

DS #:

4994

APN:

125-30-502. 009

PROJECT:

Centennial & Fort Apache Residential Development

SUBMITTAL:

2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		August 20, 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:	
	Centennial & Fort Apache Residential Development	
Cross Streets:	SWQ Fort Apache Rd. & Centennial Blvd.	
File Number:	F:\Depot\DSMemos\DS4994B.doc	
Parcel Number:	125-30-502-009	
Zoning Action:	TMP-72410; VAC-72409; WVR-72408 & VAR-72407	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES	NO X
		COPIES TO: Taney Engineering Adaven Homes Bart Anderson, P.E., DevCo CCPW

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	5/17/2018	6/4/2018 & 6/13/2018	Not Approved	\$400.00	496723: \$400
2 nd Submittal	8/2/2018	8/16/2018	See Comments Below	\$400.00	497928: \$400
			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:
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 the jurisdiction of Clark County to the south and west. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the south and west borders. CCPW concurrence is required prior to final acceptance of the study.
2. The responses to the previous Comments #3 and #4 were to maintain the existing condition and therefore to continue letting the flows in *Centennial Parkway* into the onsite street and *Regena Avenue* without any blocking. At a minimum, the proposed project shall prevent the ultimate condition flow in *Centennial Parkway* to enter the subject site. Address the ultimate condition flow in the next submittal and provide a minimum freeboard of 6" to the 100-year water surface in *Centennial Parkway*. Review the onsite street profile and onsite grading accordingly.
3. **Second Request:** The development proposes three points to accept offsite flows along the west boundary. 5'-wide public drainage easements will be created at Lot 3, Lot 6 and Lot 9. These drainage easements will burden the individual property owners with maintenance and are not desirable.

The City's policy is to minimize public drainage easements. Every attempt should be made by the developer to eliminate the public drainage easement which may require engineering, coordination with the adjacent property owner(s) or by providing additional grading offsite. All attempts must be provided in writing and submitted as a part of drainage study for documentation.

4. Sections K/GD1 and J/GD1 shown on the grading plans do not match what was shown on the detail sheet GD1. Review and revise accordingly.
5. **Second Request:** Label the slopes in the cul-de-sac to show that the 1% minimum criteria is met.

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
WSP/AYS

T/R/S: T19S/R60E/30
AREA G-30

TRANSACTION REPORT

AUG/20/2018/MON 03:44 PM

FAX(TX)

#	DATE	START T.	RECEIVER	COM.TIME	PAGE	TYPE/NOTE	FILE
001	AUG/20	03:43PM	7023625233	0:00:52	2	MEMORY OK	G3 1966

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		August 20, 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: Centennial & Fort Apache Residential Development		COPIES TO: Taney Engineering
Cross Streets:	SWQ Fort Apache Rd. & Centennial Blvd.	Adaven Homes
File Number:	F:\Depot\DSMemos\DS4994B.doc	Barl Anderson, P.E., DevCo
Parcel Number:	125-30-502-009	CCPW
Zoning Action:	TMP-72410; VAC-72409; WVR-72408 & VAR-72407	
FEMA Flood Zone	YES	NO ☒
Proposed Storm Drain	YES	NO ☒

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	5/17/2018	6/4/2018 & 6/13/2018	Not Approved	\$400.00	496723: \$400
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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:
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 the jurisdiction of Clark County to the south and west. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the south and west borders. CCPW concurrence is required prior to final acceptance of the study.
2. The responses to the previous Comments #3 and #4 were to maintain the existing condition and therefore to continue letting the flows in *Centennial Parkway* into the onsite street and *Regena Avenue* without any blocking. At a minimum, the proposed project shall prevent the ultimate condition flow in *Centennial Parkway* to enter the subject site. Address the ultimate condition flow in the next submittal and provide a minimum freeboard of 6" to the 100-year water surface in *Centennial Parkway*. Review the onsite street profile and onsite grading accordingly.
3. **Second Request:** The development proposes three points to accept offsite flows along the west boundary. 5'-wide public drainage easements will be created at Lot 3, Lot 6 and Lot 9. These drainage easements will burden the individual property owners with maintenance and are not desirable.



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

LOIS TARKANIAN
Mayor Pro Tem

STAVROS S. ANTHONY
BOB COFFIN

STEVEN G. SEROKA
MICHELE FIORE

SCOTT D. ADAMS
City Manager

March 22, 2018

Double Double LLC
10789 West Twain Avenue, 2nd Floor
Las Vegas, Nevada 89135

**RE: TMP-72410 [PRJ-72355] - TENTATIVE MAP RELATED TO WVR-
72408, VAR-72407 AND VAC-72409
CITY COUNCIL MEETING OF MARCH 21, 2018**

Dear Applicant:

The City Council at a regular meeting held on March 21, 2018 voted to **APPROVE** a request for a Tentative Map FOR A 18-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION on 4.49 acres adjacent to the south side of Centennial Parkway, approximately 275 feet west of Fort Apache Road (APN 125-30-502-009), R-1 (Single Family Residential) Zone, Ward 6 (Fiore) [PRJ-72355].

This approval is subject to the following conditions:

Planning

1. A combination of six-foot solid decorative block wall and locking wrought iron fence shall be installed across the public utility and drainage easement at the southern alignment of the cul-de-sac.
2. Approval of the Tentative Map shall be for no more than four (4) years. If a Final Map is not recorded on all or a portion of the area embraced by the Tentative Map within four (4) years of the approval of the Tentative Map, this action is void.
3. Approval of Variance (VAR-72407), Waiver (WVR-72408) and Vacation (VAC-72409) shall be required, if approved.
4. Street names must be provided in accordance with the City's Street Naming Regulations.
5. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.

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6. In conjunction with creation, declaration and recordation of the subject common-interest community, and prior to recordation of the Covenants, Codes and Restrictions ("CC&R"), or conveyance of any unit within the community, the Developer is required to record a Declaration of Private Maintenance Requirements ("DPMR") as a covenant on all associated properties, and on behalf of all current and future property owners. The DPMR is to include a listing of all privately owned and/or maintained infrastructure improvements, along with assignment of maintenance responsibility for each to the common interest community or the respective individual property owners, and is to provide a brief description of the required level of maintenance for privately maintained components. The DPMR must be reviewed and approved by the City of Las Vegas Department of Field Operations prior to recordation, and must include a statement that all properties within the community are subject to assessment for all associated costs should private maintenance obligations not be met, and the City of Las Vegas be required to provide for said maintenance. Also, the CC&R are to include a statement of obligation of compliance with the DPMR. Following recordation, the Developer is to submit copies of the recorded DPMR and CC&R documents to the City of Las Vegas Department of Field Operations.
7. All development is subject to the conditions of City Departments and State Subdivision Statutes.

Public Works

8. A Petition of Vacation, such as VAC-72409, shall record immediately prior to (concurrent with) the recordation of a Final Map for this site to eliminate the U.S. Government Patents Easements adjacent to this site.
9. Grant Public Pedestrian Access Easements for all public sidewalks located outside of the public right-of-way on Centennial Parkway on the Final Map for this site.
10. Grant a Public Pedestrian Access Easement, Public Utility Easements (P.U.E.), Public Sewer Easements, and Public Drainage Easements to be privately maintained by the Homeowner's Association across the Common Element between lots 9 and 10.

11. Construct complete half street improvements on Centennial Parkway and Regena Avenue meeting current City Standards adjacent to this site including widened paving to eliminate the "sawtooth" on Centennial Parkway concurrent with the development of this site. All existing paving damaged or removed by this development shall be restored at its original location and to its original width concurrent with development of this site. Curb and gutter along Regena Avenue is allowed to be per Standard Drawing # 217.1. Sidewalk along Regena Avenue may be deferred through VAR-72407. Streetlights on Regena Avenue and the internal public street may be deferred through WVR-72408.
12. All landscaping and private improvements installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.
13. A working sanitary sewer connection shall be in place prior to final inspection of any units within this development. Full permanent improvements on all major access streets, including all required landscaped areas between the perimeter wall and adjacent public street, shall be constructed and accepted by the City prior to issuance of any building permits beyond 50% of all units within this development. All off-site improvements adjacent to this site, including all required landscaped areas between the perimeter walls and adjacent public streets, shall be constructed and accepted prior to issuance of building permits beyond 75%. The above thresholds notwithstanding, all required Improvements shall be constructed in accordance with Title 19.02.130.D.
14. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.
15. As per Unified Development Code (UDC) 19.16.060.G, all requirements must be complied with or such future compliance must be guaranteed by an approved performance security method in accordance with UDC sections 19.02.130.C and 19.02.130.E.

16. The approval of all Public Works related improvements shown on this Tentative Map is in concept only. Specific design and construction details relating to size, type and/or alignment of improvements, including but not limited to street, sewer and drainage improvements, shall be resolved prior to approval of the construction plans by the City. No deviations from adopted City Standards shall be allowed unless specific written approval for such is received from the City Engineer prior to the recordation of a Final Map or the approval of subdivision-related construction plans, whichever may occur first. Approval of this Tentative Map does not constitute approval of any deviations. If such approval cannot be obtained, a revised Tentative Map must be submitted showing elimination of such deviations.

The Notice of Final Action was filed with the Las Vegas City Clerk on March 22, 2018.

Sincerely,



Robert Summerfield, AICP[®]
Director
Department of Planning

RTS:PL:clb

cc: Mr. Andrew Acuna
Summit Homes of Nevada LLC
3425 Cliff Shadows Parkway
Las Vegas, Nevada 89129

Ms. Jana Felipe
Taney Engineering LLC
6030 South Jones Boulevard
Las Vegas, Nevada 89118



**LAS VEGAS
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STEVEN G. SEROKA

MICHELE FIORE

SCOTT D. ADAMS
City Manager

March 22, 2018

Double Double, LLC
10789 West Twain Avenue, 2nd Floor
Las Vegas, Nevada 89135

**RE: VAC-72409 [PRJ-72355] - VACATION RELATED TO WVR-72408,
VAR-72407 AND TMP-72410
CITY COUNCIL MEETING OF MARCH 21, 2018**

Dear Applicant:

The City Council at a regular meeting held on March 21, 2018 voted to **APPROVE** a request for a Petition to Vacate a 33-FOOT U.S. GOVERNMENT PATENT EASEMENT generally located on the south side of Centennial Parkway, approximately 275 feet west of Fort Apache Road, Ward 6 (Fiore) [PRJ-72355].

This approval is subject to the following conditions:

1. The limits of this Petition of Vacation shall be the south 3-feet and the east and west 33 feet of Assessor Parcel Number 125-30-502-009, generally located on the south side of Centennial Parkway, west of Fort Apache Road.
2. The Order of Relinquishment shall record immediately prior to (concurrent with) the Final Map for this site.
3. All public improvements, if any, adjacent to and in conflict with this vacation application are to be modified, as necessary, at the applicant's expense prior to the recordation of an Order of Vacation.
4. The Order of Relinquishment of Interest shall not be recorded until all of the conditions of approval have been met provided, however, the conditions requiring modification of public improvements may be fulfilled for purposes of recordation by providing sufficient security for the performance thereof in accordance with the Subdivision Ordinance of the City of Las Vegas. City Staff is empowered to modify this application if necessary because of technical concerns or because of other related review actions as long as current City right-of-way requirements are still complied with and the intent of the vacation application is not changed. If applicable, a five foot wide easement for public streetlight and fire hydrant purposes shall be retained on all vacation actions abutting public street corridors that will remain dedicated and available for public use. Also, if applicable and where needed, public easement corridors and sight visibility or other easements that would/should cross any right-of-way being vacated must be retained.

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Double Double, LLC
VAC-72409 [PRJ-72355] - Page Two
March 22, 2018

5. Reservation of easements for the facilities of the various utility companies together with reasonable ingress thereto and egress there from shall be provided if required.
6. All development shall be in conformance with code requirements and design standards of all City Departments.
7. If the Order of Vacation (or Order of Relinquishment of Interest if a Patent Reservation) is not recorded within one (1) year after approval by the City of Las Vegas or an Extension of Time is not granted by the Planning Director, then approval will terminate and a new petition must be submitted.

The Notice of Final Action was filed with the Las Vegas City Clerk on March 22, 2018.

Sincerely,



Robert Summerfield, AICP
Director
Department of Planning

RTS:PL:clb

cc: Mr. Andrew Acuna
Summit Homes of Nevada LLC
3425 Cliff Shadows Parkway
Las Vegas, Nevada 89129

Ms. Jana Felipe
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6030 South Jones Boulevard
Las Vegas, Nevada 89118



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March 22, 2018

Double Double LLC
10789 West Twain Avenue, 2nd Floor
Las Vegas, Nevada 89135

**RE: WVR-72408 [PRJ-72355] - WAIVER RELATED TO VAR-72407, VAC-72409 AND TMP-72410
CITY COUNCIL MEETING OF MARCH 21, 2018**

Dear Applicant:

The City Council at a regular meeting held on March 21, 2018 voted to **APPROVE** a request for a Waiver TO ALLOW NO STREETLIGHTS WHERE SUCH ARE REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 4.49 acres adjacent to the south side of Centennial Parkway, approximately 275 feet west of Fort Apache Road (APN 125-30-502-009), R-1 (Single Family Residential) Zone, Ward 6 (Fiore) [PRJ-72355].

This approval is subject to the following conditions:

Planning

1. Approval of and conformance to the Conditions of Approval for Variance (VAR-72407), Vacation (VAC-72409) and Tentative Map (TMP-72410) shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
5. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

Public Works

6. The installation of streetlights on Regena Avenue and the internal public street shall be deferred. Public street lighting shall be stubbed out for later use, including all necessary underground improvements including conduit and pull boxes at each future streetlight location. Monies in lieu of such deferred streetlights and associated streetlight bases shall be contributed to the City. The contribution amount shall be based on the City's current bond schedules for all streetlights and associated bases deferred by this action adjacent to this site.

The Notice of Final Action was filed with the Las Vegas City Clerk on March 22, 2018.

Sincerely,


Robert Summerfield, AICP[®]
Director
Department of Planning

RTS:PL:clb

cc: Mr. Andrew Acuna
Summit Homes of Nevada LLC
3425 Cliff Shadows Parkway
Las Vegas, Nevada 89129

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March 22, 2018

Double Double, LLC
10789 West Twain Avenue, 2nd Floor
Las Vegas, Nevada 89135

**RE: VAR-72407 [PRJ-72355] - VARIANCE RELATED TO WVR-72408, VAC-72409 AND TMP-72410
CITY COUNCIL MEETING OF MARCH 21, 2018**

Dear Applicant:

The City Council at a regular meeting held on March 21, 2018 voted to **APPROVE** a request for a Variance TO ALLOW NO AMENITY ZONE WHERE SUCH IS REQUIRED FOR A PROPOSED RESIDENTIAL SUBDIVISION on 4.49 acres adjacent to the south side of Centennial Parkway, approximately 275 feet west of Fort Apache Road (APN 125-30-502-009), R-1 (Single Family Residential) Zone, Ward 6 (Fiore) [PRJ-72355].

This approval is subject to the following conditions:

Planning

1. Approval of and conformance to the Conditions of Approval for Waiver (WVR-72408, Vacation (VAC-72409) and Tentative Map (TMP-72410) shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
5. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

Public Works

6. Sign a Covenant Running with Land agreement for the possible future installation of half-street improvements per City Compete Street Standards (sidewalk) on Regena Avenue adjacent to this site. The Covenant agreement must be recorded with the County Recorder and a copy of the recorded document must be provided to the City prior to the approval of construction drawings for this site.

The Notice of Final Action was filed with the Las Vegas City Clerk on March 22, 2018.

Sincerely,



Robert Summerfield, AICP
Director
Department of Planning

RTS:PL:clb

cc: Mr. Andrew Acuna
Summit Homes of Nevada LLC
3425 Cliff Shadows Parkway
Las Vegas, Nevada 89129

Ms. Jana Felipe
Taney Engineering LLC
6030 South Jones Boulevard
Las Vegas, Nevada 89118



TANEY ENGINEERING

6030 SOUTH JONES BLVD.
LAS VEGAS, NV 89118
TELEPHONE: 702-362-8844
FAX: 702-362-5233

Transmittal

☐ **Priority** ☐ **Must be delivered by:**

☐ **AM**
☐ **PM**

To:	Albert Sung Flood Control-7 th Floor	From:	Janna Felipe jannaf@taneycorp.com
Company:	City of Las Vegas	Date:	8/1/18
Address:	333 N. Rancho Las Vegas, NV 89106	Job No.:	ADV-17-086
Project:	Fort Apache and Centennial	Folder:	Hydrology
Re:	TDS – Re-Submittal	Project #	DS4994A TMP72410

Items Attached

1. (1) Technical Drainage Study
2. (1) TDS Improvement Plans
3. (1) Disk of TDS
4. (1) Comment letter
5. (1) Conditions of approval letters / and zoning conditions

Please obtain key # for payment of fee online. Thanks!!

