

TECHNICAL DRAINAGE STUDY UPDATE No.4

Skye Canyon
(Phase 2 Infrastructure)
City of Las Vegas, Nevada

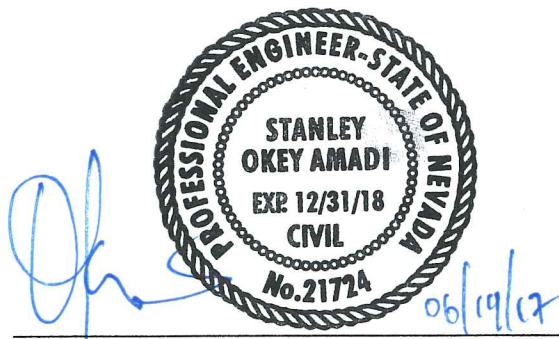
Job No.: OLY1501.001
Date: June 2017

Prepared By:

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Prepared For:

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



Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Erick Mata, E.I

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Skye Canyon – Phase 2 Infrastructure Update No.4 Date: June 2017
 Location of Development: a) Descriptive (Cross Streets): North/South: Skye Village Road
 East/West: Grand Teton Drive
 b) Section: 12 Township: 19 South Range: 59 East
 c) APN: 126-12-310-001, 126-12-410-001, 126-12-310-002, 126-12-810-001, 126-12-710-002
126-12-710-003, 126-12-710-004, 126-12-810-002, 126-12-810-003, 126-12-810-004,
126-12-810-005

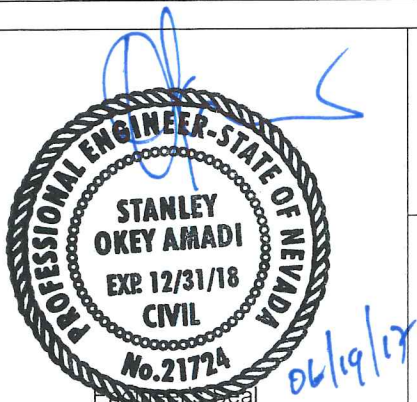
Name of Owner/Developer: Section 12, LLC / Ninety-Five Management, LLC
 Telephone No.: 702-220-6565 Fax No.: 702-220-6566 E-mail Address: mbolduc@olympiacompanies.com
 Address: 11411 Southern Highlands Parkway, Suite 300; Las Vegas, NV 89141

Contact Person – Name: Stanley Okey Amadi, P.E. Telephone No.: 702-284-5300
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 Firm: Slater Hanifan Group
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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: 665 Acres Being Developed/Disturbed: 202 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 & Storm Drain Infrastructure
5. Approximate upstream land area which drains to the subject site: 48 acre +/-
6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: Master Drainage Study for Skye Canyon (SHG, DS4420); Master Drainage Study for Kyle Canyon (GCW, DS4091)
Technical Drainage Study for Skye Canyon Phase 2 Infrastructure (SHG, DS4739) & TDS Updates 1 thru 3
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Racel Street thru CCRFCD CNKC 0050,
And Minor flows to the CCRFCD Moccasin-Hualapai Branch alignment, Hualapai Way (MOHU 0118)
8. Briefly describe your proposed schedule for the subject project: ASAP Upon Substantial Completion of Detention Basin 1 Facilities
Phase 2 – Roadway Infrastructure per this TDS; Future Phase 2 Residential Subdivisions to follow by separate TDS.



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: SHG Job No. OLY1501.001

STANDARD FORM 1

Updated 05/01/2008



CONSULTING ENGINEERS & PLANNERS

OLY1501.001

June 14, 2017

Albert Sung, P.E.
Flood Control Project Engineer
City of Las Vegas Department of Public Works
333 N. Rancho Drive
Las Vegas, Nevada 89106

Subject: Technical Drainage Study Update No.4 for Skye Canyon Ph.2 Infrastructure

Dear Mr. Sung:

Submitted for your review is this *Technical Drainage Study Update No.4 for Skye Canyon Phase 2 Infrastructure* (hereinafter referred to as the Update No.4 Study). The site had been previously analyzed and designed as addressed in the Technical Drainage Study for Skye Canyon Phase 2 Infrastructure (CLV DS4739), prepared by Slater Hanifan Group (SHG). The Phase 2 Infrastructure Study was approved on January 11, 2016 and addressed the mass grading and development of roadway and infrastructure improvements intended to support the approximately 202 acres portion of the Skye Canyon master planned community, identified hereinafter as the *Phase 2 Study*. Three previous updates (CLV DS4739D, DS4739E & DS4739F; hereinafter referred to as the Update No.1, the Update No.2 and Update No.3 correspondingly) had been approved for the site addressing additional bike lane widths, a land plan change per the Master Study and Parcel 2.16 stub relocations respectively. The relevant approval letter(s) have been included in pertinent reference appendices of this submittal.

Overview & Purpose

Majority of the parcels within the Phase 2 area of Skye Canyon Master Plan development are currently in planning with some technical drainage studies already approved and others currently under review by the City of Las Vegas. However, with the proposed site plans for the individual parcels, some of the storm drain stubs originally proposed for the drainage of the parcels do not align correctly with the interior streets conveying the flows to the stubs. The purpose of this update study is to address some of the proposed stub and/or inlet relocations as well as any other minor changes anticipated as a result of the development of the parcels. This update will specifically address the following:

- Revision to the inlet type and relocation of the previously proposed Type CM nuisance drop inlets along Grand Teton Drive due to the additional west bound lane proposed per the CLV traffic department request.
- Relocation of the nuisance drop inlets at the curb returns of Shaumber Road near Eagle Canyon Avenue and Shaumber Road near Grand Teton Drive due to dedication of right turn lanes at the respective intersections.
- Reanalysis of the Eagle Canyon Avenue corridor and mainline storm drain system as well as Hualapai Way mainline storm drain. This provides updated hydraulic analyses

that incorporates the redistribution and minor change in ultimate condition peak flows impacting the street and storm drain systems resulting from the proposed improvements of Parcels 2.15, 2.23a, 2.27, 2.28 and 2.29.

- Revision and relocation of a 5-ft Type CM2 drop inlet and the 30" RCP lateral storm drain stub (identified in the Phase 2 Study as Facilities P4 & L6) located on Eagle Canyon Avenue at approximate station 55+08.18 for the drainage of Parcel 2.27. This update study will also address a discrepancy in the drainage area for basin WML13 (Parcel 2.27) as analyzed in the Master Drainage Study Update #3 for Skye Canyon.

The following provides detailed discussions of the above listed revisions and their respective updated hydraulic calculations where pertinent. Note that the hydraulic calculations are not necessary and have not been provided for the relocated nuisance inlets.

Grand Teton Drive Nuisance Inlets

The CLV traffic department requested that another west bound lane be added along Grand Teton Drive to accommodate a future right turn lane at interchange with Puli Road. Thus, the curb line along the northern half of Grand Teton Drive shifted to the north. Consequently, the previously proposed 5-ft Type CM nuisance inlets will now be revised to 5-ft Type CM2 inlets. The inlets were previously proposed as Type CMs due to lack of room between the curb line and the existing 6'x5' RCB mainline in the street. However, with the extension of the curb line and widening of the street improvement, the Type CM2 inlets can now be constructed in place without conflict. Note that one of the inlets proposed at the curb return of Grand Teton Drive south of Shaumber Road intersection will no longer be constructed due to conflict with the future bus turn out lane. However, the inlet will not be necessary as the low point of the intersection is now designed to the curb return of Shaumber Road where another nuisance drop inlet is provided.

Shaumber Road Curb Return Inlets

Right turn lanes have now been proposed on Shaumber Road at the intersections with Grand Teton Drive and Eagle Canyon Avenue. The two drop inlets located at the curb returns of Shaumber Road just north and south of the intersections of Grand Teton Drive and Eagle Canyon Avenue respectively will be relocated to align with the curb and gutter of the proposed right turn lanes. The inlet located south of Eagle Canyon Avenue (Facility P1) was designed to intercept approximately 2 cfs from the eastern half of Shaumber Road during the 100-year storm event. Relocation of the inlet will not have any impact on the capacity as the street design grade and cross slope remains the same as previously approved. Therefore, revision to the inlet computation will not be necessary and has not been provided. Likewise, the storm drain lateral WSPG hydraulic computation has not been revised as the pipe extension is very minimal and maintains the same slope previously approved.

Parcel 2.27 Stub & Eagle Canyon Avenue Corridor Analysis

The existing 30" RCP storm drain stub provided for the drainage of Parcel 2.27 conflicts with the proposed site plan for the parcel. Thus, the storm drain stub is proposed to be relocated as a part of the revisions addressed by this Update Study. The relocated stub will connect to the downstream manhole in Eagle Canyon Avenue at approximate station 56+68.73. The stub will

now consist of a 36" RCP and connects to a 5-ft Type CM2 inlet (Facility P4) within Eagle Canyon Avenue as previously proposed. Another 5-ft Type CM2 nuisance inlet (Facility P4C) is provided with the stub to change the storm drain direction in lieu of a manhole and to help avoid conflict the existing sewer manhole in Eagle Canyon Avenue.

The ultimate condition surface flows impacting Eagle Canyon Avenue just east of Egan Crest Drive will remain same as analyzed in the most recent Phase 2 Update No.3 Study. However, with the proposed development of Parcel 2.27, the entire onsite runoff from the parcel is planned to be captured by the relocated storm drain stub. Thus, the previously anticipated surface overflow of approximately 9 cfs during the 100-year storm event will no longer impact Eagle Canyon Avenue. As previously mentioned, the Master Drainage Study Update #3 for Skye Canyon has an area discrepancy (16.4ac vs 18.1ac) for basin WML13 which was recently discovered upon the preparation of the technical study for Parcel 2.27 currently under design. The area discrepancy resulted in an increase in the peak flow (from 49 cfs to 53 cfs) generated by the parcel. Therefore, this study will incorporate the increase in flow in the revised models for the relocated lateral stub as well as the mainline system in Eagle Canyon Avenue.

It should also be noted that the approved Parcel 2.15 Study proposed to discharge approximately 22 cfs into Eagle Canyon Avenue whereas the Phase 3 Update 3 Study only assumed 14 cfs. Consequently, the downstream street capacity calculations at hydraulic sections ECA3b, ECA3C and ECA4 and the pertinent inlet computations have been updated to accurately reflect the anticipated surface flows in the street. The updated street sections and drop inlet calculations have been provided in Appendices B and C, respectively. The following table provides a summary of the updated street capacity calculations.

100-Year Street Flow Summary - Ultimate Condition					
Cross Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV
ECA3b	4.94	13	0.36	4.9	1.8
ECA3c	4.94	32	0.46	6.1	2.8
ECA4	0.50	25	0.58	2.5	1.4

Review of the street flow summary table indicates that the street criteria is satisfied along Eagle Canyon Avenue. The summary table also shows that the 100-year flows satisfied the 10-year criteria; thus, the 10-year street calculations are not necessary and have not been provided.

Storm Drain Models

Eagle Canyon Avenue & Skye Village Road Trunk lines

The updated ultimate condition storm drain alignments and models remain as previously approved but incorporates the revised flows captured by the inlets along the street. The approved storm drain alignment in Eagle Canyon Avenue consists of two systems identified as models U-ECA and U-ECAW. The main trunk line alignment is model U-ECA which terminates at the stub for Parcel 2.23a. Model U-ECAW continues west from Facility P3B and terminates at the first set of inlets in Eagle Canyon Avenue east of Shaumber Road. Model U-ECA starts at Facility L5 intercepting the flows from Parcel 2.23a. Note that the *Technical Drainage Study*

for Skye Canyon Parcel 2.23a (DS4895) which is currently under review by CLV, determined the ultimate condition flow from Parcel 2.23a to be 36 cfs.

Similarly, the improvements for Parcel 2.29 are currently under design and the drainage study for the parcel determined a revised distribution of the parcel flows between Eagle Canyon Avenue and Skye Village Road storm drain alignments. The Phase 2 Infrastructure design assumed that the ultimate condition 100-year flows from Parcel 2.29 (basin WL8; $Q_{100}=48$ cfs) will be divided equally between the two storm drain systems. However, the Technical Drainage Study for Parcel 2.29 currently under design estimated a 100-year flow of 51 cfs and determined that approximately 34 cfs will discharge into Eagle Canyon Avenue storm drain while the remainder 17 cfs will discharge into Skye Village Road system. In addition, the *Technical Drainage Study for Skye Canyon Parcel 2.28* (DS4888) currently under review determined a 100-year flow of approximately 57 cfs that discharges into Skye Village Road as surface flow.

The hydraulic analyses of both storm drain systems in Eagle Canyon Avenue and Skye Village Road as well as the street section calculations have been updated to reflect the redistributed and revised flows per Parcels 2.28 and 2.29 improvements. The revised HGLs due to the above revisions are lower than those previously approved in the most recent Update #3 Study except at the junctions for laterals P5B-L1, P5B-L2, P6-L1 & P6-L2. Therefore, the hydraulic model for the subject laterals have also been updated with this submittal. Revision to all the other connecting street mainlines storm drains and the drop inlet laterals with lower HGLs at the points of connection to Eagle Canyon Avenue system will not be necessary and has not been provided. The revised WSPG models are provided in Appendix D. Reference hydrologic analyses from the individual parcel studies have been provided in the pertinent appendices. The storm drain plan and profile sheets have been updated to reflect the revised ultimate condition flow rates and HGLs and are provided in Appendix M.

Conclusions

- This subject Phase 2 Update No.4 Study has been prepared in conformance to the approved Phase 2 Infrastructure Study and the current Master Drainage Study for Skye Canyon.
- This update proposes no changes to ultimate condition hydrologic basins but addresses minor discrepancies in some parcel drainage areas and flow rates and provides updated hydraulic models that reflect the anticipated individual parcel improvements that have been approved and/or currently under design.
- The revised analyses show that the previously approved storm drain facilities in both Eagle Canyon Avenue and Skye Village Road have adequate capacity to convey the design flows and meet all CCRFCD design criteria. The mainline facilities sizes and profiles will remain the same as previously approved but the flow rates and HGLs have been updated to reflect the revised computations.
- The relocated lateral storm drain stub provided for Parcel 2.27 has been analyzed and determined to be adequate to convey the developed condition flows generated by the parcel and satisfies the CCRFCD design criteria.

- The slight increase in peak flows resulting from Parcels 2.27 and 2.29 will not cause any negative impact to the existing downstream properties as the receiving downstream regional facility (CNKC 0050) was designed to accommodate the pre-Skye Canyon Detention Basin 1 interim condition flows estimated to be in excess of 700 cfs downstream of Hualapai Way.

The revised improvement plans have been provided in Appendix M for your review. If you have any questions or require additional information, please do not hesitate to contact our office at 702-284-5300.

Respectfully Submitted,

SLATER HANIFAN GROUP



Stanley Okey Amadi, P.E.
Project Manager - Flood Control Division

cc: Mark Failla, P.E., CFM - SHG
Jerry Slater, P.E. - SHG
Jerrod Ratcliffe - SHG

APPENDIX

- **Appendix A** – Drainage Exhibits
 - Exhibit E2 – Ultimate Condition Drainage Map
 - Exhibit F – Storm Drain Schematic Map
- **Appendix B** – Street Hydraulic Sections (Ultimate Condition)
- **Appendix C** – Drop Inlet Computations (Ultimate Condition)
- **Appendix D** – WSPG Models (Ultimate Condition)
 - Eagle Canyon Avenue (U-ECA)
 - Skye Village Road (Hualapai Way - HUS-MAIN)
 - Revised Parcel 2.27 Lateral Stub (P4-L1)
 - Eagle Canyon Avenue Laterals (P5B-L1&L2, P6-L1&L2)
- **Appendix E** – Reference Material
 - Technical Drainage Study for Skye Canyon Phase 2 Infrastructure Update No.3,*
 - by Slater Hanifan Group
 - Approval Letter
 - WSPG for Eagle Canyon Avenue Storm Drain - UECA
 - Previously Approved Drainage Maps
 - Prior Approved Plans
- **Appendix F** – Reference Material
 - Technical Drainage Study for Skye Canyon Parcel 2.15 (Approved),*
 - by Slater Hanifan Group
 - Approval Letter
 - Developed Condition HEC-1 Analysis
 - Developed Condition Drainage Map
- **Appendix G** – Reference Material
 - Technical Drainage Study for Skye Canyon Parcel 2.23a (in review),*
 - by Slater Hanifan Group
 - Proposed Condition HEC-1 Analysis
 - Proposed Condition Drainage Map
- **Appendix H** – Reference Material
 - Technical Drainage Study for Skye Canyon Parcel 2.28 (in review),*
 - by Slater Hanifan Group
 - Proposed Condition HEC-1 Analysis
 - Proposed Condition Drainage Map
- **Appendix I** – Reference Material
 - Technical Drainage Study for Skye Canyon Parcel 2.29 (under design),*
 - by Slater Hanifan Group
 - Developed Condition HEC-1 Analysis
 - Developed Condition Drainage Map

- **Appendix J** – Electronic Copy of Study (CD)
- **Appendix K** – Revised Storm Drain Plans & Profiles

APPENDIX A

Drainage Exhibits

Exhibit E2 – Ultimate Condition Drainage Map

Exhibit F – Storm Drain Schematic Map

APPENDIX B

Street Hydraulic Sections (Ultimate Condition)

Section - ECA3b (Ultimate Condition)

Worksheet for Irregular Channel

Project Description	
Worksheet	Section - ECA3b (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	4.94 %
Discharge	14.00 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	0.36 ft
Elevation Range	0.00 to 0.56
Flow Area	2.8 ft ²
Wetted Perimeter	23.27 ft
Top Width	22.45 ft
Actual Depth	0.36 ft
Critical Elevation	0.48 ft
Critical Slope	0.69 %
Velocity	5.02 ft/s
Velocity Head	0.39 ft
Specific Energy	0.76 ft
Froude Number	2.51
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+43.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+21.50	0.56
0+41.00	0.17
0+41.00	0.13
0+42.50	0.00
0+42.50	0.48
0+43.00	0.50

Section - ECA3b (Ultimate Condition) Worksheet for Irregular Channel

Notes: $Q = \text{WML13 (0 CFS)} + \text{EC3a BYPASS (11 CFS)} + \text{WEGL2/4 (3 CFS)} = 14 \text{ CFS}$

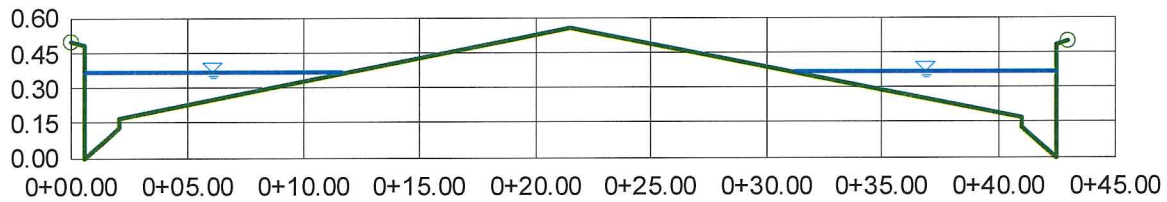
Section - ECA3b (Ultimate Condition) Cross Section for Irregular Channel

Project Description

Worksheet	Section - ECA3b (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.016
Channel Slope	4.94 %
Water Surface Elevation	0.36 ft
Elevation Range	0.00 to 0.56
Discharge	14.00 cfs



V:10.0
H:1
NTS

Section - ECA3c (Ultimate Condition)

Worksheet for Irregular Channel

Project Description	
Worksheet	Section - ECA3c (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	4.94 %
Discharge	31.00 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	0.45 ft
Elevation Range	0.00 to 0.56
Flow Area	5.1 ft²
Wetted Perimeter	32.12 ft
Top Width	31.12 ft
Actual Depth	0.45 ft
Critical Elevation	0.60 ft
Critical Slope	0.61 %
Velocity	6.06 ft/s
Velocity Head	0.57 ft
Specific Energy	1.02 ft
Froude Number	2.64
Flow Type	Supercritical

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+43.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+21.50	0.56
0+41.00	0.17
0+41.00	0.13
0+42.50	0.00
0+42.50	0.48
0+43.00	0.50

Section - ECA3c (Ultimate Condition) Worksheet for Irregular Channel

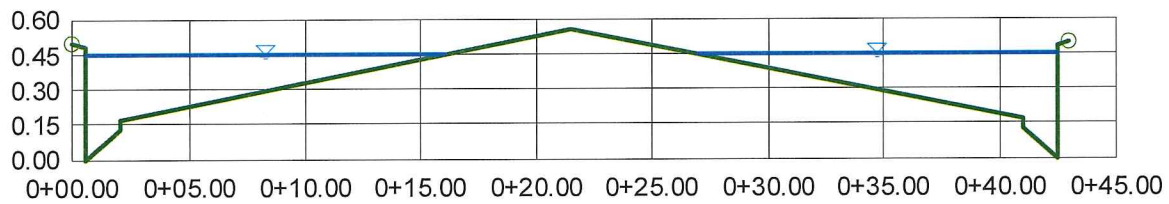
Notes: $Q = \text{Parcel 2.15 Basin ON2}\{\text{WL6B OVERFLOW (22 CFS)}\} + \text{EC3b BYPASS (6 CFS)} + \text{WEGL2/4 (3 CFS)} = 31 \text{ CFS}$

Section - ECA3c (Ultimate Condition)

Cross Section for Irregular Channel

Project Description	
Worksheet	Section - ECA3c (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Channel Slope	4.94 %
Water Surface Elevation	0.45 ft
Elevation Range	0.00 to 0.56
Discharge	31.00 cfs



V:10.0
H:1
NTS

Section - ECA4 (Ultimate Condition)

Worksheet for Irregular Channel

Project Description	
Worksheet	Section - ECA4 (Ultimate Condition)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.50 %
Discharge	24.00 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	0.58 ft
Elevation Range	0.00 to 0.56
Flow Area	9.9 ft²
Wetted Perimeter	44.21 ft
Top Width	43.00 ft
Actual Depth	0.58 ft
Critical Elevation	0.56 ft
Critical Slope	0.65 %
Velocity	2.42 ft/s
Velocity Head	0.09 ft
Specific Energy	0.67 ft
Froude Number	0.89
Flow Type	Subcritical

Calculation Messages:
 Water elevation exceeds lowest end station by 0.77367849e-1 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+43.00	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+21.50	0.56
0+41.00	0.17
0+41.00	0.13
0+42.50	0.00
0+42.50	0.48
0+43.00	0.50

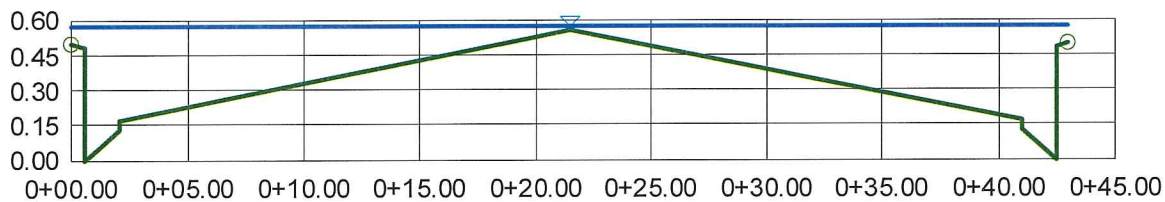
Section - ECA4 (Ultimate Condition) Worksheet for Irregular Channel

Notes: $Q = \text{WEGL2/4 (3 CFS)} + \text{ECA3c BYPASS (21 CFS)} = 24\text{CFS}$

Section - ECA4 (Ultimate Condition) Cross Section for Irregular Channel

Project Description	
Worksheet	Section - ECA4 (Ultimate Condition)
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	0.58 ft
Elevation Range	0.00 to 0.56
Discharge	24.00 cfs



V:10.0
H:1
NTS

Section HU2B Hualapai Half Street Section - West (100-YR)

Worksheet for Irregular Channel

Project Description	
Worksheet	Section HU2B Hualapai Half Street Section - West (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Channel Slope	0.57 %
Discharge	41.00 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	0.82 ft
Elevation Range	0.00 to 1.44
Flow Area	11.7 ft²
Wetted Perimeter	35.14 ft
Top Width	34.29 ft
Actual Depth	0.82 ft
Critical Elevation	0.83 ft
Critical Slope	0.51 %
Velocity	3.50 ft/s
Velocity Head	0.19 ft
Specific Energy	1.01 ft
Froude Number	1.06
Flow Type	Supercritical

Calculation Messages:
 Water elevation exceeds lowest end station by 0.31576627 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+39.00	0.016
0+39.00	0+45.50	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+39.00	0.91
0+39.01	0.99
0+39.25	1.30
0+39.42	1.32

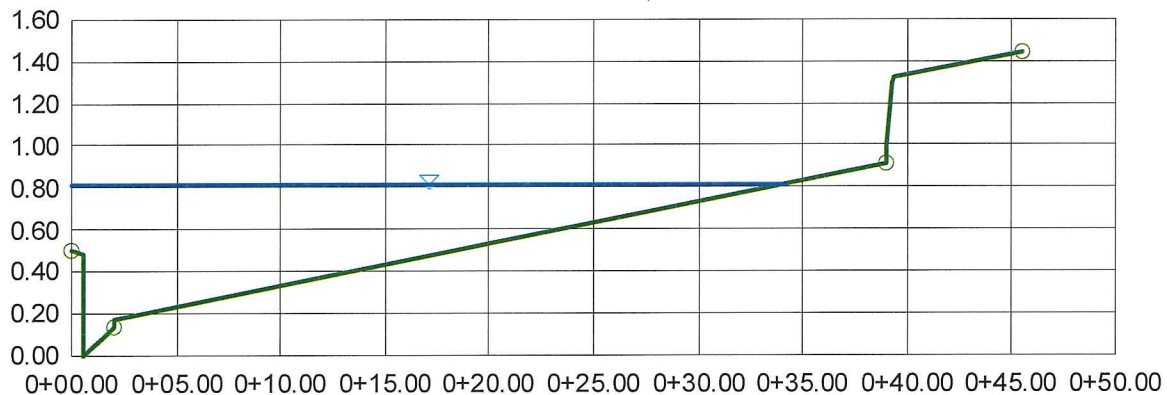
Section HU2B Hualapai Half Street Section - West (100-YR)
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+45.50	1.44

