 | 0.2 | 1 | 1 | 1 |
| WARR99 | 0.2 | 1 | 1 | 1 |
| WARR100 | 0.2 | 1 | 1 | 1 |

| Ultimate Condition Flow Rate Summary
Sky Canyon East Diversions | | | | |
|--|-----------------------|-----------------------|------------------------|-------------|
| Diversions ID | Q ₁₀ (cfs) | Q ₅₀ (cfs) | Q ₁₀₀ (cfs) | Diversed To |
| DB-OFF | 0 | 0 | 0 | CULEDB |
| TULEDB | 0 | 0 | 0 | CULEDB |
| RFTLC | 0 | 0 | 0 | CULEDB |
| OHARE | 0 | 0 | 0 | CULEDB |
| FTNOR | 0 | 0 | 0 | CULEDB |
| IREAST | 0 | 0 | 0 | CULEDB |
| BRENT | 0 | 0 | 0 | CULEDB |
| SOUTH | 0 | 0 | 0 | CULEDB |
| HORSE | 0 | 0 | 0 | CULEDB |
| RACEL | 0 | 0 | 0 | CULEDB |

| Ultimate Condition Flow Rate Summary
Sky Canyon East Concentration Points | | | | |
|--|-----------|-----------------------|-----------------------|------------------------|
| Basin/Concentration Point ID | Area (ac) | Q ₁₀ (cfs) | Q ₅₀ (cfs) | Q ₁₀₀ (cfs) |
| WARR1 | 0.2 | 1 | 1 | 1 |
| WARR2 | 0.2 | 1 | 1 | 1 |
| WARR3 | 0.2 | 1 | 1 | 1 |
| WARR4 | 0.2 | 1 | 1 | 1 |
| WARR5 | 0.2 | 1 | 1 | 1 |
| WARR6 | 0.2 | 1 | 1 | 1 |
| WARR7 | 0.2 | 1 | 1 | 1 |
| WARR8 | 0.2 | 1 | 1 | 1 |
| WARR9 | 0.2 | 1 | 1 | 1 |
| WARR10 | 0.2 | 1 | 1 | 1 |
| WARR11 | 0.2 | 1 | 1 | 1 |
| WARR12 | 0.2 | 1 | 1 | 1 |
| WARR13 | 0.2 | 1 | 1 | 1 |
| WARR14 | 0.2 | 1 | 1 | 1 |
| WARR15 | 0.2 | 1 | 1 | 1 |
| WARR16 | 0.2 | 1 | 1 | 1 |
| WARR17 | 0.2 | 1 | 1 | 1 |
| WARR18 | 0.2 | 1 | 1 | 1 |
| WARR19 | 0.2 | 1 | 1 | 1 |
| WARR20 | 0.2 | 1 | 1 | 1 |
| WARR21 | 0.2 | 1 | 1 | 1 |
| WARR22 | 0.2 | 1 | 1 | 1 |
| WARR23 | 0.2 | 1 | 1 | 1 |
| WARR24 | 0.2 | 1 | 1 | 1 |
| WARR25 | 0.2 | 1 | 1 | 1 |
| WARR26 | 0.2 | 1 | 1 | 1 |
| WARR27 | 0.2 | 1 | 1 | 1 |
| WARR28 | 0.2 | 1 | 1 | 1 |
| WARR29 | 0.2 | 1 | 1 | 1 |
| WARR30 | 0.2 | 1 | 1 | 1 |
| WARR31 | 0.2 | 1 | 1 | 1 |
| WARR32 | 0.2 | 1 | 1 | 1 |
| WARR33 | 0.2 | 1 | 1 | 1 |
| WARR34 | 0.2 | 1 | 1 | 1 |
| WARR35 | 0.2 | 1 | 1 | 1 |
| WARR36 | 0.2 | 1 | 1 | 1 |
| WARR37 | 0.2 | 1 | 1 | 1 |
| WARR38 | 0.2 | 1 | 1 | 1 |
| WARR39 | 0.2 | 1 | 1 | 1 |
| WARR40 | 0.2 | 1 | 1 | 1 |
| WARR41 | 0.2 | 1 | 1 | 1 |
| WARR42 | 0.2 | 1 | 1 | 1 |
| WARR43 | 0.2 | 1 | 1 | 1 |
| WARR44 | 0.2 | 1 | 1 | 1 |
| WARR45 | 0.2 | 1 | 1 | 1 |
| WARR46 | 0.2 | 1 | 1 | 1 |
| WARR47 | 0.2 | 1 | 1 | 1 |
| WARR48 | 0.2 | 1 | 1 | 1 |
| WARR49 | 0.2 | 1 | 1 | 1 |
| WARR50 | 0.2 | 1 | 1 | 1 |
| WARR51 | 0.2 | 1 | 1 | 1 |
| WARR52 | 0.2 | 1 | 1 | 1 |
| WARR53 | 0.2 | 1 | 1 | 1 |
| WARR54 | 0.2 | 1 | 1 | 1 |
| WARR55 | 0.2 | 1 | 1 | 1 |
| WARR56 | 0.2 | 1 | 1 | 1 |
| WARR57 | 0.2 | 1 | 1 | 1 |
| WARR58 | 0.2 | 1 | 1 | 1 |
| WARR59 | 0.2 | 1 | 1 | 1 |
| WARR60 | 0.2 | 1 | 1 | 1 |
| WARR61 | 0.2 | 1 | 1 | 1 |
| WARR62 | 0.2 | 1 | 1 | 1 |
| WARR63 | 0.2 | 1 | 1 | 1 |
| WARR64 | 0.2 | 1 | 1 | 1 |
| WARR65 | 0.2 | 1 | 1 | 1 |
| WARR66 | 0.2 | 1 | 1 | 1 |
| WARR67 | 0.2 | 1 | 1 | 1 |
| WARR68 | 0.2 | 1 | 1 | 1 |
| WARR69 | 0.2 | 1 | 1 | 1 |
| WARR70 | 0.2 | 1 | 1 | 1 |
| WARR71 | 0.2 | 1 | 1 | 1 |
| WARR72 | 0.2 | 1 | 1 | 1 |
| WARR73 | 0.2 | 1 | 1 | 1 |
| WARR74 | 0.2 | 1 | 1 | 1 |
| WARR75 | 0.2 | 1 | 1 | 1 |
| WARR76 | 0.2 | 1 | 1 | 1 |
| WARR77 | 0.2 | 1 | 1 | 1 |
| WARR78 | 0.2 | 1 | 1 | 1 |
| WARR79 | 0.2 | 1 | 1 | 1 |
| WARR80 | 0.2 | 1 | 1 | 1 |
| WARR81 | 0.2 | 1 | 1 | 1 |
| WARR82 | 0.2 | 1 | 1 | 1 |
| WARR83 | 0.2 | 1 | 1 | 1 |
| WARR84 | 0.2 | 1 | 1 | 1 |
| WARR85 | 0.2 | 1 | 1 | 1 |
| WARR86 | 0.2 | 1 | 1 | 1 |
| WARR87 | 0.2 | 1 | 1 | 1 |
| WARR88 | 0.2 | 1 | 1 | 1 |
| WARR89 | 0.2 | 1 | 1 | 1 |
| WARR90 | 0.2 | 1 | 1 | 1 |
| WARR91 | 0.2 | 1 | 1 | 1 |
| WARR92 | 0.2 | 1 | 1 | 1 |
| WARR93 | 0.2 | 1 | 1 | 1 |
| WARR94 | 0.2 | 1 | 1 | 1 |
| WARR95 | 0.2 | 1 | 1 | 1 |
| WARR96 | 0.2 | 1 | 1 | 1 |
| WARR97 | 0.2 | 1 | 1 | 1 |
| WARR98 | 0.2 | 1 | 1 | 1 |
| WARR99 | 0.2 | 1 | 1 | 1 |
| WARR100 | 0.2 | 1 | 1 | 1 |