COMMENTS:

For Review

RECEIVED BY

Signature:

Print name:

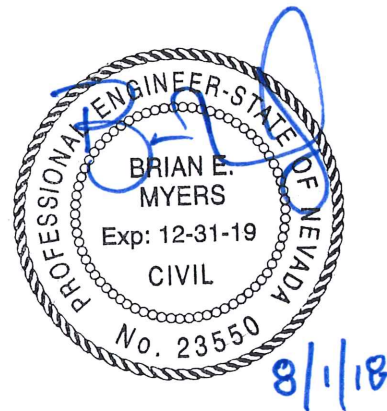
Date:

Time:



TANEY ENGINEERING

ADDENDUM #1
FOR THE
TECHNICAL DRAINAGE STUDY
FOR
CENTENNIAL & FORT APACHE
Residential Development



**CLARK COUNTY
NEVADA**

July 2018

Prepared by:

Taney Engineering
6030 S. Jones
Las Vegas, Nevada 89118
Telephone: (702) 362-8844
Fax: (702) 362-5233

Prepared for:

Adaven Homes
3425 Cliff Shadows Pkwy.
Las Vegas, NV 89129
Telephone: (702) 365-8588
Fax: (800) 998-9885

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Centennial & Fort Apache Date: Jul 31, 2018

Location of Development: a) Descriptive (Cross Streets) North/South: Fort Apache
East/West: Centennial/Regena

b) Section: 30 Township: 19S Range: 60E

c) APN : 125-30-502-009

Name of Owner: Adaven Homes

Telephone No.: (702) 365-8558 Fax No.: (702) 998-9885 E-Mail Address: _____

Address: 3425 Cliff Shadows Pkwy, Las Vegas, NV 89129

Contact Person-Name: Brian Myers, P.E. Telephone No.: (702) 362-8844

* E-Mail Address: BrianM@taneycorp.com Fax No.: (702) 362-5233

Firm: Taney Engineering

Address: 6030 S. Jones, Suite 100, 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		

1. Total Owned Land Area: At Site: 4.62+/- acres Being Developed/Disturbed: 5.01+/- acres

2. Is a portion or all of the subject property located in a designated 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

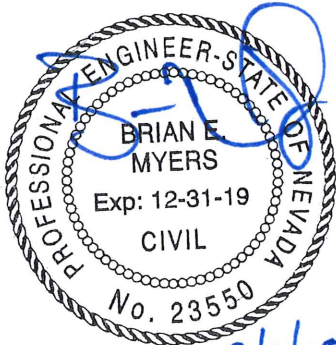
4. Proposed type of development (Residential, Commercial, Etc.): Residential

5. Approximate upstream land area which drains to the subject site: 199+/- acres

6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: The site will discharge to south to Regena then flow will be conveyed east away from the site.

8. Briefly describe your proposed schedule for the subject project: A.S.A.P



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.

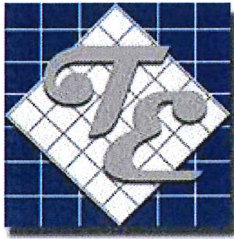
***New Required Field**

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

	Revision	Date
Local Entity File No. _____		

REFERENCE:

STANDARD FORM 1



TANEY ENGINEERING

6030 SOUTH JONES BLVD, SUITE 100

LAS VEGAS, NV 89118

TELEPHONE: 702-362-8844

Fax: 702-362-5233

July 31, 2018
Job No. ADV-17-086

Albert Sung, P.E.
Flood Control
City of Las Vegas Public Works
333 N. Rancho Drive
Las Vegas, NV 89106

Subject: Addendum #1 to the Technical Drainage Study for Fort Apache and Centennial DS4994

Dear Mr. Sung:

Taney Engineering is pleased to provide Addendum #1 to the Technical Drainage Study for **Fort Apache and Centennial**. This addendum includes a response to each comment from City of Las Vegas review memorandum dated on June 13, 2018. The comments have been reproduced and addressed as follows:

Comment 1: Provide a copy of the zoning/planning conditions associated with this site (TMP-72410; VAC-72409; WVR-72408 & VAR-72407) with the next submittal to verify compliance with conditions. Flood Control will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the City Council). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted

Zoning and planning conditions that are associated with this project have been provided with this submittal as requested.

Comment 2: The site is adjacent to the jurisdiction of Clark County to the south and west. The engineer must coordinate with Clark County Public Works Department (CCPW) and incorporate any concerns for boundary conditions along the south and west borders. CCPW concurrence is required prior to final acceptance of the study.

Coordination with Clark County Public Works and any lingering concerns will be addressed for final approval of this study.



Comment 3: The subject development accepts flows from Centennial Parkway through the onsite Street onto Regina Avenue. This flow split at Centennial and the onsite street makes the DxV condition worse from the existing condition on Regina Avenue (DV>6 in 10-year and DV>8 in 100-year) and is negatively impacting the surrounding properties. A high point at the entrance to the neighborhood will need to be put into place in order to keep the flow from Centennial Parkway entering the subject development. Review and revise accordingly.

After further review of drainage studies and many site visits, It was determined that in the existing condition the flow on Centennial Parkway is not contained on Centennial but is conveyed south to Regena.

Although there is an increase in runoff from the onsite basins in the interim (7 cfs) the overall flow depth goes from .97 (original submittal) to .98. The results of the hydrologic models show that the discharge from the project site does not negatively impact the peak flows to Regena from the site.

According to the HTE: 14-14210 study the flow in Centennial was increased to 80/162 in the developed condition of this study. This flow begins to travel south immediately once it passes the residential subdivision Centennial and Tee Pee. The flow travels to Regena where it will be conveyed to Fort Apache Road at CP3 with a total of 195/309 cfs.

In the interim condition when the site is developed the flow in Centennial will continue to travel south towards Regena as it did in the existing condition. The flow then combines at CP3 with a total of 198/316 cfs, where it will be conveyed east and match existing drainage patterns.

Because the flow naturally travels south to Regena in the interim condition the flow on the south side of Centennial is reduced to <1/2 cfs at cross section D, see Appendix B on Figure 8. The overall flow in Centennial at CP1 will be 44/94 cfs.

In the developed condition the site and offsite basins will be considered fully developed. In this condition Centennial and Regena will have fully developed roads and will have worst case governing flows traveling east on both roads. It is assumed that when the developed condition occurs on parcel APN: 125-30-502-008 the flow will be directed south to Regena matching existing historical patterns.

In the ultimate condition flow that travels east on Centennial will be reduced with the installation of the Grand Canyon regional facility and the Centennial local facility. However; with this study it will be assumed the local and regional facility will not be installed yet.



Comment 4: In the interim and ultimate condition the flow in Regena Avenue does not meet the criteria of DxV <6 for 10-year storm event and a DxV <8 for 100-year. This comment supplements the above Comment.

In the existing condition the southern portion of Centennial conveys flow (40/81 cfs) south to Regena causing the dry lane criteria to not be met.

In the interim condition the flow still continues to travel south to Regena and does not meet the criteria of DxV for the 10 and 100 year storm event. However, a portion of the flows from XOF1 will be diverted to the subject site and routed through "A" Street reducing the peak flows affecting Regena in the interim and developed condition.

In the developed condition, it is assumed the flows from Centennial will be routed through the adjacent developed parcel south to Regena matching existing drainage patterns. This will also reduce peak flows on Regena.

In the ultimate condition flows on Centennial and Regena will be reduced with the installation of the Grand Canyon regional facility and the Centennial local facility. However, with this study it will be assumed the local and regional facility will not be installed yet.

Comment 5: Revise the proposed drainage pattern and all subsequent grading designs accordingly.

Proposed drainage patterns have been revised on the basin map to show the new drainage flows in Centennial and Regena as requested.

Comment 6: The development proposes three points to accept offsite flows along the west boundary. 5'-wide public drainage easements will be created at Lot 3, Lot 6 and Lot 9. These drainage easements will burden the individual property owners with maintenance and are not desirable.

The City's policy is to minimize public drainage easements. Every attempt should be made by the developer to eliminate the public drainage easement which may require engineering, coordination with the adjacent property owner(s) or by providing additional grading offsite. All attempts must be provided in writing and submitted as a part of drainage study for documentation.

Grading plans have not been updated to show the 3 drainage easements removed. They will be shown on the grading plans until permission to grade has been received by the adjacent owner.

However, permission to grade has been asked and is currently waiting for approval from the adjacent property owner. With approval, an updated TDS will be submitted to show the new changes.



Comment 7: Construction Notes 13 and 14 are shown on the plans, but are not described in the construction notes on sheets G1 and G2. Address in the next submittal.

Construction notes have been revised with the plans to reflect this change as requested.

Comment 8: Cross Sections F, G, H, I, J and K are not provided on Sheet GD1, however these cross sections are shown on the plans. Provide as such in the next submittal.

Cross sections have been updated on the grading plans to show the correct cross sections that are shown on GD1 as requested.

Comment 9: Cross Section A: Provide 3-course of solid grouted 8"-CMU above the adjacent grade in the landscape area.

Cross section A has been revised to show a 3 course solid grouted 8" CMU wall as requested.

Comment 10: Revise Cross Section E to show a concrete lined public drainage easement to be privately maintained.

Cross section E has been updated to show a concrete lined public drainage easement to be privately maintained as requested.

A copy of the City of Las Vegas Public Works comments has been provided directly following this letter. If you need any additional information, please do not hesitate to call our office.

Sincerely,

TANEY ENGINEERING

David Westpy
Designer I



APPENDICES

APPENDIX A

Comment Letter

APPENDIX B

Figures

APPENDIX C

Hydrologic Calculations

APPENDIX D

Hydraulic Calculations

APPENDIX E

Reference Material

APPENDIX F

Improvement Plans



APPENDIX A

Comment Letter

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM

DATE:

June 13, 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:

Centennial & Fort Apache Residential Development

COPIES TO:

Taney Engineering

Cross Streets:

SWQ Fort Apache Rd. & Centennial Blvd.

Adaven Homes

File Number:

F:\Depot\DSMemos\DS4994A.doc

Bart Anderson, P.E., DevCo

Parcel Number:

125-30-502-009

CCPW

Zoning Action:

TMP-72410; VAC-72409; WVR-72408 &
VAR-72407

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	5/17/2018	6/4/2018 & 6/13/2018	See Comments Below	\$400.00	496723: \$400
TOTAL FEES (LDDRS):				\$400.00	----

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:
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. Provide a copy of the zoning/planning conditions associated with this site (**TMP-72410; VAC-72409; WVR-72408 & VAR-72407**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. The site is adjacent to the jurisdiction of Clark County to the south and west. The engineer must coordinate with *Clark County Public Works Department* (CCPW) and incorporate any concerns for boundary conditions along the south and west borders. CCPW concurrence is required prior to final acceptance of the study.
3. The subject development accepts flows from *Centennial Parkway* through the onsite street onto *Regina Avenue*. This flow split at *Centennial* and the onsite street makes the DxV condition worse from the existing condition on *Regina Avenue* (DV>6 in 10-year and DV>8 in 100-year) and is negatively impacting the surrounding properties. A high point at the entrance to the neighborhood will need to be put into place in order to keep the flow from *Centennial Parkway* entering the subject development. Review and revise accordingly.

4. In the interim and ultimate condition the flow in *Regena Avenue* does not meet the criteria of $DxV < 6$ for 10-year storm event and a $DxV < 8$ for 100-year. This comment supplements the above Comment #3. Revise the proposed drainage pattern and all subsequent grading designs accordingly.
5. The development proposes three points to accept offsite flows along the west boundary. 5'-wide public drainage easements will be created at Lot 3, Lot 6 and Lot 9. These drainage easements will burden the individual property owners with maintenance and are not desirable.

The City's policy is to minimize public drainage easements. Every attempt should be made by the developer to eliminate the public drainage easement which may require engineering, coordination with the adjacent property owner(s) or by providing additional grading offsite. All attempts must be provided in writing and submitted as a part of drainage study for documentation.
6. Construction Notes 13 and 14 are shown on the plans, but are not described in the construction notes on sheets G1 and G2. Address in the next submittal.
7. Cross Sections F, G, H, I, J and K are not provided on *Sheet GD1*, however these cross sections are shown on the plans. Provide as such in the next submittal.
8. Cross Section A: Provide 3-course of solid grouted 8"-CMU above the adjacent grade in the landscape area.
9. Revise Cross Section E to show a concrete lined public drainage easement to be privately maintained.
10. Label the slopes in the cul-de-sac to show that the 1% minimum criteria is met.

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
WSP/AYS

T/R/S: T19S/R60E/30
AREA G-30



APPENDIX B

Figures



NORTHWEST
NEIGHBORHOOD
STUDY

LEGEND

— SUB-BASIN BOUNDARY

→ FLOW ARROW

250
500
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GD28BA99
GD28BA100

PHOTO DATE: APRIL 1996

FIGURE E-1

EXISTING DRAINAGE CONDITIONS

PBSJ
POST,
BUCKLEY,
SCHUH &
JERNIGAN, INC.
ENGINEERING PLANNING SURVEYING GIS
901 N. Green Valley Pkwy, Ste 100, Henderson NV 89014
Phone: (702) 263-7275 Fax: (702) 263-7200

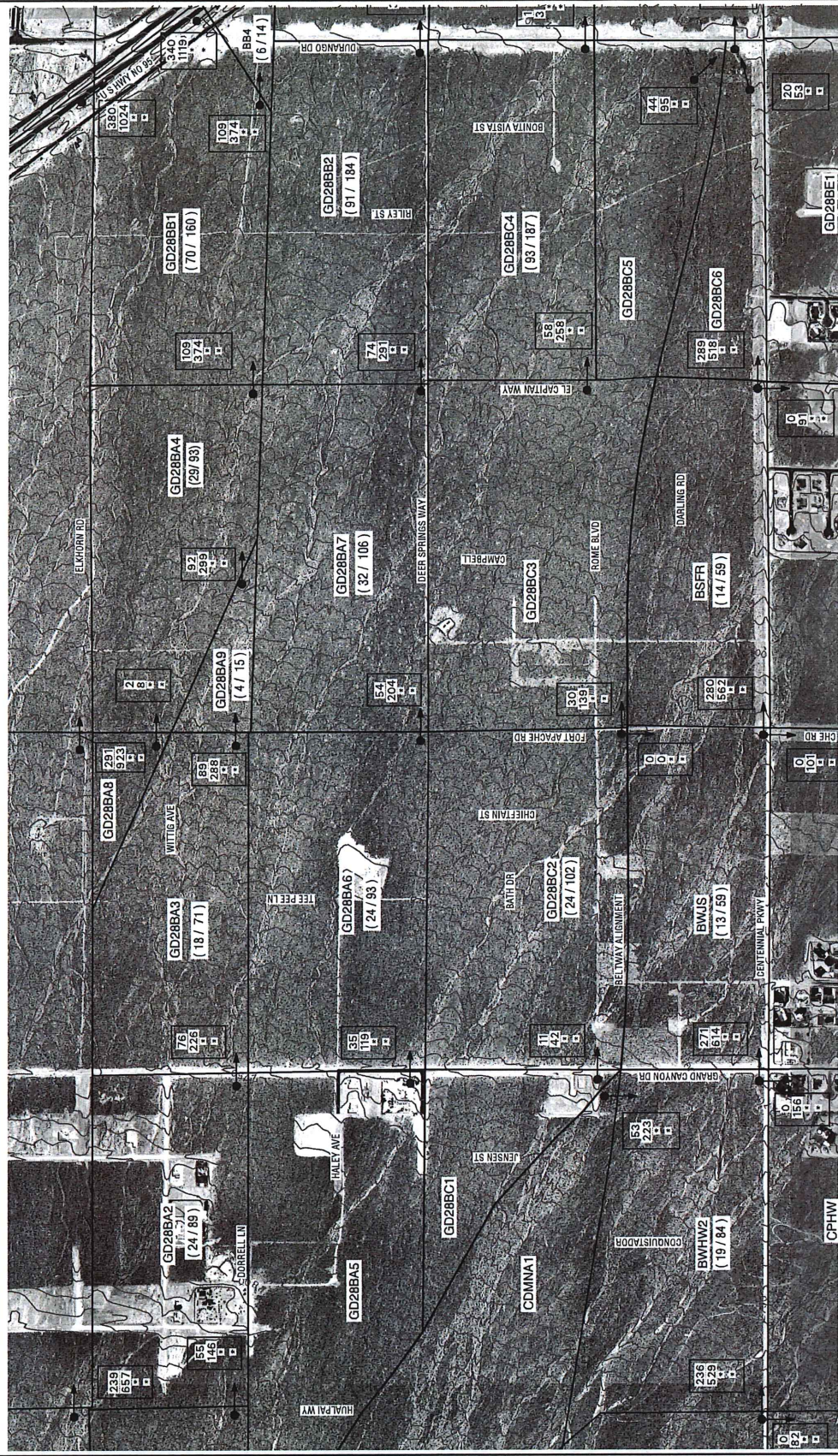


FIGURE 6

NOTE:
Existing conditions are based on future
CN values with only existing local and
CCRFCD facilities in place

