TECHNICAL DRAINAGE STUDY
ADDENDUM #2

Skye Canyon Infrastructure Phase 3A

City of Las Vegas, Nevada

Job No.: OLY1609.000
Date: August 2018

Prepared By:
Slater Hanifan Group, Inc.
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Prepared For:
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11411 Southern Highlands Parkway, Suite 300
Las Vegas, NV 89141
Phone: 702-220-6565 ▪ Fax: 702-220-6566

PROFESSIONAL ENGINEER - STATE OF NEVADA
LANT K. LEAVITT
Exp: 12/31/19
CIVIL
No. 18287
8/1/18

Lant Leavitt, P.E.
NV Professional Engineer No. 18287

Assisted by: Erick Mata, E.I.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Skye Canyon – Phase 3A Infrastructure (Addendum #2) Date: August 2018

Location of Development: a) Descriptive (Cross Streets): North/South: Skye Village Road

East/West: Grand Canyon Drive

b) Section: 7 Township: 19 South Range: 60 East

c) APN: 125-07-201-007 and a portion of 125-07-101-009

Name of Owner/Developer: M F Land, LLC / Ninety-Five Management, LLC

Telephone No.: 702-220-6565 Fax No.: 702-220-6566 E-mail Address: mbolduc@olympiacompanies.com

Address: 11411 Southern Highlands Parkway, Suite 300; Las Vegas, NV 89141

Contact Person – Name: Lant Leavitt, P.E. Telephone No.: 702-284-5300

*E-mail Address: lleavitt@shg-inc.com Fax No.: 702-284-5399

Firm: Slater Hanifan Group

Address: 5740 S. Arville Street, Suite 216; Las Vegas, NV 89118

Type of Land Development/Land Disturbance Process:

☐	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: 20 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: 1800 acre +/-

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

Master Drainage Study for Skye Canyon Update #4 (SHG, DS4420)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Skye Village Road thru MOHU 0036, And Minor flows thru local facilities discharging to desert shrub east of the project site.

8. Briefly describe your proposed schedule for the subject project: ASAP Upon Substantial Completion of Detention Basin 2 Facilities Phase 3A – Roadway Infrastructure per this TDS; Future Phase 3A Residential Subdivisions to follow by separate TDS.

PROFESSIONAL ENGINEER – STATE OF NEVADA
LANT K. LEAVITT
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Engineer's Seal

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

*Newly Required Field

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

Revision	Date

Local Entity File No.

REFERENCE: ***SHG Job No. OLY1609.000***

STANDARD FORM 1

Updated 05/01/2008

OLY1609.000

August 1, 2018

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: Addendum No.2 to the Technical Drainage Study for Skye Canyon Infrastructure Phase 3A (CLV DS4931)

Dear Mr. Sung:

This letter is submitted in response to comments contained in the May 24, 2018 review memorandum, regarding the above referenced project. A copy of the City of Las Vegas (CLV) Department of Public Works comment letter has been provided in Appendix A.

The comments have been individually addressed as follows:

1. **Comment:** *The site is adjacent to or crosses an existing or proposed Clark County Regional Flood Control District (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.*

   Response: Noted. The study will be submitted for concurrence to CCRFCD upon conditional approval from the city.

2. **Comment:** *The subject Skye Canyon Phase 3A Infrastructure Drainage Study will not be approved prior to the approval of the Skye Canyon Detention Basin 2 Technical Drainage Study.*

   Response: Conditional approval of Skye Canyon Detention Basin 2 was received by the City on June 14, 2018. Construction is expected to begin August 2018.

3. **Comment:** *Skye Canyon Phase 3A onsite developments are to be flood protected by Detention Basin 2. No occupancy permits within onsite Phase 3A will be issued prior to the substantial completion of Detention Basin 2.*

   Response: Noted.

4. **Comment:** *The future MPU facility within Skye Village Road north of the Skye Village/Grand Canyon/Iron Mountain intersection to the proposed MPU facility at the Kyle Canyon interchange area shall be substantially complete before occupancy of residential Units beyond Phase 3A, 3B and 3C. This includes residential development within Phases 4 & 6 and the development of Phase 5 as shown on the Development Phasing Exhibit dated 12/4/2017.*

   Response: Noted.

5. **Comment:** *Revise the Phase 3A **Exhibits I & G** to reflect the proposed interim MPU facility interception Berm/Levee shown on the Moccasin Rd. CCRFCD Flood Control Facility — US95/Kyle Canyon Rd Interchange to Moccasin Rd. (Skye Canyon Developer Funded) plans. Show the connection between the Grand Canyon improvements and this facility design. Provide access road and gate to the berm/levee improvements. Coordinate design between these two facilities.*

   Response: Exhibit I is revised to show interim Moccasin Berm facility, see Appendix B. Exhibit G is also revised to show facility, and flow arrows/text are added to clarify that once berm is constructed, all flow at this location will be routed north to the Moccasin Facility. Access road and gate are provided, see Sheet D-04.

6. **Comment:** ***Exhibit I** shows the future abandonment of Phase 3A storm drain improvements (P15 & P33A) once the Ultimate MPU facilities are in place. The City requires that facilities be removed from the roadway if they are no longer needed. These facilities will need included in the Maintenance Bond.*

   Response: Noted.

7. **Comment:** *Flood Control understands that the new Skye Canyon Master Plan Amendment (MPA) is being included as a part of the 2018 MPU process. Any changes not incorporated in the 2018 MPU must be approved by City of Las Vegas and Clark County Regional Flood Control District (CCRFCD) and shall be adopted by the City of Las Vegas City Council prior to the final approval of the subject improvement plans.*

   Response: Noted.

8. **Comment:** *The Design Report for Moccasin Road CCRFCD Flood Control Facility (US95 / Kyle Canyon Road Interchange to CCRFCD Facility LVUP 1076/1077) must be conditionally approved (90% submittal) prior to the final approval of the subject improvement plans. The connection to these MPU facilities shall be shown on the Grand Canyon Improvement plans.*

   Response: Noted. The Moccasin Facility catcher's mitt is shown on Sheet D-04. Access is provided to the facility via a fenced access road from Grand Canyon Drive.

9. **Comment:** *The subject Phase 3A Infrastructure Drainage Study addresses the included street improvements of Skye Village Road, Skye Park Drive, Street "E", Grand Canyon Drive, culvert crossings and storm drain systems with the streets. Technical drainage studies will be required for the future onsite parcels as they develop.*

   Response: Acknowledged.

10. **Comment:** *Since the streets network and the associated storm drain facilities will eventually be accepted by the City of Las Vegas, the engineer/developer must coordinate with City of Las Vegas Streets & Sanitation Department for their review and approval prior to the final approval of the improvement plans.*

    Response: Noted. Coordination with CLV Streets & Sanitation has taken place and the access road along the west side of the improvements is designed accordingly.

11. **Comment:** *The proposed storm drain system in Grand Canyon does not show a connection between Skye Park Drive (P1) and the storm drain at the linear park (P2) as per* ***Exhibit I.*** *These flows are shown as combining and the system shall be extended to accommodate the flow. Review and revise the storm drain segment to account for the flow and update the WSPG analysis accordingly.*

    Response: The system in Skye Canyon Park Drive (P1) and the linear park (P2) are not intended to connect and will remain as separate models. This matches the concept approved in the master drainage study (MDS). Facilities Map Exhibit I shows the future facility (green linework, label F1) on the north half of Grand Canyon Drive from Skye Park Drive to the linear park and the ultimate connection east to US 95. In addition to matching the MDS, these flow patterns are necessary to avoid increasing flows at Brent Lane in the interim condition.

12. **Comment:** *Structural plans for the storm drain improvements must be submitted for review by Flood Control and the Building Department. 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 improvement plans. The structural approval is also required to be submitted to CCRFCD prior to concurrence. Flood Control recommends that the Structural Plans be included with the next submittal.*

    Response: Acknowledged. A copy of structural plans is included with this submittal.

13. **Comment:** *Provide a junction structure detail for the RCA & 72" RCP that also includes the RCA Plug detail.*

    Response: RCA junction structure is shown on Structural Sheet S1.13. Plug detail is shown on Structural Sheet S3.10.

14. **Comment:** *Provide connection details for lateral and main line structures connection the RCA's and RCB's as a part of the Structural details.*

    Response: Connection details are provided, see overall plan on Structural Sheet S2.10 for reference to individual details.

15. **Comment:** *The proposed RCA's shall provide the required 5-foot minimum stem wall height before the arch section. Flood Control requests that the RCA plans be included with the next submittal.*

    Response: RCA structural plans are included with this submittal. The proposed RCA's provide the required 5-foot minimum stem wall height. See detailed sections on Structural Sheet S4.10.

16. **Comment:** *The project proposed to build temporary drainage facilities including drainage berms/swales over the Phase 3A site and along the west side of Skye Village Road. Prior to the final plans 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 facilities 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.

Response: Noted. Client may consider breaking maintenance bond up into two or more separate bonds so release isn't held up by a parcel that is anticipated to be slower to develop.

17. **Comment:** ***Exhibit G****: "DIV1" incorrectly shows only 40 cfs. Per "CP3" and "Facility P15", the flow is 422 cfs. Review and revise accordingly.*

    Response: DIV1 represents 40 cfs entering the MPU facility at this location via a lateral from the west. The majority of mainline flow at this location comes from the south in a 60" RCP/ 8'x5' RCB conveying flow from CP8 (366 cfs) and PARK (36 cfs). The combination of these flows is the mainline flow at this location (CP3) of 422 cfs.

18. **Comment:** *Include utility crossings on the storm drain plans. Provide a complete set of Phase 3A improvement plans that include the Utility and Roadway plans for review to verify improvement and separation requirements.*

    Response: Utility crossings are included on the storm drain plans. Utility and roadway plans will be provided at the improvement plan review level. Note that although proposed sewer and storm drain have similar profiles in Grand Canyon Drive, proposed sewer stubs are shown and do not conflict with proposed storm drain.

19. **Comment:** *The interim channels adjacent to the infrastructure roadways are the Maintenance responsibility of the Master Developer.*

    Response: Noted.