SLATER
HANIFAN
GROUP

CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5309

DATE: APRIL 2016

DRAWN: JSR

CHECKED: SMJ

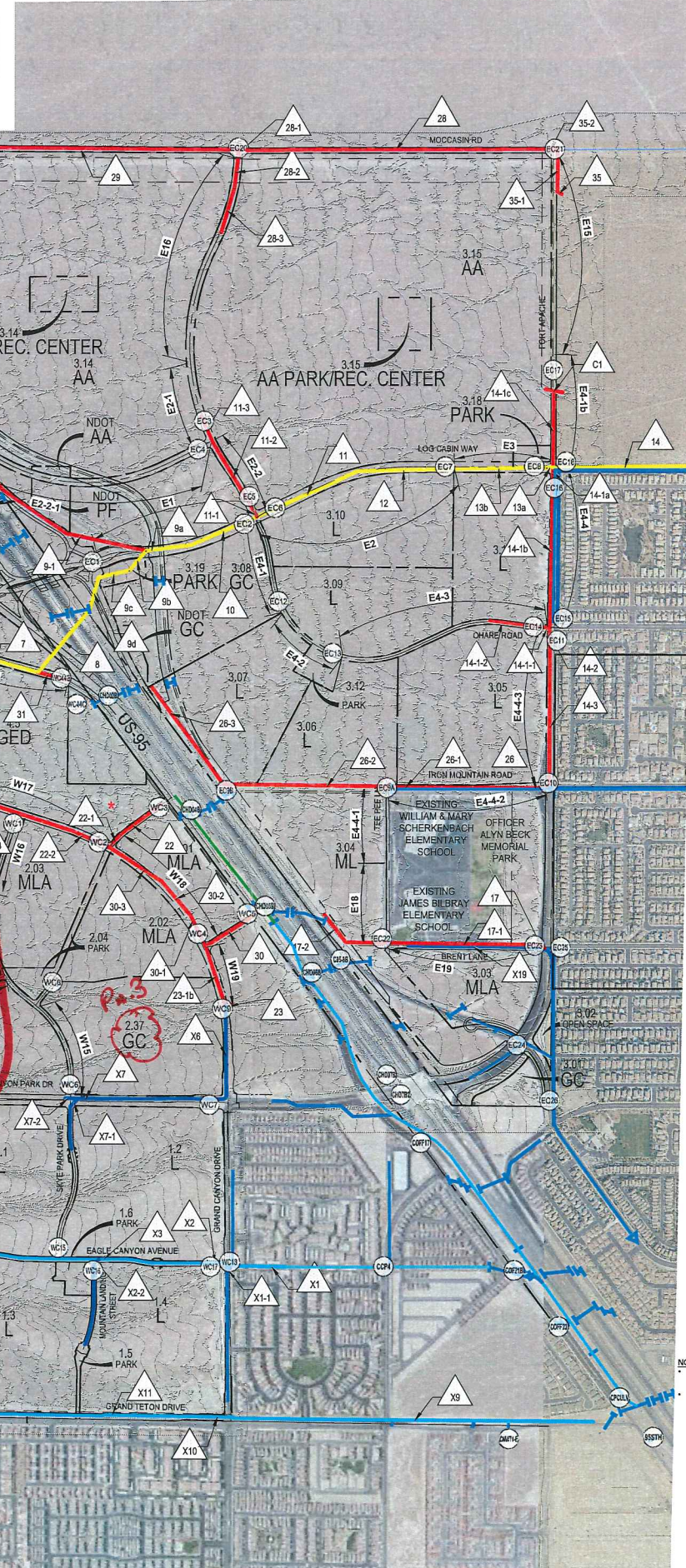
PROJECT NO.
OLY1603.000

EXHIBIT E

SHEET 1 OF 1

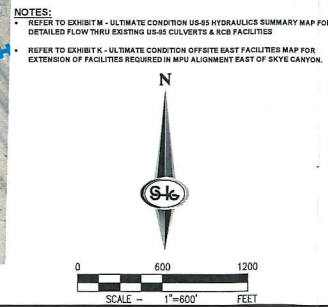
| FACILITY HYDRAULICS SUMMARY TABLE | | | | | |
|-----------------------------------|---------------------|-------------|---------------|------------------|----------|
| NETWORK | STREET ID | FACILITY ID | FACILITY TYPE | DESIGN FLOW RATE | COMMENTS |
| EX. SD | RCB | X1 | 8" x 8' RCB | 880 CFS | 787 CFS |
| EX. SD | GRAND CANYON | X1-1 | 48" RCP | 108 CFS | 84 CFS |
| EX. SD | EAGLE CANYON | X2 | 8" x 8' RCB | 728 CFS | 895 CFS |
| EX. SD | MOUNTAIN LANDING | X2-2 | 48" RCP | 110 CFS | 108 CFS |
| EX. SD | EAGLE CANYON | X3 | 72" RCP | 728 CFS | 895 CFS |
| EX. SD | SKYE VILLAGE | X4-1 | 42" RCP | 117 CFS | 140 CFS |
| EX. SD | EAGLE CANYON | X4-2 | 72" RCP | 477 CFS | 485 CFS |
| EX. SD | EAGLE CANYON | X5 | 48" RCP | 218 CFS | 280 CFS |
| EX. SD | EAGLE CREST | X3-2 | 42" RCP | 30 CFS | 30 CFS |
| EX. SD | GRAND CANYON DRIVE | X6 | 8" x 8' RCB | 197 CFS | 197 CFS |
| EX. SD | HORSE | X7 | 42" RCP | 92 CFS | 92 CFS |
| EX. SD | SKYE PARK | X7-1 | 36" RCP | 47 CFS | 47 CFS |
| EX. SD | HORSE | X7-2 | 36" RCP | 6 CFS | 6 CFS |
| EX. SD | SKY VILLAGE RD | X8 | 8" x 8' RCB | 387 CFS | 412 CFS |
| EX. SD | SKY VILLAGE RD | X8a | 60" RCP | 334 CFS | 412 CFS |
| EX. SD | SKYE VILLAGE | X8b | 42" RCP | 42 CFS | 6 CFS |
| EX. SD | GRAND TETON | X9 | 10" x 8' RCB | 895 CFS | 895 CFS |
| EX. SD | GRAND TETON | X10 | 10" x 8' RCB | 895 CFS | 895 CFS |
| EX. SD | GRAND TETON | X11 | 8" x 8' RCB | 845 CFS | 845 CFS |
| EX. SD | GRAND TETON | X12 | 8" x 8' RCB | 334 CFS | 334 CFS |
| EX. SD | GRAND TETON | X13 | 8" x 8' RCB | 484 CFS | 484 CFS |
| EX. SD | GRAND TETON | X14 | 8" x 8' RCB | 484 CFS | 484 CFS |
| EX. SD | GRAND TETON | X15 | 8" x 8' RCB | 488 CFS | 488 CFS |
| EX. SD | GRAND TETON | X16 | 8" x 8' RCB | 383 CFS | 383 CFS |
| EX. SD | SHAMBER | X17 | 36" RCP | 56 CFS | 56 CFS |
| EX. SD | EAGLE CANYON | X18 | 48" RCP | 128 CFS | 39 CFS |
| EX. SD | DB1 DISCHARGE | X23 | 60" RCP | 71 CFS | 71 CFS |
| EX. SD | CONCRETE TRAP CHNL. | X25 | 12" CMP | 471 CFS | 471 CFS |
| ARROYO WASH | EX. ARROYO WASH | XW1 | NATURAL WASH | 120 CFS | 120 CFS |
| ARROYO WASH | EX. ARROYO WASH | XW2 | NATURAL WASH | 404 CFS | 404 CFS |
| ARROYO WASH | EX. ARROYO WASH | XW3 | NATURAL WASH | 94 CFS | 94 CFS |
| ARROYO WASH | EX. ARROYO WASH | XW4 | NATURAL WASH | 308 CFS | 308 CFS |
| ARROYO WASH | EX. ARROYO WASH | XW5 | NATURAL WASH | 385 CFS | 385 CFS |

| DETENTION BASIN HYDRAULICS SUMMARY TABLE | | | | | |
|--|---------|---------|----------------|----------------|---------------|
| FACILITY ID | INFLOW | OUTFLOW | 100-YR STORAGE | DEBRIS STORAGE | TOTAL STORAGE |
| DB1 | 784 CFS | 71 CFS | 57 AC-FT | 6 AC-FT | 63 AC-FT |
| DB2 | 768 CFS | 57 CFS | 72 AC-FT | 6 AC-FT | 78 AC-FT |
| DB | 471 CFS | 471 CFS | 0 AC-FT | 0 AC-FT | 0 AC-FT |



| FACILITY HYDRAULICS SUMMARY TABLE | | | | | |
|-----------------------------------|---------------------------------|-------------|--------------------|--------|-------|
| NETWORK | STREET ID | FACILITY ID | FACILITY TYPE | LENGTH | SLOPE |
| WEST SD | DB2 OUTLET | 0 | 36" RCP | 214' | 2.0% |
| WEST SD | W1 | 1 | 30" RCP | 1939' | 2.5% |
| WEST SD | W2 | 2 | 30" RCP | 1236' | 5.0% |
| WEST SD | INFLOW FROM SHEEP MOUNTAIN CHNL | 2-1 | 18" RCP | 66' | 4.4% |
| WEST SD | W3 | 3 | 42" RCP | 1161' | 3.2% |
| WEST SD | W3-1 | 3-1 | 36" RCP | 191' | 3.0% |
| WEST SD | W3-2 | 3-2 | 30" RCP | 897' | 1.7% |
| WEST SD | W4 | 4 | 36" RCP | 1007' | 4.5% |
| WEST SD | W4 | 4b | 48" RCP | 1550' | 4.0% |
| WEST SD | W5 | 5 | 12" x 8' RCB | 931' | 1.0% |
| WEST SD | ARROYO WASH INFLOW | 5-1-1 | 8" x 8' RCB | 31' | 14.8% |
| WEST SD | W5-4 | 5-1a | 8" x 8' RCB | 109' | 8.8% |
| WEST SD | W5-4 | 5-1b | 8" x 8' RCB | 1654' | 0.0% |
| WEST SD | W5-3 | 5-2 | 8" x 8' RCB | 779' | 1.0% |
| WEST SD | W5-2 | 5-3a | 60" RCP | 79' | 3.0% |
| WEST SD | W5-2 | 5-3b | 60" RCP | 391' | 3.0% |
| WEST SD | CONVEYS FLOW TO SD 5-3a | 5-4a | 60" RCP | 451' | 3.0% |
| WEST SD | INFLOW FROM ARROYO WASH | 5-4b | 8" x 8' RCB | 50' | 2.8% |
| WEST SD | W6 | 6 | 12" x 8' RCB | 445' | 1.8% |
| WEST SD | W6 | 7 | 12" x 8' RCB | 722' | 2.0% |
| WEST SD | MPU FACILITY | 7-1 | 7" x 8' RCB | 359' | 5.0% |
| WEST SD | DISCHARGE TO ARROYO WASH | 20 | 48" RCP | 109' | 2.0% |
| WEST SD | W5-2-1 | 20-1 | 48" RCP | 140' | 2.0% |
| WEST SD | INFLOW FROM DB1 | 20-1-1 | 48" RCP | 135' | 2.2% |
| WEST SD | W5-2-1 | 20-2 | 36" RCP | 340' | 3.0% |
| WEST SD | W5-2-1 | 20-3 | 36" RCP | 193' | 3.5% |
| WEST SD | DISCHARGE TO ARROYO WASH | 21 | 48" RCP | 42' | 4.0% |
| WEST SD | W5-4-2 | 21-1 | 42" RCP | 109' | 2.5% |
| WEST SD | INFLOW FROM ARROYO WASH | 21-1b | 48" RCP | 88' | 3.4% |
| WEST SD | W5-4-2 | 21-2 | 36" RCP | 893' | 3.4% |
| WEST SD | W5-4-1 | 21-3 | 36" RCP | 105' | 1.3% |
| WEST SD | N/A | 22 | 7" x 8' RCB | 426' | 7.3% |
| WEST SD | N/A | 22-1 | 7" x 8' RCB | 146' | 2.3% |
| WEST SD | W17 | 22-2 | 8" x 8' RCB | 339' | 2.0% |
| WEST SD | W17 | 22-3 | 8" x 8' RCB | 1913' | 2.0% |
| WEST SD | W17 | 22-4 | 8" x 8' RCB | 382' | 2.8% |
| WEST SD | W19 OUTLET TO WASH | 23 | 36" RCP | 89' | 3.4% |
| WEST SD | W19 | 23-1b | 34" RCP | 829' | 1.7% |
| WEST SD | W19 | 23-2 | 42" RCP | 419' | 2.8% |
| WEST SD | W18 | 30-1 | 12" RCP | 287' | 1.2% |
| WEST SD | W18 | 30-2 | 54" RCP | 264' | 1.0% |
| WEST SD | W18 | 30-3 | 54" RCP | 527' | 1.4% |
| WEST SD | RCB | 31 | 8" x 8' RCB | 272' | 2.0% |
| WEST SD | DISCHARGE FROM SB | 50 | 12" x 8' RCB | 192' | 1.5% |
| WEST SD | DISCHARGE TO DB1 | 51 | 72" RCP | 1915' | 2.1% |
| WEST SD | ARROYO WASH CULVERT | 03 | 8" x 8' RCB | 164' | 6.1% |
| WEST SD | SHEEP MOUNTAIN CHNL | D3 | EARTHEN TRAP CHNL | 815' | 3.0% |
| WEST SD | SHEEP MOUNTAIN CHNL | D3-1 | EARTHEN TRAP CHNL | 1239' | 1.7% |
| WEST SD | SHEEP MOUNTAIN CHNL | D4 | EARTHEN TRAP CHNL | 534' | 4.5% |
| WEST SD | SHEEP MOUNTAIN CHNL | D4-1 | EARTHEN TRAP CHNL | 757' | 1.5% |
| WEST SD | SHEEP MOUNTAIN CHNL | D4-2 | EARTHEN TRAP CHNL | 891' | 1.0% |
| WEST SD | SHEEP MOUNTAIN CHNL | D5 | EARTHEN TRAP CHNL | 1232' | 1.2% |
| WEST SD | CHANNEL TO DB2 | D6 | CONCRETE TRAP CHNL | 723' | 3.0% |
| WEST SD | CHANNEL TO DB2 | D6-1 | EARTHEN TRAP CHNL | 451' | 8.0% |
| WEST SD | CHANNEL TO DB2 | D6-2 | EARTHEN TRAP CHNL | 145' | 1.4% |

| FACILITY HYDRAULICS SUMMARY TABLE | | | | | |
|-----------------------------------|----------------------|-------------|---------------|--------|-------|
| NETWORK | STREET ID | FACILITY ID | FACILITY TYPE | LENGTH | SLOPE |
| EAST SD | US-45 SD CROSSING | 8 | 12" x 8' RCB | 88' | 2.3% |
| EAST SD | US-45 | 8-1 | 60" RCP | 889' | 4.0% |
| EAST SD | US-45 | 8-2 | 60" RCP | 865' | 2.3% |
| EAST SD | US-45 | 8-3 | 60" RCP | 1191' | 1.3% |
| EAST SD | E1 | 9a | 12" x 8' RCB | 380' | 2.5% |
| EAST SD | US-45 SD CROSSING | 9b | 12" x 8' RCB | 229' | 2.0% |
| EAST SD | US-45 SD CROSSING | 9c | 12" x 8' RCB | 259' | 2.0% |
| EAST SD | US-45 SD CROSSING | 9d | 12" x 8' RCB | 282' | 2.3% |
| EAST SD | E1 | 10 | 12" x 8' RCB | 602' | 2.5% |
| EAST SD | E2 | 11 | 12" x 8' RCB | 928' | 2.9% |
| EAST SD | E2-2 | 11-1 | 36" RCP | 50' | 3.0% |
| EAST SD | E2-2 | 11-2 | 36" RCP | 880' | 1.2% |
| EAST SD | E2-1 | 11-3 | 36" RCP | 238' | 1.7% |
| EAST SD | E2 | 12 | 12" x 8' RCB | 784' | 2.5% |
| EAST SD | E3 | 13a | 14" x 7' RCB | 50' | 1.4% |
| EAST SD | E3 | 13b | 12" x 8' RCB | 889' | 2.9% |
| EAST SD | E4-1 | 14-1-1 | 42" RCP | 50' | 8.8% |
| EAST SD | E4-1 | 14-1-2 | 42" RCP | 487' | 5.0% |
| EAST SD | E4-1 | 14-1-3 | 42" RCP | 51' | 1.4% |
| EAST SD | E4-1 | 14-1-4 | 72" RCP | 1303' | 0.7% |
| EAST SD | E4-1b | 14-1b | 72" RCP | 629' | 2.0% |
| EAST SD | E4-3 | 14-2 | 48" RCP | 50' | 6.8% |
| EAST SD | E4-3 | 14-3 | 48" RCP | 1299' | 0.4% |
| EAST SD | E19 | 17 | 36" RCP | 50' | 3.0% |
| EAST SD | E19 | 17-1 | 6" x 8' RCB | 1632' | 3.5% |
| EAST SD | Parcel 3.04 | 17-2 | 48" RCP | 288' | 2.3% |
| EAST SD | E4-4-2 | 28 | 60" RCP | 209' | 2.8% |
| EAST SD | E4-4-2 | 28-1 | 60" RCP | 1180' | 2.6% |
| EAST SD | Parcel 3.08 | 28-2 | 60" RCP | 1355' | 2.6% |
| EAST SD | Parcel 3.07 | 28-3 | 60" RCP | 1018' | 2.5% |
| EAST SD | MPU FACILITY | 28 | N/A | N/A | N/A |
| EAST SD | E16 | 28-1 | 48" RCP | 50' | 6.0% |
| EAST SD | E16 | 28-2 | 48" RCP | 269' | 0.4% |
| EAST SD | E16 | 28-3 | 36" RCP | 391' | 1.0% |
| EAST SD | MPU FACILITY | 29 | N/A | 2652' | 3.1% |
| EAST SD | E17 | 29-1 | 60" RCP | 50' | 4.0% |
| EAST SD | E17 | 29-2 | 60" RCP | 647' | 0.6% |
| OFFSITE SD | LOG CABIN WAY | 14 | 14" x 7' RCB | 1591' | 2.2% |
| PROPOSED SD | CROSSING FORT APACHE | 35 | 60" RCP | 46' | 4.4% |
| PROPOSED SD | E15 | 35-1 | 60" RCP | 359' | 0.8% |
| PROPOSED SD | MOCCASIN CHNL INFLOW | 35-2 | 60" RCP | 120' | 3.3% |
| PROPOSED SD | E4-1b | C1 | 60" RCP | 147' | 2.0% |