Section HU2B Hualapai Half Street Section - West (100-YR) Cross Section for Irregular Channel

Project Description	
Worksheet	Section HU2B Hualapai Half Street Section - West (100-YR)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Channel Slope	0.57 %
Water Surface Elevation	0.82 ft
Elevation Range	0.00 to 1.44
Discharge	41.00 cfs



V:10.0
H:1
NTS

APPENDIX C

Drop Inlet Computations (Ultimate Condition)

Project:		Skye Canyon Infrastructure - Phase 2 Update No.4	
Title:		Type CM2 Drop Inlet (Continuous Grade)	
Subtitle:		5-ft Drop Inlet at Section ECA3c	
By:		ETM	
Date:		6/14/2017	
Input:		Variable:	Input:
Street Flow (cfs)		Q	15.5
Longitudinal Slope (ft/ft)		S _o	0.0494
Manning's Coefficient		n	0.016
Street Flow Velocity (fps)		V	6.06
Street Flow Depth (ft)		D	0.45
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	2.5
Length of Curb Opening (ft)		L _c	5.0
Clogging Factor - Grate (%)		CF _g	50%
Clogging Factor - Curb (%)		CF _c	50%
Effective Grate Length (ft)		L _{ge}	1.3
Effective Curb Opening Length (ft)		L _{ce}	2.50
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	0.87
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)	4.61
¹ E - Grate Flow Ratio		Frontal Flow/Side Flow	0.26
² Q _w - Frontal Flow (cfs)		Q _w = Q[1-(1-(W/T)) ^{2.67}]	4.00
¹ Q _s - Side Flow (cfs)		Q _s = Q-Q _w	11.5
T - Side Flow Spread (ft)		(D-D _g)/S _x	14.17
¹ R _s - Side Flow Factor		1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3}))	0.01
¹ Q _{gi} - Intercepted Flow (cfs)		(R _f *E+R _s *(1-E))*Q	3.6
Output (Curb):		Equation:	Output (Curb):
¹ S _e - Equivalent Cross Slope (ft/ft)		S _x +S _g *E	0.049
Q _{sx} - Remaining Flow After Grate Interception (cfs)		Q-Q _{gi}	11.920
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}	50.50
¹ Q _{ci} - Intercepted Flow (cfs)		(1-(1-L _{ce} /L _t) ^{1.8})*Q _{sx}	1.0
		or Q _{sx} if L _t is less than L _{ce}	
Output (Combination):			Output (Combination):
Total Intercepted Flow (cfs)		Intercepted (Grate) + Intercepted (Curb)	5

¹ Formula referenced from the CCRFCD Manual

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

¹ Formula referenced from the CCRFCD Manual

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

[illegible]

Project:	Skye Canyon Infrastructure - Phase 2 Update No.2	
Title:	Type CM2 Drop Inlet (Continuous Grade)	
Subtitle:	7.5-ft Drop Inlet at Section HU2B (Hualapai Evaluation)	
By:	ETM	
Date:	6/14/2017	
Input:	Variable:	Input:
Street Flow (cfs)	Q	41.0
Longitudinal Slope (ft/ft)	S _o	0.0057
Manning's Coefficient	n	0.015
Street Flow Velocity (fps)	V	3.50
Street Flow Depth (ft)	D	0.82
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	7.5
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	0.12
² Q _w - Frontal Flow (cfs)	Q _w = Q[1-(1-(W/T)) ^{2.67}]	4.84
¹ Q _s - Side Flow (cfs)	Q _s = Q-Q _w	36.2
T - Side Flow Spread (ft)	(D-D _g)/S _x	32.67
¹ R _s - Side Flow Factor	1/(1+(0.15*V ^{1.8})/(S _x *L _{ge} ^{2.3}))	0.10
¹ Q _{gi} - Intercepted Flow (cfs)	(R _f *E+R _s *(1-E))*Q	8.6
Output (Curb):	Equation:	Output (Curb):
¹ S _e - Equivalent Cross Slope (ft/ft)	S _x +S _g *E	0.033
Q _{sx} - Remaining Flow After Grate Interception (cfs)	Q-Q _{gi}	32.433
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}	52.71
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}	4.0
Output (Combination):		Output (Combination):
Total Intercepted Flow (cfs)	Intercepted (Grate) + Intercepted (Curb)	13

¹ Formula referenced from the CCRFCD Manual

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

APPENDIX D

WSPG Models (Ultimate Condition)

Eagle Canyon Avenue (U-ECA)

U-ECA.WSP

0
T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
T2 BY OLYMPIA COMPANIES
T3 EAGLE CANYON - TRUNK STORM DRAIN
SO 0613.002823.35 72 2829.26
R 0900.002830.52 72 .013 1
JX 0900.002830.52 72 48 .013 88.5 2832.52 45.00 1
R 0950.002831.58 72 .013 1
WE 0950.002831.58 72 .013
TS 1000.002835.61 66 .013 1
WX 1000.002835.61 66 .013
R 1093.002837.13 66 .013 1
JX 1093.002838.13 54 42 42.013 54.5 37.52839.132839.13 45.00 45.00 1

R 1389.502839.63 54 .013 1
JX 1394.502840.13 48 18 18.013 5.0 5.02842.632842.63 45.00 45.00 1
R 1632.002854.48 48 .013 5. 1
R 1762.002862.62 48 .013 5. 1
R 1883.002868.57 48 .013 5. 1
R 1992.002873.94 48 .013 5. 1
JX 1992.002873.94 48 18 24.013 4.0 16.02876.442875.94 75.00 75.00 1
R 2072.002877.87 48 .013 5. 1
R 2167.002882.51 48 .013 5. 1
R 2262.002885.16 48 .013 5. 1
JX 2262.002885.16 48 36 .013 56.0 2886.16 38.00 1
R 2422.002888.80 48 .013
JX 2422.002888.80 48 18 .013 3.0 2891.30 45.00 1
R 2820.002903.13 48 .013
JX 2820.002903.13 48 42 .013 86.0 2903.63 45.00 1
R 3004.002908.81 48 .013 60. 1
JX 3004.002908.81 48 36 18.013 52.0 18.02909.812911.31 60.00 45.00 1
R 3024.002910.72 48 .013
JX 3024.002910.72 48 48 .013 18.0 2912.12 90.00 1
R 3060.002912.43 48 .013
SH 3060.002912.43 48
CD 18 4 1.5
CD 24 4 2.
CD 30 4 2.5
CD 36 4 3.
CD 42 4 3.5
CD 48 4 4.
CD 54 4 4.5
CD 60 4 5.
CD 66 4 5.5
CD 72 4 6.
CD 78 4 6.5
→

0
Q
↑

36.0

U-ECA.WSQ

DATE: 6/15/2017
TIME: 16: 5

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON - TRUNK STORM DRAIN
F 0 5 1 5 P

F

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1	IS A SYSTEM OUTLET	STATION	INVERT	SECT									
		U/S DATA	613.00	2823.35	72	W S ELEV 2829.26								
ELEMENT NO	2	IS A REACH	STATION	INVERT	SECT	N								
		U/S DATA	900.00	2830.52	72	0.013	RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1							
ELEMENT NO	3	IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		U/S DATA	900.00	2830.52	72	48	0	0.013	88.5	0.0	2832.52	0.00	45.00	0.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING														
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ELEMENT NO	4	IS A REACH	STATION	INVERT	SECT	N								
		U/S DATA	950.00	2831.58	72	0.013	RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1							
ELEMENT NO	5	IS A WALL ENTRANCE	STATION	INVERT	SECT	FP								
		U/S DATA	950.00	2831.58	72	0.013								
ELEMENT NO	6	IS A TRANSITION	STATION	INVERT	SECT	N								
		U/S DATA	1000.00	2835.61	66	0.013								
ELEMENT NO	7	IS A WALL EXIT	STATION	INVERT	SECT									
		U/S DATA	1000.00	2835.61	66									
ELEMENT NO	8	IS A REACH	STATION	INVERT	SECT	N								
		U/S DATA	1093.00	2837.13	66	0.013	RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1							
ELEMENT NO	9	IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		U/S DATA	1093.00	2838.13	54	42	42	0.013	54.5	37.5	2839.13	2839.13	45.00	45.00
ELEMENT NO	10	IS A REACH	STATION	INVERT	SECT	N								
		U/S DATA	1389.50	2839.63	54	0.013	RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1							
ELEMENT NO	11	IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		U/S DATA	1394.50	2840.13	48	18	18	0.013	5.0	5.0	2842.63	2842.63	45.00	45.00
PAGE NO 3														

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PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	12	IS	A REACH	*	*	*																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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ELEMENT NO 19 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	2262.00	2885.16	48	0.013	0.00	0.00	5.00	1

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 20 IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	2262.00	2885.16	48	36	0	0.013	56.0	0.0	2886.16	0.00	38.00	0.00

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 21 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	2422.00	2888.80	48	0.013	0.00	0.00	0.00	1

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 22 IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	2422.00	2888.80	48	18	0	0.013	3.0	0.0	2891.30	0.00	45.00	0.00

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

PAGE NO 4

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 23 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	2820.00	2903.13	48	0.013	0.00	0.00	0.00	1

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 24 IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	2820.00	2903.13	48	42	0	0.013	86.0	0.0	2903.63	0.00	45.00	0.00

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 25 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	3004.00	2908.81	48	0.013	0.00	0.00	60.00	1

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 26 IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	3004.00	2908.81	48	36	18	0.013	52.0	18.0	2909.81	2911.31	60.00	45.00

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 27 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	3024.00	2910.72	48	0.013	0.00	0.00	0.00	1

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 28 IS A JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
U/S DATA	3024.00	2910.72	48	48	0	0.013	18.0	0.0	2912.12	0.00	90.00	0.00

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 29 IS A REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	3060.00	2912.43	48	0.013	0.00	0.00	0.00	1

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 30 IS A SYSTEM HEADWORKS	STATION	INVERT	SECT	W S ELEV
U/S DATA	3060.00	2912.43	48	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

LICENSEE: SLATER HANIFAN GROUP F0515P PAGE 1

WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
613.00	2823.35	4.010	2827.360	479.5	23.88	8.853	2836.213	0.00	5.621	6.00	0.00	0.00	0	0.00
70.92	0.02498					.020090	1.42		3.757			0.00		
683.92	2825.12	4.102	2829.224	479.5	23.28	8.414	2837.638	0.00	5.621	6.00	0.00	0.00	0	0.00
88.77	0.02498					.018416	1.63		3.757			0.00		
772.69	2827.34	4.284	2831.623	479.5	22.19	7.649	2839.272	0.00	5.621	6.00	0.00	0.00	0	0.00
58.23	0.02498					.016459	0.96		3.757			0.00		
830.92	2828.79	4.483	2833.277	479.5	21.16	6.954	2840.231	0.00	5.621	6.00	0.00	0.00	0	0.00
40.67	0.02498					.014774	0.60		3.757			0.00		
871.59	2829.81	4.700	2834.510	479.5	20.18	6.321	2840.831	0.00	5.621	6.00	0.00	0.00	0	0.00
28.41	0.02498					.013347	0.38		3.757			0.00		
900.00	2830.52	4.944	2835.464	479.5	19.24	5.747	2841.211	0.00	5.621	6.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.018387	0.00					0.00		
900.00	2830.52	3.332	2833.852	391.0	24.25	9.128	2842.980	0.00	5.292	6.00	0.00	0.00	0	0.00
50.00	0.02120					.024400	1.22		3.468			0.00		
950.00	2831.58	3.305	2834.885	391.0	24.49	9.314	2844.199	0.00	5.292	6.00	0.00	0.00	0	0.00
TRANS STR	0.08060					.019055	0.95					0.00		
1000.00	2835.61	4.540	2840.150	391.0	18.64	5.395	2845.545	0.00	5.168	5.50	0.00	0.00	0	0.00
WALL EXIT												0.00		
1000.00	2835.61	4.539	2840.149	391.0	18.65	5.398	2845.547	0.00	5.168	5.50	0.00	0.00	0	0.00
8.18	0.01634					.013339	0.11		4.120			0.00		
1008.18	2835.74	4.560	2840.304	391.0	18.56	5.351	2845.655	0.00	5.168	5.50	0.00	0.00	0	0.00
61.83	0.01634					.012762	0.79		4.120			0.00		
LICENSEE: SLATER HANIFAN GROUP						F0515P							PAGE	2

U-ECA.OUT
WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

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

1070.01	2836.75	4.825	2841.579	391.0	17.70	4.865	2846.444	0.00	5.168	5.50	0.00	0.00	0	0.00
22.99	0.01634					.011978	0.28			4.120		0.00		
1093.00	2837.13	5.168	2842.298	391.0	16.87	4.422	2846.720	0.00	5.168	5.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.017417	0.00					0.00		
1093.00	2838.13	5.209	2843.339	299.0	18.80	5.488	2848.827	0.00	4.385	4.50	0.00	0.00	0	0.00
296.50	0.00506					.023118	6.85			4.500		0.00		
1389.50	2839.63	10.838	2850.468	299.0	18.80	5.488	2855.956	0.00	4.385	4.50	0.00	0.00	0	0.00
JUNCT STR	0.10000											0.00		
1394.50	2840.13	2.787	2842.917	289.0	30.92	14.841	2857.758	0.00	3.963	4.00	0.00	0.00	0	0.00
237.50	0.06042					.055460	13.17			2.752		0.00		
1632.00	2854.48	2.908	2857.388	289.0	29.54	13.545	2870.933	0.00	3.963	4.00	0.00	0.00	0	0.00
70.99	0.06262					.050304	3.57			2.716		0.00		
1702.99	2858.93	3.014	2861.939	289.0	28.45	12.566	2874.505	0.00	3.963	4.00	0.00	0.00	0	0.00
59.01	0.06262					.045764	2.70			2.716		0.00		
1762.00	2862.62	3.162	2865.782	289.0	27.12	11.424	2877.206	0.00	3.963	4.00	0.00	0.00	0	0.00
15.82	0.04917					.043162	0.68			2.986		0.00		
1777.82	2863.40	3.178	2866.576	289.0	26.99	11.311	2877.887	0.00	3.963	4.00	0.00	0.00	0	0.00
105.18	0.04917					.041003	4.31			2.986		0.00		
1883.00	2868.57	3.347	2871.917	289.0	25.73	10.284	2882.201	0.00	3.963	4.00	0.00	0.00	0	0.00
7.31	0.04927					.038901	0.28			2.984		0.00		
1890.31	2868.93	3.364	2872.294	289.0	25.62	10.189	2882.483	0.00	3.963	4.00	0.00	0.00	0	0.00
60.57	0.04927					.037325	2.26			2.984		0.00		
LICENSEE: SLATER HANIFAN GROUP													PAGE	3

WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

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

1950.88	2871.91	3.567	2875.481	289.0	24.42	9.262	2884.743	0.00	3.963	4.00	0.00	0.00	0	0.00
41.12	0.04927					.035621	1.46			2.984		0.00		
1992.00	2873.94	3.848	2877.788	289.0	23.29	8.421	2886.209	0.00	3.963	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.037623	0.00					0.00		
1992.00	2873.94	3.074	2877.014	269.0	25.96	10.465	2887.479	0.00	3.951	4.00	0.00	0.00	0	0.00
13.53	0.04913					.039592	0.54			2.820		0.00		
2005.53	2874.61	3.096	2877.701	269.0	25.77	10.311	2888.012	0.00	3.951	4.00	0.00	0.00	0	0.00
66.47	0.04913					.037405	2.49			2.820		0.00		
2072.00	2877.87	3.254	2881.124	269.0	24.57	9.373	2890.497	0.00	3.951	4.00	0.00	0.00	0	0.00
39.34	0.04884					.034253	1.35			2.826		0.00		
2111.34	2879.79	3.404	2883.196	269.0	23.60	8.650	2891.846	0.00	3.951	4.00	0.00	0.00	0	0.00
33.77	0.04884					.031859	1.08			2.826		0.00		
2145.11	2881.44	3.617	2885.058	269.0	22.50	7.864	2892.922	0.00	3.951	4.00	0.00	0.00	0	0.00
21.89	0.04884					.031405	0.69			2.826		0.00		
2167.00	2882.51	3.951	2886.461	269.0	21.45	7.148	2893.609	0.00	3.951	4.00	0.00	0.00	0	0.00
2.99	0.02789					.033326	0.10			4.000		0.00		
2169.99	2882.59	4.000	2886.594	269.0	21.41	7.116	2893.710	0.00	3.951	4.00	0.00	0.00	0	0.00
92.01	0.02789					.034835	3.21			4.000		0.00		
2262.00	2885.16	5.005	2890.165	269.0	21.41	7.116	2897.281	0.00	3.951	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.028529	0.00					0.00		
2262.00	2885.16	9.449	2894.609	213.0	16.95	4.461	2899.070	0.00	3.879	4.00	0.00	0.00	0	0.00
160.00	0.02275					.021988	3.52			3.220		0.00		
LICENSEE: SLATER HANIFAN GROUP													PAGE	4

WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
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L/ELEM		SO		SF AVE		HF		U-ECA.OUT		NORM DEPTH		ZR	
2422.00	2888.80	9.550	2898.350	213.0	16.95	4.461	2902.811	0.00	3.879	4.00	0.00	0.00	0 0.00
JUNCT STR	0.00000					.021680	0.00					0.00	
2422.00	2888.80	9.791	2898.591	210.0	16.71	4.337	2902.928	0.00	3.872	4.00	0.00	0.00	0 0.00
398.00	0.03601					.021373	8.51			2.633		0.00	
2820.00	2903.13	4.184	2907.314	210.0	16.71	4.337	2911.651	0.00	3.872	4.00	0.00	0.00	0 0.00
JUNCT STR	0.00000					.014412	0.00					0.00	
2820.00	2903.13	8.490	2911.620	124.0	9.87	1.512	2913.132	0.00	3.345	4.00	0.00	0.00	0 0.00
184.00	0.03087					.007452	1.37			1.980		0.00	
3004.00	2908.81	4.556	2913.366	124.0	9.87	1.512	2914.878	0.00	3.345	4.00	0.00	0.00	0 0.00
JUNCT STR	0.00000					.004432	0.00					0.00	
3004.00	2908.81	6.213	2915.023	54.0	4.30	0.287	2915.310	0.00	2.209	4.00	0.00	0.00	0 0.00
20.00	0.09550					.001413	0.03			0.941		0.00	
3024.00	2910.72	4.346	2915.066	54.0	4.30	0.287	2915.353	0.00	2.209	4.00	0.00	0.00	0 0.00
JUNCT STR	0.00000					.001020	0.00					0.00	
3024.00	2910.72	4.665	2915.385	36.0	2.86	0.127	2915.512	0.00	1.787	4.00	0.00	0.00	0 0.00
14.23	0.04750					.000624	0.01			0.915		0.00	
3038.23	2911.40	4.000	2915.396	36.0	2.86	0.127	2915.523	0.00	1.787	4.00	0.00	0.00	0 0.00
7.61	0.04750					.000585	0.00			0.915		0.00	
3045.84	2911.76	3.629	2915.387	36.0	3.00	0.140	2915.527	0.00	1.787	4.00	0.00	0.00	0 0.00
4.31	0.04750					.000569	0.00			0.915		0.00	
3050.15	2911.96	3.413	2915.375	36.0	3.15	0.154	2915.529	0.00	1.787	4.00	0.00	0.00	0 0.00
3.44	0.04750					.000615	0.00			0.915		0.00	

LICENSEE: SLATER HANIFAN GROUP

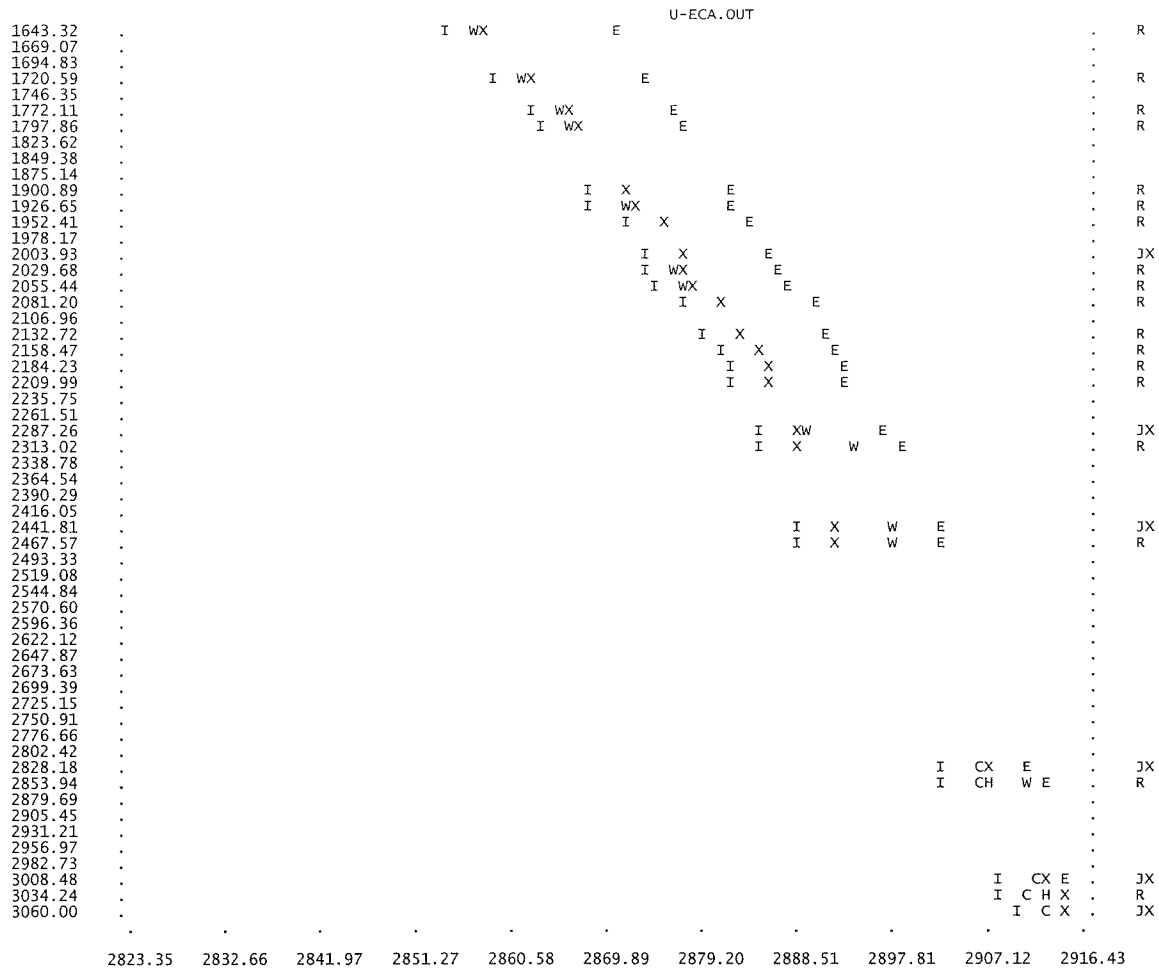
WATER SURFACE PROFILE LISTING
F0515P
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

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STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
3053.59	2912.13	3.236	2915.362	36.0	3.31	0.170	2915.532	0.00	1.787	4.00	0.00	0.00	0 0.00	
2.97	0.04750					.000677	0.00		0.915			0.00		
3056.56	2912.27	3.080	2915.347	36.0	3.47	0.187	2915.534	0.00	1.787	4.00	0.00	0.00	0 0.00	
2.60	0.04750					.000751	0.00		0.915			0.00		
3059.16	2912.39	2.940	2915.330	36.0	3.64	0.205	2915.535	0.00	1.787	4.00	0.00	0.00	0 0.00	
0.84	0.04750					.000808	0.00		0.915			0.00		
3060.00	2912.43	2.894	2915.324	36.0	3.70	0.212	2915.536	0.00	1.787	4.00	0.00	0.00	0 0.00	

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

613.00	I	W	X	E										R
638.76														
664.52														
690.27	I	W	CH	E										R
716.03														
741.79														
767.55														
793.31	I	W	X	E										R
819.06														
844.82	I	W	CH	E										R
870.58														
896.34	I	W	CH	E										R
922.09	I	W	CH	E										JX
947.85	I	W	CH	E										R
973.61	I	W	CH	E										TX
999.37														
1025.13		I	W	X	E									WX
1050.88		I	W	X	E									R
1076.64		I	W	X	E									R
1102.40		I	W	X	E									R
1128.16		I	W	X	E									JX
1153.92		I	W	X	E									R
1179.67														
1205.43														
1231.19														
1256.95														
1282.71														
1308.46														
1334.22														
1359.98														
1385.74														
1411.49		I	W	X	E									JX
1437.25		I	W	X	E									R
1463.01														
1488.77														
1514.53														
1540.28														
1566.04														
1591.80														
1617.56														



NOTES

1. GLOSSARY

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

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

Skye Village Road (Hualapai Way – HUS MAIN)

HUS-Main.WSP

0
T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 ADDENDUM (Hualapai Evaluation)
T2 BY OLYMPIA COMPANIES
T3 HUALAPAI WAY (SOUTH) - TRUNK STORM DRAIN

SO	1000.002833.01	48				2835.46			
R	1062.002836.24	48		.013				45.	1
JX	1062.002836.74	42	36	.013	30.0	2837.24		45.	
R	1309.002837.97	42		.013					1
JX	1309.002839.47	24	36	.013	42.5	2838.50		80.	
R	1699.002841.42	24		.013				45.	1
SH	1699.002841.42	24							

CD	18	4		1.5
CD	24	4		2.
CD	30	4		2.5
CD	36	4		3.
CD	42	4		3.5
CD	48	4		4.