20. **Comment:** *The area grading shown on Sheet GR-02 adjacent to Grand Canyon Drive appears to show the interim channel draining directly towards Grand Canyon Drive. Review and revise the grading to provide positive drainage away from the road improvements and toward the "Catcher's Mitt" Berm/Levee with the MPU improvements.*

    Response: A riprap berm is provided at end of earthen channel to direct water away from Grand Canyon Drive and toward the Moccasin Catcher's Mitt Berm. See HEC-RAS analysis included in Appendix C.

21. **Comment:** *Review and revise the Lateral Sheets to show the proposed pipe material. Some profiles show multiple pipe materials being used.*

    Response: Proposed pipe materials are called out on lateral sheets. All storm drain laterals are reinforced concrete pipe, except where the water district requires PVC 900 pipe due to water line crossings.

22. **Comment:** *The lateral profiles need to specify the required separation mitigation between sewer, water, and storm drain facilities.*

Response: Vertical clearances are called out where sewer and water lines cross storm drain facilities. For water lines beneath storm drains, a minimum vertical separation of six inches is required and storm drain is constructed of water quality pipe, per UDACS 2.22.02 B2 and B3a. For sewer lines beneath storm drain, a minimum vertical separation of six inches is required per DCSWCS SD-21. These clearances/mitigations are consistent with recent projects SHG has coordinated with utilities.

23. **Comment:** *Provide cut-off wall at the headwall structures and at the end of the concrete aprons.*

    Response: Cutoff walls are provided on both upstream and downstream sides of concrete apron to protect against erosion. The cutoff wall on the downstream lines up with proposed culvert headwall/end section to protect culvert against erosion.

24. **Comment:** ***Grand Canyon Drive Improvement Plans:***

    Sheet D-03: Second Request*. Provide a nominal drop inlet to the proximity of SDMH #6.*

    Sheet D-03 and D-04: *Extend the storm drain system between Skye Park Drive and linear park.*

    Sheet D-05*: Show the proposed catcher's mitt channel/berm on the plan.*

    Sheet D-06: *Response to previous comment was to upsize the original storm drain to 8'x4' RCB. However, the City requires 5'-min height in RCB for maintenance purpose. Consider 7'x5' or 8'x5' RCB.*

    Response: Sheet D-03: Nominal drop inlet added that discharges to SDMH #6.

    Sheet D-03 and D-04: Per the master drainage study, these facilities are not intended to be connected, see additional information in response to Comment #11.

    Sheet D-05: Proposed catcher's mitt ties in east of Sheet D-05 and is shown on Sheet D-04.

    Sheet D-06: 8'x4' RCB in Iron Mountain Road is revised to a 7'x5' RCB to provide the required 5' minimum height. See Appendix C for updated WSPG model.

25. **Comment:** ***Sheet D-19: Lateral Profile 6:*** *The slope of the access road (0.6% shown) and the riprap pad size (D_{50} = 8" and T = 16") does not match Sheet D-04. Review and revise accordingly.*

    Response: Access road slope (0.8%) and Riprap size/thickness (D50=8", T=16") revised to match between plan and profile.

The revised plan, profile and detail sheets adopting the revisions addressed in this letter have been included in Appendix D. If you have any questions or require additional information, please do not hesitate to contact us at 702-284-5300.

Respectfully Submitted,

SLATER HANIFAN GROUP

Lant Leavitt, P.E.
Flood Control Division

cc: Mark Failla, P.E., CFM – SHG
Jerrod Ratcliffe, P.E. – SHG

APPENDIX

Appendix A CLV Comment Letter

Appendix B Revised Drainage Exhibits

Appendix C Hydraulic Computations

Appendix D CD of Electronic Files & Revised Improvement Plans

APPENDIX A

CLV Comment Letter

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM	DATE: May 24, 2018
TO: **Land Development Services** Department of Building & Safety	FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: **Skye Canyon – Phase 3A Infrastructure**	COPIES TO: Slater Hanifan Group
Cross Streets: Skye Village Road & Grand Canyon Drive	M F Land LLC / Ninety-Five Management LLC
File Number: F:\Depot\DSMemos\DS4931B.doc	Bart Anderson, P.E., DevCo
Parcel Number: 125-07-201-007 & Portion of 125-07-101-009	CCRFCD
Zoning Action:	
FEMA Flood Zone YES NO **X**	
Proposed Storm Drain YES **X** NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/6/2017	1/22/2018	Not Approved	$400.00	491017: $400
2nd Submittal	4/18/2018	5/24/2018	See Comments Below	$400.00	495171: $400
			TOTAL FEES (LDDRS):	**$800.00**	**----**

REMARKS: The complex nature of these storm drain infrastructure improvement plans needs to include a complete set of plans with the next submittal.

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

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

1. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

2. The subject *Skye Canyon Phase 3A Infrastructure Drainage Study* will not be approved prior to the approval of the *Skye Canyon Detention Basin 2 Technical Drainage Study.*

3. *Skye Canyon Phase 3A* onsite developments are to be flood protected by *Detention Basin 2.* No occupancy permits within onsite *Phase 3A* will be issued prior to the substantial completion of *Detention Basin 2.*

4. The future MPU facility within Skye Village Road north of the Skye Village/Grand Canyon/Iron Mountain intersection to the proposed MPU facility at the Kyle Canyon interchange area shall be substantially complete before occupancy of residential Units beyond Phase 3A, 3B and 3C. This includes residential development within Phases 4 & 6 and the development of Phase 5 as shown on the Development Phasing Exhibit dated 12/4/2017.

5. Revise the Phase 3A **Exhibits I & G** to reflect the proposed interim MPU facility interception Berm/Levee shown on the *Moccasin Rd. CCRFCD Flood Control Facility – US95/Kyle Canyon Rd Interchange to Moccasin Rd. (Skye Canyon Developer Funded) plans.* Show the connection between the Grand Canyon improvements and this facility design. Provide access road and gate to the berm/levee improvements. Coordinate design between these two facilities.

6. **Exhibit I** shows the future abandonment of Phase 3A storm drain improvements (P15 & P33A) once the Ultimate MPU facilities are in place. The City requires that facilities be removed from the roadway if they are no longer needed. These facilities will need included in the Maintenance Bond.

7. Flood Control understands that the new *Skye Canyon Master Plan Amendment* (MPA) is being included as a part of the 2018 MPU process. Any changes not incorporated in the 2018 MPU must be approved by *City of Las Vegas* and *Clark County Regional Flood Control District* (CCRFCD) and shall be adopted by the *City of Las Vegas City Council* prior to the final approval of the subject improvement plans.

8. The *Design Report for Moccasin Road CCRFCD Flood Control Facility (US95 / Kyle Canyon Road Interchange to CCRFCD Facility LVUP 1076/1077)* must be conditionally approved (90% submittal) prior to the final approval of the subject improvement plans. The connection to these MPU facilities shall be shown on the Grand Canyon Improvement plans.

9. The subject *Phase 3A Infrastructure Drainage Study* addresses the included street improvements of *Skye Village Road, Skye Park Drive, Street "E", Grand Canyon Drive*, culvert crossings and storm drain systems with the streets. Technical drainage studies will be required for the future onsite parcels as they develop.

10. Since the streets network and the associated storm drain facilities will eventually be accepted by the ***City of Las Vegas***, the engineer/developer must coordinate with *City of Las Vegas Streets & Sanitation Department* for their review and approval prior to the final approval of the improvement plans.

11. The proposed storm drain system in Grand Canyon does not show a connection between Skye Park Drive (P1) and the storm drain at the linear park (P2) as per **Exhibit I**. These flows are shown as combining and the system shall be extended to accommodate the flow. Review and revise the storm drain segment to account for the flow and update the WSPG analysis accordingly.

12. Structural plans for the storm drain improvements must be submitted for review by Flood Control and the Building Department. 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 improvement plans. The structural approval is also required to be submitted to CCRFCD prior to concurrence. Flood Control recommends that the Structural Plans be included with the next submittal.

13. Provide a junction structure detail for the RCA & 72" RCP that also includes the RCA Plug detail.

14. Provide connection details for lateral and main line structures connection the RCA's and RCB's as a part of the Structural details.

15. The proposed RCA's shall provide the required 5-foot minimum stem wall height before the arch section. Flood Control requests that the RCA plans be included with the next submittal.

16. The project proposed to build temporary drainage facilities including drainage berms/swales over the *Phase 3A* site and along the west side of *Skye Village Road.* Prior to the final plans 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 facilities 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.

17. **Exhibit G**: "DIV1" incorrectly shows only 40 cfs. Per "CP3" and "Facility P15", the flow is 422 cfs. Review and revise accordingly.

18. Include utility crossings on the storm drain plans. Provide a complete set of Phase 3A improvement plans that include the Utility and Roadway plans for review to verify improvement and separation requirements.

19. The interim channels adjacent to the infrastructure roadways are the Maintenance responsibility of the Master Developer.

20. The area grading shown on Sheet GR-02 adjacent to Grand Canyon Drive appears to show the interim channel draining directly towards Grand Canyon Drive. Review and revise the grading to provide positive drainage away from the road improvemens and toward the "Catchers Mitt" Berm/Levee with the MPU improvements.

21. Review and revise the Lateral Sheets to show the proposed pipe material. Some profiles show multiple pipe materials being used.

22. The lateral profiles need to specify the required separation mitigation between sewer, water, and storm drain facilities.

23. Provide cut-off wall at the headwall structures and at the end of the concrete aprons.

24. **<u>Grand Canyon Drive Improvement Plans:</u>**

    Sheet D-03: ***Second Request***: Provide a nominal drop inlet to the proximity of SDMH #6.

    Sheet D-03 and D-04: Extend the storm drain system between Skye Park Drive and linear park.

    Sheet D-05: Show the proposed catcher's mitt channel/berm on the plan.

    Sheet D-06: Response to previous comment was to upsize the original storm drain to 8'x4' RCB. However, the City requires 5'-min height in RCB for maintenance purpose. Consider 7'x5' or 8'x5' RCB.

25. **Sheet D-19**: **Lateral Profile 6**: The slope of the access road (0.6% shown) and the riprap pad size (D_{50} = 8" and T = 16") does not match Sheet D-04. Review and revise accordingly.