- LEGEND**
- PROPOSED LOCAL FACILITIES
 - ONSITE CCRFCD REGIONAL FACILITIES
 - FUTURE CCRFCD REGIONAL FACILITIES (BY OTHERS)
 - FUTURE LOCAL FACILITIES
 - EXISTING CCRFCD REGIONAL FACILITIES
 - EXISTING LOCAL FACILITIES
 - OPEN CHANNEL FACILITIES
 - STREET SEGMENT ID

SLATER
HANIFAN
GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5090

OLYMPIA COMPANIES
SKYE CANYON - MASTER DRAINAGE STUDY
ULTIMATE CONDITION ONSITE DRAINAGE FACILITIES MAP
DATE: APRIL 2016
DRAFTER: ###
DESIGNER: ###
CHECKED: SMJ
PROJECT NO. OLY1603.000
SHEET 1 OF 1

EXHIBIT J

MASTER DRAINAGE STUDY (UPDATE #3)

Skye Canyon

City of Las Vegas, Nevada

Job No.: OLY1603.000

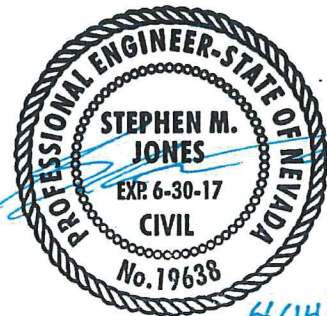
Date: April 2016

Prepared By:

Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:

KAG Property, LLC
c/o Olympia Companies
11411 Southern Highlands Parkway, Suite 300
Las Vegas, NV 89141
Phone: 702-220-6565 • Fax: 702-220-6566



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

Assisted By: Cameron Bencini, EI
Jonathan Rocha, EI
Adam Black, EI

263 PB 2.77
264 LS 0 84.0
265 UD 0.114
*

Prop3.OUT

266 KK WSKV1A
267 KM WEST BASIN, SKYE VILLAGE ROAD
268 BA .0021
269 PB 3.00
270 LS 0 98.0
271 UD 0.093
*

1

HEC-1 INPUT

PAGE 8

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

272 KK OFFG
273 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
274 BA .0397
275 PB 2.79
276 LS 0 86.5
277 UD 0.186
*

278 KK WC44A
279 KM COMBINE COFFF1, WPRK10, WSKV1A, OFFG
280 HC 4
*

281 KK WGC2
282 KM WEST BASIN, WEST OF US95
283 BA .0130
284 PB 2.93
285 LS 0 92.0
286 UD 0.107
*

287 KK WOS01
288 KM WEST BASIN, OSO BLANCA ROAD
289 BA .0034
290 PB 2.93
291 LS 0 98.0
292 UD 0.067
*

293 KK WGED1A
294 KM WEST BASIN, WEST OF US95
295 BA .0444
296 PB 2.93
297 LS 0 92.4
298 UD 0.133
*

299 KK WC44B
300 KM W OF OSO BLANCA/US95 INTERSECTION
301 KM COMBINE WGC2, WOS01, WGED1A
302 HC 3
*

303 KK VTN2I
304 HC 2
*

305 KK RVTN2I
306 DT RMPUS5
307 DI 0 200 2000
308 DQ 0 200 200
*

1

HEC-1 INPUT

PAGE 9

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

309 KK VTN2S
310 KM EXCESS CULVERT FLOW SPLIT TO CULVERT 4
311 KM RESULTING CULVERT 2 FLOW NOT EXCEED VTN MODEL 4
312 DT VTN2E
313 DI 0 150 300 450 600 750 900 1050 1100 1350
314 DI 1500
315 DQ 0 122 186 230 261 283 316 353 366 445
316 DQ 497
*

317 KK WOFF1
318 KM DISCHARGES INTO DETENTION BASIN "DB1"
319 PB 3.00
320 BA .4291
321 LS 0 86.1
322 UD 0.420
*

323 KK WOFF2
324 KM EXISTING OFFSITE DRAINAGE BASIN
325 KM DISCHARGES INTO DETENTION BASIN "DB1"
326 BA .0419
327 LS 0 84.0
328 UD 0.150
*

329 KK WOFF3
330 KM EXISTING OFFSITE DRAINAGE BASIN
331 KM DISCHARGES INTO DETENTION BASIN "DB1"
332 BA .0259
333 LS 0 86.2
334 UD 0.112
*

335 KK CP1
336 KM COMBINE WOFF1, WOFF2, AND WOFF3
337 HC 3
*

338 KK WOFF4
339 KM EXISTING OFFSITE DRAINAGE BASIN
340 KM DISCHARGES INTO DETENTION BASIN "DB1"
341 BA .0581
342 LS 0 86.2
343 UD 0.136
*

344 KK WOFF5
345 KM EXISTING OFFSITE DRAINAGE BASIN
346 KM DISCHARGES INTO DETENTION BASIN "DB1"
347 BA .2569
348 LS 0 86.5
349 UD 0.419
*

1

HEC-1 INPUT

PAGE 10

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

350 KK WOFF6
351 KM EXISTING OFFSITE DRAINAGE BASIN
352 KM DISCHARGES INTO DETENTION BASIN "DB1"
353 BA .0399

354 LS 0 86.2
355 UD 0.121
*

Prop3.OUT

356 KK WPF1B
357 KM WEST BASIN, WEST OF SHEEP MT ROAD
358 BA .0295
359 PB 3.00
360 LS 0 94.0
361 UD 0.077
*

← ACTUAL ONI DELINEATION FOR
DBI IMPROVEMENTS INSTEAD OF WPF1B

362 KK DB1
363 KM COMBINE CP1, WOFF4, WOFF5, WOFF6 AND WPF1B
364 HC 5
*

365 KK RDB1
366 KM OUTLET = 24" ORIFICE @ INVERT ELEVATION = 3013.8-FT
367 KO 1
368 RS 1 ELEV 3025.5
369 SA 4.68 5.56 5.74 5.92 6.10 7.01 7.46 8.36 9.32 10.68
370 SE 3025.5 3027 3028 3029 3030 3035 3037 3040 3043 3046
371 SQ 49.7 60.6 70.8 74.5 1436.0 3920.5 7138.3
372 SE 3025.5 3030 3035 3037 3040 3043 3046

373 KK WSHP3
374 KM WEST BASIN, SHEEP MT ROAD
375 BA .0163
376 PB 3.00
377 LS 0 88.0
378 UD 0.121
*

379 KK WPF2
380 KM WEST BASIN, WEST OF SHEEP MT
381 BA .0048
382 PB 3.00
383 LS 0 94.0
384 UD 0.074
*

385 KK WC19
386 KM FAR N OF GRAND TETON/SHEEP MT INTERSECTION
387 KM COMBINE DB1, WSHP3, WPF2
388 HC 3
*

1

HEC-1 INPUT

PAGE 11

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

389 KK WPF5
390 KM WEST BASIN, WEST OF SHAUMBER RD
391 BA .0006
392 PB 3.00
393 LS 0 86.0
394 UD 0.052
*

395 KK WML2
396 KM WEST BASIN, WEST OF SHAUMBER ROAD
397 BA .0428
398 PB 3.00
399 LS 0 93.5
400 UD 0.142
*

401 KK WSHA5
402 KM WEST BASIN, SHAUMBER ROAD
403 BA .0037
404 PB 3.00
405 LS 0 98.0
406 UD 0.086
*

407 KK WC20
408 KM S OF EAGLE CANYON/SHAUMBER INTERSECTION
409 KM COMBINE WPF5, WML2, WSHA5
410 HC 3
*

411 KK WARR4
412 KM WEST BASIN, WEST OF SHAUMBER ROAD
413 BA .0020
414 PB 3.00
415 LS 0 88.0
416 UD 0.100
*

417 KK WPF4
418 BA .0090
419 PB 3.00
420 LS 0 94.0
421 UD 0.087
*

422 KK WSHA4
423 BA .0022
424 PB 3.00
425 LS 0 98.0
426 UD 0.051
*

1

HEC-1 INPUT

PAGE 12

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

427 KK WC21
428 KM S OF SHAUMBER SPLIT INTERSECTION
429 HC 5
*

430 KK WL4A
431 KM WEST BASIN, WEST OF EGAN CREB DRIVE
432 BA .0125
433 PB 3.00
434 LS 0 92.0
435 UD 0.106
*

436 KK WL5A
437 KM WEST BASIN, WEST OF EGAN CREB DRIVE
438 BA .0170
439 PB 3.00
440 LS 0 92.0
441 UD 0.099
*

442 KK WL5B
443 BA .0059
444 PB 3.00
445 LS 0 92.0
446 UD 0.085
*

447 KK WC22A
448 HC 3
*
449 KK WPRK4
450 KM WEST BASIN, WEST OF EGAN CREB DRIVE
451 BA .0016
452 PB 3.00
453 LS 0 84.0
454 UD 0.067
*
455 KK WARR5
456 KM WEST BASIN, WEST OF EGAN CREB DRIVE
457 BA .0100
458 PB 3.00
459 LS 0 90.0
460 UD 0.100
*
461 KK WC22
462 KM FAR S OF SKYE CANYON PARK/EGAN CREB INTERSECTION
463 HC 4
*

Prop3.OUT

1

HEC-1 INPUT

PAGE 13

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

464 KK WML8
465 KM WEST BASIN, WEST OF EGAN CREB DRIVE
466 BA .0161
467 PB 3.00
468 LS 0 95.0
469 UD 0.093
*
470 KK WPF6
471 KM WEST BASIN, WEST OF EGAN CREB DRIVE
472 BA .0016
473 PB 3.00
474 LS 0 94.0
475 UD 0.050
*
476 KK WEGN1
477 KM WEST BASIN, EGAN CREB DRIVE
478 BA .0007
479 PB 3.00
480 LS 0 98.0
481 UD 0.050
*
482 KK WEGN2
483 KM WEST BASIN, EGAN CREB DRIVE
484 BA .0007
485 PB 3.00
486 LS 0 98.0
487 UD 0.050
*
488 KK WC23
489 KM FAR S OF SKYE CANYON PARK/EGAN CREB INTERSECTION
490 KM COMBINE WC22, WML8, WPF6, WEGN1, WEGN2
491 HC 5
*
492 KK WARR6
493 KM WEST BASIN, WEST OF SKYE VILLAGE ROAD
494 BA .0038
495 PB 3.00
496 LS 0 88.0
497 UD 0.100
*
498 KK WPF7
499 KM WEST BASIN, WEST OF SKYE VILLAGE ROAD
500 BA .0071
501 PB 3.00
502 LS 0 94.0
503 UD 0.097
*

1

HEC-1 INPUT

PAGE 14

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

504 KK WL6A
505 KM WEST BASIN, WEST OF SKYE VILLAGE ROAD
506 BA .0096
507 PB 3.00
508 LS 0 92.0
509 UD 0.092
*
510 KK WC24
511 KM FAR E OF SKYE CANYON PARK/EGAN CREB INTERSECTION
512 KM COMBINE WC23, WPF7, WARR6, WL6A
513 HC 4
*
514 KK WSCP2
515 KM WEST BASIN, SKYE CANYON PARK DRIVE
516 BA .0047
517 PB 3.00
518 LS 0 98.0
519 UD 0.063
*
520 KK WPRK3
521 KM WEST BASIN, WEST OF EGAN CREB DRIVE
522 BA .0028
523 PB 3.00
524 LS 0 84.0
525 UD 0.070
*
526 KK WC25
527 KM N OF SKYE CANYON PARK/EGAN CREB INTERSECTION
528 HC 2
*
529 KK WPRK6
530 KM WEST BASIN, WEST OF SKYE VILLAGE ROAD
531 BA .0207
532 PB 3.00
533 LS 0 84.0
534 UD 0.121
*
535 KK WSCP3
536 KM WEST BASIN, SKYE CANYON PARK DRIVE
537 BA .0055
538 PB 3.00
539 LS 0 98.0
540 UD 0.074
*