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16.

DATE: 6/14/2017
TIME: 16:12

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

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

F 0 5 1 5 P

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WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 ADDENDUM (Hualapai Evaluation)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

HUALAPAI WAY (SOUTH) - TRUNK STORM DRAIN
F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS	A	SYSTEM OUTLET	1000.00	2833.01	48	2835.46				
2	IS	A	REACH	1062.00	2836.24	48		0.013	0.00	45.00	1
3	IS	A	JUNCTION	1062.00	2836.74	42		0.013	0.00	45.00	1
4	IS	A	REACH	1309.00	2837.97	42		0.013	0.00	45.00	1
5	IS	A	JUNCTION	1309.00	2839.47	24		0.013	0.00	80.00	1
6	IS	A	REACH	1699.00	2841.42	24		0.013	0.00	45.00	1
7	IS	A	SYSTEM HEADWORKS	1699.00	2841.42	24	0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

LICENSEE: SLATER HANIFAN GROUP

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WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 ADDENDUM (Hualapai Evaluation)
BY OLYMPIA COMPANIES
HUALAPAI WAY (SOUTH) - TRUNK STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
1000.00	2833.01	1.712	2834.722	88.5	17.24	4.614	2839.336	0.00	2.852	4.00	0.00	0.00	0	0.00
1.30	0.05210					.026013	0.03		1.420			0.00		
1001.30	2833.08	1.717	2834.794	88.5	17.16	4.573	2839.367	0.00	2.852	4.00	0.00	0.00	0	0.00
12.68	0.05210					.024284	0.31		1.420			0.00		
1013.98	2833.74	1.780	2835.518	88.5	16.36	4.158	2839.676	0.00	2.852	4.00	0.00	0.00	0	0.00
10.11	0.05210					.021344	0.22		1.420			0.00		
1024.09	2834.26	1.847	2836.112	88.5	15.60	3.780	2839.892	0.00	2.852	4.00	0.00	0.00	0	0.00
8.24	0.05210					.018771	0.15		1.420			0.00		
1032.33	2834.69	1.916	2836.610	88.5	14.88	3.436	2840.046	0.00	2.852	4.00	0.00	0.00	0	0.00
6.73	0.05210					.016518	0.11		1.420			0.00		
1039.06	2835.05	1.989	2837.034	88.5	14.18	3.123	2840.157	0.00	2.852	4.00	0.00	0.00	0	0.00
5.54	0.05210					.014545	0.08		1.420			0.00		
1044.60	2835.33	2.065	2837.398	88.5	13.52	2.840	2840.238	0.00	2.852	4.00	0.00	0.00	0	0.00
4.53	0.05210					.012818	0.06		1.420			0.00		
1049.13	2835.57	2.145	2837.715	88.5	12.89	2.581	2840.296	0.00	2.852	4.00	0.00	0.00	0	0.00
3.70	0.05210					.011306	0.04		1.420			0.00		
1052.83	2835.76	2.229	2837.991	88.5	12.29	2.347	2840.338	0.00	2.852	4.00	0.00	0.00	0	0.00
2.95	0.05210					.009983	0.03		1.420			0.00		
1055.78	2835.92	2.318	2838.234	88.5	11.72	2.134	2840.368	0.00	2.852	4.00	0.00	0.00	0	0.00
2.33	0.05210					.008824	0.02		1.420			0.00		
1058.11	2836.04	2.411	2838.449	88.5	11.18	1.939	2840.388	0.00	2.852	4.00	0.00	0.00	0	0.00
1.73	0.05210					.007812	0.01		1.420			0.00		

E0515P

L/ELEM		SO				SF AVE		HF		NORM DEPTH		ZR					
*****														*****			
1059.84	2836.13	2.511	2838.638	88.5	10.66	1.763	2840.401	0.00	2.852	4.00	0.00	0	0.00				
1.22	0.05210					.006927	0.01			1.420		0.00					
1061.06	2836.19	2.616	2838.807	88.5	10.16	1.603	2840.410	0.00	2.852	4.00	0.00	0	0.00				
0.71	0.05210					.006153	0.00			1.420		0.00					
1061.77	2836.23	2.729	2838.957	88.5	9.69	1.457	2840.414	0.00	2.852	4.00	0.00	0	0.00				
0.23	0.05210					.005479	0.00			1.420		0.00					
1062.00	2836.24	2.852	2839.092	88.5	9.23	1.324	2840.416	0.00	2.852	4.00	0.00	0	0.00				
JUNCT STR	0.00000					.004273	0.00					0.00					
1062.00	2836.74	3.553	2840.293	58.5	6.08	0.574	2840.867	0.00	2.396	3.50	0.00	0	0.00				
35.79	0.00498					.003357	0.12			2.420		0.00					
1097.79	2836.92	3.500	2840.418	58.5	6.08	0.574	2840.992	0.00	2.396	3.50	0.00	0	0.00				
145.22	0.00498					.003144	0.46			2.420		0.00					
1243.01	2837.64	3.175	2840.816	58.5	6.38	0.632	2841.448	0.00	2.396	3.50	0.00	0	0.00				
65.07	0.00498					.003061	0.20			2.420		0.00					
1308.08	2837.97	2.987	2840.952	58.5	6.69	0.695	2841.647	0.00	2.396	3.50	0.00	0	0.00				
0.92	0.00498					.003167	0.00			2.420		0.00					
1309.00	2837.97	2.985	2840.955	58.5	6.69	0.696	2841.651	0.00	2.396	3.50	0.00	0	0.00				
JUNCT STR	0.00000					.004086	0.00					0.00					
1309.00	2839.47	2.874	2842.344	16.0	5.09	0.403	2842.747	0.00	1.442	2.00	0.00	0	0.00				
390.00	0.00500					.005002	1.95			1.640		0.00					
1699.00	2841.42	2.954	2844.374	16.0	5.09	0.403	2844.777	0.00	1.442	2.00	0.00	0	0.00				

SKYE CANYON INFRASTRUCTURE - PHASE 2 ADDENDUM (Hualapai Evaluation)
BY OLYMPIA COMPANIES
HUALAPAI WAY (SOUTH) - TRUNK STORM DRAIN

[illegible]

NOTES
1. GLOSSARY
I = INVERT ELEVATION

C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Revised Parcel 2.27 Lateral Stub (P4-L1)

0
T1 SKYE CANYON PARCEL 2.27
T2 BY OLYMPIA COMPANIES
T3 EAGLE CANYON LATERAL P4-L1 THRU PARCEL 2.27
SO 1000.002886.16 36 2894.61
R 1029.002887.72 36 .013 38. 1
JX 1029.002887.93 36 36 .013 3.0 2887.93 90.00 90. 1
R 1068.002890.02 36 .013 90. 1
JX 1068.002890.24 36 .013
R 1106.002892.25 36 .013 0. 1
SH 1106.002892.25 36
CD 18 4 1.5
CD 24 4 2.
CD 30 4 2.5
CD 36 4 3.
CD 42 4 3.5
CD 48 4 4.
CD 54 4 4.5
CD 60 4 5.
CD 66 4 5.5
CD 72 4 6.
CD 78 4 6.5

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53.0

P4-L1.WSQ

DATE: 6/19/2017
TIME: 9:37

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WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
00	18	4			1.50														
00	24	4			2.00														
00	30	4			2.50														
00	36	4			3.00														
00	42	4			3.50														
00	48	4			4.00														
00	54	4			4.50														
00	60	4			5.00														
00	66	4			5.50														
00	72	4			6.00														
00	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON PARCEL 2.27

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON LATERAL P4-L1 THRU PARCEL 2.27
F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS	A SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV													
		U/S DATA	1000.00	2886.16	36	2894.61													
ELEMENT NO	2 IS	A REACH	STATION	INVERT	SECT														
		U/S DATA	1029.00	2887.72	36														
ELEMENT NO	3 IS	A JUNCTION	STATION	INVERT	SECT														
		U/S DATA	1029.00	2887.93	36														
ELEMENT NO	4 IS	A REACH	STATION	INVERT	SECT														
		U/S DATA	1068.00	2890.02	36														
ELEMENT NO	5 IS	A JUNCTION	STATION	INVERT	SECT														
		U/S DATA	1068.00	2890.24	36														
ELEMENT NO	6 IS	A REACH	STATION	INVERT	SECT														
		U/S DATA	1106.00	2892.25	36														
ELEMENT NO	7 IS	A SYSTEM HEADWORKS	STATION	INVERT	SECT														
		U/S DATA	1106.00	2892.25	36														

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

LICENSEE: SLATER HANIFAN GROUP

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

SKYE CANYON PARCEL 2.27
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P4-L1 THRU PARCEL 2.27

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF							
1000.00	2886.16	8.450	2894.610	56.0	7.92	0.974	2895.584	0.00	2.427	3.00	0.00	0.00	0	0.00
29.00	0.05379					.007049	0.20		1.247			0.00		
1029.00	2887.72	7.265	2894.985	56.0	7.92	0.974	2895.959	0.00	2.427	3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.006681	0.00					0.00		
1029.00	2887.93	7.259	2895.189	53.0	7.50	0.873	2896.062	0.00	2.366	3.00	0.00	0.00	0	0.00
39.00	0.05359					.006314	0.25		1.211			0.00		
1068.00	2890.02	5.718	2895.738	53.0	7.50	0.873	2896.611	0.00	2.366	3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.006314	0.00					0.00		
1068.00	2890.24	5.498	2895.738	53.0	7.50	0.873	2896.611	0.00	2.366	3.00	0.00	0.00	0	0.00
38.00	0.05289					.006314	0.24		1.215			0.00		
1106.00	2892.25	3.771	2896.021	53.0	7.50	0.873	2896.894	0.00	2.366	3.00	0.00	0.00	0	0.00

SKYE CANYON PARCEL 2.27
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P4-L1 THRU PARCEL 2.27

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
1000.00	.1													
1002.16	.													
1004.33	.													
1006.49	.													
1008.65	.													
1010.82	.													
1012.98	.													
1015.14	.													
1017.31	.													
1019.47	.													

Wavelength (nm)	Intensity (a.u.)	Assignment
1021.63	10	
1023.80	10	
1025.96	10	
1028.12	10	
1030.29	10	I
1032.45	10	I
1034.61	10	
1036.78	10	
1038.94	10	
1041.10	10	
1043.27	10	
1045.43	10	
1047.59	10	
1049.76	10	
1051.92	10	
1054.08	10	
1056.24	10	
1058.41	10	
1060.57	10	
1062.73	10	
1064.90	10	
1067.06	10	
1069.22	10	I
1071.39	10	I
1073.55	10	
1075.71	10	
1077.88	10	
1080.04	10	
1082.20	10	
1084.37	10	
1086.53	10	
1088.69	10	
1090.86	10	
1093.02	10	
1095.18	10	
1097.35	10	
1099.51	10	
1101.67	10	
1103.84	10	
1106.00	10	

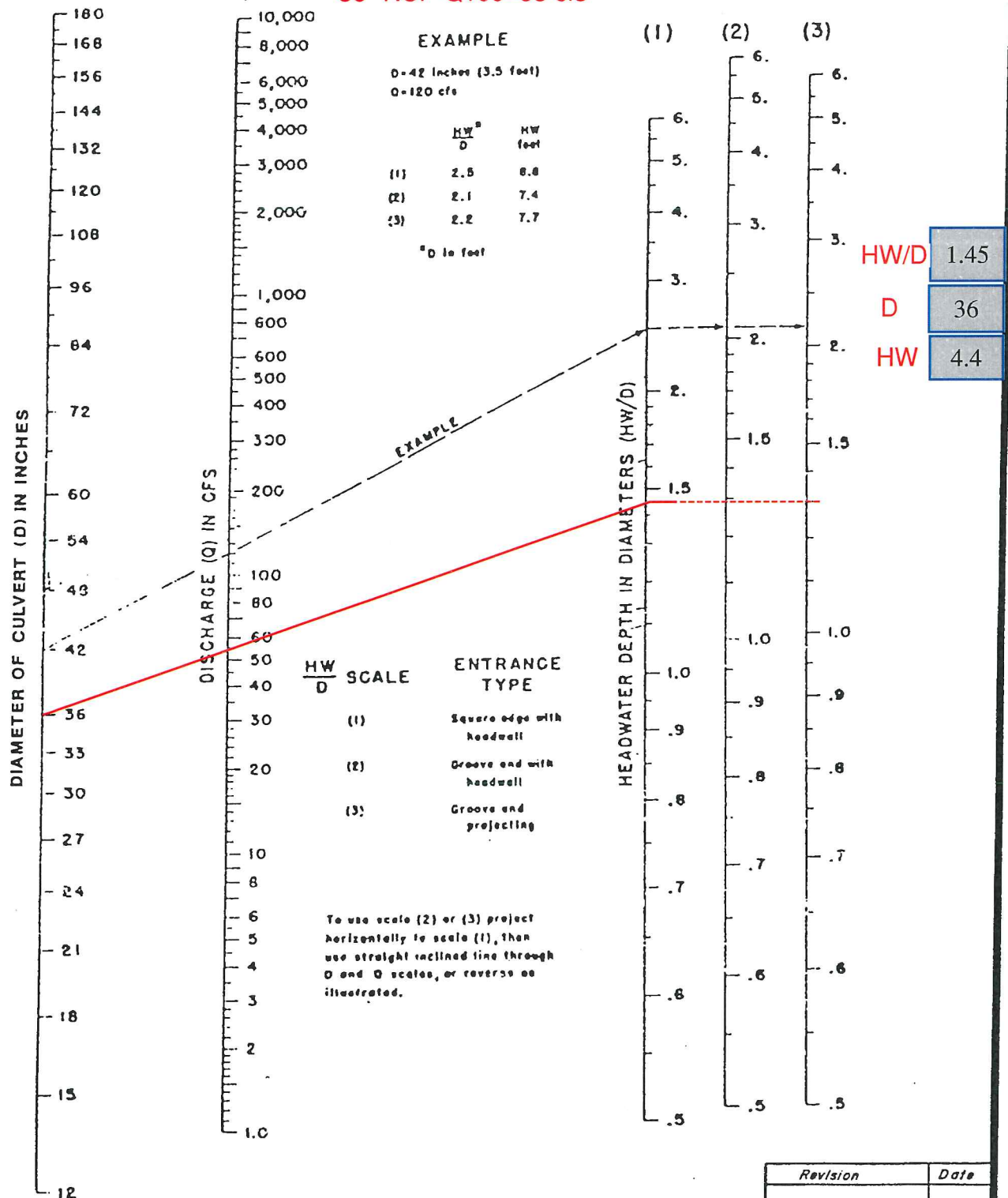
1. GLOSSARY

1. I = INVERT ELEVATION
C = CRITICAL DEPTH
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2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

NOMOGRAPH - INLET CONTROL RCP

36" RCP-Q100=53 cfs



Revision	Date

Eagle Canyon Avenue Laterals (P5B-L1&L2, P6-L1&L2)

P5B-L1.WSP

0

T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

T2 BY OLYMPIA COMPANIES

T3 EAGLE CANYON LATERAL P5B-L1

SO 1000.002842.63 18 2850.47

R 1028.002845.39 18 .013 45. 1

SH 1028.002845.39 18

CD	18	4	1.5
CD	24	4	2.
CD	30	4	2.5
CD	36	4	3.
CD	42	4	3.5
CD	48	4	4.
CD	54	4	4.5
CD	60	4	5.
CD	66	4	5.5
CD	72	4	6.
CD	78	4	6.5

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5.0

DATE: 6/14/2017
TIME: 16: 8

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON LATERAL P5B-L1

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV													
	U/S DATA		1000.00	2842.63	18	2850.47													
ELEMENT NO	2 IS A	REACH	STATION	INVERT	SECT														
	U/S DATA		1028.00	2845.39	18														
ELEMENT NO	3 IS A	SYSTEM HEADWORKS	STATION	INVERT	SECT	W S ELEV													
	U/S DATA		1028.00	2845.39	18	0.00													

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

PAGE 1

WATER SURFACE PROFILE LISTING

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P5B-L1

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO													
1000.00	2842.63	7.840	2850.470	5.0	2.83	0.124	2850.594	0.00	0.860	1.50	0.00	0.00	0	0.00
28.00	0.09857					.002266	0.06		0.400			0.00		
1028.00	2845.39	5.168	2850.558	5.0	2.83	0.124	2850.682	0.00	0.860	1.50	0.00	0.00	0	0.00

** WARNING NO. 22 ** - NO PLOT GENERATED, BAD DATA OR NOT ENOUGH POINTS, 3 OR LESS

P5B-L2.WSP

0

T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

T2 BY OLYMPIA COMPANIES

T3 EAGLE CANYON LATERAL P5B-L2

SO 1000.002842.63 18

2850.47

R 1028.002845.39 18

.013

45. 1

SH 1028.002845.39 18

CD 18 4 1.5

CD 24 4 2.

CD 30 4 2.5

CD 36 4 3.

CD 42 4 3.5

CD 48 4 4.

CD 54 4 4.5

CD 60 4 5.

CD 66 4 5.5

CD 72 4 6.

CD 78 4 6.5

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5.0

DATE: 6/14/2017
TIME: 16: 9

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON LATERAL P5B-L2

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS	A	SYSTEM OUTLET	1000.00	2842.63	18	2850.47				
2	IS	A	REACH	1028.00	2845.39	18		0.013	0.00	45.00	1
3	IS	A	SYSTEM HEADWORKS	1028.00	2845.39	18	0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

LICENSEE: SLATER HANIFAN GROUP

PAGE 1

F0515P
WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P5B-L2

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
1000.00	2842.63	7.840	2850.470	5.0	2.83	0.124	2850.594	0.00	0.860	1.50	0.00	0.00	0	0.00
28.00	0.09857					.002266	0.06		0.400			0.00		
1028.00	2845.39	5.168	2850.558	5.0	2.83	0.124	2850.682	0.00	0.860	1.50	0.00	0.00	0	0.00

** WARNING NO. 22 ** - NO PLOT GENERATED, BAD DATA OR NOT ENOUGH POINTS, 3 OR LESS

P6-L1.WSP

0
T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
T2 BY OLYMPIA COMPANIES
T3 EAGLE CANYON LATERAL P6-L1
SO 1000.002839.13 42 2843.34
R 1030.002839.30 42 .013 45. 1
JX 1030.002839.28 36 36 .013 20.5 2839.28 90.00
R 1065.002839.48 36 .013 1
SH 1065.002839.48 36

CD 18 4 1.5
CD 24 4 2.
CD 30 4 2.5
CD 36 4 3.
CD 42 4 3.5
CD 48 4 4.
CD 54 4 4.5
CD 60 4 5.
CD 66 4 5.5
CD 72 4 6.
CD 78 4 6.5
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34.0

P6-L1.WSQ

DATE: 6/14/2017
TIME: 16: 9

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON LATERAL P6-L1

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS	A	SYSTEM OUTLET	U/S DATA	1000.00	2839.13	42	2843.34				
2	IS	A	REACH	U/S DATA	1030.00	2839.30	42		0.013	0.00	0.00	45.00
3	IS	A	JUNCTION	U/S DATA	1030.00	2839.28	36		0.013	0.00	0.00	0.00
4	IS	A	REACH	U/S DATA	1065.00	2839.48	36		0.013	0.00	0.00	0.00
5	IS	A	SYSTEM HEADWORKS	U/S DATA	1065.00	2839.48	36					

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
 LICENSEE: SLATER HANIFAN GROUP

WATER SURFACE PROFILE LISTING

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
 BY OLYMPIA COMPANIES
 EAGLE CANYON LATERAL P6-L1

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
1000.00	2839.13	4.210	2843.340	54.5	5.66	0.498	2843.838	0.00	2.311	3.50	0.00	0.00	0	0.00
30.00	0.00567					.002934	0.09		2.197			0.00		
1030.00	2839.30	4.227	2843.527	54.5	5.66	0.498	2844.025	0.00	2.311	3.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002766	0.00					0.00		
1030.00	2839.28	4.787	2844.067	34.0	4.81	0.359	2844.426	0.00	1.894	3.00	0.00	0.00	0	0.00
35.00	0.00571					.002599	0.09		1.803			0.00		
1065.00	2839.48	4.696	2844.176	34.0	4.81	0.359	2844.535	0.00	1.894	3.00	0.00	0.00	0	0.00

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
 BY OLYMPIA COMPANIES
 EAGLE CANYON LATERAL P6-L1

L/ELEM	SO	SF AVE	HF	NORM DEPTH	ZR
1000.00	.I				
1001.33	.				
1002.65	.				
1003.98	.				
1005.31	.				
1006.63	.				
1007.96	.				
1009.29	.				
1010.61	.				
1011.94	.				
1013.27	.				
1014.59	.				
1015.92	.				
1017.24	.				
1018.57	.				
1019.90	.				
1021.22	.				
1022.55	.				
1023.88	.				
1025.20	.				
1026.53	.				
1027.86	.				
1029.18	.				
1030.51	. I				

[illegible]

NOTES

1. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY*
 I = INVERT ELEVATION
 C = CRITICAL DEPTH
 W = WATER SURFACE ELEVATION
 H = HEIGHT OF CHANNEL
 E = ENERGY GRADE LINE
 X = CURVES CROSSING OVER
 B = BRIDGE ENTRANCE OR EXIT
 Y = WALL ENTRANCE OR EXIT

P6-L2.WSP

0

T1 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

T2 BY OLYMPIA COMPANIES

T3 EAGLE CANYON LATERAL P6-L1

SO	1000.002839.13	42			2843.34			
R	1028.002839.49	42		.013			45.	1
JX	1028.002840.99	24	24	.013	20.5	2840.99	90.00	
R	1058.002841.44	24		.013				1
SH	1058.002841.44	24						

CD	18	4		1.5
CD	24	4		2.
CD	30	4		2.5
CD	36	4		3.
CD	42	4		3.5
CD	48	4		4.
CD	54	4		4.5
CD	60	4		5.
CD	66	4		5.5
CD	72	4		6.
CD	78	4		6.5

→

0
Q
1

17.0

P6-L2.WSQ

DATE: 6/14/2017
TIME: 16: 9

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														
CD	78	4			6.50														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)

HEADING LINE NO 2 IS -

BY OLYMPIA COMPANIES

HEADING LINE NO 3 IS -

EAGLE CANYON LATERAL P6-L1

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV								
	U/S DATA		1000.00	2839.13	42	2843.34								
ELEMENT NO	2 IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
	U/S DATA		1028.00	2839.49	42	0.013	0.00	0.00	45.00	1				
ELEMENT NO	3 IS A	JUNCTION	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	U/S DATA		1028.00	2840.99	24	24	0	0.013	20.5	0.0	2840.99	0.00	90.00	0.00
ELEMENT NO	4 IS A	REACH	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
	U/S DATA		1058.00	2841.44	24	0.013	0.00	0.00	0.00	1				
ELEMENT NO	5 IS A	SYSTEM HEADWORKS	STATION	INVERT	SECT	W S ELEV								
	U/S DATA		1058.00	2841.44	24	0.00								

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

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

LICENSEE: SLATER HANIFAN GROUP

F0515P

PAGE 1

WATER SURFACE PROFILE LISTING

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P6-L1

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
1000.00	2839.13	4.210	2843.340	37.5	3.90	0.236	2843.576	0.00	1.902	3.50	0.00	0.00	0	0.00
28.00	0.01286					.001389	0.04		1.380			0.00		
1028.00	2839.49	3.936	2843.426	37.5	3.90	0.236	2843.662	0.00	1.902	3.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.003518	0.00					0.00		
1028.00	2840.99	2.699	2843.689	17.0	5.41	0.455	2844.144	0.00	1.486	2.00	0.00	0.00	0	0.00
30.00	0.01500					.005647	0.17		1.130			0.00		
1058.00	2841.44	2.442	2843.882	17.0	5.41	0.455	2844.337	0.00	1.486	2.00	0.00	0.00	0	0.00

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.4)
BY OLYMPIA COMPANIES
EAGLE CANYON LATERAL P6-L1

1000.00	.	I	.	.	.	C	.	.	.	H	.	.	W	E	.	.	R
1001.18	.																
1002.37	.																
1003.55	.																
1004.73	.																
1005.92	.																
1007.10	.																
1008.29	.																
1009.47	.																
1010.65	.																
1011.84	.																
1013.02	.																
1014.20	.																
1015.39	.																
1016.57	.																
1017.76	.																
1018.94	.																
1020.12	.																
1021.31	.																
1022.49	.																
1023.67	.																
1024.86	.																
1026.04	.																
1027.22	.																
1028.41	.	I	.	.	.	C	.	.	.	H	.	.	W	E	.	.	JX
1029.59	.					I	.	.	.	H	.	.	W	E	.	.	R

[illegible]

1. GLOSSARY

- Page 2

APPENDIX E

Reference Material

Technical Drainage Study for Skye Canyon Phase 2 Infrastructure Update No. 3,
by Slater Hanifan Group

Approval Letter

WSPG for Eagle Canyon Storm Drain – U-ECA

Previously Approved Drainage Map

Prior Approved Plans

TECHNICAL DRAINAGE STUDY UPDATE No.3

**Skye Canyon
(Phase 2 Infrastructure)**

City of Las Vegas, Nevada

Job No.: OLY1501.001

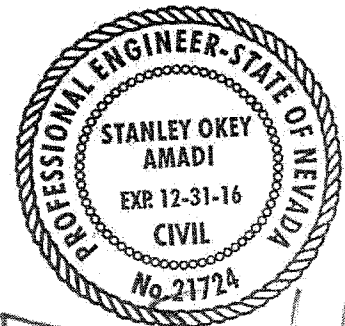
Date: December 2016

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:

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



[Handwritten signature] 12/12/16

Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Erick Mata, E.I

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		January 19, 2017
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:	COPIES TO:
	Skye Canyon – Phase 2 Infrastructure Update # 3	Slater Hanifan Group, Inc.
Cross Streets:	NWC of Grand Teton Blvd. & Hualapai Way	Section 12, LLC / Ninety Five Mgmt.
File Number:	F:\Depot\DSMemos\DS4739F.doc	Bart Anderson, P.E., DevCo
Parcel Number:	Portion of 126-12-000-001	CCRFCD
Zoning Action:	TMP-58560	
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 & Supplemental	6/18/2015, 8/4/2015	8/26/2015	Not Approved	\$400.00	402578: \$400
2 nd Submittal	10/19/2015	11/02/2015	Not Approved	\$400.00	419048: \$400
3 rd Submittal	11/19/2015 & Supplemental	1/7/2016	Conditional Approval	\$400.00	423549: \$400
4 th Submittal	4/4/2016	4/13/2016	Conditional Approval	\$100.00	438958: \$100
5 th Submittal & CCRFCD	5/12/2016 & 5/16/2016	6/8/2016 & 6/21/2016	See Comments Below	\$100.00	443735: \$100
6 th Submittal	12/15/2016 & 1/17/2017	1/19/2017	See Comments Below	\$100.00	469104: \$100
TOTAL FEES (LDDRS):				\$1,500.00	----

REMARKS: UPDATE #3 revise storm drain system capture and collection points based upon Parcel development.