SCALE: 1 INCH = 800 FEET
(IN FEET)
800 600 400 200 0 400 800

REVISED SEPTEMBER 1999

NORTHWEST
NEIGHBORHOOD
STUDY

LEGEND

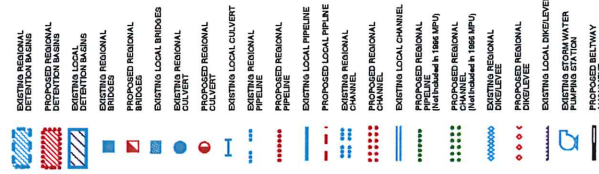


FIGURE F-1

FUTURE DRAINAGE CONDITIONS

FIGURE 6A

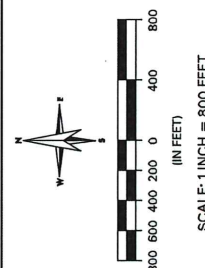


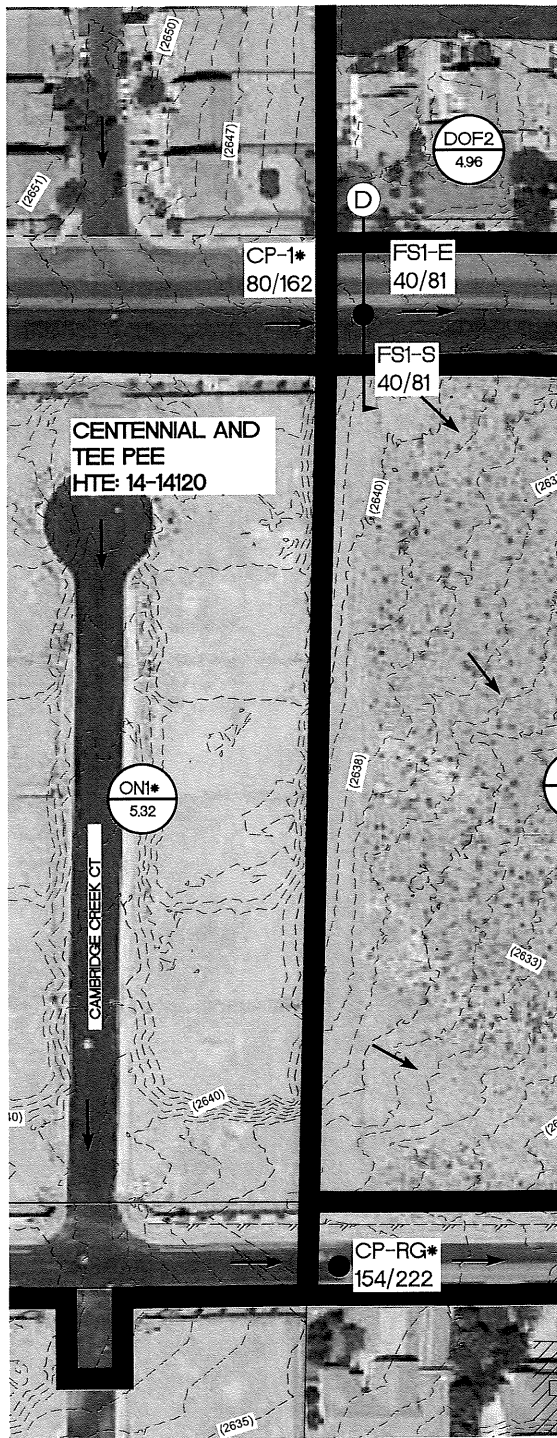
ENGINEERING PLANNING GIE SURVEYING CONSTRUCTION SERVICES

ALUTAI	10	11	12			
PT. APACHE	1	4	5	6	7	8
DUMANO	2	3	4	5	6	7
SUPALO	3	4	5	6	7	8
NAJAYON	4	5	6	7	8	9
JOLES	5	6	7	8	9	10
DECATUM	6	7	8	9	10	11
BLUOKO	7	8	9	10	11	12
CENTUMAL	8	9	10	11	12	13
ALUTAI	9	10	11	12	13	14
CHAYO	10	11	12	13	14	15
BLUOKO	11	12	13	14	15	16

NOTE: Ultimate drainage conditions are based on future CN values with all flood control facilities in place

REVISED SEPTEMBER 1999

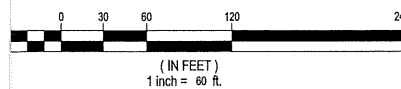




Existing Condition						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
NT EX 10 YR	ST1	43	2	0.49	3.28	1.61
NT EX 100 YR	ST1	92	2	0.63	4.00	2.52
EG EX 10 YR	ST2	195	2	0.88	6.02	5.30
EG EX 100 YR	ST2	309	2	1.06	7.22	7.65

STUDY

FILE NAME: BASIN FIGS.DWG

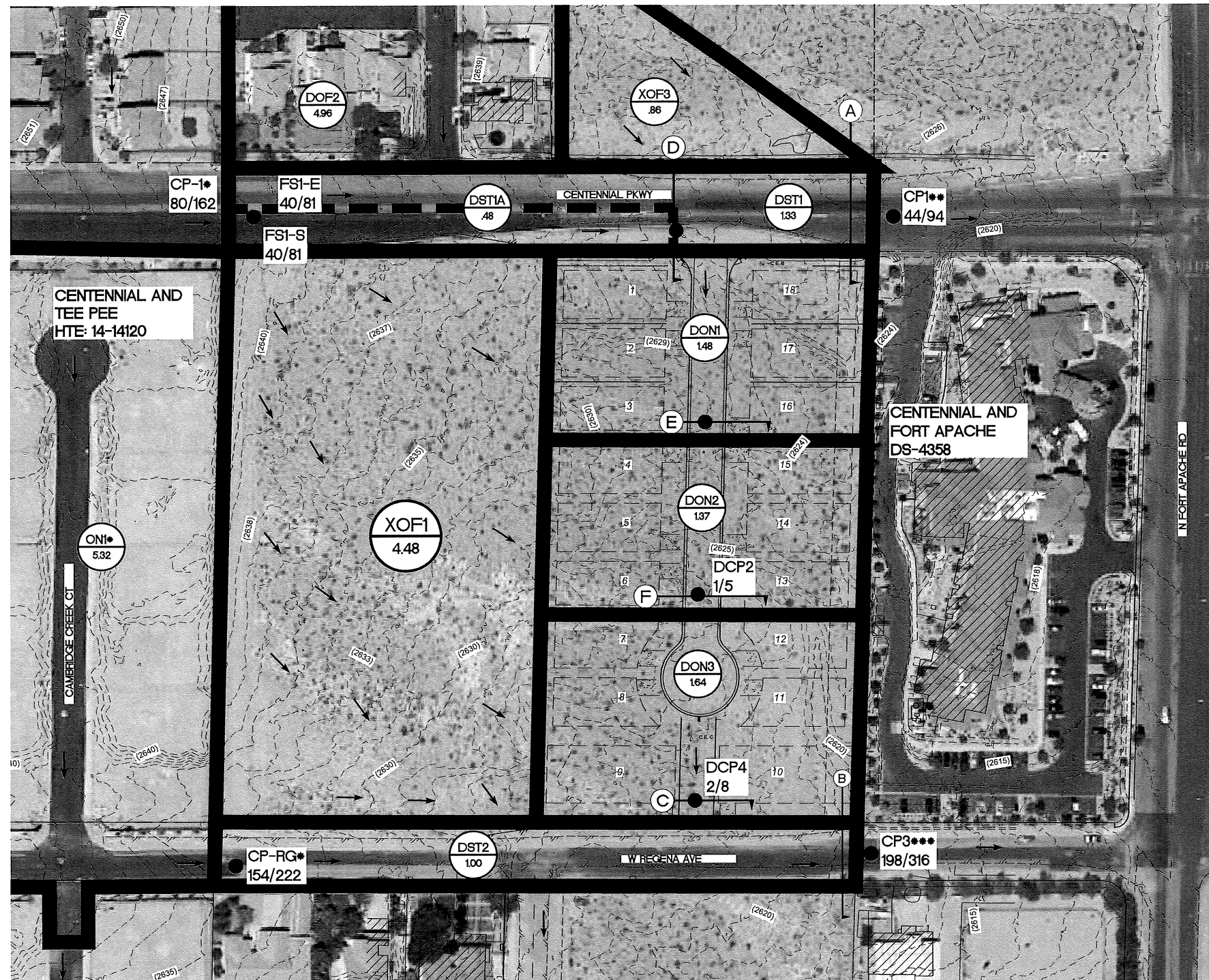


DRAINAGE LEGEND	
	BASIN IDENTIFICATION
	BASIN AREA (ACRES)
	BASIN BOUNDARY
	CONCENTRATION POINT
	FLOW PATH
	CROSS SECTION
	10-YR/100-YR FLOW (CFS)
	REFERENCE FLOW (CFS)



TANEY ENGINEERING
 6030 S. JONES BLVD STE#100
 LAS VEGAS, NV 89118
 (702) 362-8644 FAX: (702) 362-5233

FIGURE 7
EXISTING CONDITION
CENTENNIAL & FORT APACHE



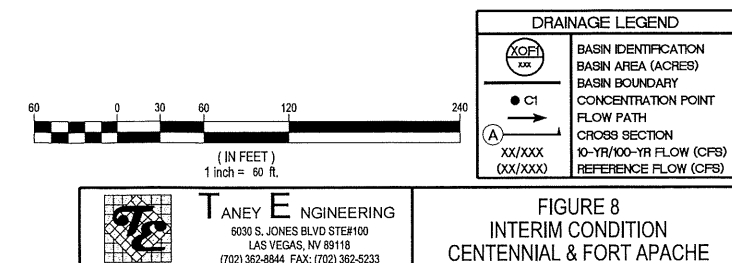
Interim Condition			
Basin	Area (acres)	Q _{f50} (cfs)	Q ₁₀₀ (cfs)
XOF1	4.48	<1	2
DOF2	4.96	2	8
XOF3	0.86	<1	<1
DN01	1.48	1	3
DN02	1.37	1	2
DN03	1.64	1	3
DS11	1.33	3	5
DS12	1.00	2	4
CP1**	-	44	94
DCP2	-	1	5
CP3***	-	198	316
DCP4	-	2	8
DCP5	-	4	9
FUT-1*	148.58	153	246
DOF4*	45.42	60	122
DOF1*	13.98	20	41
ON14*	5.32	1	6
CP-1*	-	80	162
CP-RG*	-	154	222

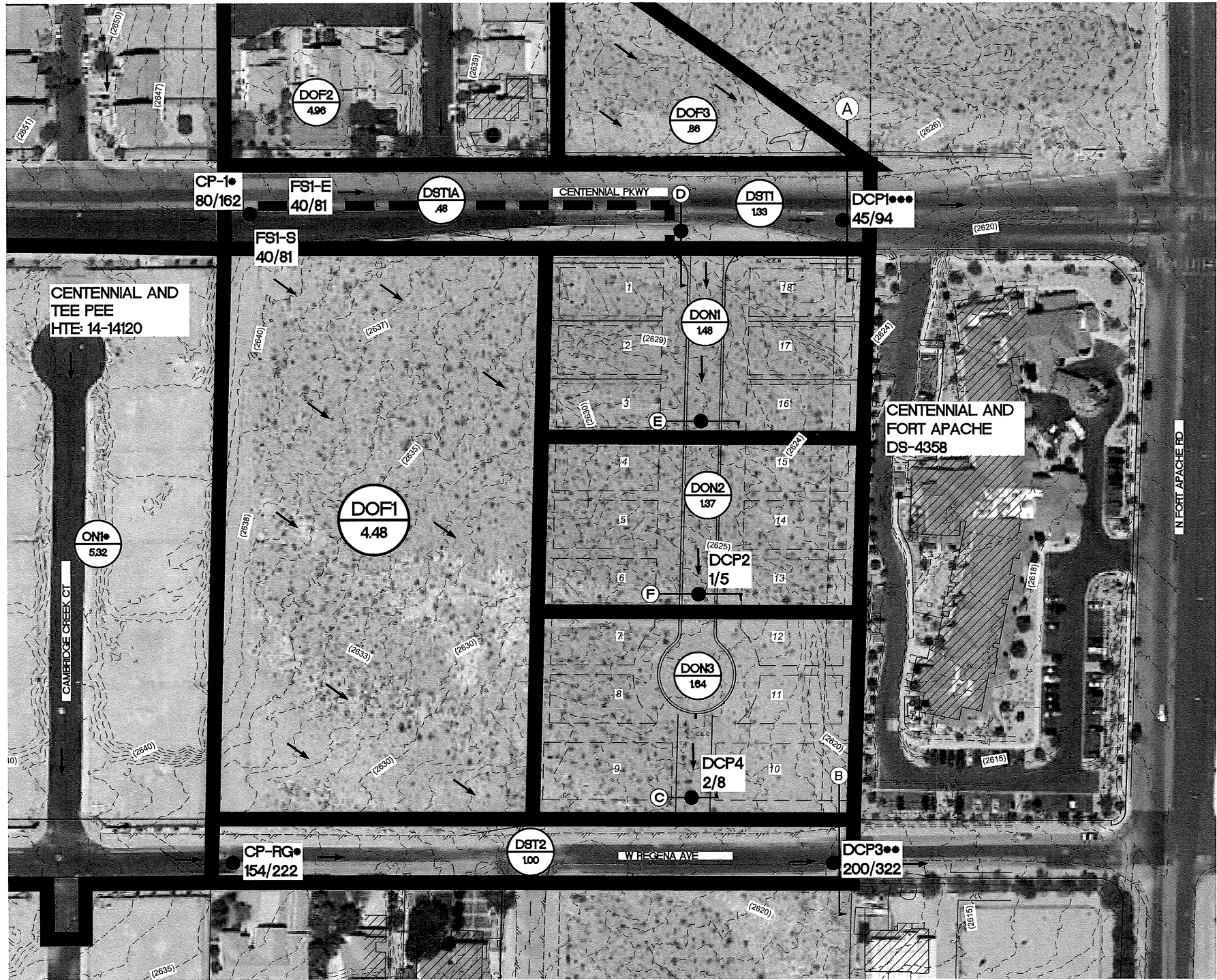
Interim Condition						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A CENT INT 10YR	DST1	44	2	0.54	4.36	2.35
A CENT INT 100 YR	DST1	94	2	0.66	5.22	3.45
B REG INT 10YR	DST2	198	2	0.84	7.69	6.46
B REG INT 100YR	DST2	316	2	0.98	9.26	9.07
C PRIV INT 10YR	DON3	2	2	0.22	2.35	0.52
C PRIV INT 100YR	DON3	8	2	0.32	3.18	1.02
D CENT INT 10YR	DST1	1	2	0.21	2.16	0.45
D CENT INT 100 YR	DST1	2	2	0.24	2.44	0.59
E PRIV INT 10YR	DON1	1	2	0.18	2.08	0.37
E PRIV INT 100YR	DON1	3	2	0.25	2.54	0.64
F PRIV INT 10YR	DON2	1	2	0.18	2.08	0.37
F PRIV INT 100YR	DON2	5	2	0.28	2.85	0.80

PRORATE FLOWS			
Basin	Area (acres)	Q ₁₀ (cfs)	cfs/acre
DST1	1.33	3	2.26
DST1A	0.48	1.08	2.26

PRORATE FLOWS			
Basin	Area (acres)	Q ₁₀₀ (cfs)	cfs/acre
DST1	1.33	5	3.76
DST1A	0.48	1.80	3.76

NOTES:
1. *REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY.
HTE: 14-1420
2. ** INCLUDES THE NORTHERN CENTENNIAL FLOW.
3. *** INCLUDES THE SOUTHERN CENTENNIAL FLOW.