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

906 KK WGR2
907 KM WEST BASIN, GRAND CANYON DRIVE
908 BA .0041
909 PB 2.93
910 LS 0 98.0
911 UD 0.075

912 KK WC4
913 KM W OF IRON MT/US95 INTERSECTION
914 KM COMBINE WPRK7, WMLA1B, WMLA2, WGR2
915 HC 4

916 KK WMLA3
917 KM WEST BASIN, WEST OF US95
918 BA .0180
919 PB 2.93
920 LS 0 95.0
921 UD 0.104

922 KK WC5
923 KM W OF IRON MT/US95 INTERSECTION
924 HC 2

925 KK VTN5I
926 KM COMBINE WC5, VTN4S
927 KM ALL FLOW ROUTED INTO HORSE INTERCHANGE MPU FACILITY
928 HC 2

929 KK VTN5S
930 KM EXCESS CULVERT FLOW SPLIT TO CULVERT 6
931 KM RESULTING CULVERT 5 FLOW NOT EXCEED VTN MODEL 4
932 DT VTN5E
933 DI 0 170 340 510 680 850 1020 1190 1360 1372
934 DI 1700
935 DQ 0
936 DQ 807

937 KK WML16
938 KM WEST BASIN, WEST OF SKYE PARK DRIVE
939 BA .0346
940 PB 2.93
941 LS 0 95.0
942 UD 0.118

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

943 KK WSPD3
944 KM WEST BASIN, SKYE PARK DRIVE
945 BA .0014
946 PB 2.93
947 LS 0 98.0
948 UD 0.072

949 KK WC6
950 KM N OF SKYE CANYON PARK/SKYE PARK INTERSECTION
951 KM COMBINE WML16, WSPD3
952 HC 2

953 KK WL9A
954 KM WEST BASIN, WEST OF SKYE PARK DRIVE
955 BA .0284
956 PB 2.93
957 LS 0 92.0
958 UD 0.118

959 KK WL10A
960 KM WEST BASIN, WEST OF GRAND CANYON DRIVE
961 BA .0267
962 PB 2.93
963 LS 0 92.0
964 UD 0.125

965 KK WSCP4
966 KM WEST BASIN, SKYE CANYON PARK DRIVE
967 BA .0122
968 PB 2.93
969 LS 0 98.0
970 UD 0.103

971 KK WC7
972 KM W OF SKYE CANYON PARK/GRAND CANYON INTERSECTION
973 KM COMBINE WC6, WL9A, WL10A, WSCP4
974 HC 4

975 KK WGC3
976 KM WEST BASIN, WEST OF GRAND CANYON DRIVE
977 BA .0476
978 PB 2.93
979 LS 0 95.0
980 UD 0.099

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

981 KK WGR1A
982 KM WEST BASIN, GRAND CANYON DRIVE
983 BA .0020
984 PB 2.93
985 LS 0 98.0
986 UD 0.111

987 KK WML15B
988 KM WEST BASIN, WEST OF SKYE PARK DRIVE
989 BA .0175
990 PB 2.93
991 LS 0 95.0
992 UD 0.102

993 KK WSPD2
994 KM WEST BASIN, SKYE PARK DRIVE
995 BA .0012
996 PB 2.93

Precipitation Worksheet
Rainfall Data and Computations

Project: Skye Canyon Master Drainage Study
Date: 3/1/2016

| Data: | Reference |
|---|-------------|
| Project is located in: Township: <u>19 S.</u> Range: <u>60 E.</u> Section: <u>7</u> | APN Map |
| | Figure 513* |
| Rainfall Depth-Duration-Frequency 10-Year, 6-Hour: 1.3 inches | Figure 503* |
| Rainfall Depth-Duration-Frequency 100-Year, 6-Hour: 2.05 inches | Figure 506* |
| Precipitation Adjustment Ratios: | |
| 10-Year: 1.24 | Table 501* |
| 100-Year: 1.43 | Table 501* |
| Six Hour Depth Area Reduction Factors (DARF): | |
| Area (gross acres): 10.0 = 0.0156 square miles | Table 502* |
| DARF = 1.00 | |

Calculations:

$P_{10} = 1.61$ 10-Year Precipitation (in)
 $P_{100} = 2.93$ 100-Year Precipitation (in)
 $P_{10}/P_{100} = 0.55$ HEC-1 Multiple Ratio Value

PRECIP RELEVANT TO
PHASE 3 DEVELOPMENT AREA

Equations:

$$P = (\text{Rainfall}) * (\text{Precipitation Adjustment Ratio}) * (\text{Depth Area Reduction Factor})$$

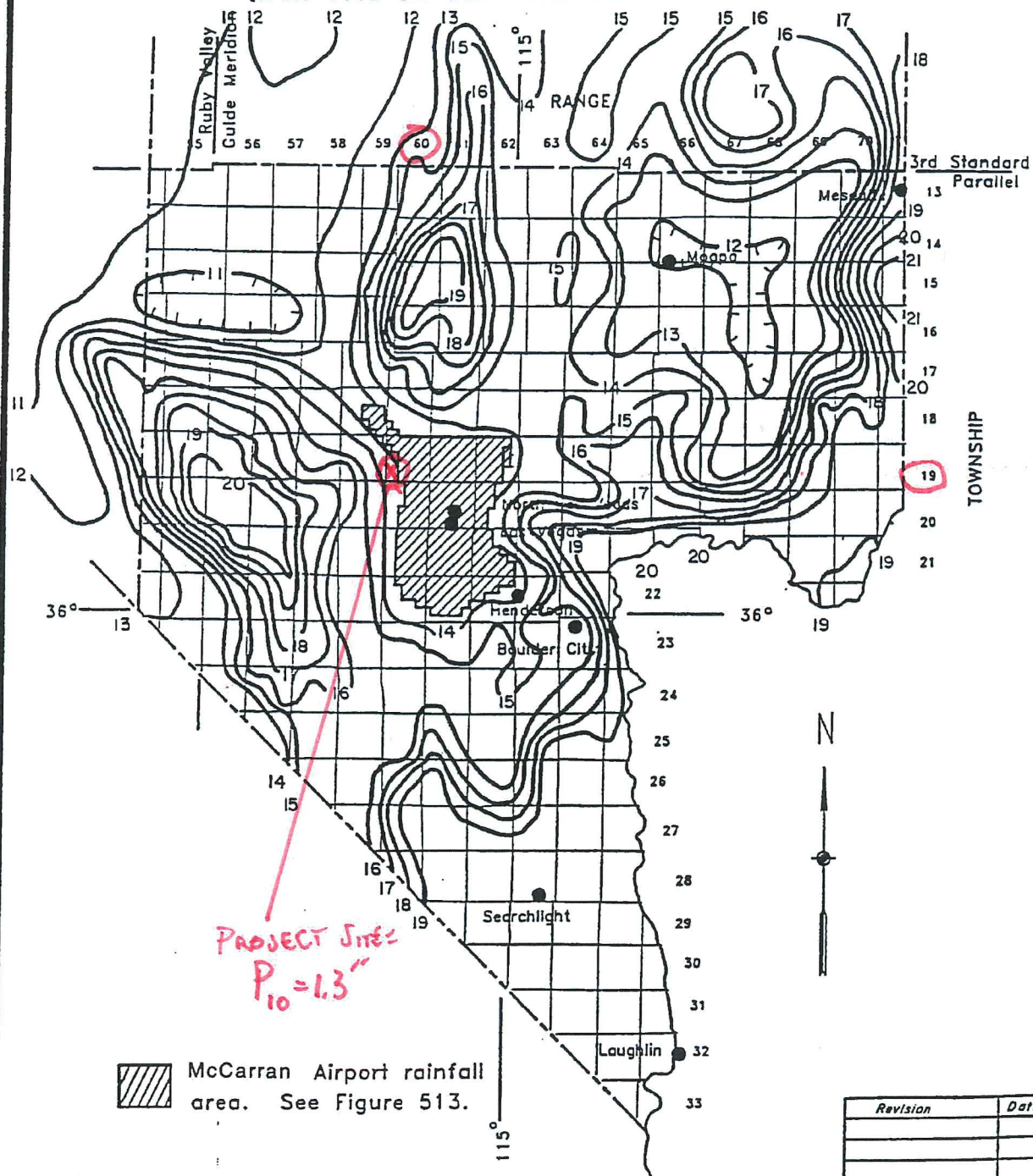
Comments:

Skye Canyon West Basins, East of Skye Village and South of Iron Mountain
 Skye Canyon East Basins, South of Iron Mountain

* Equations taken from the Clark County Regional Flood Control District - Hydrologic Criteria and Drainage Design Manual

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



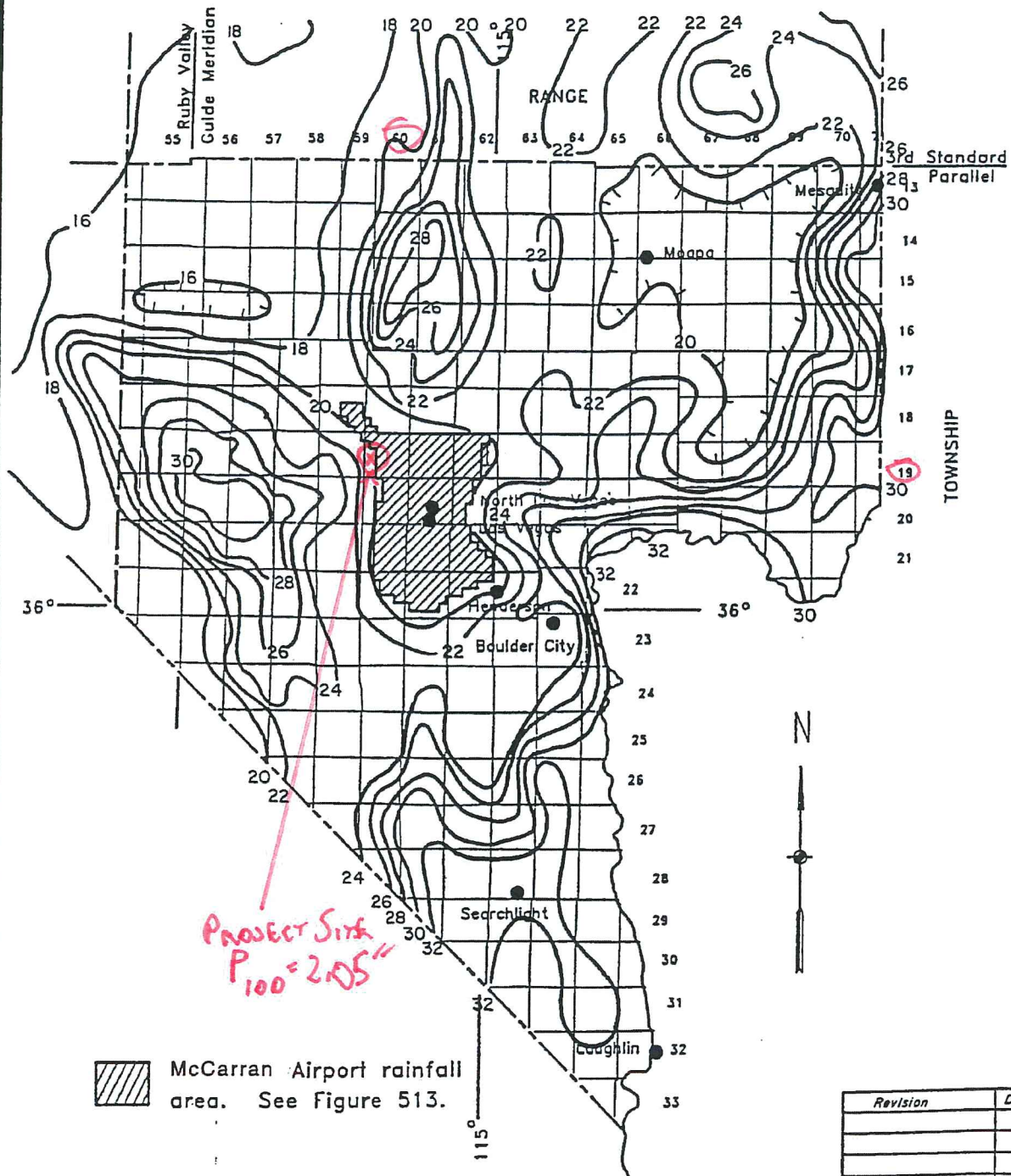
WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION ADJUSTMENT RATIOS

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

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

| <i>Revision</i> | <i>Date</i> |
|-----------------|-------------|
| | |
| | |
| | |
| | |