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/R60E/07
AREA G-07

APPENDIX B

Revised Drainage Exhibits

LEGEND

- BASIN BOUNDARY
- PRORATE BOUNDARY
- ID — BASIN ID
- ID — PRORATE BASIN ID
- ID — CONCENTRATION POINT ID
- FLOW DIRECTION
- ID — FLOWMASTER SECTION

N

SCALE – 1"=150' FEET (0, 150, 300)

Proposed Condition Flow Rate Summary			
Basin/Concentration Point ID	Area (ac)	Q_{100} (cfs)	Q_{10} (cfs)
Basins			
2.02	17.8	53	26
2.03	17.5	52	26
2.04a	1.4	3	1
2.04b	1.3	3	1
2.05a	13.5	40	19
2.05b	7.4	21	10
2.06	19.9	61	30
STR1	2.6	10	5
STR2	1.6	6	3
STR3	2.2	8	4
STR4	1.9	6	3
SVR1	2.7	10	5
SVR2	6.4	20	10
OFF1	141.0	280	108
OFF2	18.6	45	18
OFF3	96.0	185	71
OFF4	39.0	80	31
OFF5	88.8	179	69
OFF11	18.7	38	15
OFF12	8.2	21	8
Referenced Basins			
[3]WSPD0	0.6	2	1
[3]WSPD3	1.4	5	2
[3]WGRC1A	1.4	4	2
[3]WGC3	28.4	89	42
[4]WPF4	5.7	19	9
[4]WSHA4	1.4	6	3

[2]Referenced from the "Smith's" Study.
[4]Referenced from the "Master Drainage Study Update No.4".

Proposed Condition Flow Rate Summary			
Concentration Points			
Basin/Concentration Point ID	Area (mi^2)	Q_{100} (cfs)	Q_{10} (cfs)
CP1 Q = [1]RDB2 + OFF1 + OFF2 + OFF3 - DIV 2 + OFF4 - DIV1 + SVR1 + SVR2	1.5	521	240
CP2a Q = 2.05b + STR1 + 2.04a + DIV2	<0.1	95	38
CP3 Q = CP8 + [5]PARK + DIV1	1.1	422	211
CP3a Q = CP3 + 2.06	1.2	458	226
CP4 Q = STR2 + STR3 + 2.03 + 2.04b	<0.1	68	33
CP5 Q = CP4 + 2.02 + STR4	<0.1	127	62
CP6 Q = [1]RDB1 + [4]WC20 + [4]WPF4 + [4]WSHA4	0.9	156	100
CP7 Q = CP6 + [4]WL4A + [4]ONTD	1.0	208	122
CP8 Q = CP7 + OFF5	1.1	366	189
DBN Q = OUTFLOW	<0.1	87	34
WC9a Q = CP3a + DBN + [3]WSPD3 + [3]WGC3 + [3]WSPD0	1.2	588	285
CP10 Q = CP1 + 2.05A + OFF11	1.5	588	271
CP11 Q = CP12 + CP5	<0.1	148	70
CP12 Q = WC9a + [4]WC7 + [3]WGRC1A	1.3	697	330
Refrenced Concentration Points			
[1]RDB1	0.9	71	57
[2]RDB2	1.0	85	64
[4]WC20	0.1	86	40
[5]PARK	<0.1	36	13
[3]WC7	0.1	121	51

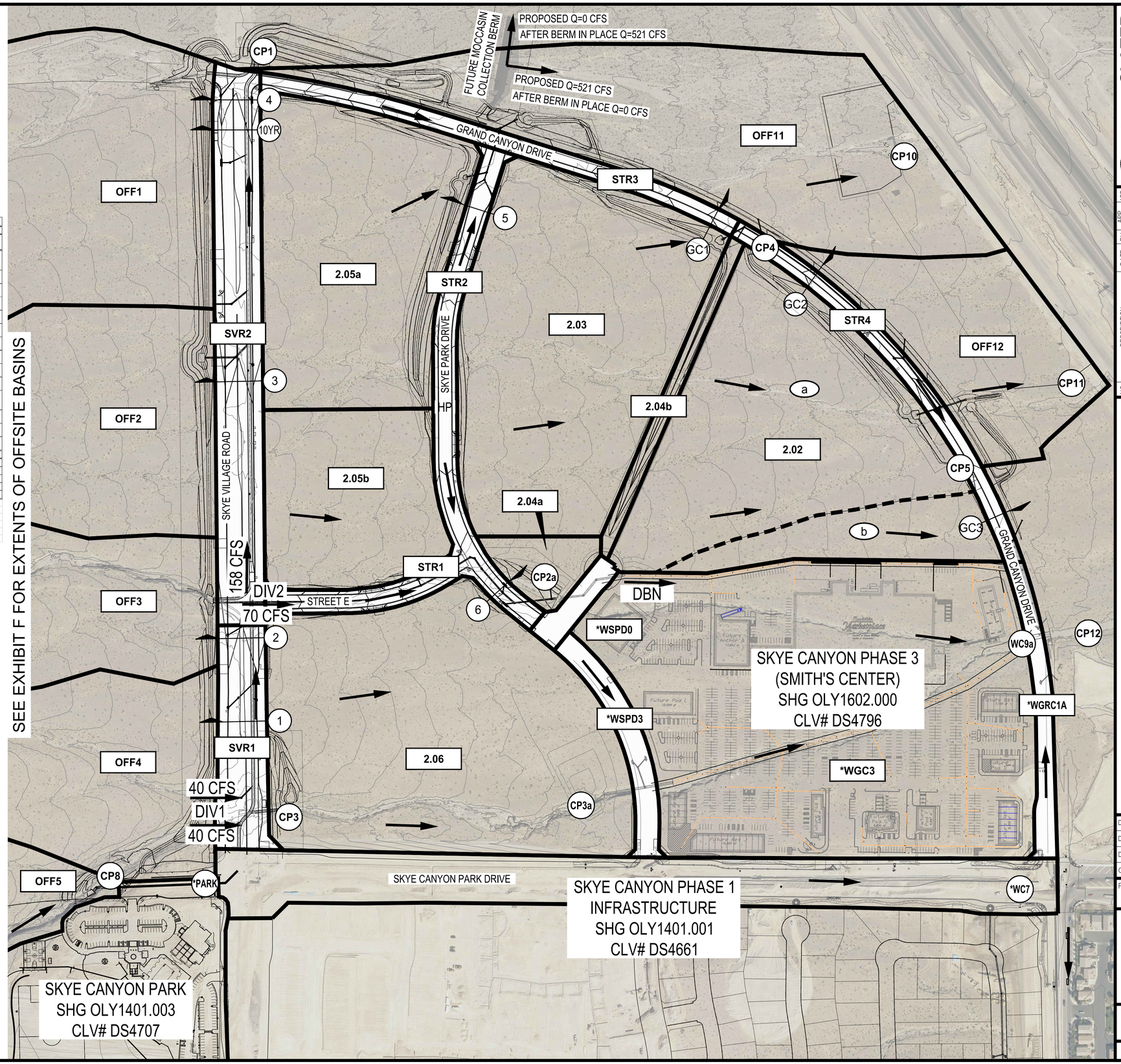
[1]Referenced from the "DB1" Study.
[2]Referenced from the "DB2" Study.
[3]Referenced from the "Smith's" Study.
[4]Referenced from the "Master Drainage Study Update No.4".
[5]Referenced from the "Park" Study.
[6]Referenced from the "Parcel 2.16" Study.

Prorated Flow Summary			
Basin ID	Q_{100} (cfs)	Area (acres)	100-yr Unit Flow (cfs/acre)
2.02	53	17.84	3.0
Subbasin ID	**Q_{100} (cfs)**	**Area (acres)**	**100-yr Unit Flow (cfs/acre)**
2.02a	43	14.39	3.0
2.02b	10	3.45	3.0
TOTAL	***53***	***17.84***	

Proposed Condition 100-Year Street Flow Summary					
Section ID	Q_{100} (cfs)	Slope (%)	Depth (ft)	Velocity (fps)	DxV
1 (Q = 1/2 (SVR1))	5	0.58	0.35	1.96	0.7
2 (Q = 1/2 (SVR1) + Facility P18 Bypass)	7	0.58	0.38	2.14	0.8
3 (Q = 1/2 (SVR2) + Facility P20 Bypass)	13	0.58	0.46	2.38	1.1
4 (Q = 1/2 (SVR2) + Facility P23 Bypass)	17	0.58	0.51	2.43	1.2
5 (Q = STR2)	5	3.24	0.3	4.01	1.2
		1.56	0.33	2.94	1.0
6 (Q = 2.05b + STR1-Half Street Capacity)	9	2.3	0.42	4.44	1.9
*6 (Half Street Capacity)	22	2.3	0.56	4.78	2.7
*GC1 (Q = STR2 + STR3)	14	2.73	0.46	5.15	2.4
*GC2 (Q = STR2 + STR3 + 1/3 (STR4))	16	1.48	0.53	4.03	2.1
*GC3 (Q = Facility P5 Bypass + 2/3 (STR4))	15	1.48	0.52	4.0	2.1

Proposed Condition 10-Year Street Flow Summary						
Section ID	Q_{10} (cfs)	Slope (%)	Depth (ft)	Velocity (fps)	DxV	Dry Lane (ft)
10YR (Q = SVR1 +SVR2)	15	0.58	0.48	2.4	1.2	21.5

Conservative Flow Utilized to represent the Entire Skye Village Road Alignment.