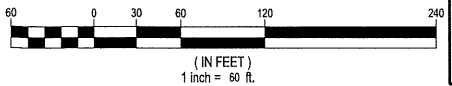
Developed Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
DOF1	4.48	2	8
DOF2	4.96	2	8
DOF3	0.86	<1	1
DON1	1.48	1	3
DON2	1.37	1	2
DON3	1.64	1	3
DST1	1.33	3	5
DST2	1.00	2	4
DCP1**	-	45	94
DCP2	-	1	5
DCP3***	-	200	322
DCP4	-	2	8
FUT-1*	148.58	153	246
DOF4*	45.42	60	122
DOF14*	13.98	20	41
ON1*	5.32	1	6
CP-1*	-	80	162
CP-RG*	-	154	222

Ultimate Condition						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A CENT ULT 10 YR	DST1	45	2	0.55	4.37	2.40
A CENT ULT 100 YR	DST1	94	2	0.66	5.22	3.45
B REG ULT 10 YR	DST2	200	2	0.84	7.72	6.48
B REG ULT 100 YR	DST2	322	2	0.99	9.32	9.23
C PRIV ULT 10 YR	DON3	2	2	0.22	2.35	0.52
C PRIV ULT 100 YR	DON3	8	2	0.32	3.18	1.02
D CENT ULT 10 YR	DST1	1	2	0.21	2.16	0.45
D CENT ULT 100 YR	DST1	2	2	0.25	2.45	0.61
E PRIV ULT 10 YR	DON1	1	2	0.18	2.08	0.37
E PRIV ULT 100 YR	DON1	3	2	0.25	2.54	0.64
F PRIV ULT 10 YR	DON2	1	2	0.18	2.08	0.37
F PRIV ULT 100 YR	DON2	5	2	0.28	2.85	0.80

PRORATE FLOWS			
Basin	Area (acres)	Q ₁₀ (cfs)	cfs/acre
DST1	1.33	3	2.26
DST1A	0.48	1.08	2.26

PRORATE FLOWS			
Basin	Area (acres)	Q ₁₀₀ (cfs)	cfs/acre
DST1	1.33	5	3.76
DST1A	0.48	1.80	3.76

- NOTES:
1. *REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
HTE: 14-1420
2. ** INCLUDES THE NORTHERN CENTENNIAL FLOW.
3. *** INCLUDES THE SOUTHERN CENTENNIAL FLOW.



TANEY ENGINEERING
6030 S. JONES BLVD STE#100
LAS VEGAS, NV 89118
(702) 362-8844 FAX: (702) 362-5233

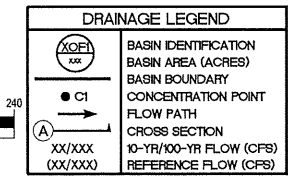
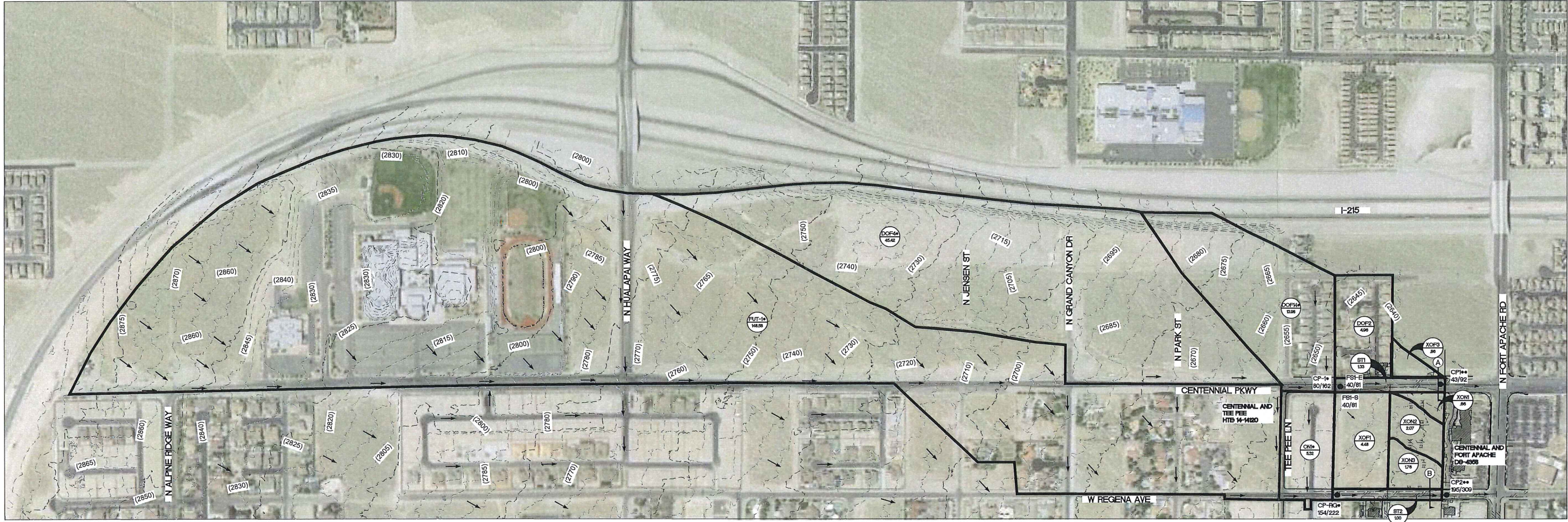


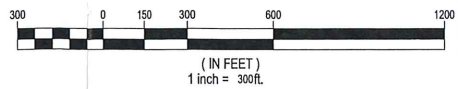
FIGURE 9
DEVELOPED CONDITION
CENTENNIAL & FORT APACHE



Existing Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
XOF1	4.48	<1	2
DOF2	4.96	2	8
XOF3	0.86	<1	<1
XON1	0.66	<1	<1
XON2	2.07	<1	1
XON3	1.76	<1	1
ST1	1.33	1	3
ST2	1.00	1	2
CP1**	-	43	92
CP2***	-	195	309
FUT-1*	148.58	153	246
DOF4*	45.42	60	122
DOF14*	13.98	20	41
ON1*	5.32	1	6
CP-1*	-	80	162
CP-RG*	-	154	222

Existing Condition						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A CENT EX 10 YR	ST1	43	2	0.49	3.28	1.61
A CENT EX 100 YR	ST1	92	2	0.63	4.00	2.52
B REG EX 10 YR	ST2	195	2	0.88	6.02	5.30
B REG EX 100 YR	ST2	309	2	1.06	7.22	7.65

NOTES:
1. *REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
HTE: 14-1420
2. ** INCLUDES THE NORTHERN CENTENNIAL FLOW.
3. *** INCLUDES THE SOUTHERN CENTENNIAL FLOW.



DRAINAGE LEGEND	
	BASIN IDENTIFICATION
	BASIN AREA (ACRES)
	BASIN BOUNDARY
	CONCENTRATION POINT
	FLOW PATH
	CROSS SECTION
	10-YR/100-YR FLOW (CFS)
	REFERENCE FLOW (CFS)

TANEY ENGINEERING
6030 S. JONES BLVD STE#100
LAS VEGAS, NV 89118
(702) 362-8844 FAX: (702) 362-6233

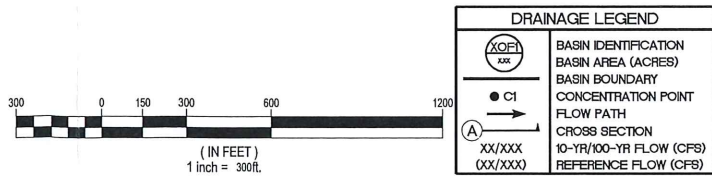
FIGURE 10
EXISTING OFFSITE BASIN
CENTENNIAL & FORT APACHE



Ultimate Condition						
Cross Section	Description	Q (cfs)	Slope (%)	Depth (ft)	Velocity (ft/s)	DxV
A CENT ULT 10 YR	DST1	45	2	0.55	4.37	2.40
A CENT ULT 100 YR	DST1	94	2	0.66	5.22	3.45
B REG ULT 10 YR	DST2	200	2	0.84	7.72	6.48
B REG ULT 100 YR	DST2	322	2	0.99	9.32	9.23
C PRIV ULT 10 YR	DON3	2	2	0.22	2.35	0.52
C PRIV ULT 100 YR	DON3	8	2	0.32	3.18	1.02
D CENT ULT 10 YR	DST1	1	2	0.21	2.16	0.45
D CENT ULT 100 YR	DST1	2	2	0.25	2.45	0.61
E PRIV ULT 10 YR	DON1	1	2	0.18	2.08	0.37
E PRIV ULT 100 YR	DON1	3	2	0.25	2.54	0.64
F PRIV ULT 10 YR	DON2	1	2	0.18	2.08	0.37
F PRIV ULT 100 YR	DON2	5	2	0.28	2.85	0.80

NOTES:
 1. *REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
 HTE: 14-1420
 2. ** INCLUDES THE NORTHERN CENTENNIAL FLOW.
 3. *** INCLUDES THE SOUTHERN CENTENNIAL FLOW.

Developed Condition			
Basin	Area (acres)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
DOF1	4.48	2	8
DOF2	4.96	2	8
DOF3	0.86	<1	1
DON1	1.48	1	3
DON2	1.37	1	2
DON3	1.64	1	3
DST1	1.33	3	5
DST2	1.00	2	4
DCP1**	-	45	94
DCP2	-	1	5
DCP3***	-	200	322
DCP4	-	2	8
FUT-1*	148.58	153	246
DOF4*	45.42	60	122
DOF14*	13.98	20	41
ON1*	5.32	1	6
CP-1*	-	80	162
CP-RG*	-	154	222



T ANEY ENGINEERING
 6030 S. JONES BLVD STE#100
 LAS VEGAS, NV 89118
 (702) 362-8844 FAX: (702) 362-6233

FIGURE 11
 DEVELOPED OFFSITE BASIN
 CENTENNIAL & FORT APACHE



APPENDIX C

Hydrologic Calculations



EXISTING CONDITION

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

```

43      KK      CP1
44      KM COMBINE DOF2, ST1, XOF3
45      HC      3
      *

46      KK      XOF1
47      BA .0070
48      LS      0      63
49      UD .134
      *

50      KK      XON1
51      BA .0010
52      LS      0      63
53      UD .110
      *

54      KK      XON2
55      BA .0032
56      LS      0      63
57      UD .144
      *

58      KK      XON3
59      BA .0028
60      LS      0      63
61      UD .100
      *

62      KK      ST2
63      BA .0016
64      LS      0      83
65      UD .074
      *

66      KK      CP2
67      KM COMBINE XOF1, XON1, XON2, XON3, ST2
68      HC      5
      *
69      ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

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

22      DOF2
      .
      .
35      .      ST1
      .      .
      .      .
39      .      .      XOF3
      .      .      .
      .      .      .
43      CP1.....
      .
      .
46      .      XOF1
      .      .
      .      .
50      .      .      XON1
      .      .      .
      .      .      .
54      .      .      .      XON2
      .      .      .      .
      .      .      .      .
58      .      .      .      .      XON3
      .      .      .      .      .
      .      .      .      .      .
62      .      .      .      .      .      ST2
      .      .      .      .      .      .
      .      .      .      .      .      .
66      .      CP2.....

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
* RUN DATE 30JUL18 TIME 11:58:40
*****

```

```

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

```

EX

[illegible]

10-YR AND 100-YR STORM EVENT

TANEY ENGINEERING
EXISTING CONDITION
FILE: EX.DAT
PROJECT No: ADV-17-086
DATE: JULY 2018

---> 6-HOUR / SDN 3 <---

19 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLST	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
            .56      1.00

```

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 .56	RATIO 2 1.00	
HYDROGRAPH AT +	DOF2	.01	1	FLOW TIME	2. 3.58	8. 3.58
HYDROGRAPH AT +	ST1	.00	1	FLOW TIME	1. 3.50	3. 3.50
HYDROGRAPH AT +	XOF3	.00	1	FLOW TIME	0. 4.92	0. 3.58
3 COMBINED AT +	CP1	.01	1	FLOW TIME	3. 3.58	11. 3.58
HYDROGRAPH AT +	XOF1	.01	1	FLOW TIME	0. 4.92	2. 3.58
HYDROGRAPH AT +	XON1	.00	1	FLOW TIME	0. 4.83	0. 3.58
HYDROGRAPH AT						

						EX
+	XON2	.00	1	FLOW TIME	0. 4.92	1. 3.58
HYDROGRAPH AT						
+	XON3	.00	1	FLOW TIME	0. 4.83	1. 3.58
HYDROGRAPH AT						
+	ST2	.00	1	FLOW TIME	1. 3.50	2. 3.50
5 COMBINED AT						
+	CP2	.02	1	FLOW TIME	1. 3.50	6. 3.58

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



INTERIM CONDITION

INT10

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
43	KK CP1
44	KM COMBINE DST1, DOF2, XOF3
45	HC 3
	*
46	KK CP-1
47	KM REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
48	BA .0001
49	BF 40
50	LS 0 63
51	UD .6
	*
52	KK RTCP-1
53	KM ROUTE CP-1 THROUGH CP3
54	RD 1021 .015 .030 TRAP
	*
55	KK XOF1
56	BA .0070
57	BF 0
58	LS 0 63
59	UD .134
	*
60	KK CP-RG
61	KM REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
62	BA .0001
63	BF 154
64	LS 0 63
65	UD .6
	*
66	KK DON1
67	BA .0023
68	BF 0
69	LS 0 80
70	UD .093
	*
71	KK DON2
72	BA .0021
73	LS 0 80
74	UD .092
	*
75	KK DCP2
76	KM COMBINE DON1, DON2
77	HC 2
	*

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
78	KK DON3
79	BA .0026
80	LS 0 80
81	UD .094
	*
82	KK DCP4
83	KM COMBINE DCP2, DON3
84	HC 2
	*
85	KK DST2
86	BA .0016
87	LS 0 98
88	UD .054
	*
89	KK CP3
90	KM COMBINE RTCP-1, XOF1, DST2, DCP4, CP-RG
91	HC 5
	*
92	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT		
LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	DOF2	
	.	
	.	

35	.	DST1			
	.	.			
39	.	.	XOF3		
	.	.	.		
	.	.	.		
43	CP1.....				
	.				
46		CP-1			
	.	V			
	.	V			
52		RTCP-1			
	.	.			
	.	.			
55	.	.	XOF1		
	.	.	.		
	.	.	.		
60	.	.		CP-RG	
	.	.	.	.	
	.	.	.	.	
66	.	.	.	.	DON1
	.	.	.	.	.
	.	.	.	.	.
71	.	.	.	.	DON2
	.	.	.	.	.
	.	.	.	.	.
75	.	.	.	.	DCP2.....
	.	.	.	.	.
	.	.	.	.	.
78	.	.	.	.	DON3
	.	.	.	.	.
	.	.	.	.	.
82	.	.	.	.	DCP4.....
	.	.	.	.	.
	.	.	.	.	.
85	.	.	.	.	DST2
	.	.	.	.	.
	.	.	.	.	.
89	CP3.....				