**WRC
ENGINEERING**

REFERENCE:
USACE, Los Angeles District, 1988

TABLE 501

APPENDIX I

Reference Material

Technical Drainage Study for Skye Canyon – Phase 1 Infrastructure
by SHG

| | | | |
|--|---|----------|---|
| CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM | | | DATE:
June 23, 2015 |
| TO:
Land Development Services
Department of Building & Safety | | | FROM:
Albert Sung, P.E.
Flood Control Project Engineer
Department of Public Works |
| SUBJECT:
Drainage Study for:
Skye Canyon – Phase 1 Infrastructure - Update #5
For Phasing a Stockpile Permit | | | COPIES TO:
Slater Hanifan Group |
| Cross Streets: | NEC of Grand Teton Blvd. & Hualapai Way | | K A G Development South, LLC /
Ninety-Five Management, LLC |
| File Number: | F:\Depot\DSMemos\DS4661J.doc | | Bart Anderson, P.E., DevCo |
| Parcel Number: | 125-07-301-001 & 125-07-301-002;
125-07-401-001 & 125-07-401-002 | | CCRFCD |
| Zoning Action: | TMP-53058 | | |
| FEMA Flood Zone | YES | NO | X |
| Proposed Storm Drain | YES | X | NO |

| HISTORY | DATE RECEIVED | DATE REVIEWED | COMMENTS | REVIEW FEES | FEES PAID
Payment Trn # |
|----------------------------|---------------|---------------|------------------------|-------------------|----------------------------|
| 1 st Submittal | 3/19/2014 | 4/17/2014 | Not Approved | \$400.00 | 351277: \$400 |
| 2 nd Submittal | 5/14/2014 | 6/12/2014 | Conditionally Approved | \$400.00 | 356797: \$400 |
| Supplemental | 8/25/2014 | 9/15/2014 | Approved | ---- | ---- |
| 3 rd Submittal | 11/25/2014 | 12/10/2014 | See Comments Below | \$100.00 | 377769: \$100 |
| 4 th Submittal | 12/10/2014 | 1/7/2015 | Approved | \$100.00 | 379537: \$100 |
| 5 th Submittal | 12/18/2014 | 1/8/2015 | Approved | \$100.00 | 380446: \$100 |
| 6 th Submittal | 3/5/2015 | 3/9/2015 | Approved | \$100.00 | 388162: \$100 |
| 7 th Submittal | 5/18/2015 | 6/2/2015 | Approved | \$100.00 | 397877: \$100 |
| 8 th Submittal | 6/8/2015 | 6/22/2015 | See Comments Below | \$100.00 | 400871: \$100 |
| TOTAL FEES (LDDRS): | | | | \$1,400.00 | ---- |

REMARKS:**8th Submittal: Update #5 for Phasing a Stockpile Permit**

7th Submittal: Update #4 for minor lateral profile revision in *Skye Canyon Parkway* at Sta. 95+28

6th Submittal: Update #3 for minor storm drain profile revision in *Skye Park Drive* at *Skye Canyon Drive* (aka Horse Drive)

5th Submittal: Update #2 for Stockpile Permit at additional locations

4th Submittal: Update for revision of storm drains alignment in *Grand Canyon Drive*, *Eagle Canyon Avenue*, *Mountain Landing Street* and *Hualapai Way*

3rd Submittal: Update for Stockpile Permit Only

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

| | |
|----------|--|
| X | 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. |

The following comments are repeated until they are complete:

1. The *Kyle Canyon Master Drainage Study* is proposing to revise the hydrology and facilities identified in the *Clark County Regional Flood Control District's (CCRFCD) 2008 Las Vegas Valley Flood Control Master Plan Update*. A *Master Plan Amendment (MPA)* must be submitted to the *City of Las Vegas* for approval. The *City of Las Vegas* will coordinate the MPA submittal to CCRFCD for approval. The Master Developer will be responsible for preparing all submittals needed for CCRFCD along with any and all presentations. The MPU must be approved by the *City of Las Vegas City Council* prior to the final approval of the *Master Drainage Study*.
2. For all culvert entrances or exits located outside of the Public Right-of-Way or dedicated "Public Drainage Easement to be Privately Maintained" must be recorded by separate document prior to the final acceptance of the improvement plans unless they are to be recorded by parcel or final map. Also, show the easement on the grading plan.
3. In an overview perspective for the proposed *Phase 1 Infrastructures, Racel Street* with its regional storm drain act as the sole perpetuation pathway for offsite flows during a major storm event in the interim condition (reference Sheets GR-01 & GR-02).

In a worst case scenario that the upstream culvert entrance is completely clogged, ie, the 100-year flow will be conveyed on the *Racel Street* surface. Provide a hydraulic calculation for the worst case 100-year water surface in *Racel Street*. The finish floor elevation of future houses in the PODs adjacent to *Racel* shall be above the corresponding water surface or flood wall for protection to that effect. This shall serve as a guideline in the future technical drainage studies for the PODs.
4. Provide a detail grading around the culvert entrance at *Racel Street Storm Drain* and make sure freeboard requirements are satisfied.
5. All drainage facilities proposed in this *Phase 1 Infrastructure Study* are considered interim facilities and must be maintained by the master developer until the facilities are formally accepted by the *City of Las Vegas*.
6. Structural plans for the storm drain improvements must be submitted for review. Provide a soil report, structural calculations and specifications, wet stamped structural sets and a grading plan to the *City of Las Vegas Building Department* for processing (call *Building Department* to confirm their submittal requirements). The engineer must provide a copy of *Building Department* approval of the structures to *Flood Control* prior to final acceptance of the technical drainage study.
7. The project proposes to build a temporary drainage facility on the west side of *Hualapai Way*. Prior to final plan approval the developer must complete a ***Maintenance and Liability Agreement*** for the interim drainage improvements (off-site berms or channels) and post a minimum maintenance bond of \$50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facility and an exhibit that adequately shows the location and limits of the drainage facility to *Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section (229-6371)* to begin the agreement process.

In order for the maintenance bond to be released in the future, a drainage update / letter will be required to justify that the offsite berms / channels are no longer necessary and can be removed.
8. **Sheet SD-09:** Review and revise an appeared low point "61.95TC" in *Grand Canyon Drive* at the intersection with *Grand Teton Drive*.
9. Technical drainage studies are required for each of the POD's. The technical drainage studies for the POD's may not be conditional approved until the final approval of the pertinent infrastructure drainage study is obtained.
10. Building permits for the homes within the individual POD's will not be issued until construction of the street and flood control infrastructure around the POD is substantially complete or interim protection is provided per the approved technical drainage study.

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.

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

END OF REMARKS

ays

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

TECHNICAL DRAINAGE STUDY
SUPPLEMENT

**Skye Canyon
(Phase 1 Infrastructure)**

City of Las Vegas, Nevada

Job No.: OLY1401.001

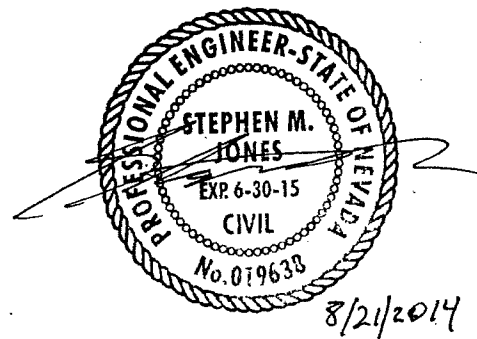
Date: August 2014

Prepared By:

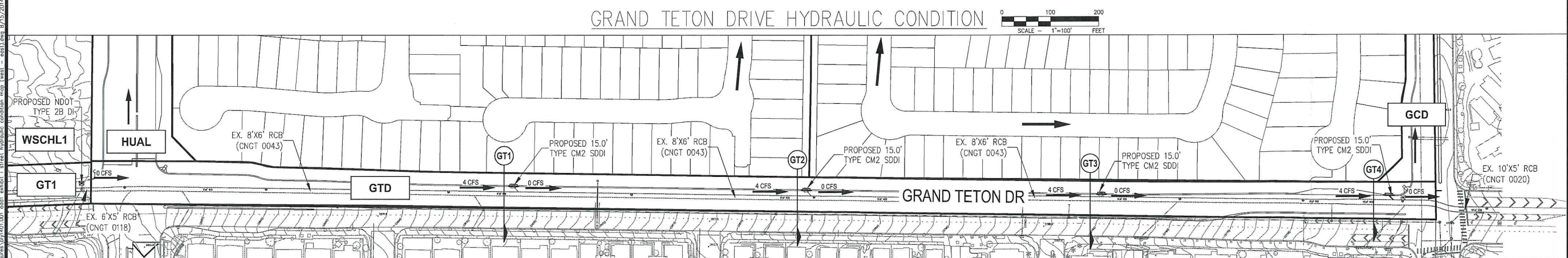
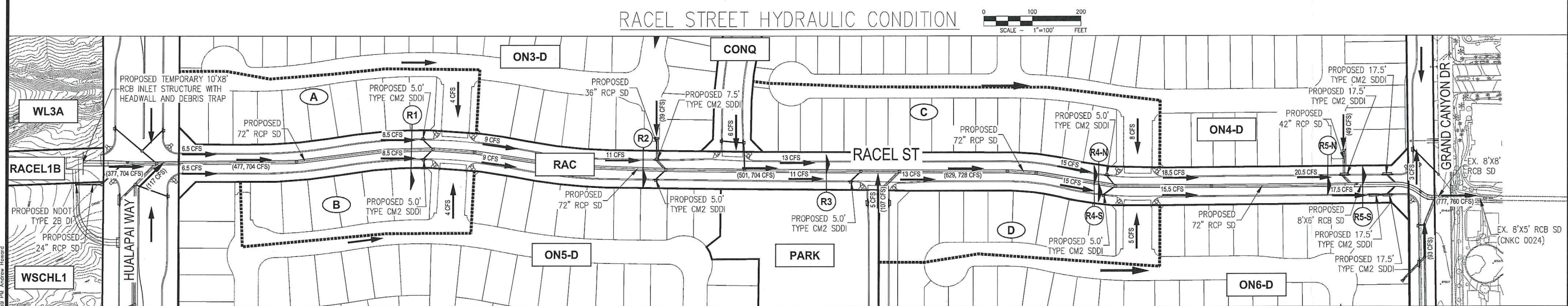
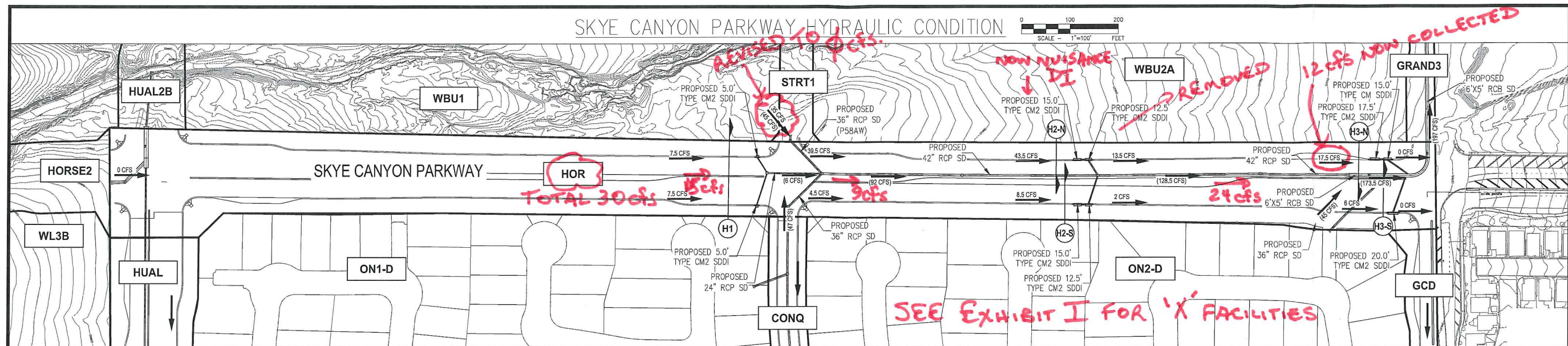
Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

Prepared For:

Ninety-Five Management, LLC
11411 Southern Highlands Parkway, Suite 300
Las Vegas, NV 89141
Phone: 702-220-6565 • Fax: 702-220-6566