5th Submittal: Update #2 and CCRFCD concurrence received. Revised Memo on 6/21/2016, Approved "At Risk".

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

	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.
X	is approved "At Risk" subject to the final approval of the Revised Master Drainage Study.

A Flood Control Master Plan Amendment (MPA) shall be updated to reflect the latest Master Plan for the Skye Canyon Development and approved by the City prior to submitting residential development plans outside of the shadow of protection from Detention Basin #1 and outside of the limits of the Phase 2 pods.

Detention Basin #1 and the Phase 2 Infrastructure are required to be substantially complete prior to the final inspection of the first Unit in Phase 2. No Certificate of Occupancy on the houses will be issued until after the detention basin has been accepted for Substantial Completion by the City.

1. Note that the ***Skye Canyon Master Drainage Study*** has not been approved in the current stage. The subject *Skye Canyon Infrastructure Phase 2* drainage study is approved “**At Risk**” until the final approval of the Master Drainage Study. Any changes required by the Master Drainage Study to the Phase 2 area shall require a drainage study update to the ***Phase 2 Infrastructure Study*** and any required facility changes to the Phase 2 Infrastructure shall be provided at the developers' cost.
2. The ***Skye Canyon Phase 2 Development*** is based on the sole protection of a planned ***Skye Canyon Detention Basin #1*** from major storm flood events. The Detention Basin #1 drainage study has been approved.
3. Building Permits for onsite developments within Phase 2 will be issued subject to the construction and substantial completion of the ***Skye Canyon Detention Basin #1***. The notice of Substantial Completion from the City of Las Vegas, Department of Public Works is required for the release of Occupancy Permits for any development within Phase 2.
4. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. CCRFCD concurrence has been provided for the Phase 2 Infrastructure.
5. The impacts to existing downstream neighborhoods of the long term discharge from the detention basin(s) and the Phase 2 developments without the associated regional outfall facilities is a major concern of both the City and the Clark County Regional Flood Control District. Flood Control understands that these interim impacts are addressed with Skye Canyon Detention Basin #1. The proposed interim impact solution was included as a part of the Skye Canyon Detention Basin #1 improvements until the overall Skye Canyon MPU facilities are completed.
6. The drainage study for Phase 2 Infrastructure assumes that the project will be constructed in one phase. It was noted within this Addendum response that the developer desires to phase the construction of the improvements. If improvement plans are submitted to break the Phase 2 Infrastructure into separate phases, a drainage study update will be required for each phase addressing the interim condition.
7. The development of Parcel 2.23B, identified as Parcel WML9 on Exhibit E2, drains through the future park and onto Eagle Canyon (WC10A) near Station 41+00 on Sheet C-03. The roadway plans shall incorporate the proposed drainage facilities as the 60 cfs will impact the 17-foot sidewalk & amenity zone. Provide concrete low flow channel connection through the 17-foot sidewalk & amenity zone.
8. The provided Phase 2 Infrastructure plans only show the proposed drainage facilities. The complete improvement plans will require additional review for impacts with other needed infrastructure; i.e. sanitary sewer, water, gas, etc. Any changes to the proposed storm drain system shall require a drainage study update.
9. The Storm Drain Plans have been revised to accommodate the proposed cross fall street sections and include added nuisance inlets at low points within the intersections.
10. The plans show preliminary mass grading with collection facilities within the parcels to intercept the flows prior to entering the infrastructure roadway improvements. It was noted that the inlet collection system needs to incorporate stormwater quality (SWQ) features and Best Management Practices (BMP's) at these interim collection points. This information will be provided and shown on the SWPPP, a copy of which shall be provided to Flood Control prior to permits. Additionally, the mass grading plan (Sheet GR-03) shows sheet flow from Basin ON2-IB discharging directly onto Hualapai Way without any interim collection. Revise to incorporate interim collection.
11. All drainage facilities proposed in this ***Phase 2 Infrastructure Study*** are considered interim facilities and must be maintained by the Master Developer until the facilities are dedicated to and formally accepted by the *City of Las Vegas*.

12. Since the streets network and the associated storm drain facilities will eventually be accepted by the City, the engineer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final approval of the subject drainage study.
13. The provided WSPG Model shows that the storm drain in *Eagle Canyon Avenue* exceeds the maximum allowed velocity (25 fps) per the *CCRFCD Hydrologic & Hydraulic Design Manual*. A *Special Construction Note* has been added to the plan & profile sheets that call out the special construction requirement and the required special inspection for the additional sacrificial concrete.
14. 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 *City Flood Control Section* prior to the final acceptance of the technical drainage study.
15. The project proposes to build temporary drainage berms/swales over the *Phase 2* site. Prior to final plan approval the developer must complete a ***Maintenance and Liability Agreement*** for the interim drainage improvements 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 construction the facility and an exhibit that adequately shows the location and limits of the drainage facility to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) 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 berms/swales are no longer necessary and can be removed.
16. Technical drainage studies are required for each of the future PODs. Final approval for the infrastructure study must be obtained prior to final approval of the impacted POD drainage studies.
17. A note on the Grading Plans has been provided that "*Property Owner is responsible to maintain the best management practices such as but not limited to the removal of accumulated sediment and debris and care of the vegetation.*"
18. A numbering system for the manholes and inlets has been provided. It was noted in the response that the project may be divided into additional phases.
19. Show the size of all the proposed riprap areas. The rip-rap pads are shown on the GR-Sheets and some of the SD-Sheets include the pad size. Add the pad size to the grading plans and revise all pertinent plans and callouts accordingly.
20. Revise the pipe penetration detail to include a concrete collar with dowelled rebar connections. The detail has not been provided at this time and was noted that it will be a part of the Structural Details.
21. Provide details for the transition structure modifications to accommodate the 66"-RCP connection and the removal of the existing facilities to allow construction of the proposed improvements. The detail has not been provided at this time and was noted that it will be a part of the Structural Details.

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

END OF REMARKS
AYS/PBJ

T/R/S: T19S/R59E/12
AREA F-12

0 Q ±

38.0

U-ECA.WSQ

DATE: 12/ 7/2016
TIME: 14:15

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

[illegible]

CD	18	4	1.50
CD	24	4	2.00
CD	30	4	2.50
CD	36	4	3.00
CD	42	4	3.50
CD	48	4	4.00
CD	54	4	4.50
CD	60	4	5.00
CD	66	4	5.50
CD	72	4	6.00
CD	78	4	6.50

F05152

HEADING LINE NO 1 IS -

HEADING LINE NO 2 IS -

HEADING LINE NO 3 IS -

PAGE NO 2

ELEMENT NO	1 IS A SYSTEM OUTLET	*	*
	U/S DATA	STATION	INVERT SECT
		613.00	2823.35 72
			W S ELEV 2829.26

ELEMENT NO	2 IS A REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
			900.00	2830.52	72	0.013	0.00	0.00	0.00	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	
				900.00	2830.52	72	48	0	0.013	97.5		0.0	2832.52	0.00	45.00	0.00
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	4 IS A REACH	U/S DATA	*	*	*
		STATION	INVERT	SECT	
		950.00	2831.58	72	
					N
					0.013
					RADIUS
					0.00
					ANGLE
					0.00
					ANG PT
					0.00
					MAN H
					1

ELEMENT NO	5	IS A	WALL	ENTRANCE			*
			U/S DATA	STATION	INVERT	SECT	
				950.00	2831.58	72	
							FP
							0.013

ELEMENT NO	6	IS A	TRANSITION	STATION	INVERT	SECT	U-ECA.OUT
			U/S DATA	1000.00	2835.61	66	N 0.013
ELEMENT NO	7	IS A	WALL EXIT	STATION	INVERT	SECT	
			U/S DATA	1000.00	2835.61	66	
ELEMENT NO	8	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1093.00	2837.13	66	N 0.013
ELEMENT NO	9	IS A	JUNCTION	STATION	INVERT	SECT	
			U/S DATA	1093.00	2838.13	54	Q3 44.0 Q4 37.0 INVERT-3 2839.13 INVERT-4 2839.13 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1
ELEMENT NO	10	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1389.50	2839.63	54	N 0.013
ELEMENT NO	11	IS A	JUNCTION	STATION	INVERT	SECT	
			U/S DATA	1394.50	2840.13	48	Q3 5.0 Q4 5.0 INVERT-3 2842.63 INVERT-4 2842.63 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1
WATER SURFACE PROFILE - ELEMENT CARD LISTING							
ELEMENT NO	12	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1632.00	2854.48	48	N 0.013
ELEMENT NO	13	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1762.00	2862.62	48	N 0.013
ELEMENT NO	14	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1883.00	2868.57	48	N 0.013
ELEMENT NO	15	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	1992.00	2873.94	48	N 0.013
ELEMENT NO	16	IS A	JUNCTION	STATION	INVERT	SECT	
			U/S DATA	1992.00	2873.94	48	Q3 5.0 Q4 21.0 INVERT-3 2876.44 INVERT-4 2875.94 RADIUS 0.00 ANGLE 0.00 ANG PT 0.00 MAN H 1
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	17	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	2072.00	2877.87	48	N 0.013
ELEMENT NO	18	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	2167.00	2882.51	48	N 0.013
ELEMENT NO	19	IS A	REACH	STATION	INVERT	SECT	
			U/S DATA	2262.00	2885.16	48	N 0.013

ELEMENT NO 20 IS A REACH U/S DATA U-ECA.OUT
 STATION INVERT SECT * * *
 2422.00 2888.80 48 N 0.013
 ELEMENT NO 21 IS A JUNCTION
 U/S DATA
 STATION INVERT SECT LAT-1 LAT-2
 2422.00 2888.80 48 30 18 0.013
 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
 F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 22 IS A REACH U/S DATA
 STATION INVERT SECT * * *
 2820.00 2903.13 48 N 0.013
 ELEMENT NO 23 IS A JUNCTION U/S DATA
 STATION INVERT SECT LAT-1 LAT-2
 2820.00 2903.13 48 42 0 0.013
 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 24 IS A REACH U/S DATA
 STATION INVERT SECT * * *
 3004.00 2908.81 48 N 0.013
 ELEMENT NO 25 IS A JUNCTION U/S DATA
 STATION INVERT SECT LAT-1 LAT-2
 3004.00 2908.81 48 36 18 0.013
 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 26 IS A REACH U/S DATA
 STATION INVERT SECT * * *
 3024.00 2910.72 48 N 0.013
 ELEMENT NO 27 IS A JUNCTION U/S DATA
 STATION INVERT SECT LAT-1 LAT-2
 3024.00 2910.72 48 48 0 0.013
 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 28 IS A REACH U/S DATA
 STATION INVERT SECT * * *
 3060.00 2912.43 48 N 0.013
 ELEMENT NO 29 IS A SYSTEM HEADWORKS U/S DATA
 STATION INVERT SECT * * *
 3060.00 2912.43 48 N 0.013

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
 LICENSEE: SLATER HANIFAN GROUP F0515P

WATER SURFACE PROFILE LISTING

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.3)
 BY OLYMPIA COMPANIES
 EAGLE CANYON - TRUNK STORM DRAIN

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

[illegible]

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1389.50	2839.63	10.192	2849.822	294.0	18.49	5.306	2855.128	0.00	4.378	4.50	0.00	0.00	0	0.00
JUNCT STR	0.10000											0.00		

Vs 2850.468 → New HGL

U-ECA.OUT

1394.50	2840.13	2.750	2842.880	284.0	30.83	14.759	2857.639	0.00	3.961	4.00	0.00	0.00	0.00
237.50	0.06042					.055399	13.16		2.717		0.00		
1632.00	2854.48	2.870	2857.350	284.0	29.43	13.446	2870.796	0.00	3.961	4.00	0.00	0.00	0.00
73.15	0.06262					.050010	3.66		2.681		0.00		
1705.15	2859.06	2.981	2862.041	284.0	28.27	12.412	2874.453	0.00	3.961	4.00	0.00	0.00	0.00
56.85	0.06262					.045308	2.58		2.681		0.00		
1762.00	2862.62	3.126	2865.746	284.0	26.96	11.284	2877.030	0.00	3.961	4.00	0.00	0.00	0.00
28.74	0.04917					.042458	1.22		2.943		0.00		
1790.74	2864.03	3.158	2867.191	284.0	26.68	11.057	2878.248	0.00	3.961	4.00	0.00	0.00	0.00
92.26	0.04917					.040079	3.70		2.943		0.00		
1883.00	2868.57	3.324	2871.894	284.0	25.44	10.052	2881.946	0.00	3.961	4.00	0.00	0.00	0.00
28.72	0.04927					.037431	1.08		2.941		0.00		
1911.72	2869.99	3.407	2873.392	284.0	24.90	9.629	2883.021	0.00	3.961	4.00	0.00	0.00	0.00
48.03	0.04927					.035477	1.70		2.941		0.00		
1959.75	2872.35	3.620	2875.971	284.0	23.74	8.754	2884.725	0.00	3.961	4.00	0.00	0.00	0.00
32.25	0.04927					.035146	1.13		2.941		0.00		
1992.00	2873.94	3.961	2877.901	284.0	22.64	7.957	2885.858	0.00	3.961	4.00	0.00	0.00	0.00
JUNCT STR	0.00000					.034149	0.00				0.00		
1992.00	2873.94	6.662	2880.602	258.0	20.53	6.546	2887.148	0.00	3.943	4.00	0.00	0.00	0.00
80.00	0.04913					.032260	2.58		2.732		0.00		

PAGE 3

LICENSEE: SLATER HANIFAN GROUP
 SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.3)
 BY OLYMPIA COMPANIES
 EAGLE CANYON - TRUNK STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO AVBPR PIER
L/ELEM	SO												
2072.00	2877.87	5.748	2883.618	258.0	20.53	6.546	2890.164	0.00	3.943	4.00	0.00	0.00	0.00
95.00	0.04884					.032260	3.06		2.737			0.00	
2167.00	2882.51	4.608	2887.118	258.0	20.53	6.546	2893.664	0.00	3.943	4.00	0.00	0.00	0.00
95.00	0.02789					.032260	3.06		4.000			0.00	
2262.00	2885.16	5.458	2890.618	258.0	20.53	6.546	2897.164	0.00	3.943	4.00	0.00	0.00	0.00

2894.609 → New HGL

New Stub Connection for Parcel 2.27
 Model Provided

U-ECA.OUT									
160.00	0.02275								
2422.00	2888.80	7.307	2896.107	258.0	20.53	6.546	2902.653	0.00	3.943
JUNCT STR	0.00000					.027021	0.00		
2422.00	2888.80	10.891	2899.691	212.0	16.87	4.420	2904.111	0.00	3.877
398.00	0.03601					.021782	8.67		
2820.00	2903.13	5.452	2908.582	212.0	16.87	4.420	2913.002	0.00	3.877
JUNCT STR	0.00000					.014738	0.00		
2820.00	2903.13	9.825	2912.955	126.0	10.03	1.561	2914.516	0.00	3.368
184.00	0.03087					.007694	1.42		
3004.00	2908.81	5.948	2914.758	126.0	10.03	1.561	2916.319	0.00	3.368
JUNCT STR	0.00000					.004607	0.00		
3004.00	2908.81	7.660	2916.470	56.0	4.46	0.308	2916.778	0.00	2.251
20.00	0.09550					.001520	0.03		
3024.00	2910.72	5.796	2916.516	56.0	4.46	0.308	2916.824	0.00	2.251
JUNCT STR	0.00000					.001110	0.00		
3024.00	2910.72	6.129	2916.849	38.0	3.02	0.142	2916.991	0.00	1.838
36.00	0.04750					.000700	0.03		
LICENSEE: SLATER HANIFAN GROUP						F0515P			

WATER SURFACE PROFILE LISTING
SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.3)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL NO	AVBPR PIER
3060.00	2912.43	4.451	2916.881	38.0	3.02	0.142	2917.023	0.00	1.838	4.00	0.00	0.00	0.00

L/ELEM ***** SO ***** SF AVE HF ***** NORM DEPTH ***** ZR *****

SKYE CANYON INFRASTRUCTURE - PHASE 2 (UPDATE NO.3)
BY OLYMPIA COMPANIES
EAGLE CANYON - TRUNK STORM DRAIN

613.00	.I	WCH	E	.	.	.	.	.	.	.	.	.	R
649.52	.			.	.	.	.	.	.	.	.	.	.
686.04	.			.	.	.	.	.	.	.	.	.	.
722.57	.			.	.	.	.	.	.	.	.	.	.
759.09	.			.	.	.	.	.	.	.	.	.	.
795.61	.	I	W X	E	.	.	.	.	.	.	.	.	R
832.13	.			.	.	.	.	.	.	.	.	.	.

[illegible]

NOTES

I = INVERT ELEVATION

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

Page 8

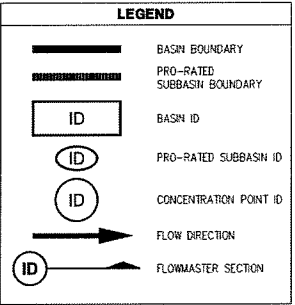
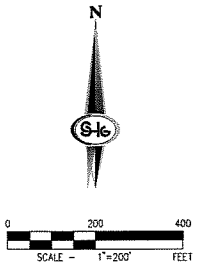
10-Year Street Flow Summary Ultimate Condition						
Cross Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV	Dry Lane (ft)
EGN1a	2.46	2	0.24	2.6	0.6	21
*EGN1b	0.50	1	0.30	1.3	0.4	18
EGN2	0.50	2	0.30	1.3	0.4	18
SHA1	2.75	1	0.18	2.8	0.5	24
*HU2	0.57	29	0.73	3.2	2.4	9
*HU2B	0.57	22	0.67	3.0	2.0	12
* Modeled as Half Streets 1 Existing Drop Inlets Capture Flows to mitigate Dry Lane						

100-Year Street Flow Summary Ultimate Condition						
Cross Section	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV	
ECA1	4.90	33	0.46	6.1	2.8	
ECA2	4.90	99	0.62	8.5	5.2	
ECA2b	2.00	47	0.58	4.7	2.7	
ECA3a	4.94	17	0.38	5.3	2.0	
ECA3b	4.94	23	0.42	5.6	2.4	
ECA3c	4.94	30	0.45	6.0	2.7	
ECA4	0.50	23	0.57	2.4	1.4	
EGN1a	2.46	4	0.29	2.9	0.8	
*EGN1b	0.50	2.5	0.38	1.6	0.6	
EGN2	0.50	4	0.35	1.6	0.6	
*SHA	2.75	4	0.33	3.3	1.1	
*SHA (West Half)	2.75	4	0.28	2.5	0.7	
SHA1	2.75	3	0.26	2.9	0.7	
*HU2	0.57	59	0.92	3.8	3.5	
*HU2B	0.57	43	0.83	3.5	2.9	
* Modeled as Half Streets						

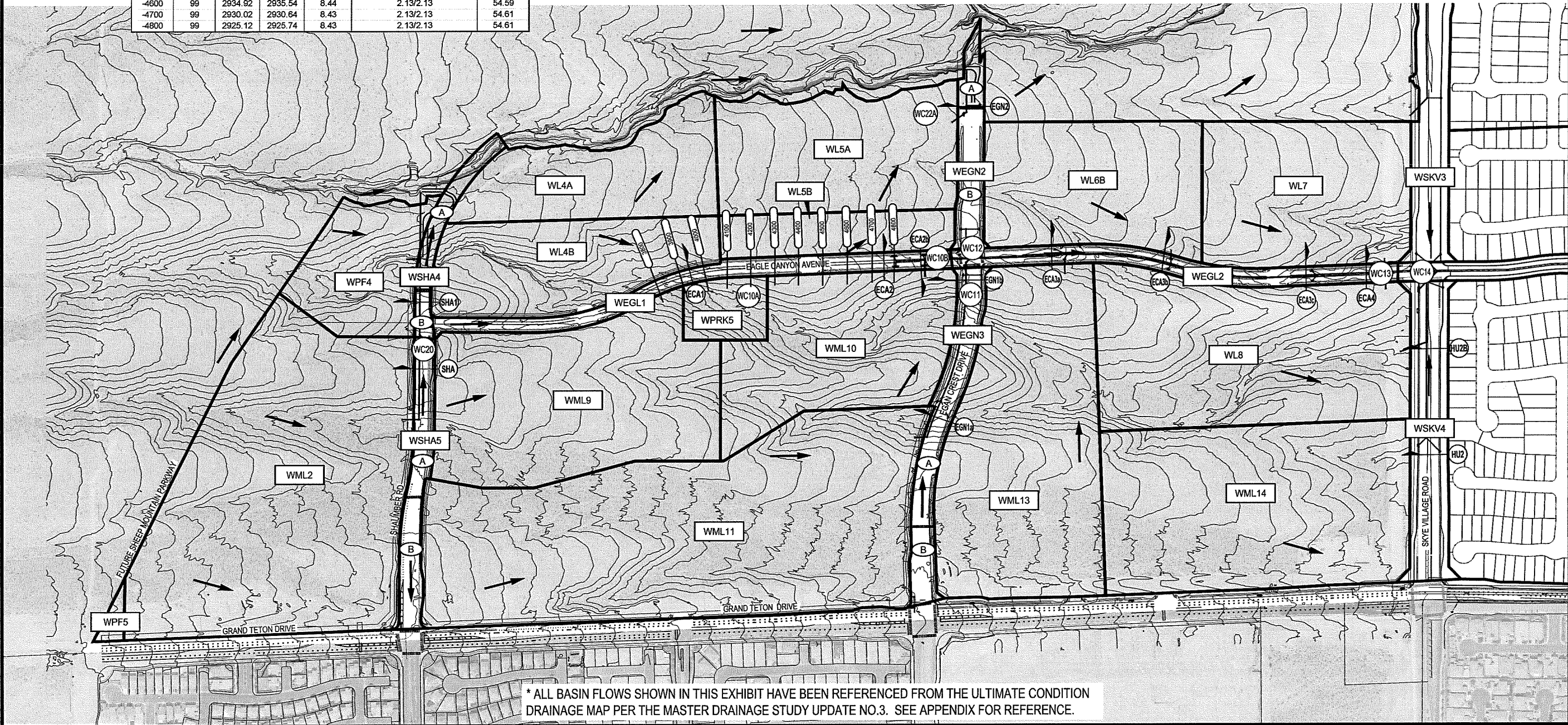
Referenced Ultimate Condition Flow Rate Summary Concentration Points				
Basin/Concentration Point ID	Area (sq. mi)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
WC10A				
Q = WML5 + WPRK5	0.03	60	30	
WC10B				
Q = WC10A + WL4B + WEG1	0.05	99	48	
WC11				
Q = WML10 + WEGN3	0.07	127	61	
WC12				
Q = WC10B + WC11	0.11	226	109	
WC13				
Q = WC12 + WML9 + WL7 + WML13 + WEG1	0.17	352	170	
WC14				
Q = WML14 + WML8 + WSKV3 + WSKV4	0.24	485	236	
WC20				
Q = WPR5 + WML2 + WSHA5	0.05	86	42	
WC22A				
Q = WL4A + WL5A + WL5B	0.05	67	43	

Ultimate Condition Prorated Flow Summary			
Basin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
WSHA4	6	1.4	4.2
WSHA5	8	2.4	3.4
WEGN2	6	2.1	3.0
WEGN3	10	3.3	3.0
Subbasin	Q ₁₀₀ (cfs)	Area (acres)	Unit Flow (cfs/acre)
WSHA4-A	5	1.1	4.2
WSHA4-B	1	0.3	4.2
TOTAL	6	1.4	
WSHA5-A	4	1.3	3.4
WSHA5-B	4	1.1	3.4
TOTAL	8	2.4	
WEGN2-A	2	0.6	3.0
WEGN2-B	5	1.5	3.0
TOTAL	6	2.1	
WEGN3-A	8	2.5	3.0
WEGN3-B	2	0.8	3.0
TOTAL	10	3.3	

Referenced Ultimate Condition Flow Rate Summary				
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	
WL4A	8.0	23	10	
WL4B	8.9	27	12	
WL5A	10.9	32	15	
WL5B	3.8	12	5	
WL6B	10.6	30	14	
WL7	11.5	34	16	
WL8	17.4	48	22	
WML10	11.6	38	19	
WML11	16.0	48	23	
WML13	16.4	49	25	
WML14	19.2	59	29	
WML2	27.4	78	38	
WML9	16.4	55	28	
WPF4	5.7	19	9	
WPF5	0.4	1	0	
WPRK5	2.0	5	2	
WEST ROADWAY BASINS				
WEG1	3.4	12	6	
WEG2	3.3	12	7	
WEGN2	2.1	2	1	
WEGN3	3.3	10	6	
WSHA4	1.4	6	3	
WSHA5	2.4	8	5	
WSKV3	4.2	14	7	
WSKV4	4.5	15	8	



HEC-RAS Summary Table						
River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Overbank Left/Right Velocity (ft/sec)	Top Width (ft)
-3800	99	2974.12	2974.74	8.43	2.13/2.13	54.61
-3900	99	2969.22	2969.84	8.43	2.13/2.13	54.61
-4000	99	2964.32	2964.94	8.43	2.13/2.13	54.61
-4100	99	2959.42	2960.04	8.43	2.13/2.13	54.61
-4200	99	2954.52	2955.14	8.43	2.13/2.13	54.61
-4300	99	2949.62	2950.24	8.43	2.13/2.13	54.61
-4400	99	2944.72	2945.34	8.44	2.13/2.13	54.59
-4500	99	2939.82	2940.44	8.43	2.13/2.13	54.61
-4600	99	2934.92	2935.54	8.44	2.13/2.13	54.59
-4700	99	2930.02	2930.64	8.43	2.13/2.13	54.61
-4800	99	2925.12	2925.74	8.43	2.13/2.13	54.61



* ALL BASIN FLOWS SHOWN IN THIS EXHIBIT HAVE BEEN REFERENCED FROM THE ULTIMATE CONDITION DRAINAGE MAP PER THE MASTER DRAINAGE STUDY UPDATE NO.3. SEE APPENDIX FOR REFERENCE.