```

1*****
*
*   FLOOD HYDROGRAPH PACKAGE   (HEC-1)
*   JUN 1998
*   VERSION 4.1
*
*   RUN DATE   31JUL18   TIME   15:06:59
*
*****

```

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

--> 6-HOUR / SDN 3 <---

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

Page 3

INT10

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
 .56 1.00

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 .56	RATIO 2 1.00
HYDROGRAPH AT					
+	DOF2	.01	1 FLOW	2.	8.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	DST1	.00	1 FLOW	3.	5.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	XOF3	.00	1 FLOW	0.	0.
			TIME	4.92	3.58
3 COMBINED AT					
+	CP1	.01	1 FLOW	4.	12.
			TIME	3.50	3.50
HYDROGRAPH AT					
+	CP-1	.00	1 FLOW	40.	40.
			TIME	5.00	4.08
ROUTED TO					
+	RTCP-1	.00	1 FLOW	40.	40.
			TIME	5.00	4.25
HYDROGRAPH AT					
+	XOF1	.01	1 FLOW	0.	2.
			TIME	4.92	3.58
HYDROGRAPH AT					
+	CP-RG	.00	1 FLOW	154.	154.
			TIME	5.00	4.08
HYDROGRAPH AT					
+	DON1	.00	1 FLOW	1.	3.
			TIME	3.58	3.50
HYDROGRAPH AT					
+	DON2	.00	1 FLOW	1.	2.
			TIME	3.58	3.50
2 COMBINED AT					
+	DCP2	.00	1 FLOW	1.	5.
			TIME	3.58	3.50
HYDROGRAPH AT					
+	DON3	.00	1 FLOW	1.	3.
			TIME	3.58	3.50
2 COMBINED AT					
+	DCP4	.01	1 FLOW	2.	8.
			TIME	3.58	3.50
HYDROGRAPH AT					
+	DST2	.00	1 FLOW	2.	4.
			TIME	3.50	3.50
5 COMBINED AT					
+	CP3	.02	1 FLOW	198.	207.
			TIME	3.50	3.50

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INT10		COMPUTATION PEAK	INTERVAL TIME TO PEAK	VOLUME
						DT	PEAK			
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)	
FOR PLAN = 1	RATIO=	.00								
RTCP-1	MANE	2.20	40.00	316.96	15439.36	5.00	40.00	315.00	15444.30	
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8247E+02 EXCESS= .0000E+00 OUTFLOW= .8247E+02 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0										
FOR PLAN = 1	RATIO=	.00								
RTCP-1	MANE	2.20	40.01	253.11	15439.30	5.00	40.01	255.00	15444.65	
CONTINUITY SUMMARY (AC-FT) - INFLOW= .8246E+02 EXCESS= .0000E+00 OUTFLOW= .8246E+02 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0										
*** NORMAL END OF HEC-1 ***										

INT100

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
43	KK CP1
44	KM COMBINE DST1, DOF2, XOF3
45	HC 3
	*
46	KK CP-1
47	KM REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
48	BA .0001
49	BF 81
50	LS 0 63
51	UD .6
	*
52	KK RTCP-1
53	KM ROUTE CP-1 THROUGH CP3
54	RD 1021 .015 .030 TRAP
	*
55	KK XOF1
56	BA .0070
57	BF 0
58	LS 0 63
59	UD .134
	*
60	KK CP-RG
61	KM REFERENCED FROM THE CENTENNIAL AND TEE PEE STUDY
62	BA .0001
63	BF 222
64	LS 0 63
65	UD .6
	*
66	KK DON1
67	BA .0023
68	BF 0
69	LS 0 80
70	UD .093
	*
71	KK DON2
72	BA .0021
73	LS 0 80
74	UD .092
	*
75	KK DCP2
76	KM COMBINE DON1, DON2
77	HC 2
	*

1

HEC-1 INPUT

PAGE 3

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
78	KK DON3
79	BA .0026
80	LS 0 80
81	UD .094
	*
82	KK DCP4
83	KM COMBINE DCP2, DON3
84	HC 2
	*
85	KK DST2
86	BA .0016
87	LS 0 98
88	UD .054
	*
89	KK CP3
90	KM COMBINE RTCP-1, XOF1, DST2, DCP4, CP-RG
91	HC 5
	*
92	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT		
LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
22	DOF2	
	.	
	.	

35	.	DST1
	.	.
39	.	XOF3
	.	.
43	CP1.....	.
	.	.
46		CP-1
	.	V
	.	V
52	. RTCP-1	.
	.	.
55	.	XOF1
	.	.
60	.	CP-RG
	.	.
66	.	DON1
	.	.
71	.	DON2
	.	.
75	.	DCP2.....
	.	.
78	.	DON3
	.	.
82	.	DCP4.....
	.	.
85	.	DST2
	.	.
89	CP3.....	.

```

1*****
*
*   FLOOD HYDROGRAPH PACKAGE   (HEC-1)
*           JUN   1998
*           VERSION 4.1
*
*   RUN DATE   31JUL18   TIME   15:07:07
*
*****

```

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

10-YR AND 100-YR STORM EVENT

TANEY ENGINEERING

INTERIM CONDITION

FILE: INT100.DAT

PROJECT No: ADV-17-086

DATE: JULY 2018

[illegible]

---> 6-HOUR / SDN 3 <---

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

Page 3

INT100

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
 .56 1.00

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 .56	RATIO 2 1.00
HYDROGRAPH AT					
+	DOF2	.01	1 FLOW TIME	2. 3.58	8. 3.58
HYDROGRAPH AT					
+	DST1	.00	1 FLOW TIME	3. 3.50	5. 3.50
HYDROGRAPH AT					
+	XOF3	.00	1 FLOW TIME	0. 4.92	0. 3.58
3 COMBINED AT					
+	CP1	.01	1 FLOW TIME	4. 3.50	12. 3.50
HYDROGRAPH AT					
+	CP-1	.00	1 FLOW TIME	81. 5.00	81. 4.08
ROUTED TO					
+	RTCP-1	.00	1 FLOW TIME	81. 5.00	81. 4.08
HYDROGRAPH AT					
+	XOF1	.01	1 FLOW TIME	0. 4.92	2. 3.58
HYDROGRAPH AT					
+	CP-RG	.00	1 FLOW TIME	222. 5.00	222. 4.08
HYDROGRAPH AT					
+	DON1	.00	1 FLOW TIME	1. 3.58	3. 3.50
HYDROGRAPH AT					
+	DON2	.00	1 FLOW TIME	1. 3.58	2. 3.50
2 COMBINED AT					
+	DCP2	.00	1 FLOW TIME	1. 3.58	5. 3.50
HYDROGRAPH AT					
+	DON3	.00	1 FLOW TIME	1. 3.58	3. 3.50
2 COMBINED AT					
+	DCP4	.01	1 FLOW TIME	2. 3.58	8. 3.50
HYDROGRAPH AT					
+	DST2	.00	1 FLOW TIME	2. 3.50	4. 3.50
5 COMBINED AT					
+	CP3	.02	1 FLOW TIME	307. 3.50	316. 3.50

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INT100			
						DT	COMPUTATION PEAK	INTERVAL TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
RTCP-1	MANE	1.85	81.00	317.37	31265.79	5.00	81.00	315.00	31274.61
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1670E+03 EXCESS= .0000E+00 OUTFLOW= .1670E+03 BASIN STORAGE= .0000E+00 PERCENT ERROR= .0									
FOR PLAN = 1 RATIO= .00									
RTCP-1	MANE	1.85	81.01	252.78	31265.69	5.00	81.01	255.00	31274.96
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1670E+03 EXCESS= .0000E+00 OUTFLOW= .1670E+03 BASIN STORAGE=-.2235E-07 PERCENT ERROR= .0									
*** NORMAL END OF HEC-1 ***									



DEVELOPED CONDITION

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10	DEV
43	KK DCP1	
44	KM COMBINE DOF2, DST1, DOF3	
45	HC 3	
	*	
46	KK DOF1	
47	BA .0070	
48	LS 0	80
49	UD .094	
	*	
50	KK DON1	
51	BA .0023	
52	LS 0	80
53	UD .093	
	*	
54	KK DON2	
55	BA .0021	
56	LS 0	80
57	UD .092	
	*	
58	KK DCP2	
59	KM COMBINE DON1, DON2	
60	HC 2	
	*	
61	KK DON3	
62	BA .0026	
63	LS 0	80
64	UD .094	
	*	
65	KK DCP4	
66	KM COMBINE DCP2, DON3	
67	HC 2	
	*	
68	KK DST2	
69	BA .0016	
70	LS 0	98
71	UD .054	
	*	
72	KK DCP3	
73	KM COMBINE DOF1, DST2, DCP4	
74	HC 3	
	*	
75	ZZ	

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

```

22  DOF2
    .
35  .      DST1
    .
39  .      .      DOF3
    .      .
43  DCP1.....
    .
46  .      DOF1
    .
50  .      .      DON1
    .      .
54  .      .      DON2
    .      .
58  .      .      DCP2.....
    .      .
61  .      .      DON3
    .      .
65  .      .      DCP4.....
    .      .
  
```

68 . . . DST2

 72 . . . DCP3