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

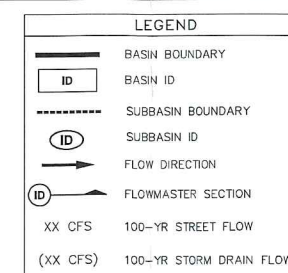


| Cross Section | Slope (%) | Q ₁₀₀ (cfs) | Depth (ft) | Velocity (fps) | Dx/V |
|---------------|-----------|------------------------|------------|----------------|------|
| H1 | 3.56 | 15 | 0.37 | 5.2 | 1.9 |
| *H2-N | 4.75 | 43.5 | 0.60 | 8.0 | 4.8 |
| *H2-S | 4.75 | 8.5 | 0.37 | 6.0 | 2.2 |
| *H3-N | 2.26 | 17.5 | 0.51 | 4.9 | 2.5 |
| *H3-S | 2.26 | 6 | 0.37 | 4.1 | 1.5 |

| Racel Street | | | | | |
|---------------|-----------|------------------------|------------|----------------|------|
| Cross Section | Slope (%) | Q ₁₀₀ (cfs) | Depth (ft) | Velocity (fps) | Dx/V |
| R1 | 4.90 | 17 | 0.36 | 6.1 | 2.2 |
| R2 | 4.90 | 11 | 0.39 | 6.3 | 2.5 |
| R3 | 1.53 | 11 | 0.47 | 3.9 | 1.8 |
| R4-N | 4.90 | 15 | 0.43 | 6.6 | 2.9 |
| R4-S | 4.90 | 15 | 0.43 | 6.6 | 2.9 |
| R5-N | 4.90 | 20.5 | 0.47 | 7.0 | 3.3 |
| R5-S | 4.90 | 17.5 | 0.45 | 6.8 | 3.1 |

*MODELS AS HALF STREET

| Cross Section | Slope (%) | Q ₁₀₀ (cfs) | Depth (ft) | Velocity (fps) | DxV |
|---------------|-----------|------------------------|------------|----------------|-----|
| *GT1 | 3.60 | 4 | 0.33 | 4.0 | 1.3 |
| *GT2 | 3.60 | 4 | 0.33 | 4.0 | 1.3 |
| *GT3 | 3.60 | 4 | 0.33 | 4.0 | 1.3 |
| *GT4 | 2.30 | 4 | 0.35 | 3.4 | 1.2 |



*RACEL STORM DRAIN FLOW DENOTED AS: (ULTIMATE CONDITION, INTERIM CONDITION CFS)

ULT-100.OUT

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 * RUN DATE 12MAR14 TIME 21:36:10 *

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

```

X  X XXXXXXX XXXX  X
X  X X  X  X  XX
X  X X  X  X  X
XXXXXXX XXXX X  XXXX X
X  X X  X  X  X
X  X X  X  X  X
X  X XXXXXXX XXXX  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

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

1          *DIAGRAM
2          ID    SLATER HANIFAN GROUP
3          ID    OLYMPIA COMPANIES
4          ID    SKYE CANYON - PHASE 1 INFRASTRUCTURE
5          ID    ULTIMATE CONDITION (100-YR STORM)
6          ID
7          ID    RETURN PERIOD ----- 100-YEAR
8          ID    DISTRIBUTION ----- 6-HOUR SDN3
9          ID    PROJECT NO. ----- OLY1401.001
10         ID    FILENAME ----- ULT-100.H1
11         ID    DATE ----- 03/11/14
12         ID    MODELED BY ----- AJH/SMJ
13         ID
14         ID    SIX HOUR DEPTH-AREA REDUCTION FACTORS
15         ID    DRAINAGE AREA (MI^2)  DARF
16         ID    0.0-0.49              1.00
17         ID    0.5-0.99              0.98
18         ID    1.0-1.99              0.97
19         ID
20         IT    5      0      0      300
21         IO    5      0      0
22         IN    5      0      0
23         JR    PREC  1.00  0.98  0.97

23         KK    HUAL
24         KM    OFFSITE STREET BASIN FOR HUALAPAI WAY
25         PB    2.93
26         PC    0      0.020  0.057  0.070  0.087  0.108  0.124  0.130  0.130  0.130
27         PC    0.130  0.130  0.130  0.133  0.140  0.142  0.148  0.158  0.172  0.181
28         PC    0.190  0.197  0.199  0.200  0.201  0.204  0.214  0.229  0.241  0.249
29         PC    0.251  0.256  0.270  0.278  0.281  0.283  0.295  0.322  0.352  0.409
30         PC    0.499  0.590  0.710  0.744  0.781  0.812  0.819  0.835  0.851  0.856
31         PC    0.860  0.868  0.876  0.888  0.910  0.926  0.937  0.950  0.970  0.976
32         PC    0.982  0.985  0.987  0.989  0.990  0.993  0.993  0.994  0.995  0.998
33         PC    0.998  0.999      1
34         BA    .0144
35         LS    0      93.2
36         UD    0.136

* *****
* BEGIN REFERENCED WATERSHED FROM MASTER DRAINAGE STUDY
* ADJUSTED TO REMOVE BASIN WML4 FROM RACEL WATERSHED AND INTO HUALAPAI WATERSHED
* AREA ADJUSTED TO MEET ALLOWABLE FLOW IN DOWNSTREAM RACEL STORM DRAIN
* REFER TO "ULTIMATE CONDITION - EVALUATION" HEC-1 MODEL FOR IMPACTS OF
* ROUTING WML4 INTO HUALAPAI WATERSHED
* *****

37         KK    SHAUM1
38         BA    .0066
39         PB    3.00
40         LS    0      98.0
41         UD    .098
  