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

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

NINETY-FIVE MANAGEMENT, LLC.
SKYE CANYON PHASE 3A INFRASTUCTURE
PROPOSED CONDITION DRAINAGE MAP

DATE: JULY 2018
DRAFTER: ETM
DESIGNER: ETM
CHECKED: LL
PROJECT NO. OLY1609.000

EXHIBIT G
SHEET 1 OF 1

j:\oly1609-000 skye canyon phase 3a 3b 3c\drainage\technical study\addendum 2\figures\oly1609 tds exhibit g proposed condition drainage map.dwg 7/26/2018 3:24 PM Lorri Leavitt

LEGEND

- BASIN BOUNDARY
- PRORATE BOUNDARY
- 000 — PRORATE ID
- ID — BASIN ID
- ID — CONCENTRATION POINT ID
- FLOW DIRECTION
- ID — FACILITY ID
- EXISTING SD FACILITIES
- PROPOSED SD FACILITIES
- TO BE REMOVED IN ULTIMATE CONDITION
- FUTURE SD FACILITIES
- PROPOSED DITCHES
- ID — DITCH LABELS
- CULVERT TO BE REMOVED IN ULTIMATE CONDITION

N

0 150 300
SCALE – 1"=150' FEET

Prorated Flow Summary

Basin ID	Q_{100} (cfs)	Area (acres)	100-yr Unit Flow (cfs/acre)
OFF1	280	141.00	2.0
OFF3	185	96.00	1.9
OFF4	80	39.00	2.1
2.05a	40	13.50	3.0
2.03	52	17.50	3.0
2.02	53	17.8	3.0

Subbasin ID	Q_{100} (cfs)	Area (acres)	100-yr Unit Flow (cfs/acre)
OFF1A	27	13.4	2.0
OFF1B	253	127.6	2.0
TOTAL	***280***	***141.0***	
OFF3A	1	0.7	1.9
OFF3B	173	90.0	1.9
OFF3C	10	5.3	1.9
TOTAL	***185***	***96.0***	
OFF4A	5	2.6	2.1
OFF4B	75	36.4	2.1
TOTAL	***80***	***39.0***	
2.05a-A	2	0.7	3.0
2.05a-B	5	1.7	3.0
2.05a-C	33	11.1	3.0
TOTAL	***40***	***13.5***	
2.03A	9	2.9	3.0
2.03B	31	10.5	3.0
2.03C	12	4.1	3.0
TOTAL	***52***	***17.5***	
2.02A	9	2.9	3.0
2.02B	3	1.1	3.0
2.02C	31	10.4	3.0
2.02D	10	3.4	3.0
TOTAL	***53***	***17.8***	

Recommended Flood Control Facility Summary

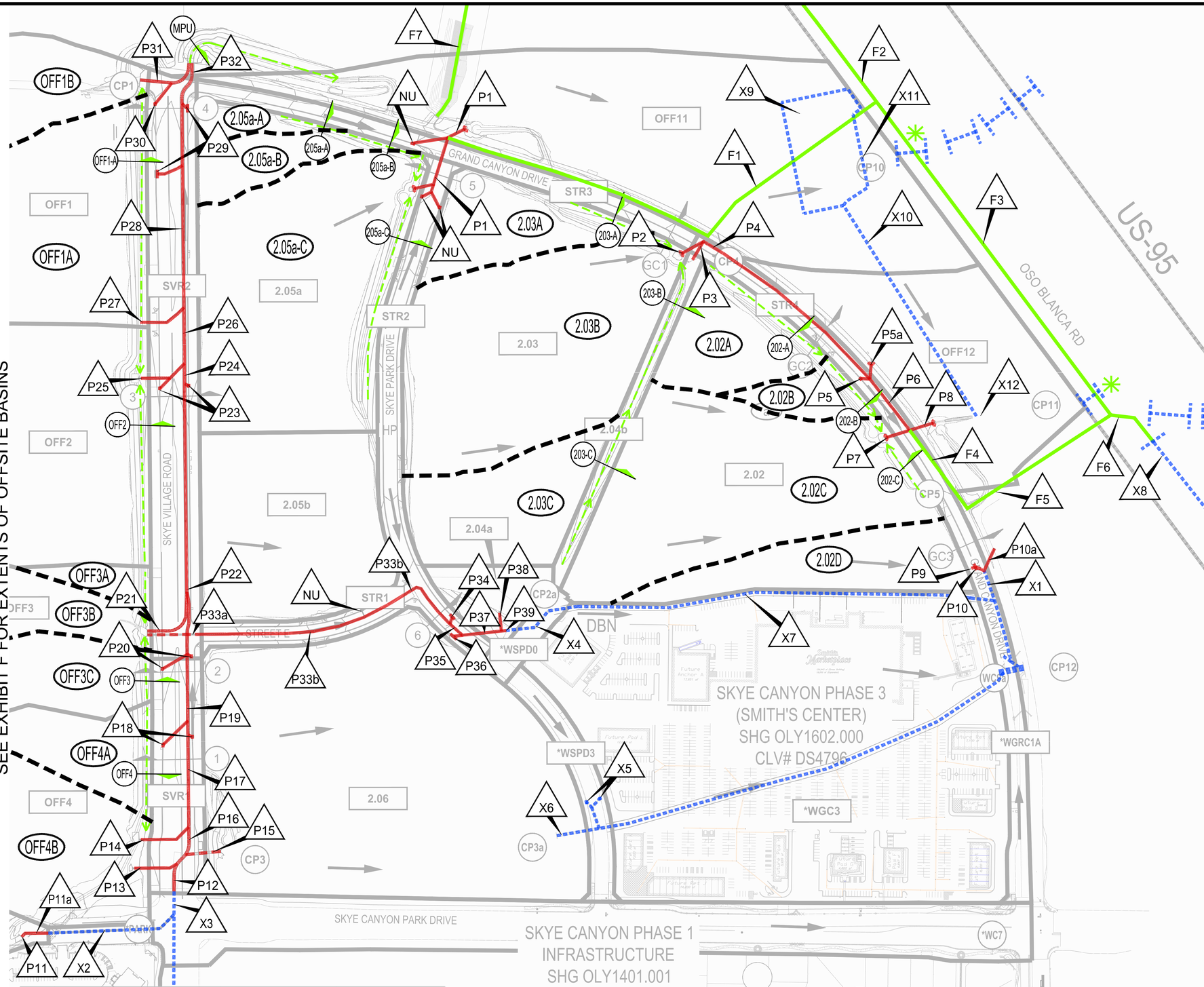
Facility ID	Facility Description	$Q_{PROPOSED}$ (cfs)	$Q_{ULTIMATE}$ (cfs)	Notes
X1	Existing 66" RCP	11	**32**	
X2	Existing 60" RCP	319	**359**	
X3	Existing 8'x5' RCB	335	**412**	Ties into Facility P12
X4	Existing 54" RCP	**98**	28	
X5	(2) Existing 12.0' Type CM2 D.I.	N/A	**52**	26 cfs/ drop inlet with 24" laterals
X6	Existing 60" RCP	**458**	433	
X7	Existing 60" RCP	98	**260**	
X8	Existing 5' x 5' RCB	160	**301**	
X9	DB2 Sediment Basin	**588**	N/A	
X10	DB2 Sediment Basin Discharge Ditch	**85**	N/A	
X11	DB2 Sediment Basin Spillway	**503**	N/A	CP10 - 85CFS
X12	Beginning of Existing Wash	**233**	N/A	CP11 = 85CFS
P1	Proposed 30" RCP	**40**	40	To collect basin 2.05a Flow
P2	Proposed 30" RCP	**55**	52	
P3	Proposed 18" RCP	N/A	3	Capped Stub for Future Park Flow
P4	Proposed 30" RCP	**55**	55	
P5	Proposed 5.0' Type CM2 D.I.	**5**	5	w/ 18" Lateral
P5a	Proposed 18" RCP	N/A	**5**	Capped Stub for Future Drop Inlet
P6	Proposed 36" RCP	60	**65**	
P7	Proposed 36" RCP	53	**53**	Assumes all Parcel 2.02 flow is conservatively collected at Facility P7
P8	Proposed 42" RCP	113	**118**	
P9	Proposed 18" RCP	10	**10**	Capped Stub for Future Parcel Flow
P10	Proposed 15.0' Type CM2 D.I.	11	**11**	w/ 24" Lateral
P10a	Proposed 18" RCP	N/A	**11**	Capped Stub for Future Drop Inlet
P11	Proposed 72" RCP	**366**	N/A	Interim Improved Inlet
P11a	Proposed 60" RCP	**366**	359	
P12	Proposed 8'x7' RCA	382	**412**	
P13	Proposed 30" RCP	**40**	29.5	
P14	Proposed 30" RCP	**40**	29.5	
P15	Proposed 72" RCP	**422**	N/A	To be removed in ultimate condition
P16	Proposed 8'x7' RCA	N/A	**445.5**	Alignment is plugged and provided for future use only
P17	Proposed 8'x7' RCA	40	**479**	
P18	(2) Proposed 5.0' Type CM2 D.I.	4	**4**	2 cfs/ drop inlet with 18" laterals
P19	Proposed 8'x7' RCA	44	**483**	
P20	(2) Proposed 5.0' Type CM2 D.I.	4	**4**	2 cfs/ drop inlet with 18" laterals
P21	Proposed 6'x6' RCB	156	**359**	
P22	Proposed 10'x9' RCA	204	**876**	
P23	(2) Proposed 5.0' Type CM2 D.I.	6	**6**	3 cfs/ drop inlet with 18" laterals
P24	Proposed 10'x9' RCA	207	**879**	
P25	Proposed 42" RCP	45	**69**	
P26	Proposed 10'x9' RCA	255	**932**	
P27	Proposed 36" RCP	N/A	**51**	Capped Stub for Future Parcel Flow
P28	Proposed 10'x9' RCA	255	**983**	
P29	(2) Proposed 20.0' Type CM2 D.I.	17	**17**	8.5 cfs/ drop inlet with 18" laterals
P30	Proposed 5.0' Type CM2 D.I.	Nuisance	Nuisance	
P31	Proposed 8'x4' RCB	364	**398**	
P32	Proposed 10'x9' RCA	521	**1325**	
P33a	Proposed 42" RCP	**70**	N/A	To be removed in ultimate condition
P33b	Proposed 36" RCP	**70**	Nuisance	
P34	Proposed 15.0' Type CM2 D.I.	**8**	8	w/ 18" Lateral
P35	Proposed 36" RCP	**78**	8	
P36	Proposed 20.0' Type CM2 D.I.	**17**	17	w/ 24" Lateral
P37	Proposed 36" RCP	**95**	25	
P38	Proposed 18" RCP	**3**	3	
P39	Proposed 54" RCP	**98**	28	
*F1	Future 36" RCP	N/A	**73**	
*F2	Future 18" RCP	N/A	**10**	
*F3	Future 36" RCP	N/A	**75**	
*F4	Future 36" RCP	N/A	**56**	
*F5	Future 42" RCP	N/A	**170**	
*F6	Future 60" RCP	N/A	**301**	Connects to Existing Regional Facility
*F7	Future Moccasin Facility Collection Berm	N/A	**1330**	
NU	Facility has been provided for collection and conveyence of nuisance flow only.			