SLATER
HANIFAN
GROUP

CONSULTING ENGINEERS & PLANNERS

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

PHONE (702) 284-5300 FAX (702) 284-5399

DATE: DECEMBER 2016

DRAFTER: ETM

DESIGNER: ETM

CHECKED: SMJ

PROJECT NO. OLY1501.001

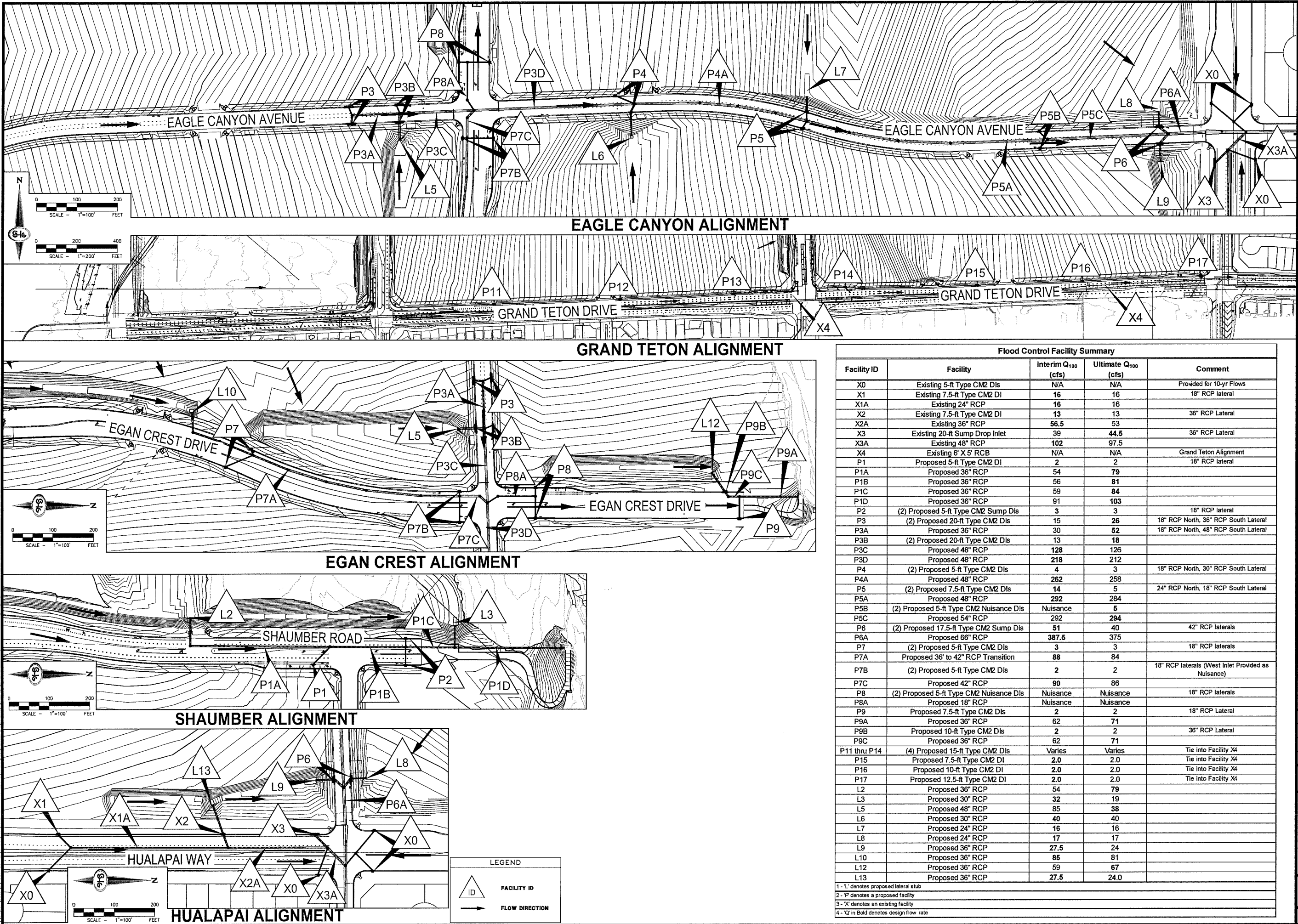
EXHIBIT E2

SHEET 1 OF 1

OLYMPIA COMPANIES

SKYE CANYON - PHASE 2 INFRASTRUCTURE UPDATE NO.3

ULTIMATE CONDITION DRAINAGE MAP

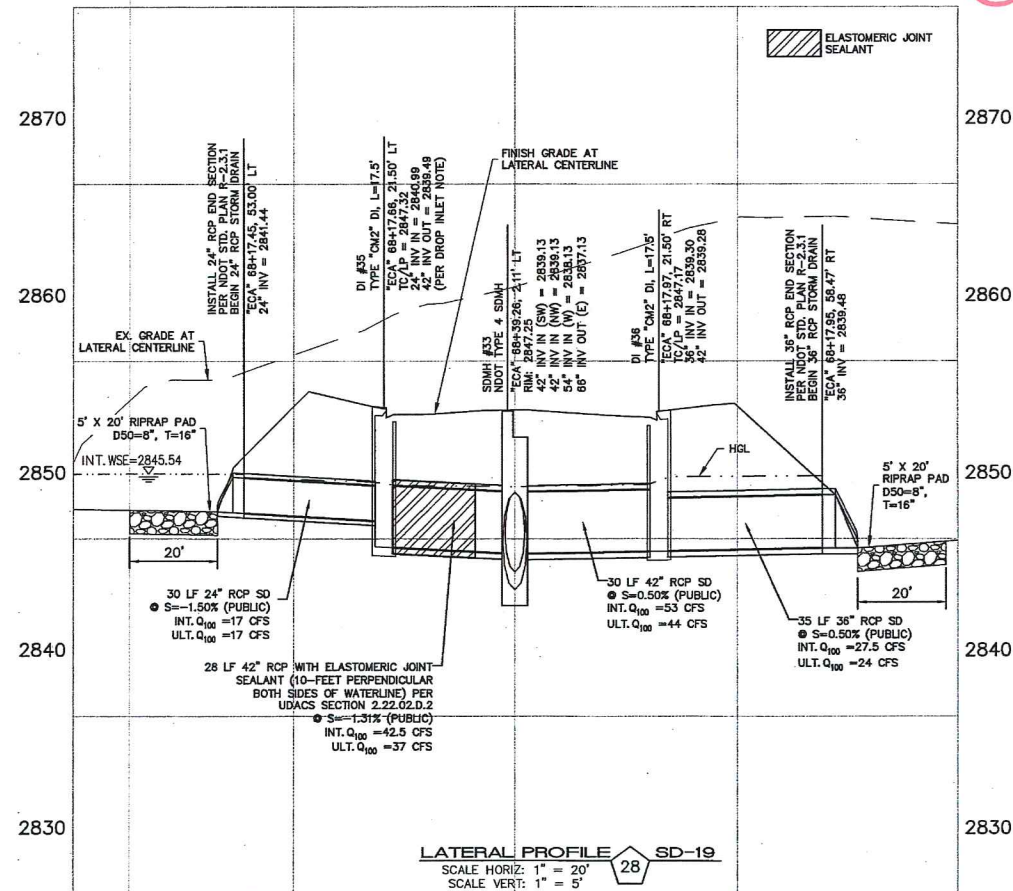
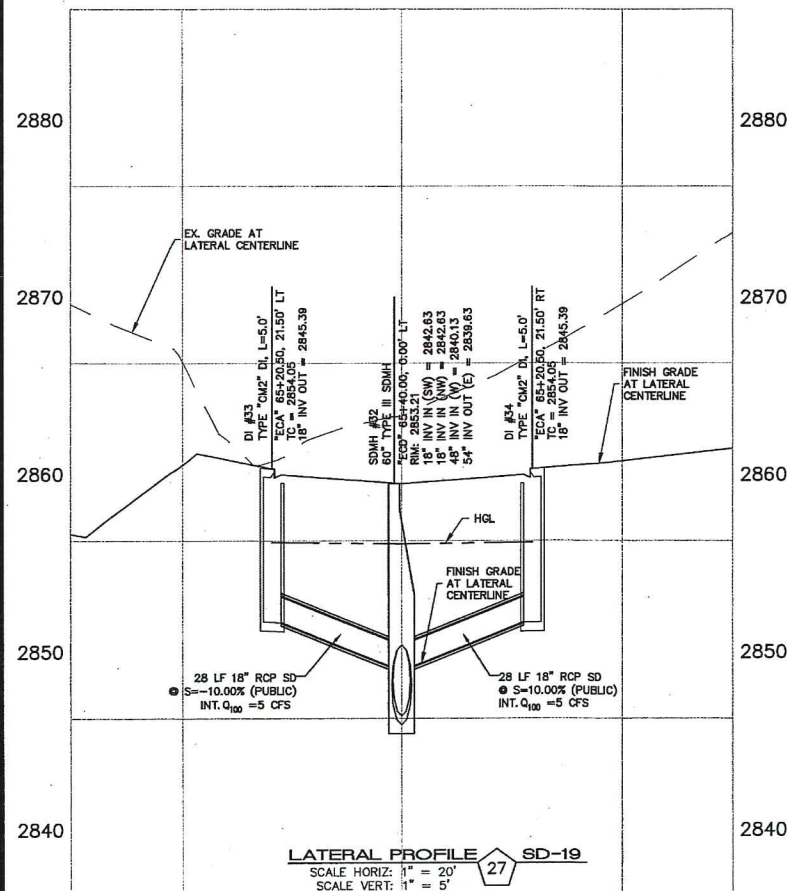
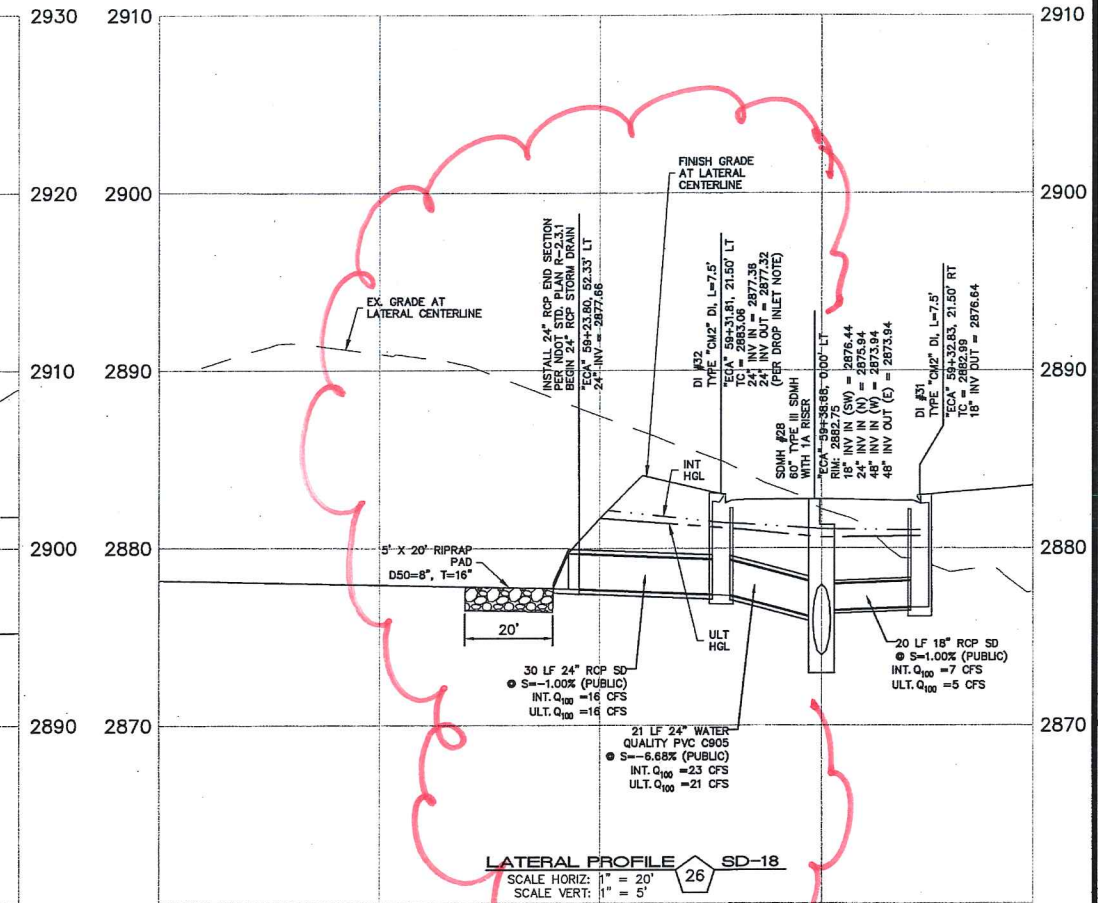
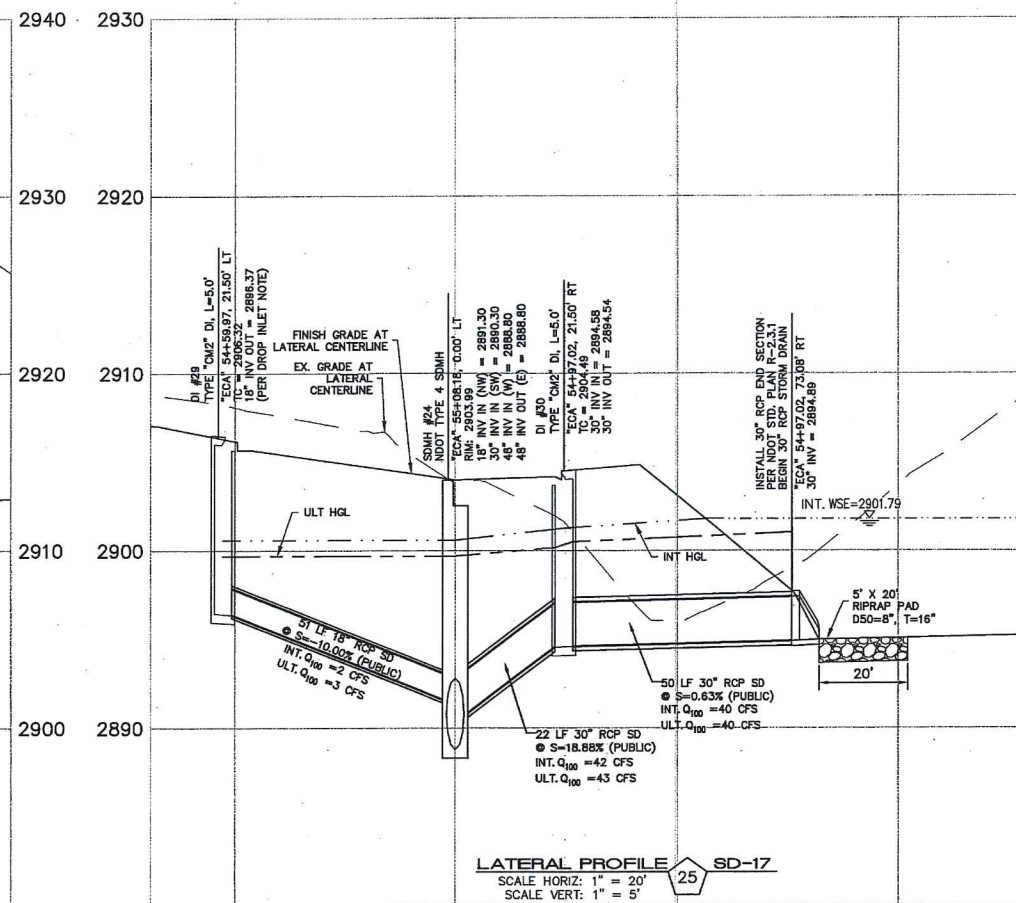
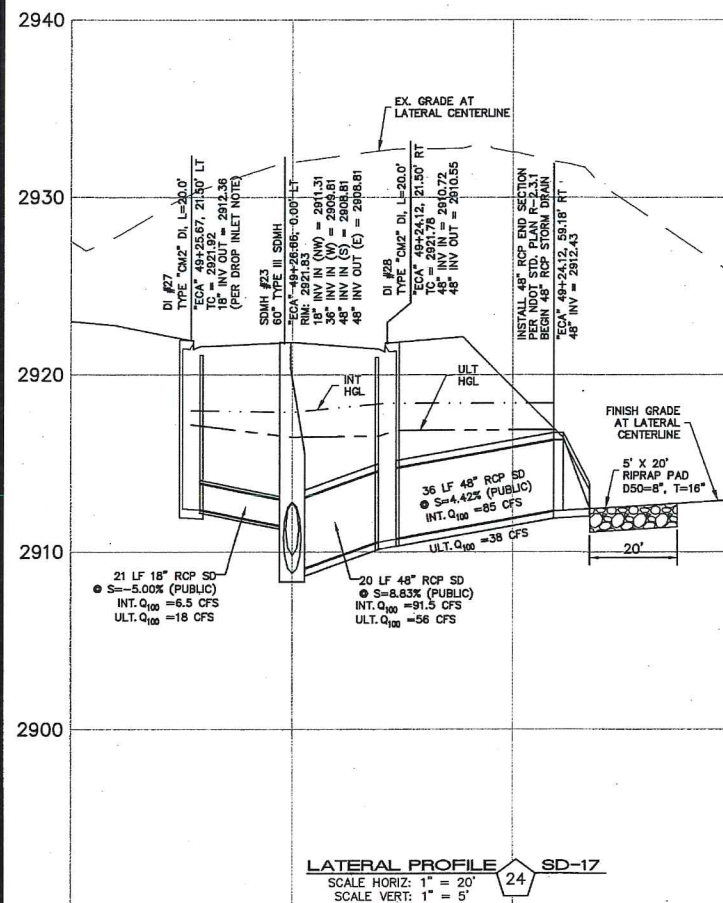


Flood Control Facility Summary				
Facility ID	Facility	Interim Q ₁₀₀ (cfs)	Ultimate Q ₁₀₀ (cfs)	Comment
X0	Existing 5-ft Type CM2 DIs	N/A	N/A	Provided for 10-yr Flows
X1	Existing 7.5-ft Type CM2 DI	16	16	18" RCP lateral
X1A	Existing 24" RCP	16	16	
X2	Existing 7.5-ft Type CM2 DI	13	13	36" RCP Lateral
X2A	Existing 36" RCP	56.5	53	
X3	Existing 20-ft Sump Drop Inlet	39	44.5	36" RCP Lateral
X3A	Existing 48" RCP	102	97.5	
X4	Existing 6' X 5' RCB	N/A	N/A	Grand Teton Alignment
P1	Proposed 5-ft Type CM2 DI	2	2	18" RCP lateral
P1A	Proposed 36" RCP	54	79	
P1B	Proposed 36" RCP	56	81	
P1C	Proposed 36" RCP	59	84	
P1D	Proposed 36" RCP	91	103	
P2	(2) Proposed 5-ft Type CM2 Sump Dis	3	3	18" RCP lateral
P3	(2) Proposed 20-ft Type CM2 DIs	15	26	18" RCP North, 36" RCP South Lateral
P3A	Proposed 36" RCP	30	52	18" RCP North, 48" RCP South Lateral
P3B	(2) Proposed 20-ft Type CM2 DIs	13	18	
P3C	Proposed 48" RCP	128	126	
P3D	Proposed 48" RCP	218	212	
P4	(2) Proposed 5-ft Type CM2 DIs	4	3	18" RCP North, 30" RCP South Lateral
P4A	Proposed 48" RCP	262	258	
P5	(2) Proposed 7.5-ft Type CM2 DIs	14	5	24" RCP North, 18" RCP South Lateral
P5A	Proposed 48" RCP	292	284	
P5B	(2) Proposed 5-ft Type CM2 Nuisance DIs	Nuisance	5	
P5C	Proposed 54" RCP	292	294	
P6	(2) Proposed 17.5-ft Type CM2 Sump Dis	51	40	42" RCP laterals
P6A	Proposed 66" RCP	387.5	375	
P7	(2) Proposed 5-ft Type CM2 DIs	3	3	18" RCP laterals
P7A	Proposed 36' to 42" RCP Transition	88	84	
P7B	(2) Proposed 5-ft Type CM2 DIs	2	2	18" RCP laterals (West Inlet Provided as Nuisance)
P7C	Proposed 42" RCP	90	86	
P8	(2) Proposed 5-ft Type CM2 Nuisance DIs	Nuisance	Nuisance	18" RCP laterals
P8A	Proposed 18" RCP	Nuisance	Nuisance	
P9	Proposed 7.5-ft Type CM2 DIs	2	2	18" RCP Lateral
P9A	Proposed 36" RCP	62	71	
P9B	Proposed 10-ft Type CM2 DIs	2	2	36" RCP Lateral
P9C	Proposed 36" RCP	62	71	
P11 thru P14	(4) Proposed 15-ft Type CM2 DIs	Varies	Varies	Tie into Facility X4
P15	Proposed 7.5-ft Type CM2 DI	2.0	2.0	Tie into Facility X4
P16	Proposed 10-ft Type CM2 DI	2.0	2.0	Tie into Facility X4
P17	Proposed 12.5-ft Type CM2 DI	2.0	2.0	Tie into Facility X4
L2	Proposed 36" RCP	54	79	
L3	Proposed 30" RCP	32	19	
L5	Proposed 48" RCP	85	38	
L6	Proposed 30" RCP	40	40	
L7	Proposed 24" RCP	16	16	
L8	Proposed 24" RCP	17	17	
L9	Proposed 36" RCP	27.5	24	
L10	Proposed 36" RCP	85	81	
L12	Proposed 36" RCP	59	67	
L13	Proposed 36" RCP	27.5	24.0	

1 - 'L' denotes proposed lateral stub
2 - 'P' denotes a proposed facility
3 - 'X' denotes an existing facility
4 - 'Q' in Bold denotes design flow rate

NO.	DATE	BY	APP.	DESCRIPTION

DATE:	DECEMBER 2016
DRAFTER:	ETM
DESIGNER:	ETM
CHECKED:	SOA
PROJECT NO.	OLY1501.001



Natural struts and
inlet are being
relocated

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:
CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS.
BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB,
OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL).

APPROVED FOR CONSTRUCTION
LWVWD WILL HAVE TO BE PRESENT AND VIEW INSTALLATION OF STORM DRAIN THAT WILL BE INSTALLED THAT MAY AFFECT THE WATER MAINS

LVVWD ENGINEERING SERVICES MANAGER
PROJECT NO. 124568

DATE _____

NINETY-FIVE MANAGEMENT LLC

SKYE CANYON II PHASE 2

STORM DRAIN LATERAL PROFILES

DATE: 8/3/16
RAFTER: JAS
DESIGNER: DAM
CHECKED: JSR
PROJECT NO.
OLY1501-001



SD-24
ET 27 OF 32

APPENDIX F

Reference Material

Technical Drainage Study for Skye Canyon Parcel 2.15,
by Slater Hanifan Group

Approval Letter

Developed Condition HEC-1 Analysis

Developed Condition Drainage Map

TECHNICAL DRAINAGE STUDY

Skye Canyon Parcel 2.15

City of Las Vegas, Nevada

Job No.: OLY1607.001

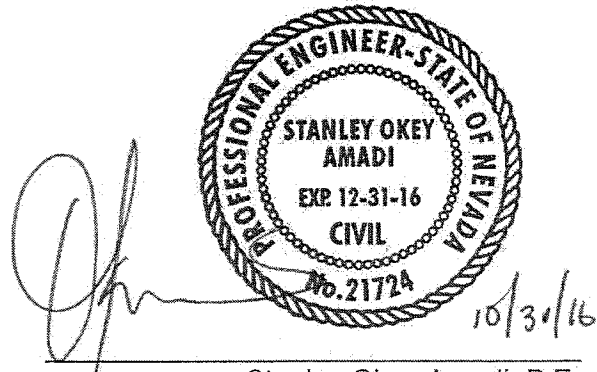
Date: October 2016

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:

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



Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Erick Mata, EI

CITY OF LAS VEGAS		DATE: Revised
INTER-OFFICE MEMORANDUM		January 23, 2017
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 Parcel 2.15	
Cross Streets:	NEC of Egan Crest Dr. & Eagle Canyon Av.	COPIES TO: Slater Hanifan Group
File Number:	F:\Depot\DSMemos\DS4840B-Rev.doc	Section 12, LLC / Ninety-Five Mangt.
Parcel Number:	126-12-000-001	Bart Anderson, P.E., DevCo
Zoning Action:	TMP-66276	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	10/31/2016	11/22/2016	Not Approved	\$400.00	463801: \$400
2 nd Submittal	12/21/2016	1/9/2017	Conditional Approval	\$400.00	469700: \$400
Revised	1/23/2017	1/23/2017	See Comments Below	N/C	N/C
TOTAL FEES (LDDRS):				\$800.00	----

REMARKS:

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

	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.
X	is conditionally approved subject to Comment #5 below:

All Onsite **Skye Canyon Phase 2 Developments** such as **Parcel 2.xx series** are allowed to proceed with the following conditions:

1. Per the response to previous Comment #1, the developer/engineer has elected to construct the ultimate **Detention Basin 1** for adequate flood protection of the **Phase 2 Developments**.
2. No **Certificate of Occupancy** on the houses will be issued until after the detention basin has been accepted for Substantial Completion by the **City of Las Vegas** (with the *Notice of Substantial Completion* by Public Works Department).
3. The *Developer* provides a bond for the detention basin now, showing good faith that the *Developer's* intentions are to get started with the final detention basin as soon as permitting allows.