```

1

HEC-1 INPUT

PAGE 2

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

42         KK    WML3A
43         BA    .0174
44         PB    3.00
45         LS    0      95.0
46         UD    .080

47         KK    WML2
  
```

ULT-100.OUT

| | | | |
|-----|----|---|------|
| 112 | PB | 2.93 | |
| 113 | BA | .0583 | |
| 114 | LS | 0 | 94.6 |
| 115 | UD | 0.139 | |
| | * | | |
| 116 | KK | PARK | |
| 117 | KM | ONSITE BASIN FOR COMMUNITY PARK | |
| 118 | PB | 2.93 | |
| 119 | BA | .0028 | |
| 120 | LS | 0 | 81.5 |
| 121 | UD | 0.082 | |
| | * | | |
| 122 | KK | CP1B | |
| 123 | KM | COMBINES ON5-D, PARK | |
| 124 | HC | 2 | |
| | * | | |
| 125 | KK | RAC | |
| 126 | KM | STREET BASIN FOR RACEL ST | |
| 127 | PB | 2.93 | |
| 128 | BA | .0071 | |
| 129 | LS | 0 | 92.5 |
| 130 | UD | 0.097 | |
| | * | | |
| 131 | KK | CONQ | |
| 132 | KM | STREET BASIN FOR CONQUISTADOR ST | |
| 133 | PB | 2.93 | |
| 134 | BA | .0035 | |
| 135 | LS | 0 | 92.5 |
| 136 | UD | 0.133 | |
| | * | | |
| 137 | KK | CP1 | |
| 138 | KM | COMBINES RA-HU, ON3-D, ON5-D, RAC, CONQ AND PARK | |
| 139 | HC | 4 | |
| | * | | |
| 140 | KK | ON4-D | |
| 141 | KM | ONSITE BASIN NORTH OF RACEL AND EAST OF CONQUISTADOR ST | |
| 142 | PB | 2.93 | |
| 143 | BA | .0252 | |
| 144 | LS | 0 | 94.6 |
| 145 | UD | 0.105 | |
| | * | | |

1

HEC-1 INPUT

PAGE 5

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

| | | | |
|-----|----|--|------|
| 146 | KK | ON6-D | |
| 147 | KM | SOUTHEAST QUAD ONSITE BASIN | |
| 148 | PB | 2.93 | |
| 149 | BA | .0505 | |
| 150 | LS | 0 | 94.6 |
| 151 | UD | 0.128 | |
| | * | | |
| 152 | KK | GCD | |
| 153 | KM | OFFSITE (HALF) STREET BASIN FOR GRAD CANYON DR | |
| 154 | PB | 2.93 | |
| 155 | BA | .0053 | |
| 156 | LS | 0 | 93.8 |
| 157 | UD | 0.137 | |
| | * | | |
| 158 | KK | CP26 | |
| 159 | KM | COMBINES CP1, ON4-D, ON6-D AND GCD | |
| 160 | HC | 4 | |
| | * | | |
| 161 | KK | ON1-D | |
| 162 | KM | NORTHWEST QUAD ONSITE BASIN | |
| 163 | PB | 2.93 | |
| 164 | BA | .0278 | |
| 165 | LS | 0 | 91.2 |
| 166 | UD | 0.114 | |
| | * | | |
| 167 | KK | ON2-D | |
| 168 | KM | NORTHEAST QUAD ONSITE BASIN | |
| 169 | PB | 2.93 | |
| 170 | BA | .0301 | |
| 171 | LS | 0 | 88.8 |
| 172 | UD | 0.152 | |
| | * | | |
| 173 | KK | HOR | |
| 174 | KM | OFFSITE STREET BASIN FOR HORSE DR | |
| 175 | PB | 2.93 | |
| 176 | BA | .0163 | |
| 177 | LS | 0 | 93.3 |
| 178 | UD | 0.108 | |
| | * | | |

REFERENCED

 * BEGIN REFERENCED FUTURE WATERSHED CONTRIBUTING TO HORSE FROM MASTER DRAINAGE S

1

HEC-1 INPUT

PAGE 6

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

179 KK WBUL

ULT-100.OUT

146
152
158
161
167
173
179
184
189
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198
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210
213
223
221
228
226
229
235
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248
246
253
251
256
262
264
269
274
279
284
286
291
296
301
306
308

ON6-D

GCD

CP26

ON1-D

ON2-D

HOR

REF.
TRIBUTARY

WBUI

STRT1

NO LONGER CONTRIBUTE
TO SKYE CANYON PARK

CP2

NOW
WC7

OFF21

OFF20

DB1

PT1

V

V

DET1

DIV1

DIV-1

DIV-1

DIV-1

AROY1

WPRK5

SHEEP1

SHEPAB

RSHEPA

DSHEPC

DSHEPB

AROY2

DUMMY

WPRK3

WGC2

WML3B

EGAN2

DUMMY

WPRK2A

WPRK2B

AROY3

WL3B

DUMMY

HORSE2

ULT-100.OUT

| | | | | | | | |
|---------------|--------|-----|---|--------------|--------------|--------------|--------------|
| HYDROGRAPH AT | EGAN1 | .00 | 1 | FLOW
TIME | 10.
3.50 | 10.
3.50 | 10.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | RACL1A | .01 | 1 | FLOW
TIME | 14.
3.50 | 13.
3.50 | 13.
3.50 |
| + | | | | | | | |
| 3 COMBINED AT | RA-EG | .12 | 1 | FLOW
TIME | 234.
3.50 | 229.
3.50 | 226.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | WML1 | .02 | 1 | FLOW
TIME | 47.
3.50 | 46.
3.50 | 46.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | STRT4 | .00 | 1 | FLOW
TIME | 6.
3.58 | 6.
3.58 | 6.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | WL3A | .03 | 1 | FLOW
TIME | 54.
3.58 | 53.
3.58 | 52.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | WSCHL1 | .06 | 1 | FLOW
TIME | 104.
3.50 | 101.
3.50 | 100.
3.50 |
| + | | | | | | | |
| 5 COMBINED AT | DUMMY | .24 | 1 | FLOW
TIME | 443.
3.50 | 432.
3.50 | 427.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | RACL1B | .00 | 1 | FLOW
TIME | 11.
3.50 | 10.
3.50 | 10.
3.50 |
| + | | | | | | | |
| 3 COMBINED AT | RA-HU | .26 | 1 | FLOW
TIME | 477.
3.50 | 466.
3.50 | 460.
3.50 |
| + | | | | | | | |
| ROUTED TO | RRA-HU | .26 | 1 | FLOW
TIME | 462.
3.50 | 451.
3.58 | 446.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | ON3-D | .02 | 1 | FLOW
TIME | 39.
3.58 | 38.
3.58 | 38.
3.58 |
| + | | | | | | | |
| 2 COMBINED AT | CP1A | .28 | 1 | FLOW
TIME | 501.
3.58 | 489.
3.58 | 483.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | ON5-D | .06 | 1 | FLOW
TIME | 107.
3.58 | 104.
3.58 | 103.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | PARK | .00 | 1 | FLOW
TIME | 4.
3.50 | 3.
3.50 | 3.
3.50 |
| + | | | | | | | |
| 2 COMBINED AT | CP1B | .06 | 1 | FLOW
TIME | 110.
3.58 | 107.
3.58 | 106.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | RAC | .01 | 1 | FLOW
TIME | 13.
3.50 | 13.
3.50 | 13.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | CONQ | .00 | 1 | FLOW
TIME | 6.
3.58 | 6.
3.58 | 6.
3.58 |
| + | | | | | | | |
| 4 COMBINED AT | CP1 | .35 | 1 | FLOW
TIME | 629.
3.58 | 614.
3.58 | 607.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | ON4-D | .03 | 1 | FLOW
TIME | 49.
3.50 | 47.
3.50 | 47.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | ON6-D | .05 | 1 | FLOW
TIME | 93.
3.58 | 91.
3.58 | 90.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | GCD | .01 | 1 | FLOW
TIME | 10.
3.58 | 9.
3.58 | 9.
3.58 |
| + | | | | | | | |
| 4 COMBINED AT | CP26 | .43 | 1 | FLOW
TIME | 777.
3.58 | 760.
3.58 | 751.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | ON1-D | .03 | 1 | FLOW
TIME | 47.
3.58 | 46.
3.58 | 45.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | ON2-D | .03 | 1 | FLOW
TIME | 45.
3.58 | 44.
3.58 | 44.
3.58 |
| + | | | | | | | |
| HYDROGRAPH AT | HOR | .02 | 1 | FLOW
TIME | 30.
3.50 | 29.
3.50 | 29.
3.50 |
| + | | | | | | | |
| HYDROGRAPH AT | | | | | | | |

APPENDIX J

Meeting Notes with City of Las Vegas

MEETING NOTES

Project Number: OLY1602.000

Project Name: Skye Canyon

Meeting Date: 2/18/2016

Meeting Location: CLV Public Works – Granite Room (9th Floor)

Meeting Topic: Skye Canyon Smith's Drainage (re: Master Drainage Impacts)

| Attendees: | Company Name: |
|-------------------|----------------------|
| Oh Sang Kwon | CLV |
| Allen Pavelka | CLV |
| Lucien Paet | CLV |
| Jerry Slater | SHG |
| Steve Jones | SHG |

Meeting Notes:

| Item: | Discussion: |
|--------------|---|
| 1 | Smith's Development & Pending Land Plan Change – SHG noted that due to the timing of the Smith's development, mapping will proceed utilizing the current approved land plan. A new Tentative Map will be filed to split the larger parcel that the Smiths is located within into 2 parcels, and then a commercial subdivision map will be filed for the now split parcel that encompasses Smiths. CLV determined this is an acceptable process. |
| 2 | Smith's Drainage – SHG presented that the Smiths project and its associated infrastructure is outside the influence of the formal development of the MPU changes in Moccasin and Log Cabin. Additionally, its plan to not adversely impact downstream property is to not exceed existing condition flow rates at its discharge point. It was acknowledged that this scenario will involve the developer to construct interim facilities with the Smiths development, including storm drains not planned in the Master Drainage Study and a small peaking basin. CLV concurred on this direction of development, noting that the developer will not be allowed to continue use of these facilities for the major MPU facility flows in the ultimate build-out of the property. |
| 3 | Master Drainage Study Impacts – SHG noted that currently the Master Drainage Study approval letter is written such that no development outside of Phase 2 is allowed until the National Monument Grant issues are resolved. Due to other meetings between SHG, Olympia, CLV and CCRFCD, it is concurred that a viable alternative to master plan drainage patterns has been presented. However, CLV wants some assurances beyond what has been presented thus far that the master plan drainage patterns have been resolved by way of formal review of a new Master Drainage Study. SHG noted that currently its schedule to submit the new Master Drainage Study is April 1, which is planned as prior to submittal of drainage studies for the Smiths offsite and onsite improvements. CLV agreed that if it could review the new Master Drainage Study prior to the Smiths improvements, then that would give them the ability to confirm that proper assurances regarding the master drainage patterns are resolved. It was agreed by both CLV and SHG that proceeding with the Smiths projects is at-risk to the developer pending a more formal review of the new Master Drainage Study. |

Action Items:

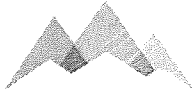
| Item: | Discussion: |
|--------------|--|
| 1,2,3 | Allen Pavelka requested that SHG and Olympia communicate deadline dates for the Smiths closing and its schedule of delivery of infrastructure. If informed, CLV can assist the developer meet those dates. |

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 K

Clean Water Act Permitting



NEVADA DIVISION OF
**ENVIRONMENTAL
PROTECTION**

STATE OF NEVADA
Department of Conservation & Natural Resources
Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

September 29, 2015

Mr. Jason Deters
U.S. Army Corps of Engineers
196 E Tabernacle Street Room 30
St. George, Utah 84770-3474

Dear Mr. Deters,

The Nevada Division of Environmental Protection (NDEP) grants 401 Water Quality Certification (NV401-15-041) for the Kyle (Skye) Canyon Master Planned Community in Clark County, Nevada (SPK-2005-50517). Activities will include filling of existing ephemeral drainages and the construction of 2 regional detention basins for flood control. Approximately 1.7 acres of waters of the U.S. considered tributary to the Las Vegas Wash will be impacted within the 1700 acre development.

Photographs which document conditions before, during and after construction should be submitted to the Bureau of Water Quality Planning (BWQP) after project completion and must include BMPs used to prevent erosion, control sediment and protect water quality. Photos taken at each stage of the project should be documented using the same locations, camera position, view angles and zoom. If natural materials such as mulch or straw bales are selected as BMPs they should be certified as weed free. Any modifications to original project submittal must be reviewed and approved by this office prior to implementation.