```

*****
*      FLOOD HYDROGRAPH PACKAGE  (HEC-1)      *
*              JUN  1998              *
*              VERSION 4.1              *
*                                          *
*  RUN DATE   31JUL18  TIME  15:03:33  *
*                                          *
*****

```

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

TANEY ENGINEERING
ULTIMATE CONDITION
FILE: ULT.DAT
PROJECT No: ADV-17-086
DATE: JULY 2018

---> 6-HOUR / SDN 3 <---

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

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

JR	MULTI-RATIO OPTION
	RATIOS OF PRECIPITATION
	.56 1.00

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

Page 3

							DEV
+	DOF3	.00	1	FLOW TIME	0. 3.50	1. 3.50	
	3 COMBINED AT						
+	DCP1	.01	1	FLOW TIME	5. 3.50	13. 3.50	
	HYDROGRAPH AT						
+	DOF1	.01	1	FLOW TIME	2. 3.58	8. 3.50	
	HYDROGRAPH AT						
+	DON1	.00	1	FLOW TIME	1. 3.58	3. 3.50	
	HYDROGRAPH AT						
+	DON2	.00	1	FLOW TIME	1. 3.58	2. 3.50	
	2 COMBINED AT						
+	DCP2	.00	1	FLOW TIME	1. 3.58	5. 3.50	
	HYDROGRAPH AT						
+	DON3	.00	1	FLOW TIME	1. 3.58	3. 3.50	
	2 COMBINED AT						
+	DCP4	.01	1	FLOW TIME	2. 3.58	8. 3.50	
	HYDROGRAPH AT						
+	DST2	.00	1	FLOW TIME	2. 3.50	4. 3.50	
	3 COMBINED AT						
+	DCP3	.02	1	FLOW TIME	6. 3.50	19. 3.50	

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



APPENDIX D

Hydraulic Calculations



EXISTING CONDITION

Worksheet for A CENT EX 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 43.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.88
0+15.0	2630.38
0+30.0	2630.88
0+50.0	2631.08
0+70.0	2630.88
0+82.5	2630.38
0+95.0	2630.88

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.88)	(0+30.0, 2630.88)	0.025
(0+30.0, 2630.88)	(0+70.0, 2630.88)	0.016
(0+70.0, 2630.88)	(0+95.0, 2630.88)	0.025

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 0.49 ft
Elevation Range 2630.38 to 2631.08 ft
Flow Area 13.10 ft²
Wetted Perimeter 53.73 ft

Worksheet for A CENT EX 10 YR

Results

Hydraulic Radius	0.24	ft
Top Width	53.69	ft
Normal Depth	0.49	ft
Critical Depth	0.52	ft
Critical Slope	0.01443	ft/ft
Velocity	3.28	ft/s
Velocity Head	0.17	ft
Specific Energy	0.66	ft
Froude Number	1.17	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.49	ft
Critical Depth	0.52	ft
Channel Slope	2.00	%
Critical Slope	0.01443	ft/ft

Worksheet for A CENT EX 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 92.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.88
0+15.0	2630.38
0+30.0	2630.88
0+50.0	2631.08
0+70.0	2630.88
0+82.5	2630.38
0+95.0	2630.88

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.88)	(0+30.0, 2630.88)	0.025
(0+30.0, 2630.88)	(0+70.0, 2630.88)	0.016
(0+70.0, 2630.88)	(0+95.0, 2630.88)	0.025

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 0.63 ft
Elevation Range 2630.38 to 2631.08 ft
Flow Area 22.99 ft²
Wetted Perimeter 82.29 ft

Worksheet for A CENT EX 100 YR

Results

Hydraulic Radius	0.28	ft
Top Width	81.98	ft
Normal Depth	0.63	ft
Critical Depth	0.71	ft
Critical Slope	0.01095	ft/ft
Velocity	4.00	ft/s
Velocity Head	0.25	ft
Specific Energy	0.88	ft
Froude Number	1.33	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.71	ft
Channel Slope	2.00	%
Critical Slope	0.01095	ft/ft

Cross Section for A CENT EX 100 YR

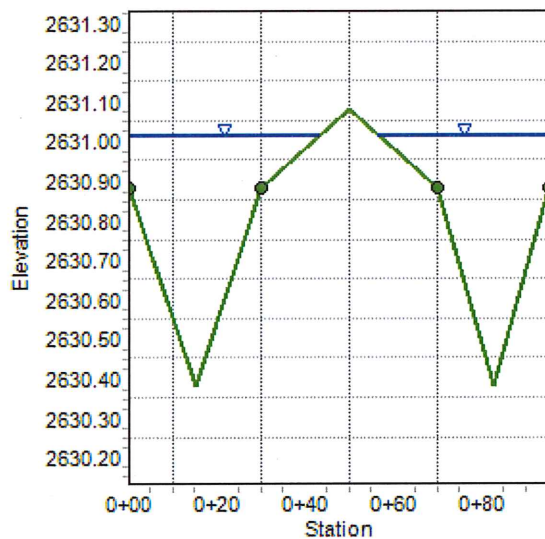
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.63 ft
Discharge 92.00 ft³/s

Cross Section Image



Worksheet for B REG EX 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 195.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3.00
0+00.0	0.60
0+11.0	0.00
0+22.0	0.47
0+30.0	0.63
0+38.0	0.47
0+49.0	0.00
0+60.0	0.60
0+60.0	3.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3.00)	(0+22.0, 0.47)	0.025
(0+22.0, 0.47)	(0+38.0, 0.47)	0.016
(0+38.0, 0.47)	(0+60.0, 3.00)	0.025

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 0.88 ft
Elevation Range 0.00 to 3.00 ft

Worksheet for B REG EX 10 YR

Results

Flow Area	32.38	ft²
Wetted Perimeter	60.62	ft
Hydraulic Radius	0.53	ft
Top Width	60.00	ft
Normal Depth	0.88	ft
Critical Depth	1.03	ft
Critical Slope	0.00888	ft/ft
Velocity	6.02	ft/s
Velocity Head	0.56	ft
Specific Energy	1.45	ft
Froude Number	1.45	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.88	ft
Critical Depth	1.03	ft
Channel Slope	2.00	%
Critical Slope	0.00888	ft/ft

Cross Section for B REG EX 10 YR

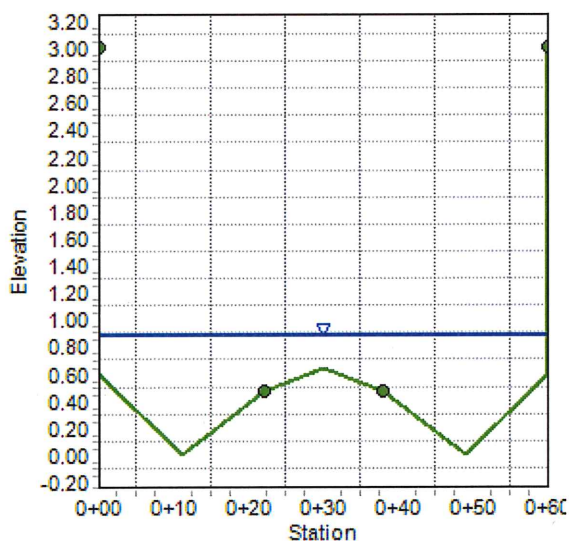
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.88 ft
Discharge 195.00 ft³/s

Cross Section Image



Worksheet for B REG EX 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 309.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3.00
0+00.0	0.60
0+11.0	0.00
0+22.0	0.47
0+30.0	0.63
0+38.0	0.47
0+49.0	0.00
0+60.0	0.60
0+60.0	3.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3.00)	(0+22.0, 0.47)	0.025
(0+22.0, 0.47)	(0+38.0, 0.47)	0.016
(0+38.0, 0.47)	(0+60.0, 3.00)	0.025

Options

Current Roughness Vweighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Results

Normal Depth 1.06 ft
Elevation Range 0.00 to 3.00 ft

Worksheet for B REG EX 100 YR

Results

Flow Area	42.78	ft ²
Wetted Perimeter	60.97	ft
Hydraulic Radius	0.70	ft
Top Width	60.00	ft
Normal Depth	1.06	ft
Critical Depth	1.28	ft
Critical Slope	0.00811	ft/ft
Velocity	7.22	ft/s
Velocity Head	0.81	ft
Specific Energy	1.87	ft
Froude Number	1.51	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.06	ft
Critical Depth	1.28	ft
Channel Slope	2.00	%
Critical Slope	0.00811	ft/ft



INTERIM CONDITION

Worksheet for A CENT INT 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 44.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.013
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.016
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.013

Options

Current Roughness Weighted Pavlovskii's Method
Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for A CENT INT 10 YR

Results

Normal Depth	0.54	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	10.10	ft ²
Wetted Perimeter	55.33	ft
Hydraulic Radius	0.18	ft
Top Width	54.31	ft
Normal Depth	0.54	ft
Critical Depth	0.64	ft
Critical Slope	0.00588	ft/ft
Velocity	4.36	ft/s
Velocity Head	0.29	ft
Specific Energy	0.84	ft
Froude Number	1.78	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.54	ft
Critical Depth	0.64	ft
Channel Slope	2.00	%
Critical Slope	0.00588	ft/ft

Worksheet for A CENT INT 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 94.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.013
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.016
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for A CENT INT 100 YR

Results

Normal Depth	0.66	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	18.01	ft ²
Wetted Perimeter	75.77	ft
Hydraulic Radius	0.24	ft
Top Width	74.61	ft
Normal Depth	0.66	ft
Critical Depth	0.80	ft
Critical Slope	0.00519	ft/ft
Velocity	5.22	ft/s
Velocity Head	0.42	ft
Specific Energy	1.09	ft
Froude Number	1.87	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.66	ft
Critical Depth	0.80	ft
Channel Slope	2.00	%
Critical Slope	0.00519	ft/ft

Project Description

Input Data

Station (ft)

Elevation (ft)

Roughness Segment Definitions

Start Station

Ending Station

Roughness Coefficient

(0+00.0, 3.00)	(0+07.0, 0.17)	0.013
(0+07.0, 0.17)	(0+53.0, 0.17)	0.016
(0+53.0, 0.17)	(0+60.0, 3.00)	0.013

Current Roughness vweighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Worksheet for B REG INT 10 YR

Results

Normal Depth	0.84	ft
Elevation Range	0.00 to 3.00	ft
Flow Area	25.76	ft ²
Wetted Perimeter	61.51	ft
Hydraulic Radius	0.42	ft
Top Width	60.00	ft
Normal Depth	0.84	ft
Critical Depth	1.11	ft
Critical Slope	0.00402	ft/ft
Velocity	7.69	ft/s
Velocity Head	0.92	ft
Specific Energy	1.76	ft
Froude Number	2.07	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.84	ft
Critical Depth	1.11	ft
Channel Slope	2.00	%
Critical Slope	0.00402	ft/ft

Project Description

Normal Depth

198.00 ft³/s

The graph displays the elevation of a road profile (blue line) and the ground profile (green line) over a station range from 0+00 to 0+60. The vertical axis represents Elevation from -0.20 to 3.20. The road profile shows a dip at station 0+05 and a rise at station 0+55. The ground profile shows a dip at station 0+05 and a rise at station 0+55. A blue triangle points to the road profile at station 0+30.

Station	Road Elevation	Ground Elevation
0+00	0.60	0.60
0+05	0.00	0.00
0+10	0.20	0.20
0+20	0.40	0.40
0+30	0.60	0.60
0+40	0.40	0.40
0+50	0.20	0.20
0+55	0.00	0.00
0+60	0.60	0.60

Project Description

Input Data

Station (ft)	Elevation (ft)
--------------	----------------

Roughness Segment Definitions

Options

Bentley Systems, Inc. Haestad Methods Software Center Master V8i (SELECTseries 1) [08.11.01.03]

Worksheet for B REG INT 100 YR

Results

Normal Depth	0.98	ft
Elevation Range	0.00 to 3.00 ft	
Flow Area	34.13	ft ²
Wetted Perimeter	61.79	ft
Hydraulic Radius	0.55	ft
Top Width	60.00	ft
Normal Depth	0.98	ft
Critical Depth	1.36	ft
Critical Slope	0.00366	ft/ft
Velocity	9.26	ft/s
Velocity Head	1.33	ft
Specific Energy	2.31	ft
Froude Number	2.16	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.98	ft
Critical Depth	1.36	ft
Channel Slope	2.00	%
Critical Slope	0.00366	ft/ft

Project Description

Manning Formula

Normal Depth

Channel Slope	2.00	%
Normal Depth	0.98	ft
Discharge	316.00	ft ³ /s

Worksheet for C PRIV INT 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 2.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for C PRIV INT 10 YR

Results

Normal Depth	0.22	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	0.85	ft ²
Wetted Perimeter	12.17	ft
Hydraulic Radius	0.07	ft
Top Width	12.08	ft
Normal Depth	0.22	ft
Critical Depth	0.25	ft
Critical Slope	0.00784	ft/ft
Velocity	2.35	ft/s
Velocity Head	0.09	ft
Specific Energy	0.31	ft
Froude Number	1.56	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.25	ft
Channel Slope	2.00	%
Critical Slope	0.00784	ft/ft

Project Description

Manning Formula

Normal Depth

2.00 ft³/s

Worksheet for C PRIV INT 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 8.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness vweighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for C PRIV INT 100 YR

Results

Normal Depth	0.32	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	2.52	ft ²
Wetted Perimeter	22.25	ft
Hydraulic Radius	0.11	ft
Top Width	22.12	ft
Normal Depth	0.32	ft
Critical Depth	0.39	ft
Critical Slope	0.00740	ft/ft
Velocity	3.18	ft/s
Velocity Head	0.16	ft
Specific Energy	0.47	ft
Froude Number	1.66	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.39	ft
Channel Slope	2.00	%
Critical Slope	0.00740	ft/ft

Project Description

Normal Depth

8.00 ft³/s

Worksheet for D CENT INT 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.016
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.013
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.016

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for D CENT INT 10 YR

Results

Normal Depth	0.21	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	0.46	ft ²
Wetted Perimeter	8.19	ft
Hydraulic Radius	0.06	ft
Top Width	7.76	ft
Normal Depth	0.21	ft
Critical Depth	0.23	ft
Critical Slope	0.00793	ft/ft
Velocity	2.16	ft/s
Velocity Head	0.07	ft
Specific Energy	0.28	ft
Froude Number	1.56	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.21	ft
Critical Depth	0.23	ft
Channel Slope	2.00	%
Critical Slope	0.00793	ft/ft

Cross Section for D CENT INT 10 YR

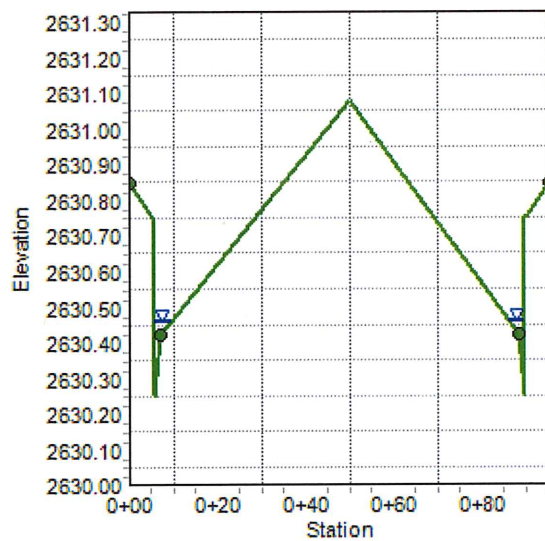
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.21 ft
Discharge 1.00 ft³/s

Cross Section Image



Worksheet for D CENT INT 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 2.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.016
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.013
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.016

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for D CENT INT 100 YR

Results

Normal Depth	0.24	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	0.82	ft ²
Wetted Perimeter	12.66	ft
Hydraulic Radius	0.06	ft
Top Width	12.15	ft
Normal Depth	0.24	ft
Critical Depth	0.28	ft
Critical Slope	0.00688	ft/ft
Velocity	2.44	ft/s
Velocity Head	0.09	ft
Specific Energy	0.34	ft