The following are comments pertaining to the subject site specific drainage study and grading plans:

4. All roadways and flood control facilities as proposed and approved in **Skye Canyon Phase 2 Infrastructures** must be substantially constructed prior to the issuance of building permits for the subject development.

5. **Grading Plans G-7 and G-8:** Revise the proposed hump in the entrance *Skyestar Street* to "4.10 HP" at the center of the entrance driveway.
6. All drainage easements must be public drainage easements to be privately maintained and common lots to be labeled on the grading plans and to be dedicated as such in the final map.
7. The engineer must provide a table on the grading plans that shows a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.
8. Private streets must be public drainage easements. Provide a note on the grading plans: "Note: All private streets are P.U.E., Public Sewer Easements and Public Drainage Easements to be privately maintained by HOA".
9. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

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

END OF REMARKS
ays

T/R/S: T19S/R59E/12
AREA F-12



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Project Name: Skye Canyon Parcel 2.15

Description: _____

File Name: OLY1607.001 TDS SF4.xls

By: ETM

Date: 10/12/2016

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)				TRAVEL TIME (Tt)				Tc		Tc Check		Tlag	
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi ²	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	VELOCITY FPS	V1 FPS	V2 FPS	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Tlag Hours
			[1]		[2]			[3]				[4]	[5]	[6]	[7]	[8]	[9]	[10]
ON1	D	92.0	0.824	5.38	0.0084	105	1.00	5.08	740	3.40		3.72	5.64	2.95	8.03	845	14.694	0.080
ON2	D	92.0	0.824	11.35	0.0177	105	1.00	5.08	1115	2.64		3.28	4.97	4.60	9.68	1220	16.778	0.097

DEVELOPED CONDITION

[1] $K = 0.0132 (CN) - 0.39$

[2] $A = \text{Area}/640$

[3] $Ti = (1.8 (1.4-K) L^{0.5})/S^{0.33}$

[4] For Existing Conditions: $V1 = 14.8 * (S/100)^{0.5}$

For Developed Conditions: $V1 = 20.2 * (S/100)^{0.5}$

[5] For Existing Conditions: $V2 = 29.4 * (S/100)^{0.5}$

For Developed Conditions: $V2 = 30.6 * (S/100)^{0.5}$

[6] $Tt = L/(60*V)$

[7] $Tc = Ti + Tt$

[8] Total L = Initial L + Travel L

[9] $Tc = (L/180) + 10$

[10] $Tlag = (0.6*Tc)/60$

[11] Min Tlag = 0.05

Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.

REFERENCE :

STANDARD FORM 4

DEV

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*****
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*
* JUN 1998 *
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* VERSION 4.1 *
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*
* RUN DATE 04OCT16 TIME 15:29:59 *
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*
* U.S. ARMY CORPS OF ENGINEERS
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* 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 X XX
X X X X X X
X X X X X X
XXXXXX XXXX XXXX X
X X 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

*DIAGRAM
ID SLATER HANIFAN GROUP
ID SKYE CANYON PARCEL 2.15
ID DEVELOPED CONDITION
ID
ID RETURN PERIOD ----- 100-YR & 10-YR
ID DISTRIBUTION ----- 6-HOUR SDN3
ID PROJECT NO. ----- OLY1607.001
ID FILENAME ----- DEV.H1
ID DATE ----- 10/04/2016
ID MODELED BY ----- ETM
ID
ID PRECIPITATION STORM EVENT RATIOS
ID STORM EVENT RATIO
ID 10-YR 0.56
ID 100-YR 1
ID
ID 5 0 0 300
ID 5 0 0
ID 5 0 0
ID JR PREC 1.00 0.56
ID
ID
ID KK ON1
ID KM DEVELOPED ONSITE BASIN
ID BA 0.0084
ID PB 3.00
ID PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
ID PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
ID PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
ID PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
ID PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
ID PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
ID PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
ID PC 0.998 0.999 1
ID LS 0 92.0
ID UD 0.080
ID
ID
ID KK ON2
ID KM DEVELOPED ONSITE BASIN
ID BA .0177
ID LS 0 92.0
ID UD 0.097
ID
ID
ID KK DUMMY
ID KM COMBINE ON1 AND ON2
ID HC 2
ID
ID ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

21 ON1
.
.
35 ON2
.
.
40 DUMMY.....

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DEV

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 04OCT16 TIME 15:29:59 *
*

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* HYDROLOGIC ENGINEERING CENTER
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* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*

SLATER HANIFAN GROUP
SKYE CANYON PARCEL 2.15
DEVELOPED CONDITION
RETURN PERIOD ----- 100-YR & 10-YR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1607.001
FILENAME ----- DEV.H1
DATE ----- 10/04/2016
MODELED BY ----- ETM

PRECIPITATION STORM EVENT RATIOS
STORM EVENT RATIO
10-YR 0.56
100-YR 1

18 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

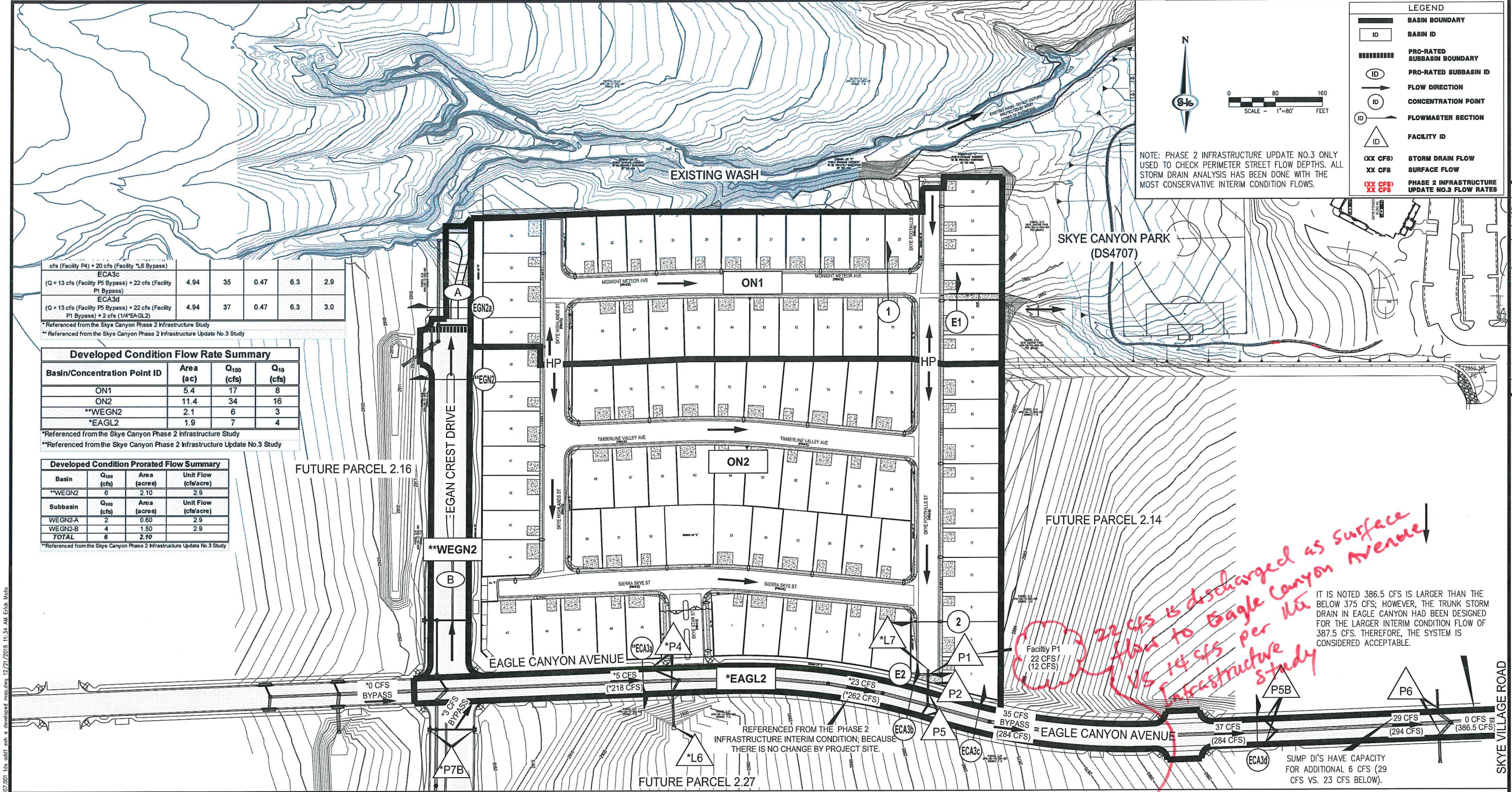
JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00 .56

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 .56
HYDROGRAPH AT +	ON1	.01	1 FLOW TIME	17. 3.50	8. 3.50
HYDROGRAPH AT +	ON2	.02	1 FLOW TIME	34. 3.50	16. 3.50
2 COMBINED AT +	DUMMY	.03	1 FLOW TIME	50. 3.50	23. 3.50

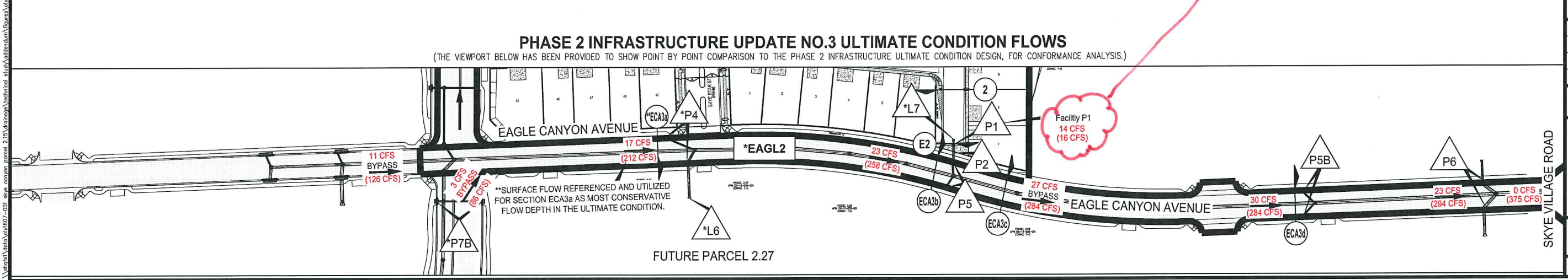
*** NORMAL END OF HEC-1 ***



22 cfs is discharged as surface flow to Eagle Canyon Avenue
vs 14 cfs per the Infrastructure Study

IT IS NOTED 386.5 CFS IS LARGER THAN THE BELOW 375 CFS; HOWEVER, THE TRUNK STORM DRAIN IN EAGLE CANYON HAD BEEN DESIGNED FOR THE LARGER INTERIM CONDITION FLOW OF 387.5 CFS. THEREFORE, THE SYSTEM IS CONSIDERED ACCEPTABLE.

SUMP D'S HAVE CAPACITY FOR ADDITIONAL 6 CFS (29 CFS VS. 23 CFS BELOW).



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 - PARCEL 2.15
DEVELOPED CONDITION DRAINAGE MAP

DATE: DECEMBER 2016
DRAFTER: ETM
DESIGNER: ETM
CHECKED: SOA
PROJECT NO. OLY1607.001

EXHIBIT E
SHEET 1 OF 1

APPENDIX G

Reference Material

Technical Drainage Study for Skye Canyon Parcel 2.23a,
by Slater Hanifan Group

Proposed Condition HEC-1 Analysis

Proposed Condition Drainage Map

TECHNICAL DRAINAGE STUDY

Skye Canyon Parcel 2.23a

City of Las Vegas, Nevada

Job No.: OLY1607.007

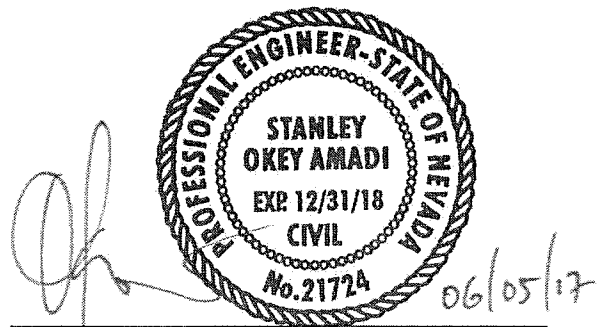
Date: May 2017

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



Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Erick T. Mata, EI



Date: 6/14/2017

[illegible]

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* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 11MAY17 TIME 11:08:55 *

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* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *

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X   X XXXXXXX XXXXX   X
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X   X X   X   X   X
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X   X XXXXXXX XXXXX   XXX

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

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

1 ID SLATER HANIFAN GROUP

2 ID SKYE CANYON PARCEL 2.23a

3 ID DEVELOPED CONDITION

4 ID

5 ID RETURN PERIOD ----- 100-YR & 10-YR

6 ID DISTRIBUTION ----- 6-HOUR SDN3

7 ID PROJECT NO. ----- OLY1607.007

8 ID FILENAME ----- DEV.H1

9 ID DATE ----- 05/11/2017

10 ID MODELED BY ----- SOA

11 ID

12 ID PRECIPITATION STORM EVENT RATIOS

13 ID STORM EVENT RATIO

14 ID 10-YR 0.56

15 ID 100-YR 1

16 ID

17 IT 5 0 0 300

18 IO 5 0 0

19 IN 5 0 0

20 JR PREC 1.00 0.56

*

21 KK ON1

22 KM DEVELOPED ONSITE BASIN

23 BA 0.0181

24 PB 3.00

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 LS 0 95.0

34 UD 0.103

*

35 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT

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

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

21 ON1

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 11MAY17 TIME 11:08:55 *

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

SLATER HANIFAN GROUP
SKYE CANYON PARCEL 2.23a
DEVELOPED CONDITION

RETURN PERIOD ----- 100-YR & 10-YR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1607.007
FILENAME ----- DEV.H1
DATE ----- 05/11/2017
MODELED BY ----- SOA

PRECIPITATION STORM EVENT RATIOS
STORM EVENT RATIO
10-YR 0.56
100-YR 1

18 IO

OUTPUT CONTROL VARIABLES

PR.OUT

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 .56

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	RATIO 2
HYDROGRAPH AT +	ON1	.02	1	1.00	.56
				36. 3.50	18. 3.50

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

*Site generates 36 cfs versus
 38 cfs anticipated by the
 Master Study. Therefore
 U-BCA model updated to
 utilize 36 cfs as starting Q.*

APPENDIX H

Reference Material

Technical Drainage Study for Skye Canyon Parcel 2.28,
by Slater Hanifan Group

Proposed Condition HEC-1 Analysis
Proposed Condition Drainage Map

TECHNICAL DRAINAGE STUDY
Skye Canyon Parcel 2.28
City of Las Vegas, Nevada

Job No.: OLY1709.000
Date: May 2017

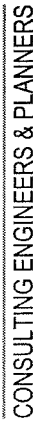
Prepared By:
Slater Hanifan Group, Inc.
5740 S. Arville Street, Suite 216
Las Vegas, Nevada 89118
Phone: 702-284-5300 • Fax: 702-284-5399

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



Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Caitlyn Alcantara, EI



Date: 6/14/2017

[illegible]

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* JUN 1998
* VERSION 4.1
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* RUN DATE 01MAY17 TIME 13:22:57
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* 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
1          *DIAGRAM
2          ID      SLATER HANIFAN GROUP
3          ID      SKYE CANYON PARCEL 2.28
4          ID      DEVELOPED CONDITION
5          ID
6          ID      RETURN PERIOD ----- 100-YR & 10-YR
7          ID      DISTRIBUTION ----- 6-HOUR SDN3
8          ID      PROJECT NO. ----- OLY1709.000
9          ID      FILENAME ----- DEV.H1
10         ID      DATE ----- 05/01/2017
11         ID      MODELED BY ----- caa
12         ID
13         ID      PRECIPITATION STORM EVENT RATIOS
14         ID      STORM EVENT          RATIO
15         ID      10-YR                0.56
16         ID      100-YR               1
17         ID
18         IT      5          0          0      300
19         IO      5          0          0
20         IN      5          0          0
21         JR      PREC      1.00      0.56
22         *
23         KK      ON1
24         KM      DEVELOPED ONSITE BASIN
25         BA      0.0300
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         LS      0          95.0
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1
SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE      (V) ROUTING      (--->) DIVERSION OR PUMP FLOW
NO.      (.) CONNECTOR      (<---) RETURN OF DIVERTED OR PUMPED FLOW
21      ON1

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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****
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* JUN 1998
* VERSION 4.1
*
* RUN DATE 01MAY17 TIME 13:22:57
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SLATER HANIFAN GROUP
SKYE CANYON PARCEL 2.28
DEVELOPED CONDITION

RETURN PERIOD ----- 100-YR & 10-YR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1709.000
FILENAME ----- DEV.H1
DATE ----- 05/01/2017
MODELED BY ----- caa

PRECIPITATION STORM EVENT RATIOS
STORM EVENT          RATIO
10-YR                0.56
100-YR               1

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18 IO OUTPUT CONTROL VARIABLES PR.OUT
 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 .56

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	RATIO 2
+ HYDROGRAPH AT	ON1	.03	1	1.00	.56
				57. 3.58	29. 3.58

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

Site generates 57 cfs versus 59 cfs anticipated by the Master Study. Therefore, Corridor analysis of Skye Village Road and inlets Computations updated

APPENDIX I

Reference Material

Technical Drainage Study for Skye Canyon Parcel 2.29,
by Slater Hanifan Group

Ultimate Condition HEC-1 Analysis
Ultimate Condition Drainage Map

TECHNICAL DRAINAGE STUDY

Skye Canyon Parcel 2.29

City of Las Vegas, Nevada

Job No.: OLY1709.000

Date: May 2017

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

Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Andrew Howard, EI



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Project Name: Skye Canyon Parcel 2.29
 Description: Lag Time Data
 File Name: OLY1710-000 TDS Lag Time Standard Form 4.xlsx
 By: AJH
 Date: 6/14/2017

SUB-BASIN DATA				INITIAL / OVERLAND TIME (Ti)				TRAVEL TIME (Tt)				Tc		Tc Check		Tag		
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi ²	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	VELOCITY FPS	V1 FPS	V2 VELOCITY FPS	Tt Min	Tc Calc.	Urbanized Basins Total Length Feet	Tc Check [9]	Tag Hours [10]
Phase 1 Interim Condition																		
ON1-I	D	91.0	0.811	17.43	0.0272	200	1.00	7.35	1590	2.70	3.32	5.03	6.12	13.47	1790	19.944	0.135	
Phase 2 Ultimate Condition																		
ON1-D	D	95.0	0.864	17.43	0.0272	100	1.00	4.25	1730	2.83	3.40	5.15	6.43	10.68	1830	20.167	0.107	
[1]	K = 0.0132 (CN) - 0.39																	
[2]	A = Area/640																	
[3]	Ti = (1.8 (1.1-K) L ^{0.5})/S ^{0.33}																	
[4]	For Existing Conditions: V1 = 14.8 * (S/100) ^{0.5}																	
	For Developed Conditions: V1 = 20.2 * (S/100) ^{0.5}																	
[5]	For Existing Conditions: V2 = 29.4 * (S/100) ^{0.5}																	
	For Developed Conditions: V2 = 30.6 * (S/100) ^{0.5}																	
[6]	Tt = L/(60*V)																	
[7]	Tc = Ti + Tt																	
[8]	Total L = Initial L + Travel L																	
Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.																		
REFERENCE :																		

STANDARD FORM 4

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 13JUN17 TIME 10:09:07 *

ULT.OUT

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* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *

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X X XXXXXXX XXXXX XXX

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

*DIAGRAM

1 ID SLATER HANIFAN GROUP

2 ID SKYE CANYON PARCEL 2.29

3 ID ULTIMATE CONDITION

4 ID

5 ID RETURN PERIOD ----- 100-YR & 10-YR

6 ID DISTRIBUTION ----- 6-HOUR SDN3

7 ID PROJECT NO. ----- OLY1709.000

8 ID FILENAME ----- ULT.H1

9 ID DATE ----- 05/24/2017

10 ID MODELED BY ----- AJH

11 ID

12 ID PRECIPITATION STORM EVENT RATIOS

13 ID STORM EVENT RATIO

14 ID 10-YR 0.56

15 ID 100-YR 1

16 ID

17 IT 5 0 0 300

18 IO 5 0 0

19 IN 5 0 0

20 JR PREC 1.00 0.56

*

21 KK ON1-D

22 KM DEVELOPED ONSITE BASIN

23 BA 0.0272

24 PB 2.86

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 LS 0 95.0

34 UD 0.107

*

35 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

21 ON1-D

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 13JUN17 TIME 10:09:07 *

*
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* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *

SLATER HANIFAN GROUP
SKYE CANYON PARCEL 2.29
ULTIMATE CONDITION

RETURN PERIOD ----- 100-YR & 10-YR
DISTRIBUTION ----- 6-HOUR SDN3
PROJECT NO. ----- OLY1709.000
FILENAME ----- ULT.H1
DATE ----- 05/24/2017
MODELED BY ----- AJH

PRECIPITATION STORM EVENT RATIOS
STORM EVENT RATIO
10-YR 0.56
100-YR 1

18 IO

OUTPUT CONTROL VARIABLES

ULT.OUT

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 ACRES-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 .56

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	RATIO 2
HYDROGRAPH AT +	ON1-D	.03	1	1.00	.56
				51. 3.50	26. 3.50

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

Flow increased by approx. 3 cfs in comparison to 48 cfs anticipated by the Master Study. Also flow distribution to Eagle Canyon Avenue and Sky Village Road storm drains changed from 24/24 cfs anticipated by the Infrastructure Study to 34/17 cfs. That is 10 cfs higher in Eagle Canyon and 7 cfs less in Sky Village Road, both storm drain systems updated.