All conditions of the Temporary Authorization to Discharge (Working in Waterways permit) or other permits issued by NDEP for the project must be followed. A copy of the Final Report submitted to the Bureau of Water Pollution Control (BWPC) for the Temporary Discharge permit will satisfy BWQP's reporting requirement after project completion.

This Section 401 Water Quality Certification is subject to the acquisition of all necessary local, regional, state and federal permits and approvals as required by law. Failure to meet any conditions of this Certification, any other permit required by NDEP for this project or any violation of NAC 445A may result in the revocation of this 401 Water Quality Certification.

If you have any questions, please contact me via jstone@ndep.nv.gov or at (775) 687-9456.

Sincerely yours,

Jeanmarie Stone

Jeanmarie Stone
Environmental Scientist III
Bureau of Water Quality Planning

cc: Marc Bolduc, Ninety-Five Management, LLC
Steve Jones, Slater Hanifan Group
Cliff Lawson, NDEP-BWPC



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

August 17, 2015

Regulatory Division SPK-2005-50517

Ninety-Five Management, LLC
11411 Southern Highlands Parkway, Suite 300
Las Vegas, NV 89141

Dear Sir or Madam:

We are responding to your consultant's August 3, 2015 request to modify your Department of the Army permit number SPK-2005-50517. The permit was issued on May 22, 2006 for discharge of dredged or fill material into approximately 1.7 acres of waters of the United States (ephemeral washes) to construct the Kyle Canyon Master Planned Community (Now Skye Canyon Master Plan). The project is located on 1,712 acres in the northwest portion of the Las Vegas Valley within Sections 1 and 12, Township 19 South, Range 59 East, in Clark County, Nevada. The approximately 1,712-acre project site is located several unnamed, ephemeral tributaries of the Las Vegas Wash, Latitude 36.314911°, Longitude - 115.308475°, and can be seen on the NV-TULE SPRINGS PARK USGS Topographic Quadrangle. The modification request involves an extension of time and the addition of 0.10 acres of additional fill for construction of detention basins that have been designed to discharge into the ephemeral washes; thereby allowing flow into the waterways.

Permit number SPK-2005-50517 is hereby modified as follows:

- 1. The time limit for completing the work authorized ends on August 17, 2020. If you find that you need more time to complete the authorized activity, submit a request for a time extension to this office for consideration at least one month before the above date is reached.**
- 2. This permit authorizes fill material in 1.8 acres of ephemeral washes. Mitigation for the previous 1.7 acres of impact has been purchased from Clark County Wetlands In-Lieu Fee Program. The Corps has a receipt of the payment. The additional 0.10 acre impact does not require additional mitigation.**
- 3. This re-authorization is contingent upon application and issuance of a 401 Water quality Certification from the Nevada Department of Environmental Protection.**

All other terms and conditions of the permit remain in full force and effect. Failure to comply with the terms and conditions of this authorization may result in the suspension

or revocation of your permit. For more information regarding our program, please visit our website at www.spk.usace.army.mil/Missions/Regulatory.aspx.

Please refer to identification number SPK-2005-50517 in any correspondence concerning this project. If you have any questions, please contact me at Saint George Regulatory Office, 196 E Tabernacle Street Room 30, St. George, Utah 84770, by email at Patricia.L.McQueary@usace.army.mil, or telephone at 435-986-3979.

Sincerely,



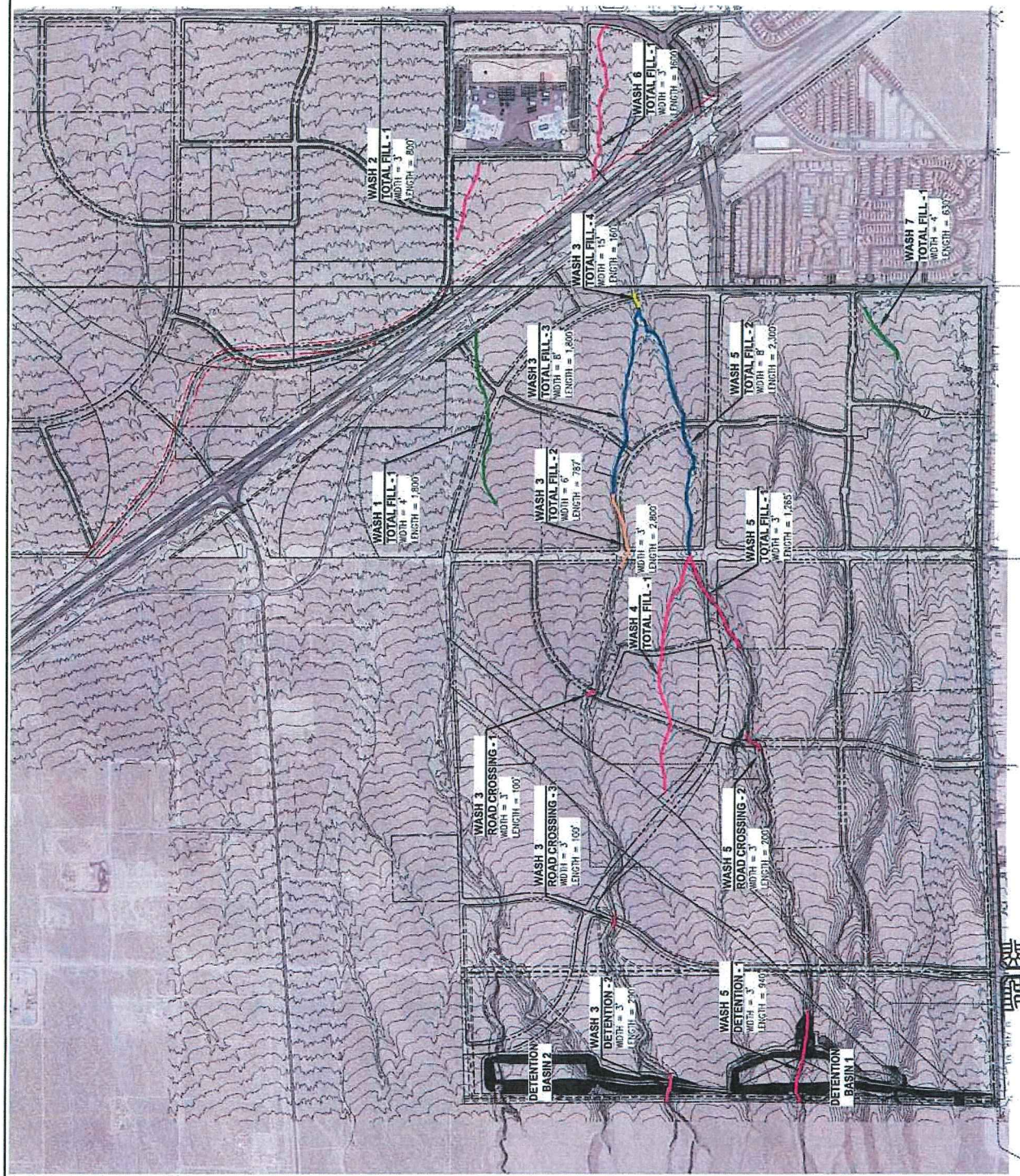
Patricia L. McQueary
Senior Regulatory Project Manager
St. George Regulatory Office
Sacramento District

Enclosures

cc: (w/o encls)

Ms. Jean Stone, NDEP, 901 S. Stewart Street Suite 4001, Carson City, Nevada 89701-5249

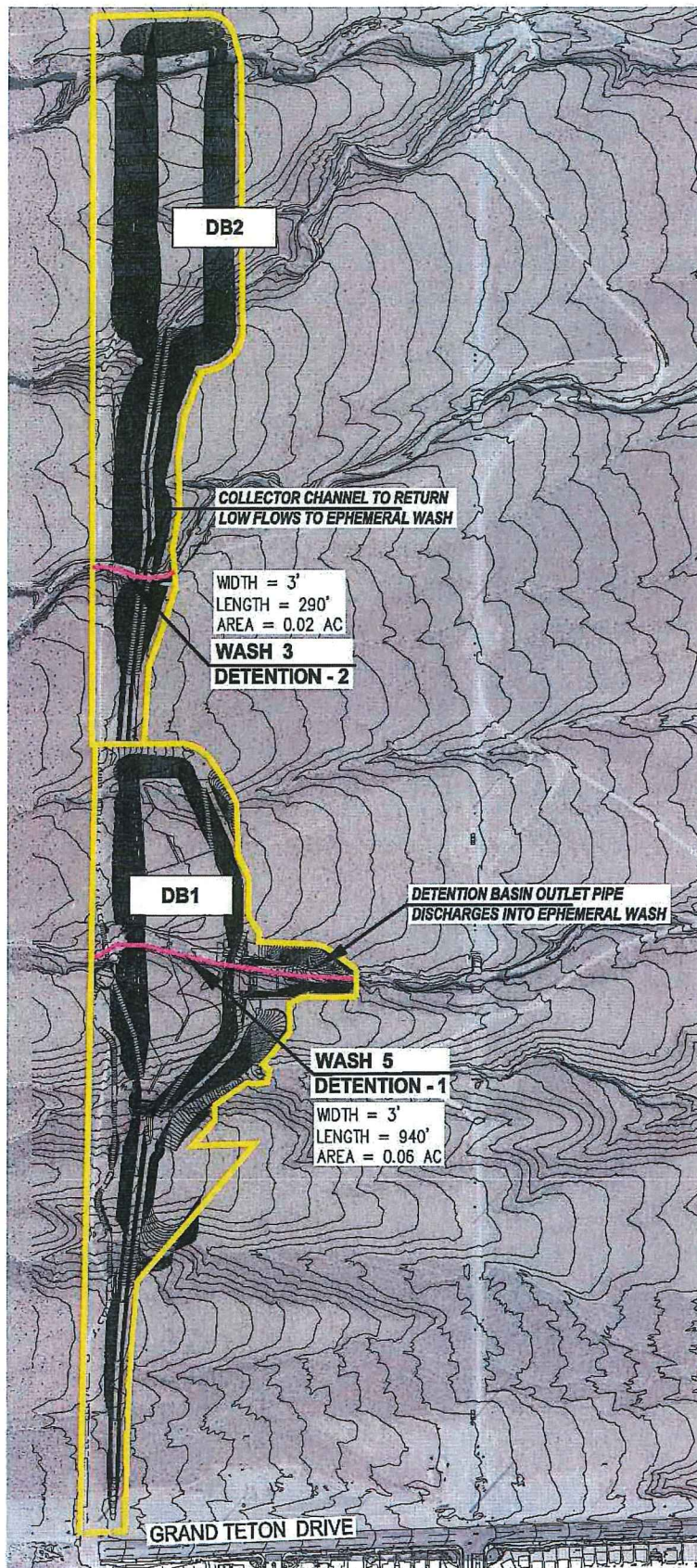
Mr. Steve Jones, Slater Hanifan Group, Inc., 5740 S. Arville Street, Suite 216, Las Vegas, Nevada 89118



| <u>ONSITE DISTURBED AREAS</u> | | |
|-------------------------------|--|---------|
| WASH 1 | | 0.17 AC |
| WASH 2 | | 0.06 AC |
| WASH 3 | | 0.49 AC |
| WASH 4 | | 0.19 AC |
| WASH 5 | | 0.51 AC |
| WASH 6 | | 0.11 AC |
| WASH 7 | | 0.06 AC |
| BANK STABILIZATION | | 0.10 AC |
| ROAD CROSSING | | 0.03 AC |
| DETENTION BASIN | | 0.08 AC |
| <u>TOTAL DISTURBED AREA</u> | | |
| TOTAL PROJECT WOUS | | 2.4 AC |
| DISTURBED AREA | | 1.8 AC |

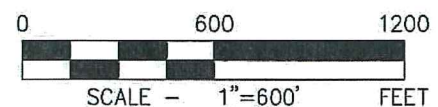
FIGURE 5

j:\oly1401-004\drainage\404_report\oly1401-004_detention_basin_exhibit.dwg 8/3/2015 9:00 AM Steve Jones



LEGEND

- US Waters (3' Width)
- Detention Basin Project Boundary



S-16
SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NINETY-FIVE MANAGEMENT, LLC
SKYE CANYON MASTER PLAN
DETENTION BASIN DISTURBANCES TO 404 WATERS

DATE: 7/31/2015
DRAFTER: AJH
DESIGNER: SJ
CHECKED: SJ

PROJECT NO.
OLY1401.004
FIGURE 6
SHEET 1 OF 1



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
COLORADO/GUNNISON BASIN
REGULATORY OFFICE
400 ROOD AVENUE, ROOM 142
GRAND JUNCTION, COLORADO 81501-2563

COPY

REPLY TO
ATTENTION OF

May 22, 2006

Regulatory Branch (200550517)

Mr. Tom Devore
Kyle Acquisition Group, LLC
3455 Cliff Shadows Parkway, Suite 220
Las Vegas, Nevada 89129

Dear Mr. Devore:

This letter of permission authorizes your proposed discharge of dredged or fill material into approximately 1.7 acres of waters of the United States (ephemeral washes) to construct the Kyle Canyon Master Planned Community, as shown on the drawings accompanying your permit application dated December 15, 2005. The project is located on 1,712 acres in the northwest portion of the Las Vegas Valley within Sections 1 and 12, Township 19 South, Range 59 East, in Clark County, Nevada.

The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer. Work in waters of the United States must be in accordance with the following conditions of authorization:

Special Conditions:

1. To mitigate for the loss of 1.7 acres of waters of the United States (ephemeral washes), you shall agree to purchase 0.425 acre of mitigation credits from the Clark County Wetlands Park. Evidence of this purchase shall be provided to the Corps of Engineers prior to proceeding with any activity otherwise authorized by this permit.

2. This Corps permit does not authorize you to take an endangered species, in particular the Mojave desert tortoise (*Gopherus agassizii*), or designated critical habitat. In order to legally take a listed species, you must have separate authorization under the Endangered Species Act (e.g., an Endangered Species Act Section 10 permit, or a Biological Opinion under Endangered Species Act Section 7, with "incidental take" provisions with which you must comply).

The enclosed Fish and Wildlife Service Biological Opinion (Number 1-5-06-F-465, dated March 8, 2006), contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached Biological Opinion, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with the incidental take statement in the Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The Fish and Wildlife Service is the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the Endangered Species Act. The permittee must comply with all conditions of this Biological Opinion, including those ascribed to the Corps.

3. If feasible, land clearing shall be conducted outside of the avian breeding season to avoid destruction of migratory birds protected by the Migratory Bird Treaty Act of 1918 (40 Stat. 755, amended: 16 U.S.C. 703 et seq.). If this is not feasible, you shall hire a qualified biologist to survey the project area prior to land clearing. If active nests are located, or if other evidence of nesting (mated pairs, territorial defense, carrying nesting material, transporting food, and so forth) is observed, a protective buffer (the size depending on the requirement of the species) shall be delineated and the entire area shall be avoided to prevent destruction or disturbance to nests until they are no longer active.

4. Best management practices must be followed during and after construction to minimize potential indirect adverse impacts (such as siltation).

General Conditions:

1. The time limit for completing the work authorized ends on June 1, 2009. If you find that you need more time to complete the authorized activity, submit a request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of these requirements if you abandon the permitted activity. This permit may be transferred upon request provided the work complies with the terms and conditions of this authorization. When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. Should you wish to cease to maintain the authorized activity or abandon it without a good faith transfer, you must obtain a permit modification from this office.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. You must ensure that the work complies with the conditions of the January 31, 2006, Section 401 water quality certification for this project.

5. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

- () Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
- (✓) Section 404 of the Clean Water Act (33 U.S.C. 1344).
- () Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

- a. You fail to comply with the terms and conditions of this permit.
- b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

- c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

This letter of permission becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below. A notice of appeal options is enclosed. Please refer to number 200550517 in any correspondence concerning this permit. If you have any questions, please contact our St. George Regulatory Office at 321 North Mall Drive, Suite L-101, St. George, Utah 87490-7310, or telephone 435-986-3979.

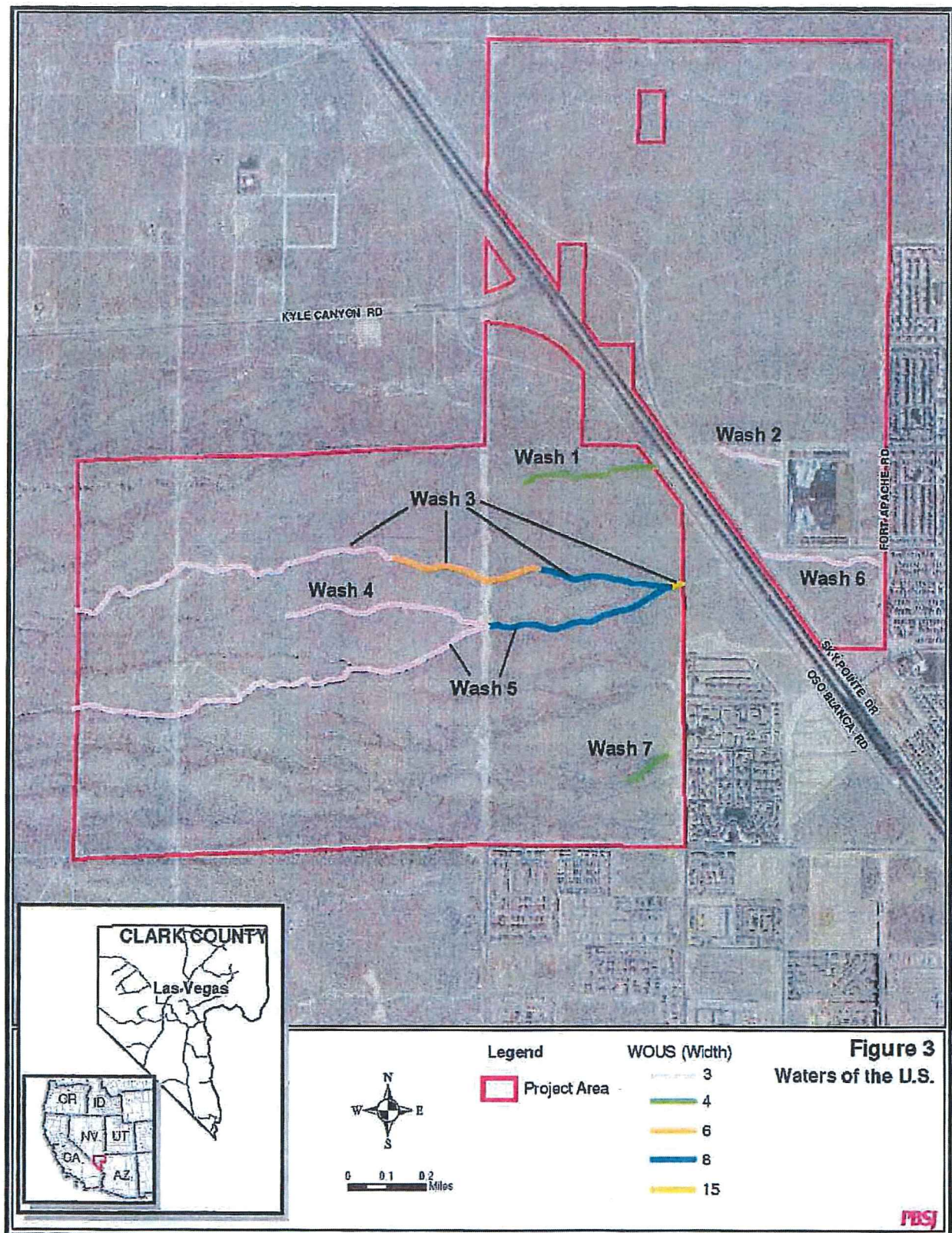
For and on behalf of Ronald N. Light, Colonel, US Army, District Engineer.


Susan Bachini Nall
Acting Chief, St. George Regulatory Office

Enclosures

Copies Furnished Without Enclosures:

Ms. Billye Sisler, PBS&J, 2270 Corporate Circle, Suite 100,
Henderson, Nevada 89074-6382
Ms. Heather Adams, U.S. Fish and Wildlife Service, Nevada Fish
and Wildlife Office, 1340 Financial Boulevard, Suite 234, Reno,
Nevada 89502
Mr. Glen Gentry, Nevada Division of Environmental Protection,
Bureau of Water Quality Planning, 901 South Stewart Street,
Suite 4001, Carson City, Nevada 89701-5249



APPENDIX L

Plan, Profile & Detail Sheets