X' - Depicts an Existing Facility P' - Depicts a Proposed Facility F' - Depicts a Future Facility

*Flow summarized adopted from the Skye Canyon Master Drainage Study Update.

Interim Ditch Section Summary

Section ID	Section Description	Q_{100} (cfs)	Slope (%)	Depth (ft)	Velocity (fps)
OFF1-A (Q = OFF1A)	Earthen Trapezoidal-Ditch w/ 3:1 Side Slopes and Min 1.5-ft Deep	27.0	1.10	0.82	4.43
OFF2 (Q = OFF2)	Earthen Trapezoidal-Ditch w/ 3:1 Side Slopes and Min 1.5-ft Deep	45.0	0.90	1.13	4.77
OFF3 (Q = OFF3C)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1.5-ft Deep	10.0	1.70	0.88	4.32
OFF4 (Q = OFF4A)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1.5-ft Deep	5.0	0.50	0.85	2.30
205a-A (Q = 2.05a-A)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1-ft Deep	2.0	5.00	0.39	4.33
205a-B (Q = 2.05a-B)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1-ft Deep	7.0	2.70	0.70	4.71
205a-C (Q = 2.05a-C)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 2-ft Deep	33.0	1.00	1.52	4.77
203-A (Q = 2.03A)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1-ft Deep	9.0	1.50	0.86	4.02
203-B (Q = 2.03B)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 2-ft Deep	43.0	0.50	1.91	3.93
203-C (Q = 2.03C)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1.5-ft Deep	12.0	1.50	0.96	4.32
202-A (Q = 2.02A)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1-ft Deep	9.0	2.50	0.79	4.87
202-B (Q = 2.02B)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 1-ft Deep	12.0	2.00	0.91	4.81
202-C (Q = 2.02C)	Earthen V-Ditch w/ 3:1 Side Slopes and Min 2-ft Deep	31.0	0.50	1.69	3.62
MPU (Riprap) (Q = CP1)	Trapezoidal Ditch; 3:1 SS, 18-ft Base and Min 4-ft Deep w/ 8" Riprap	521.0	0.50	3.50	5.21
MPU (Earthen) (Q = CP1)	Earthen Trapezoidal Ditch; 3:1 SS, 45-ft Base and Min 3-ft Deep	521.0	0.25	2.04	5.00



Recommended Flood Control Facility Summary

Facility ID	Facility Description	Total/Approaching Flow (cfs) Q_{100}	Facility Flow (cfs) Q_{100}	Surface/Bypass Flow (cfs) Q_{100}	Notes
P5	5.0' Type CM2 D.I.	16	5	11	
P10	15.0' Type CM2 D.I.	15	11	4	
P18	(2) 5.0' Type CM2 D.I.	2.5	1.5	1	Flow collect per inlet
P20	5.0' Type CM2 D.I.	3.5	2	1.5	Flow collect per inlet
P23	5.0' Type CM2 D.I.	6.5	3	3.5	Flow collect per inlet
P29	5.0' Type CM2 D.I.	8.5	8.5	0	Flow collect per inlet
P30	5.0' Type CM2 D.I.	Nuisance	Nuisance	0	
P34	15.0' Type CM2 D.I.	9	8	1	
P36	20.0' Type CM2 D.I.	22	17	5	

SLATER HANIFAN GROUP
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NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

NINETY-FIVE MANAGEMENT, LLC.

SKYE CANYON PHASE 3A INFRASTUCTURE FACILITIES MAP

DATE: JULY 2018
DRAFTER: ETM
DESIGNER: ETM
CHECKED: LL
PROJECT NO. OLY1609.000

EXHIBIT I
SHEET 1 OF 1

F:\oly1609-000 skye canyon phase 3a, 3b, 3c\drainage\technical study\addendum 2\figures\oly1609 tds exhibit i facilities map.dwg 7/26/2018 3:46 PM Lorri Leavitt

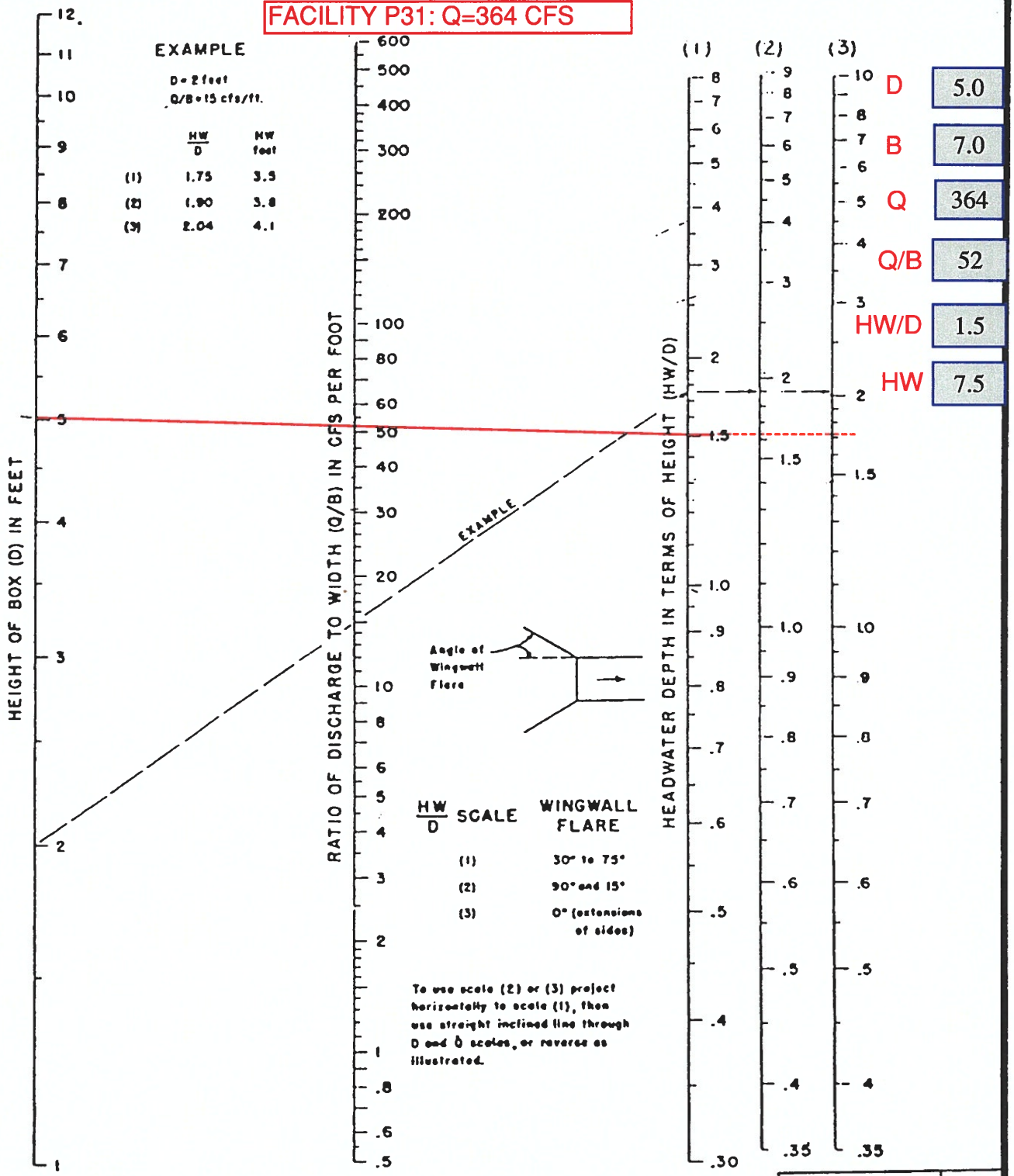
APPENDIX C

Hydraulic Computations

Iron Mountain Road 7’x5’ RCB

NOMOGRAPH – INLET CONTROL BOX CULVERT

FACILITY P31: Q=364 CFS



Revision	Date

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS No.5, 1985

FIGURE 1004

```
T1 SKYE CANYON INFRASTRUCTURE - PHASE 3A
T2 BY OLYMPIA COMPANIES
T3 SKYE VILLAGE ROAD MAINLINE LATERAL (FACILITY U31)
SO   1000.0002824.890 10      .013                2835.800
R    1010.0002825.590 10      .013
R    1078.0002830.160 10      .013                                    77.922    .000 0
R    1094.0002830.230 10      .013
SH   1189.0002830.720 10      .013
CD   5  3   0    .000   9.000   18.000  .000  .000   .00
CD   6  3   0    .000   6.000    6.000  .000  .000   .00
CD   7  3   0    .000   4.000    8.000  .000  .000   .00
CD   8  3   0    .000   7.000   15.000  .000  .000   .00
CD   9  3   0    .000   9.000   15.000  .000  .000   .00
CD  10  3   0    .000   5.000    7.000  .000  .000   .00
CD  18  4   1    .000   1.500     .000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  48  4   1    .000   4.000     .000  .000  .000   .00
CD  54  4   1    .000   4.500     .000  .000  .000   .00
CD  60  4   1    .000   5.000     .000  .000  .000   .00
CD  72  4   1    .000   6.000     .000  .000  .000   .00
CD   1  6   0      0.0      0.0      0.0     0.0      0.0     0.0
CD   2  6   0      0.0      0.0      0.0     0.0      0.0     0.0
CD   3  6   0      0.0      0.0      0.0     0.0      0.0     0.0
CD   4  6   0      0.0      0.0      0.0     0.0      0.0     0.0
PTS  121   .000   .000 10.000   .000 10.000   .010 10.000  5.500  9.490  6.870
PTS       9.000  7.280  8.500  7.500  8.000  7.630  7.520  7.740  7.000  7.840
PTS       6.000  7.960  5.000  8.000  4.000  7.960  3.000  7.840  2.480  7.740
PTS       2.000  7.630  1.500  7.500  1.000  7.280   .510  6.870   .000  5.500
PTS        .000   .010
PTS  221   .000   .000  8.000   .000  8.000   .010  8.000  5.000  7.900  5.570
PTS       7.700  5.950  7.500  6.190  7.250  6.390  7.000  6.530  6.000  6.800
PTS       5.000  6.950  4.000  7.000  3.000  6.950  2.000  6.800  1.000  6.530
PTS        .750  6.390   .500  6.190   .300  5.950   .100  5.570   .000  5.000
PTS        .000   .010
PTS  321   .000   .000 10.000   .000 10.000   .010 10.000  6.500  9.490  7.870
PTS       9.000  8.280  8.500  8.500  8.000  8.630  7.520  8.740  7.000  8.840
PTS       6.000  8.960  5.000  9.000  4.000  8.960  3.000  8.840  2.480  8.740
PTS       2.000  8.630  1.500  8.500  1.000  8.280   .510  7.870   .000  6.500
PTS        .000   .010
PTS  421   .000   .000  8.000   .000  8.000   .010  8.000  6.000  7.900  6.570
PTS       7.700  6.950  7.500  7.190  7.250  7.390  7.000  7.530  6.000  7.800
PTS       5.000  7.950  4.000  8.000  3.000  7.950  2.000  7.800  1.000  7.530
PTS        .750  7.390   .500  7.190   .300  6.950   .100  6.570   .000  6.000
PTS        .000   .010
Q           398.000   .0
```