APPENDIX J

Reference Material

Technical Drainage Study for Skye Canyon Parcel 2.27,
by Slater Hanifan Group

Developed Condition HEC-1 Analysis
Developed Condition Drainage Map

TECHNICAL DRAINAGE STUDY

Skye Canyon Parcel 2.27

City of Las Vegas, Nevada

Job No.: OLY1607.005

Date: May 2017

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

Stanley Okey Amadi, P.E.
NV Professional Engineer No. 21724

Assisted by: Erick Mata, EI

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL TIME OF CONCENTRATION

Project Name & Number: Skye Canyon Parcel 3.05 **2.27**

Description:

By: ETM

Date: 6/14/2017

SUB-BASIN DATA					INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tag							
DESIG:		DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	VELOCITY FPS	V1	V2	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Tag Hours			
				[1]		[2]			[3]				[4]	[5]	[6]	[7]	[8]	[9]	[10]			
DEVELOPED CONDITION																						
ON1	D	94.9	0.863	18.14	0.0283		115	1.00	4.58	1850	1.30	2.30	3.49		10.07	14.65	1965	20.917	0.146			
[1]	K = 0.0132 (CN) - 0.39							[5]	For Existing Conditions: V2 = 29.4 * (S/100)^0.5				[9]	Tc = (L/180) + 10								
[2]	A = Area/640											For Developed Conditions: V2 = 30.6 * (S/100)^0.5				[10]	Tag = (0.6*Tc)/60					
[3]	Ti = (1.8 (1.1-K) L^0.5)/S^0.33							[6]	Tt = L/(60*V)								[11]	Min Tag =0.05				
[4]	For Existing Conditions: V1 = 14.8 * (S/100)^0.5							[7]	Tc = Ti + Tt								Note: For Travel Time Calcs: V1 applies to first 500 feet and V2 applies to remaining distance.					
	For Developed Conditions: V1 = 20.2 * (S/100)^0.5							[8]	Total L = Initial L + Travel L													
REFERENCE :																						
STANDARD FORM 4																						

STANDARD FORM 4

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* DAVIS, CALIFORNIA 95616 *
* (916) 756-1104 *

1 HEC-1 INPUT PAGE 1

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*      VERSION 4.1
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* RUN DATE 14JUN17 TIME 15:40:05
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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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Page 1

18 IO

OUTPUT CONTROL VARIABLES

DEV.OUT

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 .56

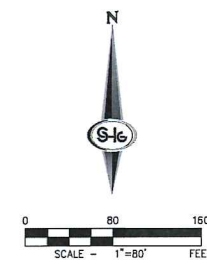
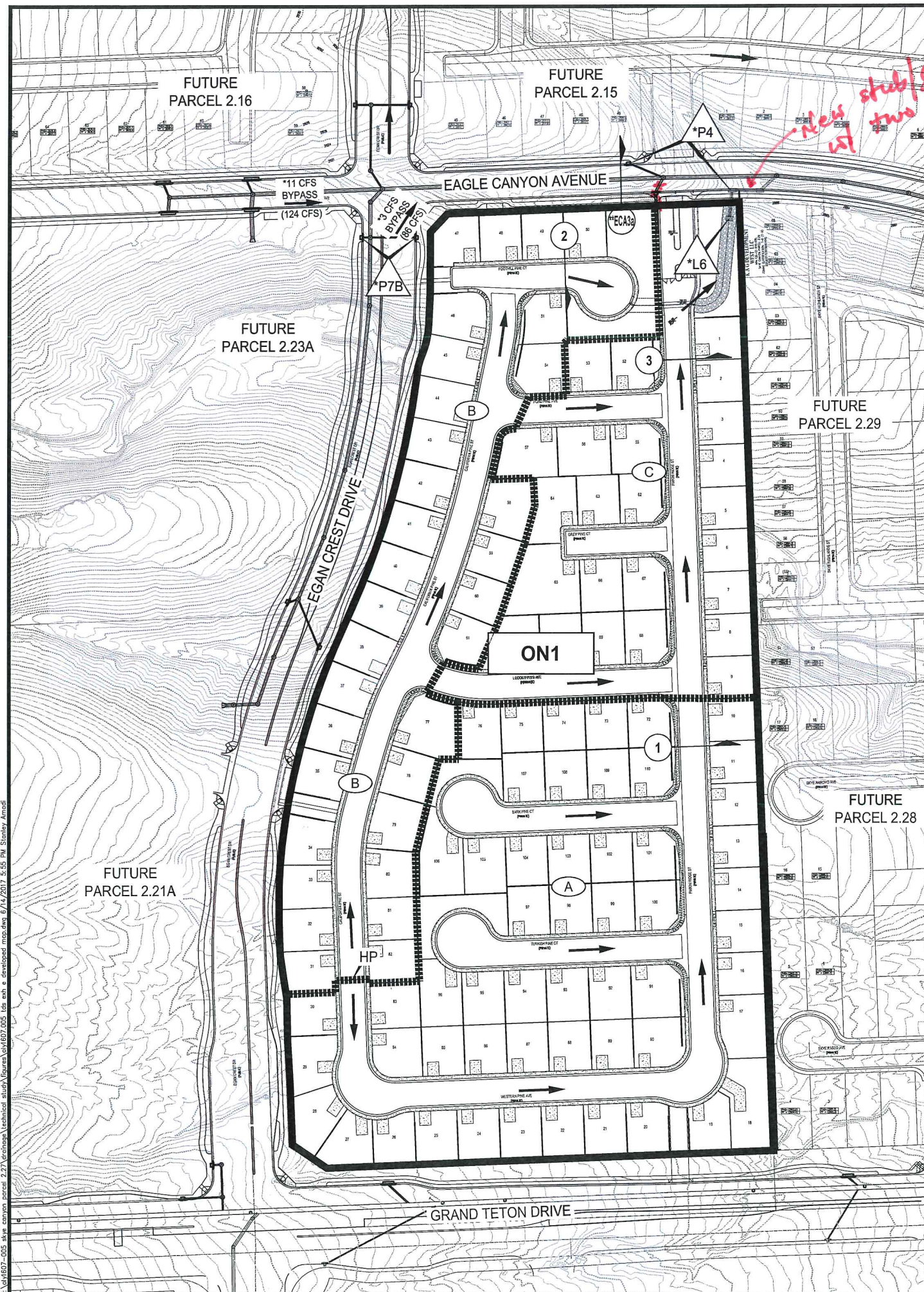
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PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
HYDROGRAPH AT +	ON1	.03	1	1.00	.56
				53. 3.58	27. 3.58

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

53 cfs generated by the site is greater than 49 cfs anticipated by the Master Study. Also the Due to drainage area discrepancy. Also, Stub Connection for flume is relocated. Thereby, Eagle Canyon mainline SD is updated to reflect new connection and revised flow rate



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

Developed Condition Flow Rate Summary			
Basin/Concentration Point ID	Area (ac)	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)
ON1	18.1	53	27

Prorated Flow Summary			
Basin ID	Q₁₀₀ (cfs)	Area (acres)	100-yr Uni Flow (cfs/acre)
ON1	53	18.1	2.9
Subbasin ID	Q₁₀₀ (cfs)	Area (acres)	100-yr Uni Flow (cfs/acre)
ON1 (a)	24	8.2	2.9
ON1 (b)	16	5.4	2.9
ON1 (c)	13	4.5	2.9
TOTAL	53	18.1	

Developed Condition 100-Year Street Flow Summary					
Section ID	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV
1 (Q = CP1)	3.88	24	0.37	5.7	2.1
	0.77		0.48	2.7	1.3
2 (Q = CP1)	4.16	16	0.32	5.4	1.7
	0.60		0.45	2.2	1.0
3 (Q = CP1)	3.38	53	0.49	5.6	2.7
	0.60		0.62	3.5	2.2

Developed Condition 100-Year Street Flow Summary					
Section ID	Slope (%)	Q ₁₀₀ (cfs)	Depth (ft)	Velocity (fps)	DxV
1 (Q = CP1)	3.88	24	0.37	5.7	2.1
	0.77		0.48	2.7	1.3
2 (Q = CP1)	4.16	16	0.32	5.4	1.7
	0.60		0.45	2.2	1.0
3 (Q = CP1)	3.38	53	0.49	5.6	2.7
	0.60		0.62	3.5	2.2

APPENDIX K

Reference Material

Master Drainage Study Update No.3 for Skye Canyon,
by Slater Hanifan Group

Ultimate Condition HEC-1 Analysis

Ultimate Condition Drainage Map

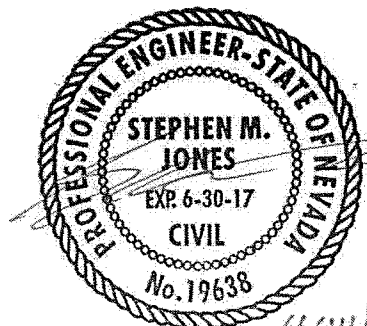
**MASTER DRAINAGE STUDY
(UPDATE #3)**

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

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM			DATE: August 15, 2016
TO: Land Development Services Department of Public Works			FROM: Oh Sang Kwon, P.E. Flood Control Section Department of Public Works
SUBJECT:	Drainage Study for:		COPIES TO:
Skye Canyon Master Drainage Study – Update #3			Slater Hanifan Group
Cross Streets:	Fort Apache Road & Moccasin Road		KAG Development South, LLC
File Number:	F:\Depot\DSMemos\DS4420N.doc		Bart Anderson, P.E., DevCo
Parcel Number:	125-06-001-001		CCRFCD
Zoning Action:			CCPW
FEMA Flood Zone	YES	NO X	NDOT; NV Energy
Proposed Storm Drain	YES X	NO	PB America, Inc.

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	6/22/2010	7/13/2010	Not Approved	\$1,000.00	147216: \$1000
2 nd Submittal	9/17/2010	10/4/2010	Not Approved	\$400.00	153788: \$400
3 rd Submittal	10/15/2011	11/14/2011	Not Approved	\$400.00	153788: \$400
4 th Submittal	2/13/2012	3/1/2012	Conditional Approval	\$400.00	274196: \$400
CCRFCD	5/23/2012	5/24/2012	Concurrence Recv'd	N/C	N/C
5 th Submittal NDOT Comments	9/10/2012	9/19/2012	Conditional Approval	N/C	N/C
6 th Submittal	12/4/2014	12/30/2014	Conditional Approval	\$400.00	378889: \$400
7 th Submittal	2/17/2015	3/3/2015	Conditional Approval	\$400.00	385987: \$400
8 th Submittal	3/16/2015	4/6/2015	See Comments Below	\$400.00	388961: \$400
CCRFCD	4/2/2015	4/6/2015	Concurrence Recv'd	N/C	N/C
9 th Submittal	6/23/2015	7/21/2015	See Comments Below	\$400.00	403025: \$400
Revised Memo	8/12/2015	8/12/2015	See Comments Below	N/A	N/A
10 th Submittal	10/19/2015	11/23/2015	Conditional Approval	\$400.00	N/A
11 th Submittal	4/19/2016	5/16/2016 & 8/15/2016	See Comments Below	\$400.00	440941: \$400
TOTAL FEES (LDDRS):				\$4,600.00	----

REMARKS: 11th Submittal: Update # 3 – Overall Master Plan Revision of Skye Canyon development. The proposed size and location of MPU facilities are being changed with the concept of allowing development without impacting the National Monument.

Skye Canyon Master Drainage Study Update #3 proposes substantial changes to amend the previously approved Master Plan Amendment (MPA). A new MPA must be submitted to City of Las Vegas and CCRFCD for approval and shall be adopted by the City of Las Vegas City Council prior to the final approval of the subject Master Study Update #3.

The City of Las Vegas will not allow further residential development outside of the limits of Phase 2 at this time until the New Master Plan is approved.

10th Submittal - Phase 2 interim impacts.

Revised Memo – National Monument Drainage Impacts

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

	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
X	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
X	is conditionally approved subject to Clark County Department of Public Works concurrence.
X	is conditionally approved subject to Nevada Department of Transportation concurrence.
X	is conditionally approved subject to BLM concurrence/approval.

1. The overall concept presented in the Master Plan Update #3 for Skye Canyon appears to satisfy the intent of providing regional connectivity of proposed Master Planned facilities without impacting the National Monument. Specific Technical Drainage Studies shall be required to address the specific impacts of each proposed Master Planned facility and the interaction with proposed facilities needed for each phase of development.
2. The Regional Flood Control District has requested that engineering consultants utilize the latest NRCS soils data as a part of the drainage study parameters. The Master Plan Update shall discuss the soil data used in the analysis and discuss the impacts on the overall hydraulic analysis. Provide an updated HEC-1 analysis and address local and MPU facility size modifications, if necessary based upon the revised Soil Survey data. Update the NRCS soils data in the References (Section 7). Review and revise Exhibit & Figures accordingly. This needs to be addressed as supplemental information prior to the MPA approval.
3. The Master Plan shall clearly define when the proposed interim facilities will be taken out of service and the construction of the required MPU facilities. A complete Phasing Plan shall be updated and approved by the City of Las Vegas and Regional Flood Control prior to the approval of the MPA.
4. This Update proposes to construct the *Log Cabin Detention Basin #3* with flows that will increase the runoff volume routed towards the *Tule Springs North Environmental Detention Basin* (TSNEDB). The engineer proposes to modify the TSNEDB by removing the orifice plate at the detention basin outfall pipe to increase the outflow. Detention basin design uses the orifice plate to insure that the basin outfall remains under inlet control parameters per the HCDDM, Section 1200. Discuss the impact of removing the orifice plate and provide calculations verifying that the existing outfall will convey the proposed 78 cfs under inlet control conditions. Discuss the drain time impacts to the TSNEDB and the impacts to the downstream development. Alternatively, the TSNEDB may need modifications to meet the HCDDM requirements. This could include the expansion of the TSNEDB basin to increase the storage volume accordingly or replacement of the TSNEDB outfall. These or other modifications need to be conceptually addressed as supplemental information prior to the MPA approval.
5. The premise of the Master Plan Update #3 for Skye Canyon is to add two (2) new CCRFCD Master Plan Detention Basins that are located outside of the Skye Canyon development. The City of Las Vegas is in the process of applying for BLM grants for these detention basin sites. These ultimate facilities shall be included in the MPA as CCRFCD facilities. The intent of the Detention Basin (157DB) is to reduce developed flows to maintain the existing condition flow rate in the ultimate condition and reduce the size of the downstream regional facilities. The intent of the Log Cabin Detention Basin (DB3) is to reduce developed flows to reduce the size of the downstream regional facilities that impact the TSNEDB. The concept for the addition of these two detention basins to the CCRFCD Master Plan is acceptable and will require the submittal of technical studies to refine the facility parameters. The construction of DB3 shall be the responsibility of the Skye Canyon

development and will be of sufficient size to reduce the flow impacts to development downstream and ultimately the TSNEDB.

6. This Master Study notes that drainage study updates for both Phase 1 and Phase 2 to accommodate the increased system flows impacting these Phases are necessary. A detailed analysis & review of the required updates will determine the system impacts and if any needed system upgrades are necessary to maintain HCDDM criteria.
7. **Exhibit 1:** The developed condition Exhibit 1 shall be updated to include the coordinated Kyle Canyon Interchange drainage improvements. The size of the downstream facilities shall be reviewed based upon the interchange improvements.
8. **Exhibit 1:** The developed condition Exhibit 1 shows that a portion of the developed flows will drain north of Moccasin into the BLM land and the National Monument to mimic existing drainage patterns. Concentrated flow discharges to the north shall require BLM and National Park Service concurrence.
9. **Exhibit J:** The proposed facility 14 that drains from EC18 easterly to the proposed DB3 shall be a permanent facility meeting the requirements of Title 20 and shall be constructed as a permanent MPU facility with this development.
10. **Exhibit J:** The proposed onsite DB1 & DB2 facilities shall include the collection facilities as a part of the detention basins areas.
11. **Exhibit J:** The proposed changes to DB1 will impact the alignment and size of the ultimate collection facility that drains to DB1. The proposed facility shall remain an open channel to allow flow interception from the west in this undeveloped drainage.
12. The **Master Land Use Plan** has been provided however, any further changes to the adopted Master Land Use Plan shall require a complete update to the Master Drainage Study.
13. A copy of the approved 404 Permit from the Army Corps of Engineers has been provided.
14. The Phasing Plan for Phase 1 & 2 have addressed the interim condition and associated downstream impacts to address the impact of the long term discharge from the outfall of the Detention Basin #1. This includes upgrading the existing storm drain system near the intersection of Brent Lane and Fort Apache. These improvements have been included in the Detention Basin #1 improvements.
15. Flood Control requires an interim condition drainage analysis in support of the Phasing Plan that clearly shows the impacts to each Phase, existing washes, upstream concentration points and the downstream concentration points. Flood Control needs to make sure that each Phase of Development is protected during the interim and full build-out of this overall project. The current Phasing Plan does not adequately address these issues beyond Phase 2.
16. The interim conditions of the Phasing Plan need to address the impact of the long term discharge from the outfall of any future detention basins. It is noted that Only Detention Basin #1 has been reviewed. The technical review of Detention Basin #2 will determine the impacts downstream along the Iron Mountain Road alignment and/or other needed facilities to mitigate that impact. The provided Basin Attenuated Outfall Exhibit is only conceptual in nature and is subject to further review as a part of the technical reviews. Existing flow conditions do not have a drawn out discharge from a detention basin. This discharge impact must be accounted for in the interim condition without negatively impacting the existing downstream neighborhoods.
17. CCRFCD concurrence has previously been provided. A new concurrence for Update #3 shall be provided from CCRFCD after Conditional Approval by the City of Las Vegas.

18. CCPW concurrence has previously been provided. A new concurrence for Update #3 shall be provided from CCPW after Conditional Approval by the City of Las Vegas.
19. NDOT concurrence has previously been provided. A new concurrence for Update #3 shall be provided from NDOT after Conditional Approval by the City of Las Vegas.

The following comments are repeated until they are complete:

1. Please note that the Traffic Study must be approved prior to final approval of the Master Drainage Study. If the street layout does not match the Master Drainage Study, an update to the Master Drainage Study must be submitted to address the changes.
2. Per a meeting held in August 18, 2011 between the developer and the *City of Las Vegas*, it was agreed that NV Energy's approval of any proposed drainage facilities within their access easements (such as the proposed detention basins) must be obtained prior to the final approval of the Master Drainage Study. Please provide documentation for such approval or acknowledgment.
3. Please note that any future technical drainage study submittals that differ from the Master Drainage Study (ie. Changes in pods, infrastructure, flows etc.) will require an update to the Master Drainage Study and this update must be approved by the *City of Las Vegas Flood Control Section* prior to final approval of technical drainage study.
4. The proposed detention basins will require coordination with the State of Nevada, Division of Water Resources Dam Safety and will require the State's approval prior to permitting.
5. Please note that the proposed 100-year flood protection facilities identified on Exhibit J must be constructed by the Master Developer as a part of the master planned infrastructure. Technical drainage studies are required for each phase of the master planned infrastructure improvements. The technical drainage studies for the infrastructure improvements may be submitted with conditional approval of this Master Drainage Study. However, final approval for the Master Drainage Study must be obtained prior to conditional approval of the infrastructure drainage studies.
6. Technical drainage studies are required for each of the Pod's. The technical drainage studies for the Pod's may not be submitted until the conditional approval of the pertinent infrastructure drainage study is obtained. Final approval for the infrastructure drainage study must be obtained prior to conditional approval of the impacted Pod drainage studies.
7. 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.
8. The design of debris basins at all major culvert entrances to limit the amount of sediment and debris entering the storm drain facilities will be required in a future infrastructure study.
9. Please note that all detention basins must be designed per CCRFCD criteria including a low flow facility around the detention basin.
10. Please note that all proposed interim facilities must be maintained by the master developer.
11. Provide a legal description of the proposed detention basins prior to recordation of the parent final map.
12. Coordinate the proposed drainage facilities with *Sheep Mountain Parkway* project. Please contact Greg McDermott, P.E., at 702-229-2143 to coordinate the proposed drainage facilities.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved master drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1)

year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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

END OF REMARKS

Osk/pbj

T/R/S: T19S/R60E/6 & 7

AREA G-6, 7, & F-12

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Company: SHG, Inc
By: JSR
Date: 3/10/2016

Project Name: Skye Canyon Master Drainage Study - 2016
Description: Ultimate Conditions
File Name: J:\JOLY1603-000 Skye MDS-2016\Drainage\Conceptual Stu

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc		Tc Check		Tag
DESIG:	DEV./EX. (D or E)	CN	K	AREA Ac	AREA Mi^2	INITIAL LENGTH Feet	SLOPE %	Ti Min	TRAVEL LENGTH Feet	SLOPE %	V1 VELOCITY FPS	V2 VELOCITY FPS	Tt Min	Tc Calc.	Total Length Feet	Tc Check	Tag	
			[1]		[2]			[3]			[4]	[5]	[6]	[7]	[8]	[9]	[10]	
SKYE CANYON WEST																		
WL1A	D	92.0	0.8244	29.8	0.0465	100	1.0	4.96	2260	2.2	3.00	4.55	9.22	14.18	2360	23.111	0.142	
WL1B	D	92.0	0.8244	28.0	0.0437	100	1.0	4.96	1710	3.2	3.62	5.49	5.98	10.94	1810	20.056	0.109	
WL2	D	92.0	0.8244	15.7	0.0245	100	1.0	4.96	1345	2.6	3.26	4.94	5.41	10.37	1445	18.028	0.104	
WL3	D	92.0	0.8244	24.9	0.0390	100	1.0	4.96	2020	2.7	3.30	5.00	7.59	12.55	2120	21.778	0.125	
WL4A	D	92.0	0.8244	8.0	0.0125	100	1.0	4.96	1455	2.7	3.35	5.07	5.63	10.59	1555	18.639	0.106	
WL4B	D	92.0	0.8244	8.9	0.0140	100	1.0	4.96	1195	3.3	3.70	5.60	4.32	9.28	1295	17.194	0.093	
WL5A	D	92.0	0.8244	10.9	0.0170	100	1.0	4.96	1350	3.2	3.61	5.46	4.91	9.87	1450	18.056	0.099	
WL5B	D	92.0	0.8244	3.8	0.0059	100	1.0	4.96	1055	4.0	4.03	6.11	3.58	8.54	1155	16.417	0.085	
WL6A	D	92.0	0.8244	6.2	0.0096	100	1.0	4.96	1170	3.4	3.73	5.66	4.20	9.17	1270	17.056	0.092	
WL6B	D	92.0	0.8244	10.6	0.0165	100	1.0	4.96	1385	2.5	3.21	4.86	5.63	10.59	1485	18.250	0.106	
WL7	D	92.0	0.8244	11.5	0.0180	100	1.0	4.96	1240	3.2	3.63	5.50	4.54	9.50	1340	17.444	0.095	
WL8	D	92.0	0.8244	17.4	0.0272	100	1.0	4.96	1625	1.7	2.65	4.02	7.81	12.77	1725	19.583	0.128	
WL9A	D	92.0	0.8244	18.2	0.0284	100	1.0	4.96	1646	2.3	3.07	4.65	6.82	11.78	1746	19.700	0.118	
WL9B	D	92.0	0.8244	14.4	0.0224	100	1.0	4.96	1590	2.3	3.08	4.67	6.60	11.56	1690	19.389	0.116	
WL10A	D	92.0	0.8244	17.1	0.0267	100	1.0	4.96	1705	2.0	2.85	4.32	7.57	12.53	1805	20.028	0.125	
WL10B	D	92.0	0.8244	18.3	0.0286	100	1.0	4.96	1720	1.5	2.44	3.69	8.93	13.89	1820	20.111	0.139	
WL11	D	92.0	0.8244	36.7	0.0573	100	1.0	4.96	2105	2.5	3.21	4.86	8.11	13.07	2205	22.250	0.131	
WL12	D	92.0	0.8244	31.4	0.0490	100	1.0	4.96	1850	2.7	3.32	5.03	6.98	11.94	1950	20.833	0.119	
WML1	D	92.0	0.8244	18.0	0.0282	100	1.0	4.96	1460	3.1	3.55	5.37	5.33	10.29	1560	18.667	0.103	
WML2	D	93.5	0.8441	27.4	0.0428	100	1.0	4.61	2245	2.0	2.86	4.33	9.63	14.23	2345	23.028	0.142	
WML3	D	95.0	0.8640	17.3	0.0270	100	1.0	4.25	1570	3.3	3.68	5.57	5.47	9.72	1670	19.278	0.097	
WML4	D	95.0	0.8640	25.1	0.0393	100	1.0	4.25	1970	3.0	3.53	5.34	6.95	11.20	2070	21.500	0.112	
WML5	D	95.0	0.8640	27.3	0.0427	100	1.0	4.25	2220	2.6	3.27	4.95	8.35	12.60	2320	22.889	0.126	
WML6	D	95.0	0.8640	20.5	0.0321	100	1.0	4.25	1545	2.3	3.08	4.67	6.43	10.68	1645	19.139	0.107	
WML7	D	95.0	0.8640	18.6	0.0291	100	1.0	4.25	1485	2.7	3.32	5.02	5.78	10.03	1585	18.806	0.100	
WML8	D	95.0	0.8640	10.3	0.0161	100	1.0	4.25	1450	3.4	3.75	5.68	5.01	9.26	1550	18.611	0.093	
WML9	D	94.9	0.8628	16.4	0.0257	100	1.0	4.27	1355	4.8	4.42	6.70	4.01	8.28	1455	18.083	0.083	
WML10	D	95.0	0.8640	11.6	0.0181	100	1.0	4.25	1250	2.8	3.38	5.12	4.91	9.15	1350	17.500	0.092	
WML11	D	92.7	0.8336	28.7	0.0448	100	1.0	4.79	2315	3.7	3.89	5.89	7.28	12.08	2415	23.417	0.121	
WML13	D	95.0	0.8640	12.3	0.0193	100	1.0	4.25	1870	2.4	3.13	4.75	7.47	11.72	1970	20.944	0.117	

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* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 12APR16 TIME 18:43:45 *
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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 -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
*DIAGRAM
1 ID SLATER HANIFAN GROUP
2 ID OLYMPIA COMPANIES
3 ID SKYE CANYON
4 ID MASTER DRAINAGE STUDY 2016
5 ID ULTIMATE DRAINAGE CONDITION - REVISED TO TULE SPRINGS NORTH ENV. DB
6 ID
7 ID RETURN PERIOD ----- 100-YEAR
8 ID DISTRIBUTION ----- 6-HOUR SDN3
9 ID PROJECT NO. ----- OLY1603.000
10 ID FILENAME ----- Ultimate3-TULEDB.H1
11 ID DATE ----- APR11 2016
12 ID MODELED BY ----- SMJ/JSR
13 ID
14 ID SIX HOUR DEPTH-AREA REDUCTION FACTORS
15 ID DRAINAGE AREA (MIA2) 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 2.0-3.99 0.93
20 ID 4.0-5.99 0.91
21 ID 6.0-7.99 0.90
22 ID
23 IT 5 0 0 2000
24 IO 5 0 0
25 IN 5 0 0
26 JR PREC 1.00 0.98 0.97 0.93 0.91 0.90
*
27 KK WUS95
28 KM KYLE CANYON INTERCHANGE - WEST HALF
29 BA .0133
30 PB 2.77
31 PC 0 0.020 0.057 0.070 0.087 0.108 0.124 0.130 0.130 0.130
32 PC 0.130 0.130 0.130 0.133 0.140 0.142 0.148 0.158 0.172 0.181
33 PC 0.190 0.197 0.199 0.200 0.201 0.204 0.214 0.229 0.241 0.249
34 PC 0.251 0.256 0.270 0.278 0.281 0.283 0.295 0.322 0.352 0.409
35 PC 0.499 0.590 0.710 0.744 0.781 0.812 0.819 0.835 0.851 0.856
36 PC 0.860 0.868 0.876 0.888 0.910 0.926 0.937 0.950 0.970 0.976
37 PC 0.982 0.985 0.987 0.989 0.990 0.993 0.993 0.994 0.995 0.998
38 PC 0.998 0.999 1.000
39 LS 0 98.0
40 UD 0.082
*
41 KK DHD018
42 KM FACILITY E-9
43 KM FLOW SPLIT AT VTN CULVERT 1
44 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
45 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
46 DT DCHD1B
47 DI 0 133 187 250
48 DQ 0 120 135 150
*