Froude Number	1.66	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.28	ft
Channel Slope	2.00	%
Critical Slope	0.00688	ft/ft

Cross Section for D CENT INT 100 YR

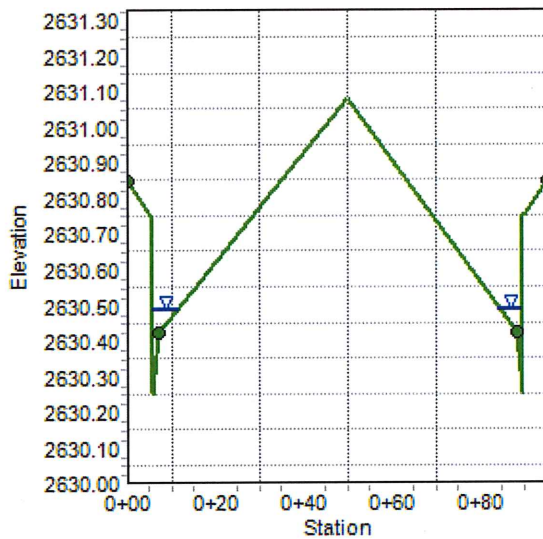
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.24 ft
Discharge 2.00 ft³/s

Cross Section Image



Worksheet for E PRIV INT 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness vweighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for E PRIV INT 10 YR

Results

Normal Depth	0.18	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	0.48	ft ²
Wetted Perimeter	8.44	ft
Hydraulic Radius	0.06	ft
Top Width	8.36	ft
Normal Depth	0.18	ft
Critical Depth	0.21	ft
Critical Slope	0.00819	ft/ft
Velocity	2.08	ft/s
Velocity Head	0.07	ft
Specific Energy	0.25	ft
Froude Number	1.52	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.21	ft
Channel Slope	2.00	%
Critical Slope	0.00819	ft/ft

Project Description

Manning Formula

Normal Depth

1.00 ft³/s

The graph shows the vertical alignment of a road. The x-axis represents the stationing from 0+00 to 0+45, and the y-axis represents the elevation from -0.20 to 0.70. The green line represents the existing ground surface, and the blue line represents the proposed road grade. The road grade is a parabolic curve that starts at an elevation of 0.38 at station 0+00, drops to a minimum elevation of 0.18 at station 0+05, rises to a maximum elevation of 0.48 at station 0+25, and then drops to a minimum elevation of 0.18 at station 0+40, before rising to 0.38 at station 0+45. The ground surface is relatively flat at 0.38 from station 0+00 to 0+05, then drops to 0.00 at station 0+05, rises to a peak of 0.48 at station 0+25, and then drops to 0.00 at station 0+40, before rising to 0.38 at station 0+45. The vertical curve points are marked with black dots at stations 0+05 and 0+40.

Worksheet for E PRIV INT 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 3.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for E PRIV INT 100 YR

Results

Normal Depth	0.25	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	1.18	ft ²
Wetted Perimeter	14.72	ft
Hydraulic Radius	0.08	ft
Top Width	14.62	ft
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Critical Slope	0.00757	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	0.35	ft
Froude Number	1.58	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Channel Slope	2.00	%
Critical Slope	0.00757	ft/ft

Project Description

Manning Formula

Normal Depth

Channel Slope

2.00 %

0.25 ft

3.00 ft³/s

Worksheet for F PRIV INT 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for F PRIV INT 10 YR

Results

Normal Depth		0.18	ft
Elevation Range	0.00 to 0.48 ft		
Flow Area		0.48	ft ²
Wetted Perimeter		8.44	ft
Hydraulic Radius		0.06	ft
Top Width		8.36	ft
Normal Depth		0.18	ft
Critical Depth		0.21	ft
Critical Slope		0.00819	ft/ft
Velocity		2.08	ft/s
Velocity Head		0.07	ft
Specific Energy		0.25	ft
Froude Number		1.52	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.21	ft
Channel Slope	2.00	%
Critical Slope	0.00819	ft/ft

Project Description

Manning Formula

Normal Depth

Channel Slope

2.00 %

0.18 ft

1.00 ft³/s

The profile view graph shows the elevation of the ground and the proposed road grade. The ground profile is shown as a green line, and the proposed road grade is shown as a blue line. The ground profile starts at an elevation of 0.38 at station 0+00, drops to 0.00 at station 0+05, rises to a peak of 0.48 at station 0+25, and then drops to 0.00 at station 0+40. The proposed road grade starts at 0.38 at station 0+00, drops to 0.18 at station 0+05, rises to 0.48 at station 0+25, and then drops to 0.18 at station 0+40. Vertical curve points are marked with blue triangles.

Worksheet for F PRIV INT 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 5.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for F PRIV INT 100 YR

Results

Normal Depth	0.28	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	1.75	ft ²
Wetted Perimeter	18.32	ft
Hydraulic Radius	0.10	ft
Top Width	18.21	ft
Normal Depth	0.28	ft
Critical Depth	0.32	ft
Critical Slope	0.00718	ft/ft
Velocity	2.85	ft/s
Velocity Head	0.13	ft
Specific Energy	0.41	ft
Froude Number	1.62	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.32	ft
Channel Slope	2.00	%
Critical Slope	0.00718	ft/ft

Cross Section for F PRIV INT 100 YR

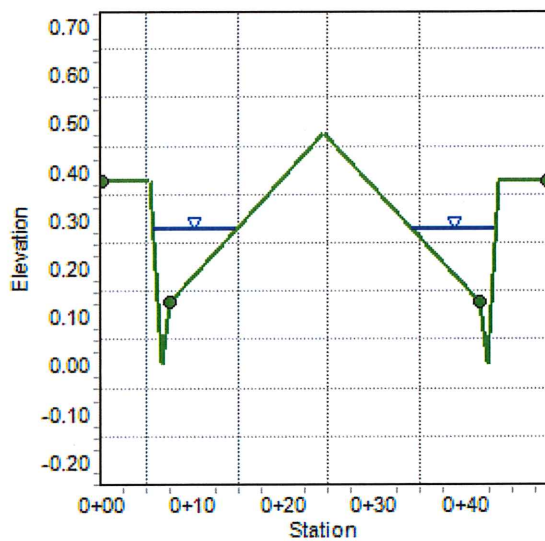
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.28 ft
Discharge 5.00 ft³/s

Cross Section Image





DEVELOPED CONDITION

Worksheet for A CENT DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 45.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.013
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.016
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for A CENT DEV 10 YR

Results

Normal Depth	0.55	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	10.29	ft ²
Wetted Perimeter	56.11	ft
Hydraulic Radius	0.18	ft
Top Width	55.08	ft
Normal Depth	0.55	ft
Critical Depth	0.64	ft
Critical Slope	0.00585	ft/ft
Velocity	4.37	ft/s
Velocity Head	0.30	ft
Specific Energy	0.84	ft
Froude Number	1.78	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.55	ft
Critical Depth	0.64	ft
Channel Slope	2.00	%
Critical Slope	0.00585	ft/ft

Worksheet for A CENT DEV 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 94.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+05.5	2630.25
0+07.0	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.0, 2630.42)	0.013
(0+07.0, 2630.42)	(0+88.0, 2630.42)	0.016
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for A CENT DEV 100 YR

Results

Normal Depth	0.66	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	18.01	ft ²
Wetted Perimeter	75.77	ft
Hydraulic Radius	0.24	ft
Top Width	74.61	ft
Normal Depth	0.66	ft
Critical Depth	0.80	ft
Critical Slope	0.00519	ft/ft
Velocity	5.22	ft/s
Velocity Head	0.42	ft
Specific Energy	1.09	ft
Froude Number	1.87	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.66	ft
Critical Depth	0.80	ft
Channel Slope	2.00	%
Critical Slope	0.00519	ft/ft

Cross Section for A CENT DEV 100 YR

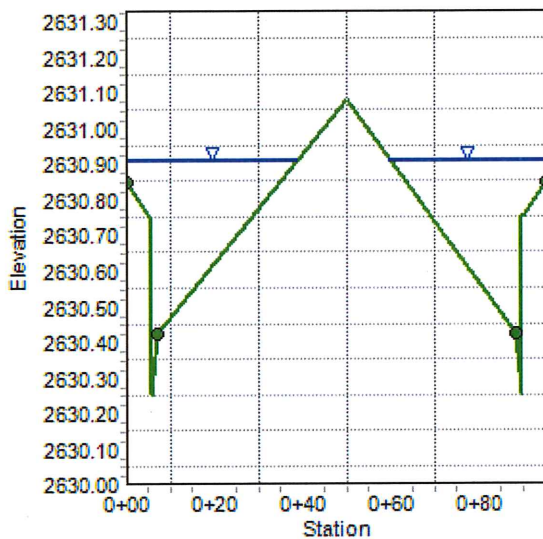
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.66 ft
Discharge 94.00 ft³/s

Cross Section Image



Worksheet for B REG DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 200.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3.00
0+00.0	0.60
0+05.0	0.50
0+05.5	0.50
0+05.5	0.00
0+07.0	0.17
0+30.0	0.63
0+53.0	0.17
0+54.5	0.00
0+54.5	0.50
0+55.0	0.50
0+60.0	0.60
0+60.0	3.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3.00)	(0+07.0, 0.17)	0.013
(0+07.0, 0.17)	(0+53.0, 0.17)	0.016
(0+53.0, 0.17)	(0+60.0, 3.00)	0.013

Options

Current Roughness vweighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for B REG DEV 10 YR

Results

Normal Depth	0.84	ft
Elevation Range	0.00 to 3.00	ft
Flow Area	25.91	ft ²
Wetted Perimeter	61.52	ft
Hydraulic Radius	0.42	ft
Top Width	60.00	ft
Normal Depth	0.84	ft
Critical Depth	1.11	ft
Critical Slope	0.00401	ft/ft
Velocity	7.72	ft/s
Velocity Head	0.93	ft
Specific Energy	1.77	ft
Froude Number	2.07	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.84	ft
Critical Depth	1.11	ft
Channel Slope	2.00	%
Critical Slope	0.00401	ft/ft

Project Description

Normal Depth

200.00 ft³/s

Worksheet for B REG DEV 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 322.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	3.00
0+00.0	0.60
0+05.0	0.50
0+05.5	0.50
0+05.5	0.00
0+07.0	0.17
0+30.0	0.63
0+53.0	0.17
0+54.5	0.00
0+54.5	0.50
0+55.0	0.50
0+60.0	0.60
0+60.0	3.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 3.00)	(0+07.0, 0.17)	0.013
(0+07.0, 0.17)	(0+53.0, 0.17)	0.016
(0+53.0, 0.17)	(0+60.0, 3.00)	0.013

Options

Current Roughness vweighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for B REG DEV 100 YR

Results

Normal Depth	0.99	ft
Elevation Range	0.00 to 3.00	ft
Flow Area	34.54	ft ²
Wetted Perimeter	61.80	ft
Hydraulic Radius	0.56	ft
Top Width	60.00	ft
Normal Depth	0.99	ft
Critical Depth	1.37	ft
Critical Slope	0.00365	ft/ft
Velocity	9.32	ft/s
Velocity Head	1.35	ft
Specific Energy	2.34	ft
Froude Number	2.17	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.99	ft
Critical Depth	1.37	ft
Channel Slope	2.00	%
Critical Slope	0.00365	ft/ft

Cross Section for B REG DEV 100 YR

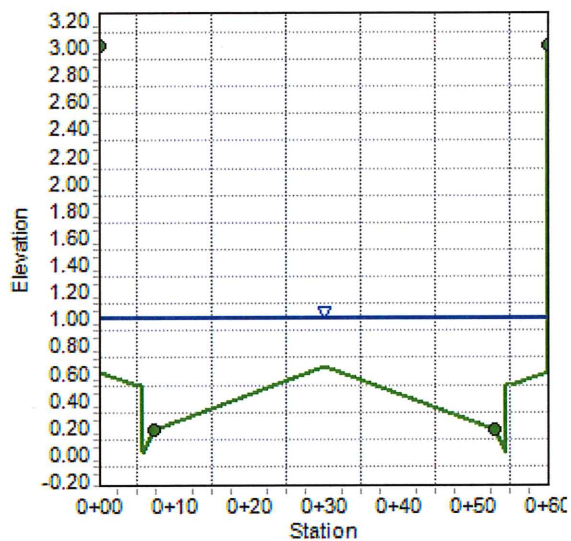
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.99 ft
Discharge 322.00 ft³/s

Cross Section Image



Worksheet for C PRIV DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 2.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for C PRIV DEV 10 YR

Results

Normal Depth	0.22	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	0.85	ft ²
Wetted Perimeter	12.17	ft
Hydraulic Radius	0.07	ft
Top Width	12.08	ft
Normal Depth	0.22	ft
Critical Depth	0.25	ft
Critical Slope	0.00784	ft/ft
Velocity	2.35	ft/s
Velocity Head	0.09	ft
Specific Energy	0.31	ft
Froude Number	1.56	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.25	ft
Channel Slope	2.00	%
Critical Slope	0.00784	ft/ft

Project Description

Manning Formula

Normal Depth

2.00 ft³/s

Project Description

Input Data

Station (ft)

Elevation (ft)

Roughness Segment Definitions

Start Station

Ending Station

Roughness Coefficient

Options

Bentley Systems, Inc. Haestad Methods Software Bentley eCenter Master V8i (SELECTseries 1) [08.11.01.03]

Worksheet for C PRIV DEV 100 YR

Results

Normal Depth	0.32	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	2.52	ft ²
Wetted Perimeter	22.25	ft
Hydraulic Radius	0.11	ft
Top Width	22.12	ft
Normal Depth	0.32	ft
Critical Depth	0.39	ft
Critical Slope	0.00740	ft/ft
Velocity	3.18	ft/s
Velocity Head	0.16	ft
Specific Energy	0.47	ft
Froude Number	1.66	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.39	ft
Channel Slope	2.00	%
Critical Slope	0.00740	ft/ft

Cross Section for C PRIV DEV 100 YR

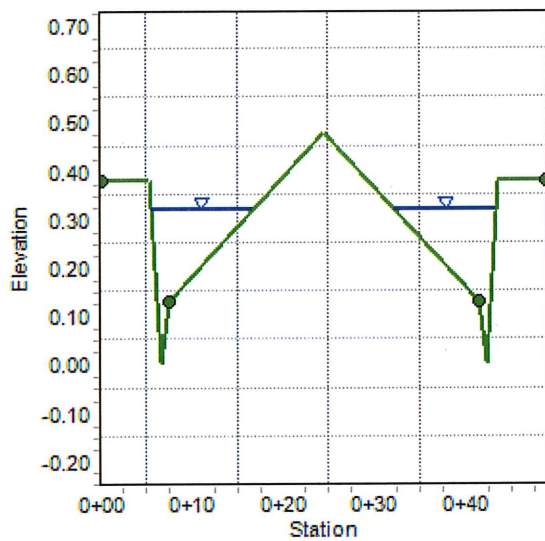
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.32 ft
Discharge 8.00 ft³/s

Cross Section Image



Worksheet for D CENT DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+06.5	2630.25
0+07.5	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.5, 2630.42)	0.016
(0+07.5, 2630.42)	(0+88.0, 2630.42)	0.013
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.016

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for D CENT DEV 10 YR

Results

Normal Depth	0.21	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	0.46	ft ²
Wetted Perimeter	8.22	ft
Hydraulic Radius	0.06	ft
Top Width	7.93	ft
Normal Depth	0.21	ft
Critical Depth	0.24	ft
Critical Slope	0.00770	ft/ft
Velocity	2.16	ft/s
Velocity Head	0.07	ft
Specific Energy	0.28	ft
Froude Number	1.58	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.21	ft
Critical Depth	0.24	ft
Channel Slope	2.00	%
Critical Slope	0.00770	ft/ft

Worksheet for D CENT DEV 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 2.00 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.0	2630.85
0+05.0	2630.75
0+05.5	2630.75
0+06.5	2630.25
0+07.5	2630.42
0+50.0	2631.08
0+88.0	2630.42
0+89.5	2630.25
0+89.5	2630.75
0+90.0	2630.75
0+95.0	2630.85

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 2630.85)	(0+07.5, 2630.42)	0.016
(0+07.5, 2630.42)	(0+88.0, 2630.42)	0.013
(0+88.0, 2630.42)	(0+95.0, 2630.85)	0.016

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for D CENT DEV 100 YR

Results

Normal Depth	0.25	ft
Elevation Range	2630.25 to 2631.08 ft	
Flow Area	0.82	ft ²
Wetted Perimeter	12.60	ft
Hydraulic Radius	0.06	ft
Top Width	12.27	ft
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Critical Slope	0.00674	ft/ft
Velocity	2.45	ft/s
Velocity Head	0.09	ft
Specific Energy	0.34	ft
Froude Number	1.67	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Channel Slope	2.00	%
Critical Slope	0.00674	ft/ft

Cross Section for D CENT DEV 100 YR

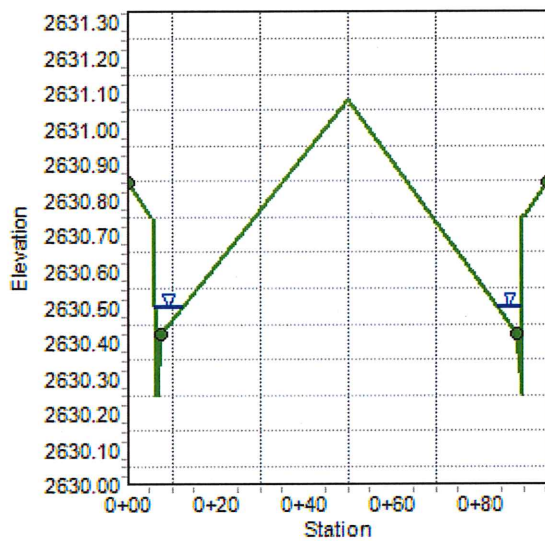
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.25 ft
Discharge 2.00 ft³/s

Cross Section Image



Worksheet for E PRIV DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for E PRIV DEV 10 YR

Results

Normal Depth		0.18	ft
Elevation Range	0.00 to 0.48 ft		
Flow Area		0.48	ft ²
Wetted Perimeter		8.44	ft
Hydraulic Radius		0.06	ft
Top Width		8.36	ft
Normal Depth		0.18	ft