IRON MT RD 7x5 RCB ULT. MODEL

Program Package Serial Number: 1704

WATER SURFACE PROFILE LISTING Date: 7-31-2018 Time: 8:26:12

SKYE CANYON INFRASTRUCTURE - PHASE 3A

BY OLYMPIA COMPANIES

SKYE VILLAGE ROAD MAINLINE LATERAL (FACILITY U31) IRON MT RD 7x5 RCB ULT. MODEL

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2824.890	10.910	2835.800	398.00	11.37	2.01	2837.81	.00	4.65	7.00	5.000	7.000	.00	0 .0
10.000	.0700					.0060	.06	10.91	.90	1.71	.013	.00	.00	BOX
1010.000	2825.590	10.270	2835.860	398.00	11.37	2.01	2837.87	.00	4.65	7.00	5.000	7.000	.00	0 .0
68.000	.0672					.0060	.41	.00	.90	1.74	.013	.00	.00	BOX
1078.000	2830.160	6.481	2836.640	398.00	11.37	2.01	2838.65	.00	4.65	7.00	5.000	7.000	.00	0 .0
16.000	.0044					.0060	.10	6.48	.90	4.72	.013	.00	.00	BOX
1094.000	2830.230	6.506	2836.736	398.00	11.37	2.01	2838.74	.00	4.65	7.00	5.000	7.000	.00	0 .0
95.000	.0044					.0030	3.27	6.51	.90	4.72	.013	.00	.00	BOX
1189.000	2830.720	6.506	2837.226	398.00	11.37	2.01	2839.23	.00	4.65	7.00	5.000	7.000	.00	0 .0

HEC-RAS Analysis - Earthen Channel to Catcher Mitt Berm

HEC-RAS HEC-RAS 5.0.4 April 2018
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Skye 3A - Iron Mt Wash Downstream
Project File : IronMtWash.prj
Run Date and Time: 7/31/2018 5:12:23 PM

Project in English units

PLAN DATA

Plan Title: Plan 02
Plan File : J:\OLY1609-000 Skye Canyon Phase 3a 3b 3c\Drainage\Technical Study\Addendum 2\Calcs\Iron Mt Wash HEC-RAS\IronMtWash.p02

Geometry Title: FG
Geometry File : J:\OLY1609-000 Skye Canyon Phase 3a 3b 3c\Drainage\Technical Study\Addendum 2\Calcs\Iron Mt Wash HEC-RAS\IronMtWash.g02

Flow Title : Qproposed
Flow File : J:\OLY1609-000 Skye Canyon Phase 3a 3b 3c\Drainage\Technical Study\Addendum 2\Calcs\Iron Mt Wash HEC-RAS\IronMtWash.f01

Plan Summary Information:

Number of:	Cross Sections	= 11	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	=	0.01
Critical depth calculation tolerance	=	0.01
Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3

Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Qproposed
Flow File : J:\OLY1609-000 Skye Canyon Phase 3a 3b 3c\Drainage\Technical Study\Addendum 2\Calcs\Iron Mt Wash HEC-RAS\IronMtWash.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Iron Mt Wash	Downstream Ph3A	383	521

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Iron Mt Wash	Downstream Ph3A	PF 1	Normal S = 0.005	Normal S = 0.03

GEOMETRY DATA

Geometry Title: FG
Geometry File : J:\OLY1609-000 Skye Canyon Phase 3a 3b 3c\Drainage\Technical Study\Addendum 2\Calcs\Iron Mt Wash HEC-RAS\IronMtWash.g02

CROSS SECTION

RIVER: Iron Mt Wash
REACH: Downstream Ph3A RS: 383

INPUT
Description:
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-52.17	2836	-22.5	2824.22	22.5	2824.22	52.17	2836

Manning's n Values num= 3

```
     Sta    n Val      Sta    n Val      Sta    n Val
  -52.17     .025   -52.17     .025    52.17     .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        -52.17   52.17            83.68   83.68   83.68             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
REACH: Downstream Ph3A    RS: 300

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -46.5    2832   -22.5 2824.01    22.5 2824.01    46.5    2832

Manning's n Values        num=       3
     Sta    n Val     Sta    n Val     Sta    n Val
   -46.5     .025   -46.5     .025    46.5     .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         -46.5    46.5              100     100     100             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
REACH: Downstream Ph3A    RS: 200

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -41.48    2830   -22.5 2823.76    22.5 2823.76   41.48    2830

Manning's n Values        num=       3
     Sta    n Val     Sta    n Val     Sta    n Val
  -41.48     .025  -41.48     .025   41.48     .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        -41.48   41.48              100     100     100             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
```

```
REACH: Downstream Ph3A    RS: 100

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  -30.48    2826   -22.5  2823.5    22.5  2823.5   30.48    2826

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  -30.48    .025  -30.48    .025   30.48    .025

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        -30.48   30.48              100     100     100             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
REACH: Downstream Ph3A    RS: 0

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    -1002823.188 -87.2782823.647 -85.2852823.741 -72.7842824.111 -
70.5242824.008
 -63.3342823.786 -57.174 2824.05 -55.9522824.206 -25.001  2824.9 -
23.4972824.566
 -21.5822823.945 -18.4632823.454 -17.8012823.283 -15.0832823.045  -
13.092822.829
  -8.4322822.657  -3.7222822.582  -1.8692822.493    .1572823.048
10.5672823.374
  11.621 2823.37    22.5    2824    31.5    2827    43.5    2827

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -100    .042 -23.497    .042    22.5    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       -23.497    22.5             37.4      50    77.7             .1
.3
Left Levee      Station=     -25      Elevation=  2824.9

CROSS SECTION


RIVER: Iron Mt Wash
REACH: Downstream Ph3A    RS: -50
```

INPUT
Description:
Station Elevation Data num= 45
Sta Elev Sta Elev Sta Elev Sta Elev Sta
Elev
-1002823.125 -97.5762823.155 -89.6412823.345 -84.6952823.472 -
81.5282823.507
-76.3982823.223 -76.0692823.208 -75.7192823.234 -68.4192823.381 -
66.9632823.418
-35.7262823.893 -35.1812823.908 -34.8882823.771 -30.4722821.453 -
24.0662821.035
-22.5242820.994 -21.963 2820.9 -19.9642820.807 -18.3292820.565 -
16.3022820.566
-14.1932820.703 -12.3932820.994 -10.8992821.207 -8.9842821.178 -
6.8342821.225
-5.753 2821.85 -5.2462822.035 -4.3362822.064 .9482822.378
3.0312822.455
5.5432822.659 7.2842822.383 9.4282821.897 12.0722821.179
19.4472821.119
21.814 2821.09 22.1512821.079 23.452821.046 23.7012821.043
27.1182821.013
27.7112821.712 28.432821.934 30.35 2822 39.35 2825 51.35
2825

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-100 .042 -35.181 .042 30.35 .042

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.
Expan.
-35.181 30.35 50.64 50 50.26 .1
.3

CROSS SECTION

RIVER: Iron Mt Wash
REACH: Downstream Ph3A RS: -100

INPUT
Description:
Station Elevation Data num= 32
Sta Elev Sta Elev Sta Elev Sta Elev Sta
Elev
-1002821.103 -98.3352821.218 -90.2972821.194 -88.7662821.205 -
87.9892821.228
-87.8872821.228 -87.7612821.229 -50.5482822.164 -49.9522822.146 -
49.5182822.138
-44.6792822.162 -43.2052822.242 -39.9472819.745 -37.3172819.542 -
27.4832819.152
-15.6272818.875 -10.1182819.103 -9.1582819.732 -8.1032820.315
15.5682819.587
16.7192819.548 16.822819.522 16.9822819.497 17.338 2819.45
20.7552818.894

```
  28.521 2818.55  28.7122818.549  28.8932818.556  34.4312818.902   38.32
2819
   47.32    2822   59.32    2822

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -100    .042 -43.205    .042   38.32    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       -43.205   38.32            52.24      50   49.99             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
REACH: Downstream Ph3A    RS: -150

INPUT
Description:
Station Elevation Data    num=      40
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    -1002820.049 -82.3312819.802 -79.2772819.848 -76.348 2819.88 -
72.5632819.797
 -69.4352819.824 -63.015 2819.75 -61.5932819.699 -55.6172820.497 -
54.6742820.521
 -52.9922820.786 -52.566  2820.8 -49.7122821.012 -47.8082821.239 -
43.4272821.104
 -36.7912820.976 -31.5542818.707 -29.605 2818.08 -14.9912817.664 -
13.2832817.897
 -12.0052818.097 -11.196 2818.31  -9.7972818.841  -9.0392819.121  -
1.4962818.023
   -.0132817.942   1.063 2818.08   3.5482818.443   4.1062818.538
8.8472818.333
  13.9122818.172  16.5912817.854  20.5372817.249  24.5632816.591
31.542816.643
  35.3162816.709  36.1692817.608    37.3  2818.2    46.3  2821.2    58.3
2821.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -100    .042 -36.791    .042    37.3    .042

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       -36.791    37.3            52.42      50   46.95             .1
.3

CROSS SECTION


RIVER: Iron Mt Wash
```