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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
49 KK DHD02B
50 KM FACILITY E-10
51 KM FLOW SPLIT AT VTN CULVERT 2
52 KM FLOW SPLITS TO BETWEEN NB AND SB ROADS OF US-95
53 KM REFERENCED FROM GCW MASTER DRAINAGE STUDY
54 DT DCHD2B
55 DI 0 100 138
56 DQ 0 99 135
*
57 KK WML15A
58 KM WEST BASIN, WEST OF SKYE PARK DRIVE
59 BA .0193
60 PB 2.93
61 LS 0 95.0
62 UD 0.084
*
63 KK WSPD1
64 KM WEST BASIN, SKYE PARK DRIVE
65 BA .0011
66 PB 2.93
67 LS 0 98.0
68 UD 0.055
*
69 KK WCL
70 KM FAR NW OF IRON MT/GRAND CANYON INTERSECTION
71 KM COMBINE WML15A, WSPD1
72 HC 2
*
73 KK WIRN4
74 KM WEST BASIN, IRN MT ROAD
75 BA .0042
76 PB 2.93
77 LS 0 98.0
78 UD 0.079
*

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Ultimate3-TULEDB.OUT

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431      UD      0.079
      *
432      KK      ON4D
433      BA      .0041
434      LS              95
435      UD      0.096
      *

436      KK      CP3
437      KM      COMBINE ON1D AND ON4D
438      HC      2
      *

439      KK      CP4
440      KM      COMBINE CP2 AND CP3
441      KM      END GRAND CANYON APARTMENTS HEC-1 DATA
442      HC      2
      *

443      KK      CENGCA
444      KM      COMBINE DRCDIC, C9, CP4
445      KM      CDIC IS DIVERSION OF FLOW ON TEE PEE FROM CENTENNIAL POINT
446      KM      CP4 AND C9 ARE ENDING OF THE APARTMENT COMPLEX AND DEVELOPMENT
447      HC      4
      *

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1 HEC-1 INPUT PAGE 13

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

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448      KK      WML9
449      KM      WEST BASIN, WEST OF EGAN CREST DRIVE
450      BA      .0257
451      PB      3.00
452      LS      0      94.9
453      UD      0.083
      *

454      KK      WPRK5
455      KM      WEST BASIN, WEST OF EGAN CREST DRIVE
456      BA      .0031
457      PB      3.00
458      LS      0      84.0
459      UD      0.064
      *

460      KK      WC10A
461      KM      FAR W OF EAGLE CANYON/EGAN CREST INTERSECTION
462      KM      COMBINE WML9, WPRK5
463      HC      2
      *

464      KK      WEGL1
465      KM      WEST BASIN, EAGLE CANYON AVE
466      BA      .0052
467      PB      3.00
468      LS      0      98.0
469      UD      0.083
      *

470      KK      WL4B
471      BA      .0140
472      PB      3.00
473      LS      0      92.0
474      UD      0.093
      *

475      KK      WC10B
476      KM      W OF EAGLE CANYON/EGAN CREST INTERSECTION
477      HC      3
      *

478      KK      WML10
479      KM      WEST BASIN, WEST OF EGAN CREST DRIVE
480      BA      .0181
481      PB      3.00
482      LS      0      95.0
483      UD      0.092
      *

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1 HEC-1 INPUT PAGE 14

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

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484      KK      WEGN3
485      KM      WEST BASIN, EGAN CREST DRIVE
486      BA      .0051
487      PB      3.00
488      LS      0      98.0
489      UD      0.136
      *

490      KK      WML11
491      KM      WEST BASIN, WEST OF EGAN CREST DRIVE
492      BA      .0448
493      PB      3.00
494      LS      0      92.7
495      UD      0.121
      *

496      KK      WC11
497      KM      W OF EAGLE CANYON/EGAN CREST INTERSECTION
498      KM      COMBINE WML10, WEGN3, WML11
499      HC      3
      *

500      KK      WC12
501      KM      W OF EAGLE CANYON/EGAN CREST INTERSECTION
502      KM      COMBINE WC10B, WC11
503      HC      2
      *

504      KK      WL6B
505      KM      WEST BASIN, WEST OF SKY VILLAGE ROAD
506      BA      .0165
507      PB      3.00
508      LS      0      92.0
509      UD      0.106
      *

510      KK      WL7
511      KM      WEST BASIN, WEST OF SKY VILLAGE ROAD
512      BA      .0180
513      PB      3.00
514      LS      0      92.0
515      UD      0.095
      *

516      KK      WML13
517      KM      WEST BASIN, WEST OF SKY VILLAGE ROAD
518      BA      .0256
519      PB      3.00
520      LS      0      95.0
521      UD      0.117
      *

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1 HEC-1 INPUT PAGE 15

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Ultimate3-TULEDB.OUT
CP4.....
439
443 CENGCA.....
448 WML9
454 WPRK5
460 WC10A.....
464 WEG1
470 WL48
475 WC10B.....
478 WML10
484 WEGN3
490 WML11
496 WC11.....
500 WC12.....
504 WL6B
510 WL7
516 WML13
522 WGL2
528 WC13.....
532 WML14
538 WL8
544 WSKV3
550 WSKV4
556 WC14.....
560 WL9B
566 WSPD4
572 WC15.....
576 WL11
582 WPRK8
588 WPRK9
594 WMTL1
600 WC16.....
604 WGL3
610 WL10B
616 WC17.....
620 WL12
626 WGR18
632 WC18.....
636 CCP4.....
638 OFF21B
645 COF21B.....
652 <----- DOFF23
649 ROFF23
653 OFF23
659 COFF23.....
663 OFFU
668 CPCULV.....

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Ultimate3-TULEDB.OUT

HYDROGRAPH AT +	ON7	.01	1	FLOW TIME	14. 3.50	13. 3.50	13. 3.50	12. 3.50	12. 3.50	12. 3.50
3 COMBINED AT +	C8	.01	1	FLOW TIME	51. 3.50	50. 3.50	49. 3.50	47. 3.50	45. 3.50	45. 3.50
HYDROGRAPH AT +	RET1A	.00	1	FLOW TIME	13. 3.50	12. 3.50	12. 3.50	12. 3.50	11. 3.50	11. 3.50
HYDROGRAPH AT +	RET1B	.00	1	FLOW TIME	20. 3.50	20. 3.50	20. 3.50	19. 3.50	18. 3.50	18. 3.50
HYDROGRAPH AT +	RET1C	.00	1	FLOW TIME	7. 3.50	7. 3.50	7. 3.50	6. 3.50	6. 3.50	6. 3.50
3 COMBINED AT +	C9	.00	1	FLOW TIME	40. 3.50	39. 3.50	38. 3.50	36. 3.50	35. 3.50	35. 3.50
HYDROGRAPH AT +	ON2D	.01	1	FLOW TIME	21. 3.50	21. 3.50	20. 3.50	19. 3.50	19. 3.50	19. 3.50
HYDROGRAPH AT +	ON5D	.00	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50	8. 3.50	7. 3.50	7. 3.50
2 COMBINED AT +	CP1	.01	1	FLOW TIME	29. 3.50	29. 3.50	28. 3.50	27. 3.50	26. 3.50	26. 3.50
HYDROGRAPH AT +	ON3D	.00	1	FLOW TIME	7. 3.50	7. 3.50	7. 3.50	7. 3.50	7. 3.50	7. 3.50
2 COMBINED AT +	CP2	.02	1	FLOW TIME	37. 3.50	36. 3.50	36. 3.50	34. 3.50	33. 3.50	33. 3.50
HYDROGRAPH AT +	ON1D	.01	1	FLOW TIME	16. 3.50	15. 3.50	15. 3.50	15. 3.50	14. 3.50	14. 3.50
HYDROGRAPH AT +	ON4D	.00	1	FLOW TIME	8. 3.50	8. 3.50	8. 3.50	8. 3.50	7. 3.50	7. 3.50
2 COMBINED AT +	CP3	.01	1	FLOW TIME	24. 3.50	23. 3.50	23. 3.50	22. 3.50	21. 3.50	21. 3.50
2 COMBINED AT +	CP4	.03	1	FLOW TIME	61. 3.50	59. 3.50	59. 3.50	56. 3.50	55. 3.50	54. 3.50
4 COMBINED AT +	CENGCA	.08	1	FLOW TIME	152. 3.50	148. 3.50	146. 3.50	139. 3.50	135. 3.50	134. 3.50
HYDROGRAPH AT +	WML9	.03	1	FLOW TIME	55. 3.50	54. 3.50	53. 3.50	51. 3.50	50. 3.50	49. 3.50
HYDROGRAPH AT +	WPRK5	.00	1	FLOW TIME	5. 3.50	5. 3.50	5. 3.50	4. 3.50	4. 3.50	4. 3.50
2 COMBINED AT +	WC10A	.03	1	FLOW TIME	60. 3.50	59. 3.50	58. 3.50	55. 3.50	54. 3.50	53. 3.50
HYDROGRAPH AT +	WEGL1	.01	1	FLOW TIME	12. 3.50	12. 3.50	11. 3.50	11. 3.50	11. 3.50	11. 3.50
HYDROGRAPH AT +	WL4B	.01	1	FLOW TIME	27. 3.50	26. 3.50	26. 3.50	25. 3.50	24. 3.50	24. 3.50
3 COMBINED AT +	WC10B	.05	1	FLOW TIME	99. 3.50	97. 3.50	95. 3.50	91. 3.50	89. 3.50	88. 3.50
HYDROGRAPH AT +	WML10	.02	1	FLOW TIME	38. 3.50	37. 3.50	37. 3.50	35. 3.50	34. 3.50	34. 3.50
HYDROGRAPH AT +	WEGN3	.01	1	FLOW TIME	10. 3.58	10. 3.58	10. 3.58	9. 3.58	9. 3.58	9. 3.58
HYDROGRAPH AT +	WML11	.04	1	FLOW TIME	81. 3.58	79. 3.58	78. 3.58	74. 3.58	72. 3.58	71. 3.58
3 COMBINED AT +	WC11	.07	1	FLOW TIME	127. 3.50	124. 3.50	123. 3.50	117. 3.50	114. 3.50	112. 3.50
2 COMBINED AT +	WC12	.12	1	FLOW TIME	226. 3.50	221. 3.50	218. 3.50	208. 3.50	202. 3.50	200. 3.50
HYDROGRAPH AT +	WL6B	.02	1	FLOW TIME	30. 3.50	29. 3.50	29. 3.50	28. 3.50	27. 3.50	26. 3.50
HYDROGRAPH AT +	WL7	.02	1	FLOW TIME	34. 3.50	33. 3.50	33. 3.50	31. 3.50	31. 3.50	30. 3.50
HYDROGRAPH AT +	WML13	.03	1	FLOW TIME	49. 3.50	48. 3.50	47. 3.50	45. 3.50	44. 3.50	44. 3.50
HYDROGRAPH AT +	WEGL2	.01	1	FLOW TIME	12. 3.50	12. 3.50	12. 3.50	11. 3.50	11. 3.50	11. 3.50
5 COMBINED AT +	WC13	.18	1	FLOW TIME	352. 3.50	343. 3.50	339. 3.50	323. 3.50	315. 3.50	311. 3.50
HYDROGRAPH AT +	WML14	.03	1	FLOW TIME	59. 3.50	57. 3.50	57. 3.50	54. 3.50	53. 3.50	52. 3.50
HYDROGRAPH AT +	WL8	.03	1	FLOW TIME	48. 3.58	47. 3.58	46. 3.58	44. 3.58	43. 3.58	42. 3.58

Ultimate3-TULED8.OUT

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1618E+02 EXCESS= .0000E+00 OUTFLOW= .1617E+02 BASIN STORAGE= .1593E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW130 MANE 1.34 167.60 231.28 1.19 5.00 166.57 230.00 1.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1559E+02 EXCESS= .0000E+00 OUTFLOW= .1559E+02 BASIN STORAGE= .1470E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW130 MANE 1.35 164.24 230.78 1.17 5.00 163.32 230.00 1.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1531E+02 EXCESS= .0000E+00 OUTFLOW= .1530E+02 BASIN STORAGE= .1586E-03 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.25 748.66 232.19 1.34 5.00 740.43 230.00 1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5168E+03 EXCESS= .0000E+00 OUTFLOW= .5169E+03 BASIN STORAGE=-.1501E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.26 722.12 231.32 1.31 5.00 713.42 230.00 1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5049E+03 EXCESS= .0000E+00 OUTFLOW= .5050E+03 BASIN STORAGE=-.1503E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.26 708.03 232.15 1.29 5.00 699.27 235.00 1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4989E+03 EXCESS= .0000E+00 OUTFLOW= .4990E+03 BASIN STORAGE=-.1503E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.28 654.25 231.81 1.23 5.00 647.81 235.00 1.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4752E+03 EXCESS= .0000E+00 OUTFLOW= .4753E+03 BASIN STORAGE=-.1507E+00 PERCENT ERROR= .0

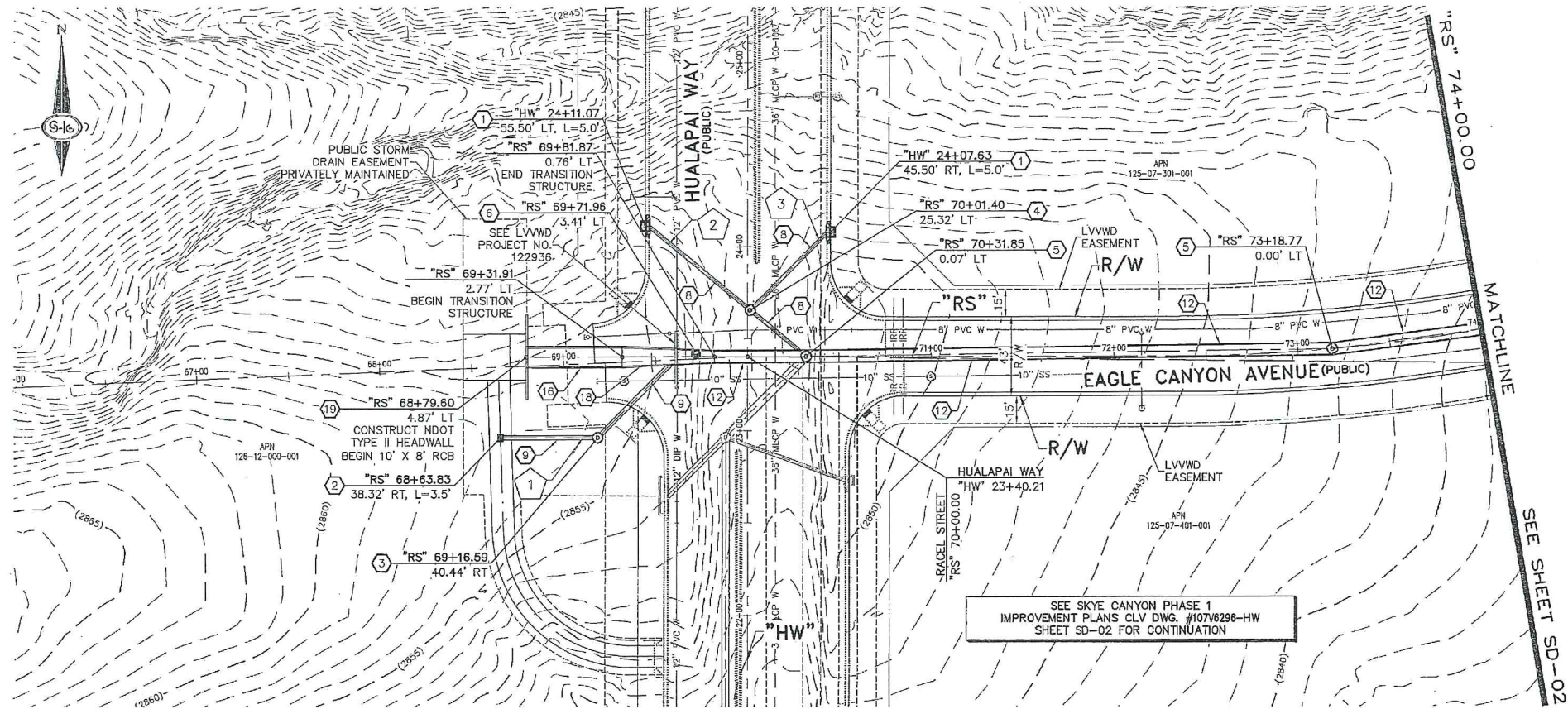
FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.29 627.91 232.33 1.20 5.00 622.92 235.00 1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4634E+03 EXCESS= .0000E+00 OUTFLOW= .4635E+03 BASIN STORAGE=-.1509E+00 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCW148 MANE 1.30 614.33 231.98 1.18 5.00 609.70 235.00 1.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4574E+03 EXCESS= .0000E+00 OUTFLOW= .4575E+03 BASIN STORAGE=-.1509E+00 PERCENT ERROR= .0

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



- ### STORM DRAIN NOTES
1. CONSTRUCT TYPE "CM2" DROP INLET (USDCCA STD. DWG. NO. 412.1)
 2. CONSTRUCT NDOT TYPE 2B DROP INLET (NDOT STD. PLAN R-4.2.2)
 3. CONSTRUCT 60" TYPE I MANHOLE (USDCCA STD. DWG. NO. 403.1)
 4. CONSTRUCT 60" TYPE III MANHOLE (USDCCA STD. DWG. NO. 408.1)
 5. CONSTRUCT NDOT TYPE 4 MANHOLE (NDOT STD. PLAN R-4.3.2)
 6. CONSTRUCT RCB ACCESS MANHOLE (TYPE I OR IA MANHOLE ASSEMBLY PER USDCCA STD. DWG. NO. 403 OR 404. USE OF TYPE I OR IA SHALL BE DETERMINED BASED ON FINAL COVER REQUIRED)
 7. INSTALL 48" RCP (USDCCA STD. DWG. NO. 503.2)
 8. INSTALL 18" RCP (USDCCA STD. DWG. NO. 503.2)
 9. INSTALL 24" RCP (USDCCA STD. DWG. NO. 503.2)
 10. INSTALL 36" RCP (USDCCA STD. DWG. NO. 503.2)
 11. INSTALL 42" RCP (USDCCA STD. DWG. NO. 503.2)
 12. INSTALL 72" RCP (USDCCA STD. DWG. NO. 503.2) WITH 1" SACRIFICIAL CONCRETE (INSIDE DIAMETER 2" CONCRETE OVER STEEL)
 13. INSTALL 36" RCP END SECTION (NDOT STD. PLAN R-2.3.1)
 14. INSTALL 42" RCP END SECTION (NDOT STD. PLAN R-2.3.1)
 15. CONSTRUCT PRECAST 8' X 6' RCB (NDOT STD. PLAN B-20.1.8) WITH 1" SACRIFICIAL CONCRETE
 16. CONSTRUCT PRECAST 10' X 8' RCB (NDOT STD. PLAN B-20.1.2) WITH 1" SACRIFICIAL CONCRETE
 17. CONSTRUCT JUNCTION STRUCTURE (SEE STRUCTURAL DETAILS)
 18. CONSTRUCT TRANSITION STRUCTURE (SEE STRUCTURAL DETAILS)
 19. CONSTRUCT NDOT TYPE II HEADWALL (NDOT STD. PLAN B-20.1.5 & B-20.1.5.1)

- ### NOTES
1. ALL RCP SHALL BE CLASS III UNLESS OTHERWISE SHOWN.
 2. ALL PIPE LENGTHS ARE MEASURED ALONG PIPE CENTERLINE TO CENTER OF MANHOLE OR INSIDE EDGE OF DI OR RCB/RCA.
 3. ALL DROP INLETS SHALL INCLUDE STORM WATER MANAGEMENT STAMP AND DETAIL PER USDCCA STD. DWG. NO. 421.
 4. SEE STRUCTURAL PLANS FOR ADDITIONAL STRUCTURAL DETAILS AND CONNECTIONS.
 5. ALL PIPES ARE PUBLICLY MAINTAINED.

DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE

CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

LEGEND

1 STORM DRAIN LATERAL # (SEE SHEETS SD-07 THRU SD-09)

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED TECHNICAL DRAINAGE STUDY 05-4661 ON FILE AT THE CITY OF LAS VEGAS FOR THE SUBJECT PROJECT

JERRY SLATER, P.E. 14167 DATE

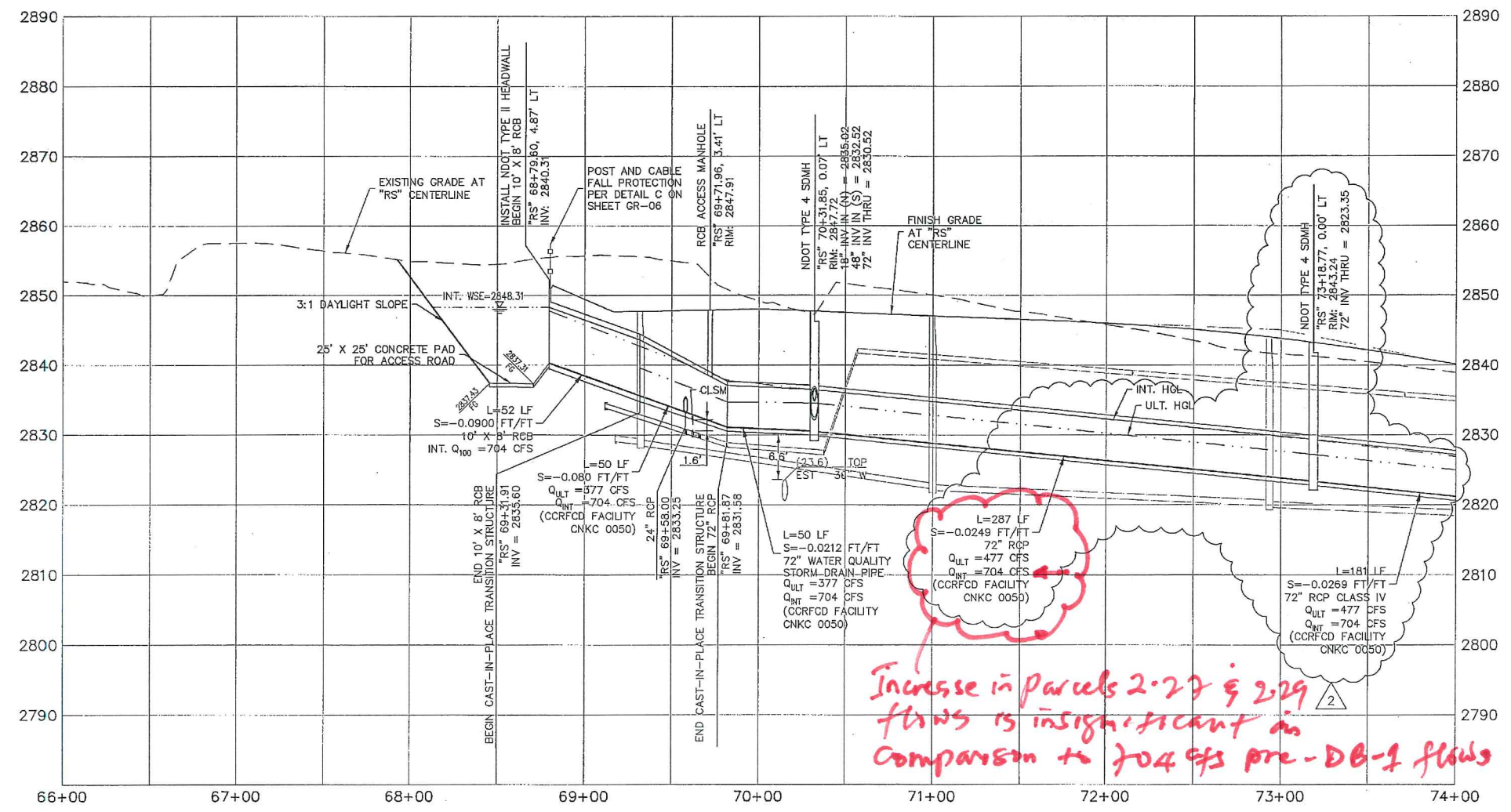
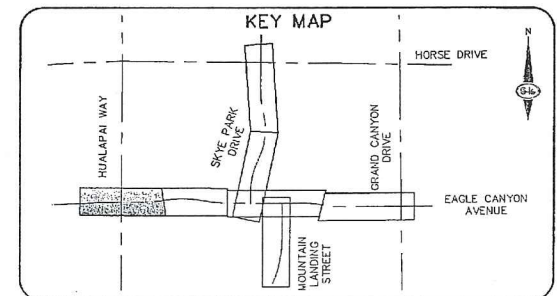
FLOOD ZONE

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE "X" (OUTSIDE THE 500-YEAR FLOOD PLAIN) ON THE FLOOD INSURANCE RATE MAP (FIRM) PANELS: 32003C1735E, 32003C1745E, 32003C1750E, ALL DATED SEPTEMBER 27, 2002

APPROVED FOR CONSTRUCTION

LVWD ENGINEERING SERVICES MANAGER DATE

PROJECT NO. 122933



Increase in parcels 2-27 & 2-29 flows is insignificant in comparison to 704 cfs pre-DB-1 flows

SLATER HANIFAN GROUP

CONSULTING ENGINEERS & PLANNER

5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89111

PHONE (702) 284-5300 FAX (702) 284-5301

NINETY-FIVE MANAGEMENT LLC

SKYE CANYON PHASE 1

EAGLE CANYON AVENUE, SKYE PARK DRIVE & MOUNTAIN LANDING STREET

STORM DRAIN PLAN AND PROFILE - "RS" 66+00.00 TO "RS" 74+00.00

DATE: 9/17/14

DRAFTER: SPC

DESIGNER: DAM

CHECKED: JSR

PROJECT NO. OLY1401-001

SD-01

SHEET 19 OF 50

DWG NO. 107V6298-RC

HANSEN NO. 54673

APPENDIX L

Electronic Copy of Study (CD)

APPENDIX M

Revised Storm Drain Plan & Profile Sheets