REACH: Downstream Ph3A RS: -200

INPUT
Description:
Station Elevation Data num= 84
```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    -1002817.492 -99.2992817.483 -96.3512817.468 -93.2282817.345  -
88.532818.095
 -87.6852818.199  -83.732819.021 -80.7462819.069 -76.3842819.221 -
67.3392819.491
  -66.462819.491 -53.8682819.713 -48.5182819.215 -41.2162818.904 -
39.2092818.733
 -36.3952817.253  -34.942816.415  -30.592816.266 -28.8022816.223 -
27.8092816.446
 -26.3022816.797 -24.4472817.211 -24.313 2817.23 -23.0082817.248  -
21.572817.248
  -17.71 2816.84 -17.371 2816.89 -15.818 2817.19 -15.6652817.228 -
15.0912817.235
 -13.7072817.248 -10.2642817.248   -9.812817.282  -4.9612817.248  -
3.2292817.248
  -2.6752817.212     -.52815.953   -.2862815.755       0 2815.75
.1262815.748
   2.8792815.684   5.8582816.195   8.9862815.443  10.8962815.583
11.6042815.936
  11.7432815.955  11.8952815.924  13.1572815.583  16.2832815.403
20.2672815.139
  20.5782815.115   22.07 2814.82  22.1782814.805  22.4472814.804
26.8262814.826
  28.0042815.222  28.4932815.396  30.4462815.528  31.6562816.193
33.1312817.116
  33.6062817.116  36.2842817.208  39.8342817.377  48.8582817.828
48.9742817.835
  49.1032817.841  49.2982817.845  61.5772817.817  61.9082817.796
63.8912817.723
  64.8492817.712  68.5512818.154  69.4042818.193  81.2432818.721
832818.809
  86.6242818.942  87.1242818.771  88.3892818.402  89.0632818.559
89.9152818.842
  90.3062818.925  92.0282818.977  97.9842819.057     100 2819.12
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-100	.042	-39.209	.042	48.858	.042

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-39.209	48.858	52.47	50	46.93	.1	.3

CROSS SECTION

RIVER: Iron Mt Wash

REACH: Downstream Ph3A RS: -250

INPUT
Description:
Station Elevation Data num= 76
Sta Elev Sta Elev Sta Elev Sta Elev Sta
Elev
-1002816.575 -95.1822816.836 -91.0272816.856 -75.2062816.806 -
69.4652817.165
-69.2432817.178 -68.5932817.062 -63.501 2816.51 -53.2862816.617 -
45.0172816.648
-44.68 2816.66 -40.786 2816.8 -40.0762816.819 -39.9312816.816 -
39.6842816.709
-35.9822814.394 -34.6712814.291 -30.492814.323 -28.4662814.619 -
26.6612814.958
-22.8252815.326 -22.212815.341 -21.0882815.254 -18.1632814.958 -
16.7522814.784
-11.5132815.073 -11.032815.103 -10.8532815.112 -10.1382815.121 -3.997
2814.75
-3.3152814.678 -.0272814.354 .1362814.375 3.0792814.534
3.192814.542
5.948 2814.06 7.4922813.501 9.2312813.392 10.8472813.263
16.082813.492
21.1282813.651 22.1712814.304 22.4422814.518 23.135 2814.5
29.5162814.518
30.6742814.558 31.4842814.351 32.603 2814.23 35.7622814.426
37.6742814.607
38.9492814.825 39.4882814.883 40.2932814.975 40.712815.025
44.0492815.376
46.3672815.911 51.403 2816.5 56.6942816.967 59.8722817.182
64.3342817.238
70.7792817.449 71.2392817.456 71.9852817.533 73.7732817.592
74.2192817.602
75.9822817.904 79.5292817.767 82.6292817.733 83.7932817.628
872817.393
90.3722817.697 92.6632817.821 93.6772817.904 94.2542817.947
98.8572818.194
1002818.128

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-100 .042 -39.931 .042 51.403 .042

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.
Expan.
-39.931 51.403 52.47 50 48.07 .1
.3

CROSS SECTION

RIVER: Iron Mt Wash
REACH: Downstream Ph3A RS: -300

```
INPUT
Description:
Station Elevation Data    num=      79
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    -1002814.417 -99.1972814.403 -96.9662814.341 -96.3152814.319 -
93.4842814.249
 -83.4762814.225 -74.8482814.273 -67.353 2814.22 -58.211 2815.23 -
51.9912815.834
 -51.322  2815.9  -49.482815.604 -47.2572815.252 -44.738  2814.9 -
39.3742814.706
   -34.42813.809 -34.116 2813.75 -33.9222813.668 -30.1542812.543 -
29.8992812.528
 -29.3622812.597 -29.1262812.669 -28.7172812.786 -26.5242813.512 -
24.4972812.996
 -23.8772812.586 -23.3042812.198 -22.7222812.037 -22.0282811.841 -
10.1772811.787
  -3.0082811.818  -2.2762812.591  -1.0272813.149   3.1292813.045
6.812812.968
   8.7352813.572  11.825 2813.93  12.2692813.898   12.492813.864
15.4562813.495
  19.0652813.038  20.7912812.839  21.6782812.699  23.2072812.711
27.5382812.799
  29.2312813.358  30.3412813.672  30.4842813.766   31.722814.013
34.292814.825
  34.7092814.879  37.5622814.934  40.0482815.261  40.8722815.275  41.727
2815.32
  48.1942815.432  50.1552815.652  54.8182815.962  57.4572815.855
60.5442815.887
  64.9792816.234  65.8522816.234  70.4152816.455  74.349 2815.98
74.7682815.944
  75.1892815.978  79.6972816.401  83.1512816.456  86.0092816.531
87.8852816.546
  88.6022816.236  91.1432815.401  93.6112815.668  93.722 2815.67
93.8732815.683
  94.2012815.709  98.4652816.058   99.622816.333     1002816.413

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    -100    .042 -39.374    .042  41.727    .042

Bank Sta: Left   Right    Coeff Contr.   Expan.
       -39.374  41.727             .1       .3
```

SUMMARY OF MANNING'S N VALUES

River:Iron Mt Wash

Reach	River Sta.	n1	n2	n3
Downstream Ph3A	383	.025	.025	.025
Downstream Ph3A	300	.025	.025	.025

Downstream Ph3A	200	.025	.025	.025
Downstream Ph3A	100	.025	.025	.025
Downstream Ph3A	0	.042	.042	.042
Downstream Ph3A	-50	.042	.042	.042
Downstream Ph3A	-100	.042	.042	.042
Downstream Ph3A	-150	.042	.042	.042
Downstream Ph3A	-200	.042	.042	.042
Downstream Ph3A	-250	.042	.042	.042
Downstream Ph3A	-300	.042	.042	.042

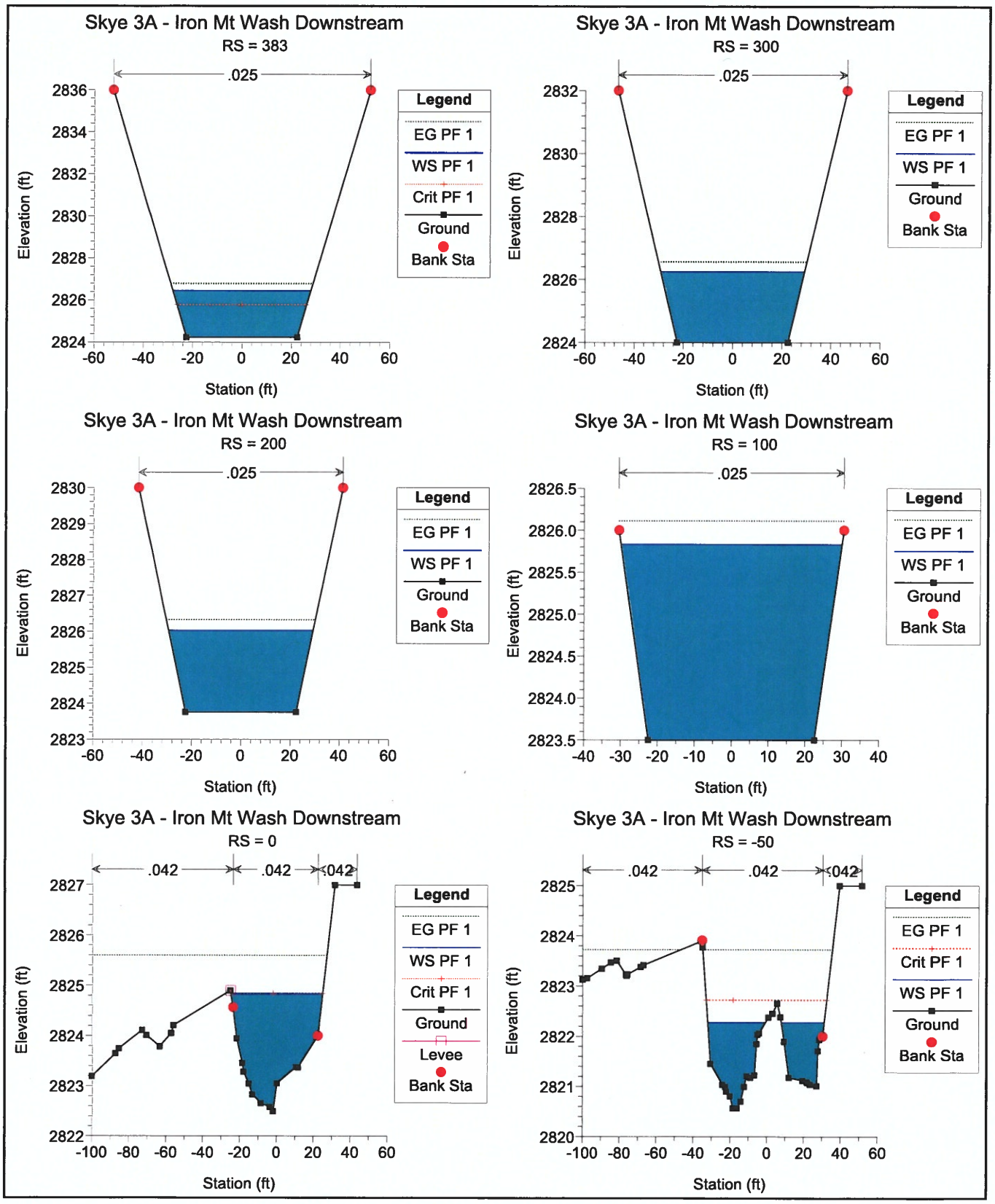
SUMMARY OF REACH LENGTHS

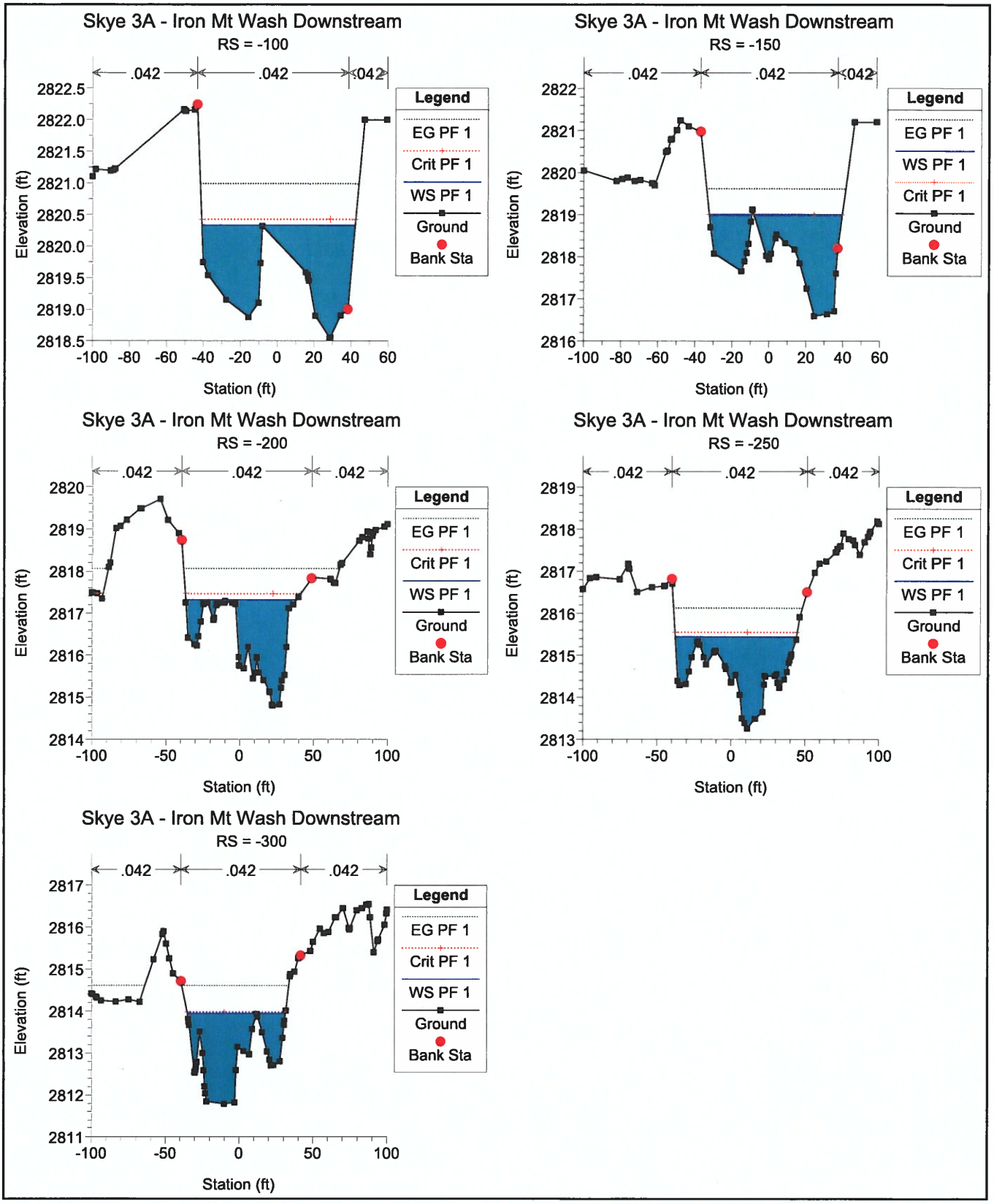
River: Iron Mt Wash

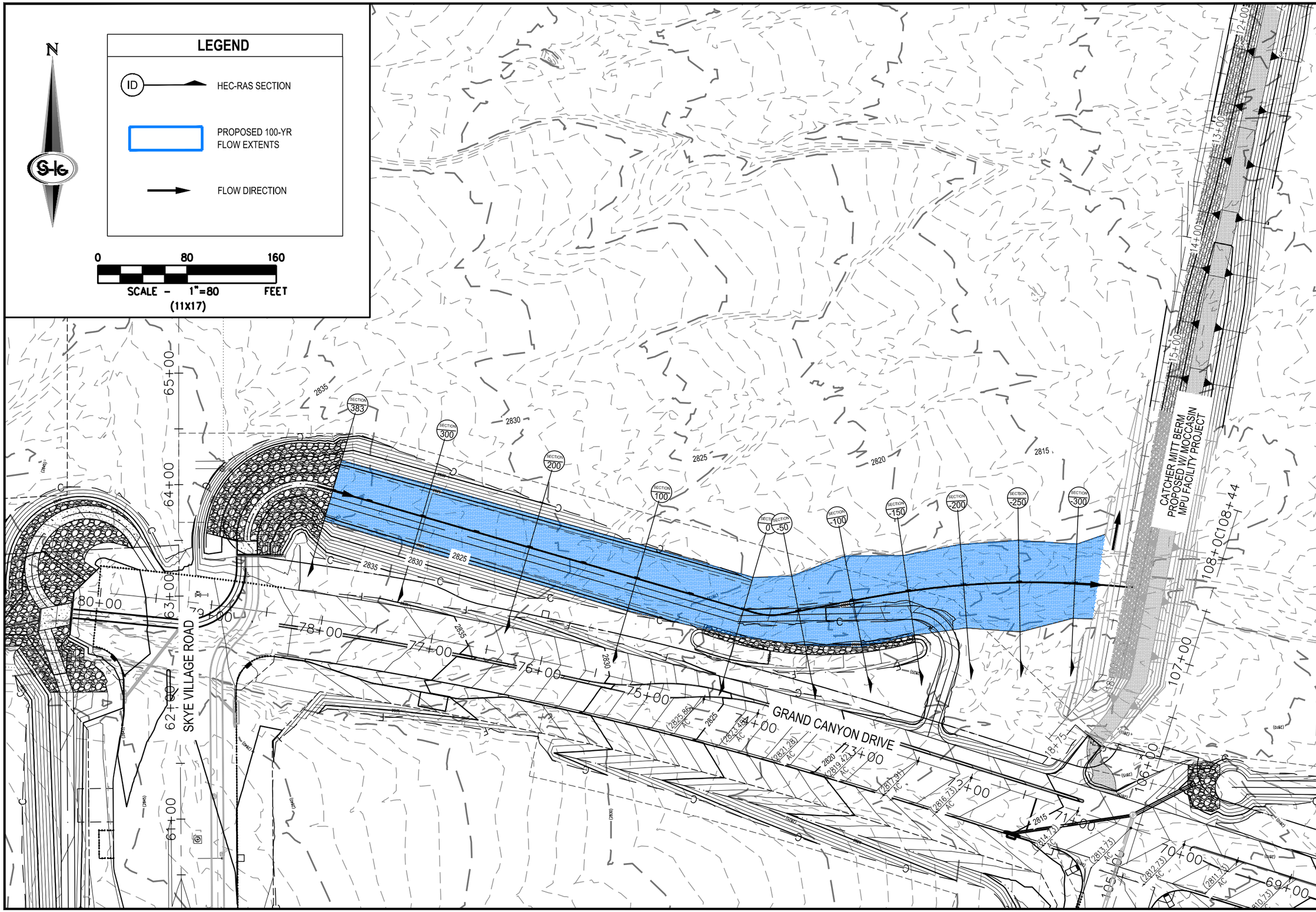
Reach	River Sta.	Left	Channel	Right
Downstream Ph3A	383	83.68	83.68	83.68
Downstream Ph3A	300	100	100	100
Downstream Ph3A	200	100	100	100
Downstream Ph3A	100	100	100	100
Downstream Ph3A	0	37.4	50	77.7
Downstream Ph3A	-50	50.64	50	50.26
Downstream Ph3A	-100	52.24	50	49.99
Downstream Ph3A	-150	52.42	50	46.95
Downstream Ph3A	-200	52.47	50	46.93
Downstream Ph3A	-250	52.47	50	48.07
Downstream Ph3A	-300			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Iron Mt Wash

Reach	River Sta.	Contr.	Expan.
Downstream Ph3A	383	.1	.3
Downstream Ph3A	300	.1	.3
Downstream Ph3A	200	.1	.3
Downstream Ph3A	100	.1	.3
Downstream Ph3A	0	.1	.3
Downstream Ph3A	-50	.1	.3
Downstream Ph3A	-100	.1	.3
Downstream Ph3A	-150	.1	.3
Downstream Ph3A	-200	.1	.3
Downstream Ph3A	-250	.1	.3
Downstream Ph3A	-300	.1	.3


Skye 3A - Iron Mt Wash Downstream
RS = 383
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Skye 3A - Iron Mt Wash Downstream
RS = 300
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Skye 3A - Iron Mt Wash Downstream
RS = 200
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Skye 3A - Iron Mt Wash Downstream
RS = 100
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Skye 3A - Iron Mt Wash Downstream
RS = 0
.042
.042
.042
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Skye 3A - Iron Mt Wash Downstream
RS = -50
.042
.042
.042
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Skye 3A - Iron Mt Wash Downstream
RS = -100
.042
.042
.042
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Skye 3A - Iron Mt Wash Downstream
RS = -150
.042
.042
.042
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Skye 3A - Iron Mt Wash Downstream
RS = -200
.042
.042
.042
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Skye 3A - Iron Mt Wash Downstream
RS = -250
.042
.042
.042
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Skye 3A - Iron Mt Wash Downstream
RS = -300
.042
.042
.042
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta



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NO.	DESCRIPTION	DATE	BY	APP DATE	APP

NINETY-FIVE MANAGEMENT LLC

SKYE CANYON PHASE 3A

DISCHARGE TO MOCCASIN BERM EXHIBIT

DATE:	AUG 2018
DRAFTER:	
DESIGNER:	
CHECKED:	
PROJECT NO.	OLY1609

APPENDIX D

CD of Electronic Files & Revised Improvement Plans