Critical Depth		0.21	ft
Critical Slope		0.00819	ft/ft
Velocity		2.08	ft/s
Velocity Head		0.07	ft
Specific Energy		0.25	ft
Froude Number		1.52	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

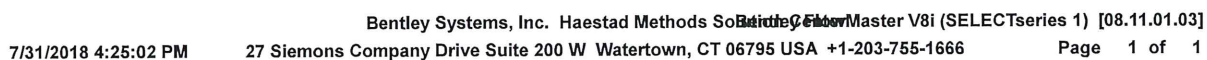
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.21	ft
Channel Slope	2.00	%
Critical Slope	0.00819	ft/ft

Project Description

Input Data

Cross Section Image



Worksheet for E PRIV DEV 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 3.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for E PRIV DEV 100 YR

Results

Normal Depth	0.25	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	1.18	ft ²
Wetted Perimeter	14.72	ft
Hydraulic Radius	0.08	ft
Top Width	14.62	ft
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Critical Slope	0.00757	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	0.35	ft
Froude Number	1.58	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

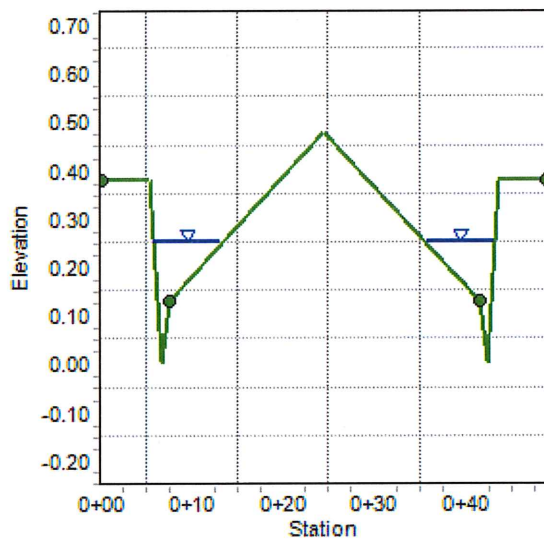
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Channel Slope	2.00	%
Critical Slope	0.00757	ft/ft

Project Description

Input Data

Cross Section Image



Worksheet for F PRIV DEV 10 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 1.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for F PRIV DEV 10 YR

Results

Normal Depth		0.18	ft
Elevation Range	0.00 to 0.48 ft		
Flow Area		0.48	ft ²
Wetted Perimeter		8.44	ft
Hydraulic Radius		0.06	ft
Top Width		8.36	ft
Normal Depth		0.18	ft
Critical Depth		0.21	ft
Critical Slope		0.00819	ft/ft
Velocity		2.08	ft/s
Velocity Head		0.07	ft
Specific Energy		0.25	ft
Froude Number		1.52	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.21	ft
Channel Slope	2.00	%
Critical Slope	0.00819	ft/ft

Cross Section for F PRIV DEV 10 YR

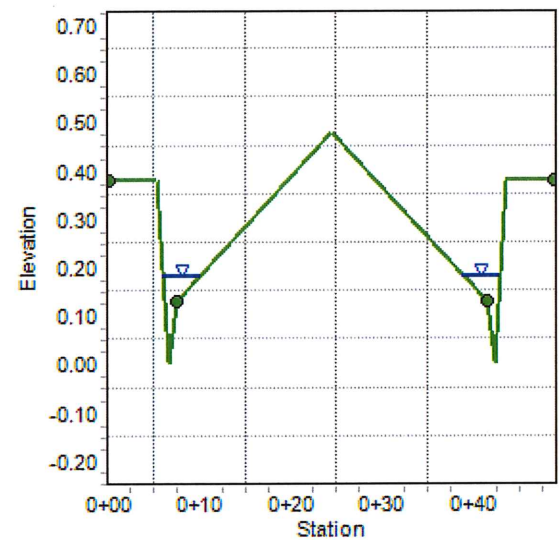
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.00	%
Normal Depth	0.18	ft
Discharge	1.00	ft ³ /s

Cross Section Image



Worksheet for F PRIV DEV 100 YR

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Discharge 5.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.0	0.38
0+05.0	0.38
0+05.4	0.38
0+06.5	0.00
0+07.5	0.13
0+24.5	0.48
0+41.5	0.13
0+42.5	0.00
0+43.6	0.38
0+44.0	0.38
0+49.0	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.0, 0.38)	(0+07.5, 0.13)	0.013
(0+07.5, 0.13)	(0+41.5, 0.13)	0.016
(0+41.5, 0.13)	(0+49.0, 0.38)	0.013

Options

Current Roughness Weighted Method Pavlovskii's Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for F PRIV DEV 100 YR

Results

Normal Depth	0.28	ft
Elevation Range	0.00 to 0.48	ft
Flow Area	1.75	ft²
Wetted Perimeter	18.32	ft
Hydraulic Radius	0.10	ft
Top Width	18.21	ft
Normal Depth	0.28	ft
Critical Depth	0.32	ft
Critical Slope	0.00718	ft/ft
Velocity	2.85	ft/s
Velocity Head	0.13	ft
Specific Energy	0.41	ft
Froude Number	1.62	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.32	ft
Channel Slope	2.00	%
Critical Slope	0.00718	ft/ft

Cross Section for F PRIV DEV 100 YR

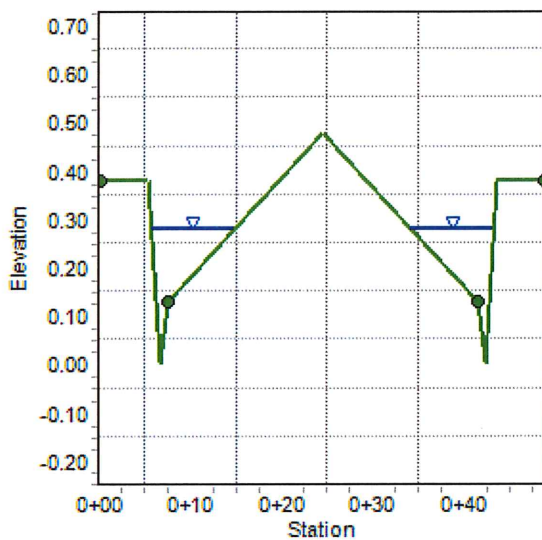
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.00 %
Normal Depth 0.28 ft
Discharge 5.00 ft³/s

Cross Section Image





APPENDIX E

Reference Material

Cross section locations for the normal depth calculations for developed conditions have been shown on Figure 6R. Offsite storm flows used for the developed condition have not been revised from the first submittal of this update. As is shown in the summary table for the 100-year storm hydraulic calculations, the $V \cdot D$ product is equal to or less than 8. Velocities are greater than 5 fps in Regina Avenue and in Azure Drive under developed conditions, therefore a 3-foot deep cutoff wall is proposed for erosion protection adjacent to the pavement in the rural streets. Normal depth calculations of cross sections that have been revised have been included in Appendix B. Asterisks have been added to the Hydraulic Summary Tables on Figure 6R for the normal depth calculations that have been revised from the first submittal to this update.

The normal depth calculation for Cross Sections 1F in Centennial Parkway were revised to show that the 100-year storm flow and 10-year storm flow will meet Clark County criteria with the storm flows split evenly in both sides of the street.

Cross Sections 3F, 4F, and 9F were cut in Regena Avenue for the revised cross sections using a 6-foot landscape strip with riprap. The $V \cdot D$ product is equal to or less than 8 in all cases. The normal depth calculation for Cross Section 9F was also revised with 222 cfs instead of 221 cfs which is an additional 100-year storm flow of 1 cfs more that will be generated in Subbasin ON1 due to hydrologic revisions. The normal depth calculation for Cross Section 6F in Azure Drive was also revised using the riprap in the landscape easement and with 174 cfs instead of 173 cfs which is an additional 100-year storm flow of 1 cfs more that will be generated in Subbasin ON3 due to hydrologic revisions.

storm event 10-year calculations were not required for those cross sections. Ten year storm flow calculations were conducted for Regena Avenue and Azure Drive since Manual criteria for a 10-year storm event is not met during a 100-year storm event ($D*V$ less than 6). Onsite streets will be constructed 39 feet wide with roll curb and gutter and a sidewalk on one side. Cross sections were cut for the flattest and steepest slopes for the interior streets. Additionally, future conditions storm flow calculations were conducted for the adjacent 60-foot streets assuming that curb, gutter and sidewalk may be required at some future date and to ensure that Manual criteria is met under those conditions.

TABLE 2 100-YEAR HYDRAULIC SECTIONS					
Location*	Slope (%)	Q_{100} (cfs)	D_{100} (ft)	V_{100} (ft/sec)	$D*V_{100}$
Section 1E Centennial Parkway	2.70	45	1.02	5.54	N/A
Section 1F Centennial Parkway-North Half	2.65	162	0.95	8.62	8.2
Section 2E Tee Pee Lane West	1.25	24	0.88	3.62	N/A
Section 2E Tee Pee Lane East	1.25	1	0.28	1.76	N/A
Section 3F Regena Avenue	2.70	246	1.21	7.71	9.3
Section 4F Regena Avenue	2.93	216	1.16	7.54	8.7
Section 5F Tee Pee Lane	2.81	30	0.65	4.7	3.1
Section 6F Azure Drive	3.46	173	1.07	7.34	7.9
Section 7F Tee Pee Lane	1.22	30	0.78	3.14	2.4
Section 8F Bright Angel Way	2.07	52	0.84	4.45	3.7
Section 9F Regena Avenue	2.70	216	1.18	7.40	8.7
Section 10 Eagan Ranch Court (flattest)	1.29	5	0.28	2.57	0.7
Section 11 Flaxa Ranch Court (steepest)	1.52	18	0.40	3.61	1.4

*See Figure 6

In most cases the streets do meet the Manual 100-year criteria for a depth times velocity ($D*V$) product to be less than 8 except for the north half of Centennial Parkway and in Regena Avenue. The north half of Centennial Parkway is existing and was calculated as a check to show that the flow doesn't overtop the crown and affect the Project. Regena Avenue adjacent to the site is a nonurban street section without curb and gutter. Table 3 shows that at Sections 3F and 4F the $D*V$ product will be 9.3 and 8.7, respectively. The sections are based on offsite flows only that do not include any runoff from the site itself. The only runoff to Regena Avenue is the 5 cfs

Worksheet for SECT 1F 100-YR CENT PKWY

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 2.65000 %
Discharge 162.00 ft³/s **DEVELOPED**
Section Definitions

Station (ft)	Elevation (ft)
--------------	----------------

1+00.0	2.00
1+00.0	0.60
1+05.0	0.50
1+05.5	0.48
1+05.5	0.00
1+07.0	0.13
1+07.0	0.17
1+50.0	1.03
1+93.0	0.17
1+93.0	0.13
1+94.5	0.00
1+94.5	0.48
1+95.0	0.50
2+00.0	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(1+00.0, 2.00)	(1+07.0, 0.17)	0.013
(1+07.0, 0.17)	(1+93.0, 0.17)	0.016
(1+93.0, 0.17)	(2+00.0, 0.60)	0.013

Results

Normal Depth 0.77 ft
Elevation Range 0.000 to 2.000 ft

Worksheet for SECT 1F 100-YR CENT PKWY FUTURE-new

Results

Flow Area	22.80	ft²
Wetted Perimeter	75.730	ft
Top Width	74.320	ft
Normal Depth	0.77	ft
Critical Depth	1.01	ft
Critical Slope	0.00459	ft/ft
Velocity	7.11	ft/s
Velocity Head	0.78	ft
Specific Energy	1.55	ft
Froude Number	2.26	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

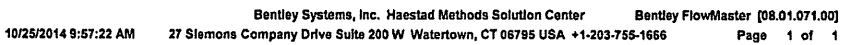
GVF Output Data

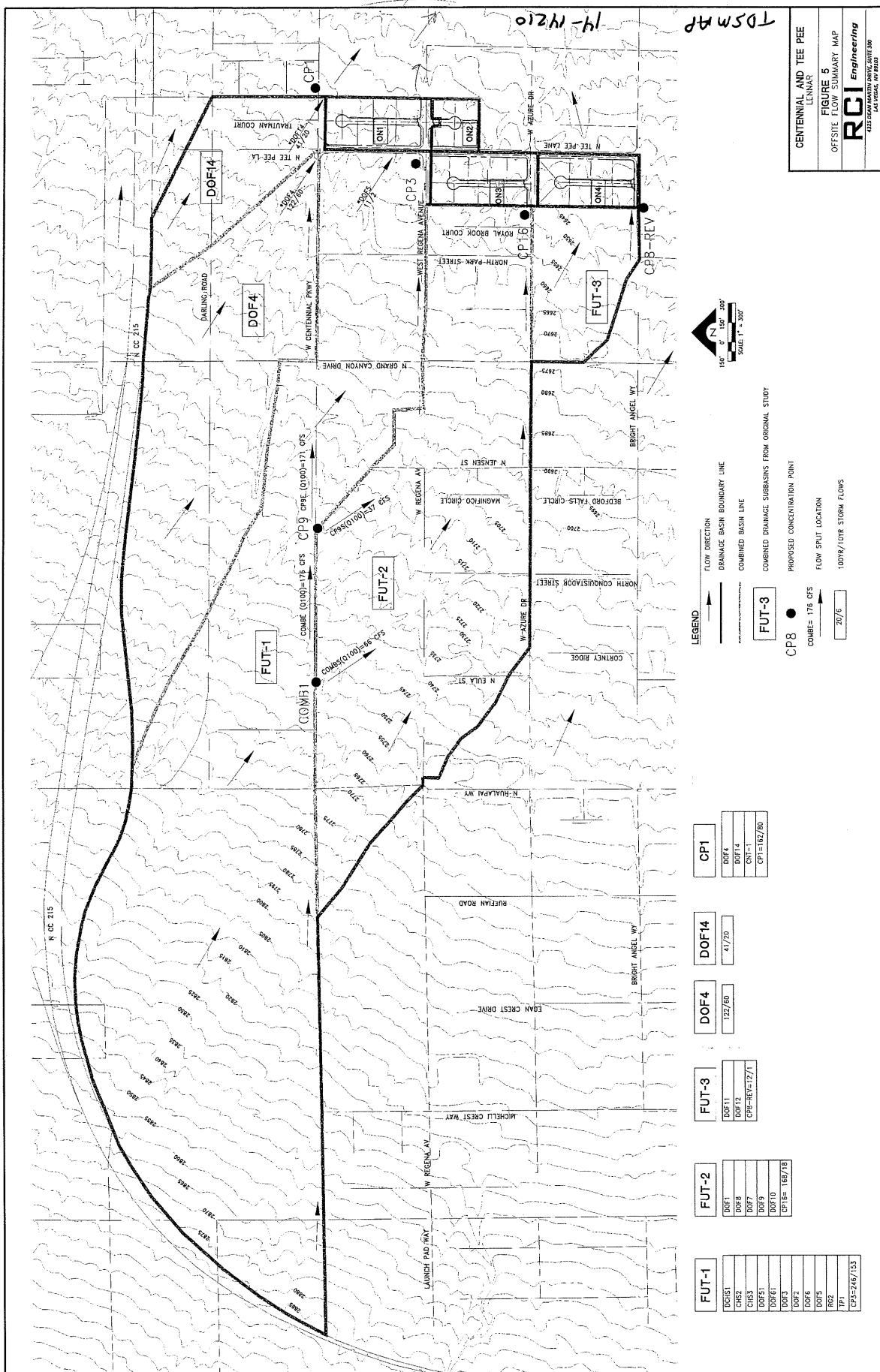
Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.77	ft
Critical Depth	1.01	ft
Channel Slope	0.02650	ft/ft
Critical Slope	0.00459	ft/ft

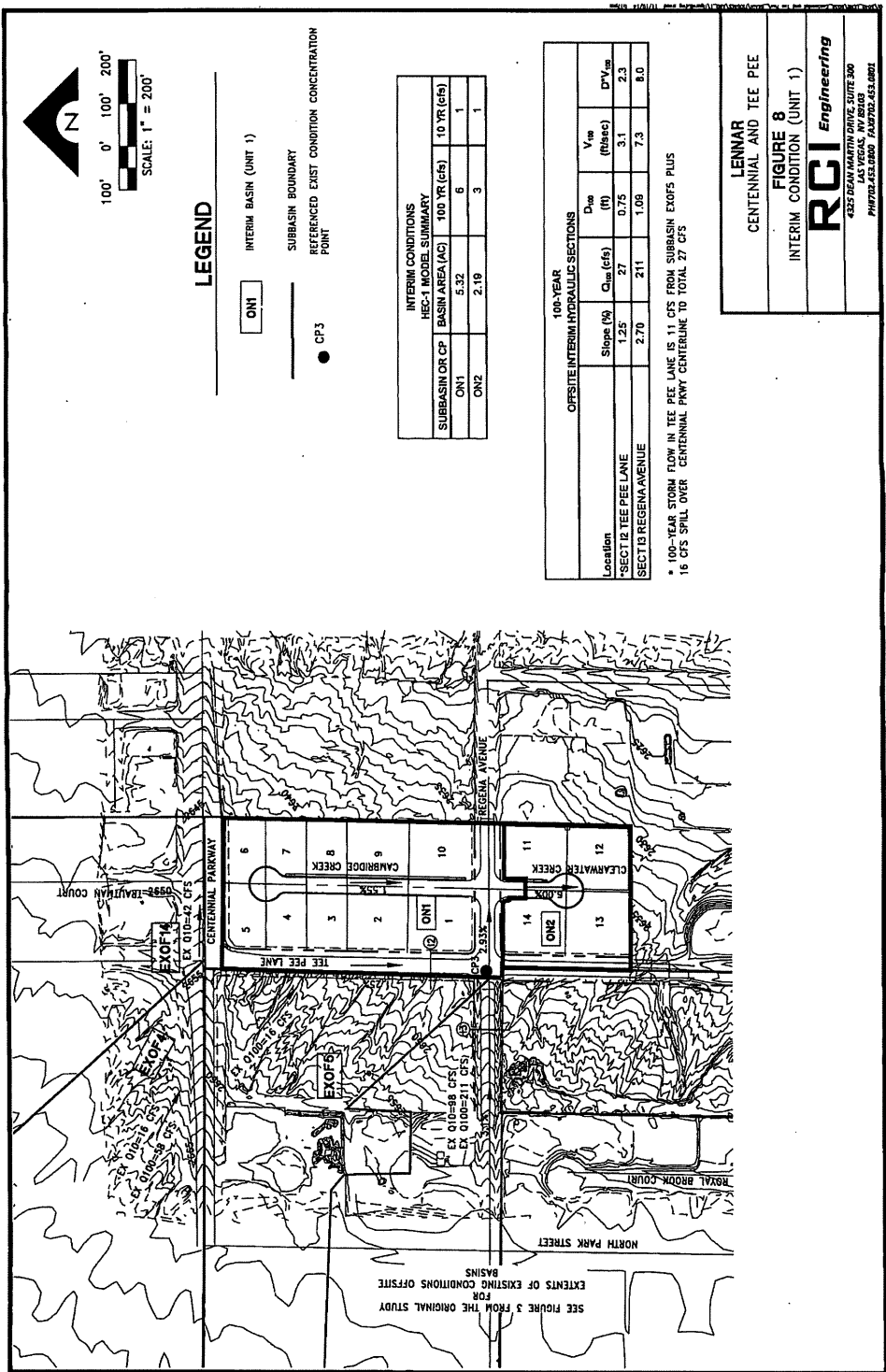
Project Description	1. The project is a research study on the impact of climate change on the environment. The study will focus on the effects of rising temperatures and changing precipitation patterns on various ecosystems. 2. The project is a research study on the impact of climate change on the environment. The study will focus on the effects of rising temperatures and changing precipitation patterns on various ecosystems.	1. The project is a research study on the impact of climate change on the environment. The study will focus on the effects of rising temperatures and changing precipitation patterns on various ecosystems. 2. The project is a research study on the impact of climate change on the environment. The study will focus on the effects of rising temperatures and changing precipitation patterns on various ecosystems.
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Input Data

Cross Section Image



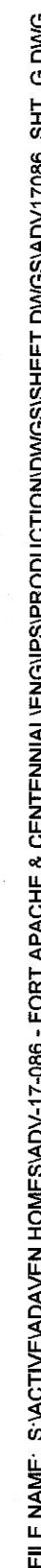






APPENDIX F

Improvement Plans



- ## EARTHWORK

FLOOD ZONE
THIS PROJECT IS LOCATED IN FLOOD ZONE "X", AN AREA DETERMINED TO BE OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD PLAIN PER FIRM PANEL 32003C1745E, REVISED SEPTEMBER 27, 2002.

UTILITY DISCLAIMER

GRADING NOTES

COMPLETION OF SECTION II OF DRAINAGE COMPLIANCE REPORT REQUIRED

ADD 2600 FEET TO ALL GRADE TAGS TO GET ACTUAL ELEVATION

THE ELEVATION DIFFERENCE BETWEEN THE PAD AND FINISH FLOOR IS DETERMINED FROM THE MINIMUM THICKNESS REQUIRED PER THE GEOTECHNICAL REPORT. FINISH FLOORS MAY INCREASE DEPENDING ON THE TYPE OF SOIL AND FOUNDATION PLAN USED. NOTE THAT THE STRUCTURAL PLANS & GEOTECHNICAL REPORT SHALL SUPERSEDE THE CIVIL IMPROVEMENT PLANS.

ALL PRIVATE STREETS AND DRAINAGE EASEMENTS ARE TO BE PRIVATELY OWNED AND MAINTAINED BY THE HOMEOWNERS ASSOCIATION (H.O.A.).

ALL WORK TO BE PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENTS HAVE BEEN OBTAINED FROM THE OFFSITE OWNER AND GIVEN TO THE GOVERNING ENTITY.

CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES AND NOTIFY THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.

BENCHMARK

RIVET AND SQUARE ALUMINUM PLATE IN A CONCRETE MONUMENT, 50' NORTH AND 40' WEST OF CENTENNIAL PKWY AND FORT APACHE RD. STATION: 1C9019SES
ELEVATION (FEET): 2618.96 (798.258 METERS)

GRADING CERTIFICATION

I CERTIFY THIS GRADING PLAN COMPLIES WITH THE APPROVED DRAINAGE STUDY, HTE# XX-XXXXX, ON FILE WITH CLARK COUNTY FOR THIS PROJECT.

S JUSTIN THORNE, PE DATE

ACCEPTANCE OF PLANS

ACCEPTANCE OF PLANS	
1. The proposed plan is consistent with the overall goals and objectives of the organization.	
2. The proposed plan is feasible given the organization's resources and capabilities.	
3. The proposed plan is supported by the majority of the organization's stakeholders.	
4. The proposed plan is consistent with the organization's values and mission statement.	
5. The proposed plan is consistent with the organization's legal and regulatory requirements.	
6. The proposed plan is consistent with the organization's risk management strategy.	
7. The proposed plan is consistent with the organization's financial strategy.	
8. The proposed plan is consistent with the organization's human resources strategy.	
9. The proposed plan is consistent with the organization's information technology strategy.	
10. The proposed plan is consistent with the organization's environmental strategy.	

SOUTHWEST GAS CORPORATION DATE

ACCEPTANCE OF PLANS FOR FILING

BY: _____
DEVELOPMENT AND FLOOD CONTROL _____ DATE: _____

LAS VEGAS, NV 89118
(02) 362-8844 FAX: (702) 362-5233



SCALE: 1"

JOB NO: ADV-17

DESIGNED BY:	CHECKED:
RD	

BP	
SHEET NAME:	

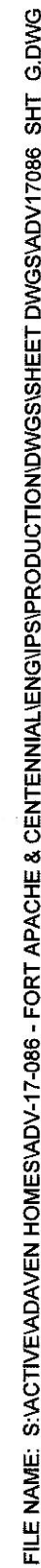
©

SHEET NUMBER: 29

3 OF 8

STUDY DESIGN

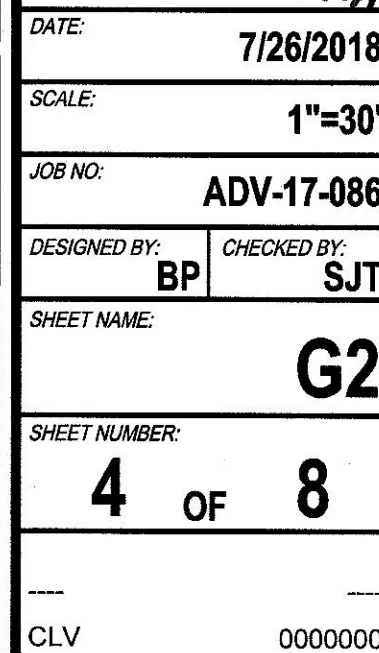
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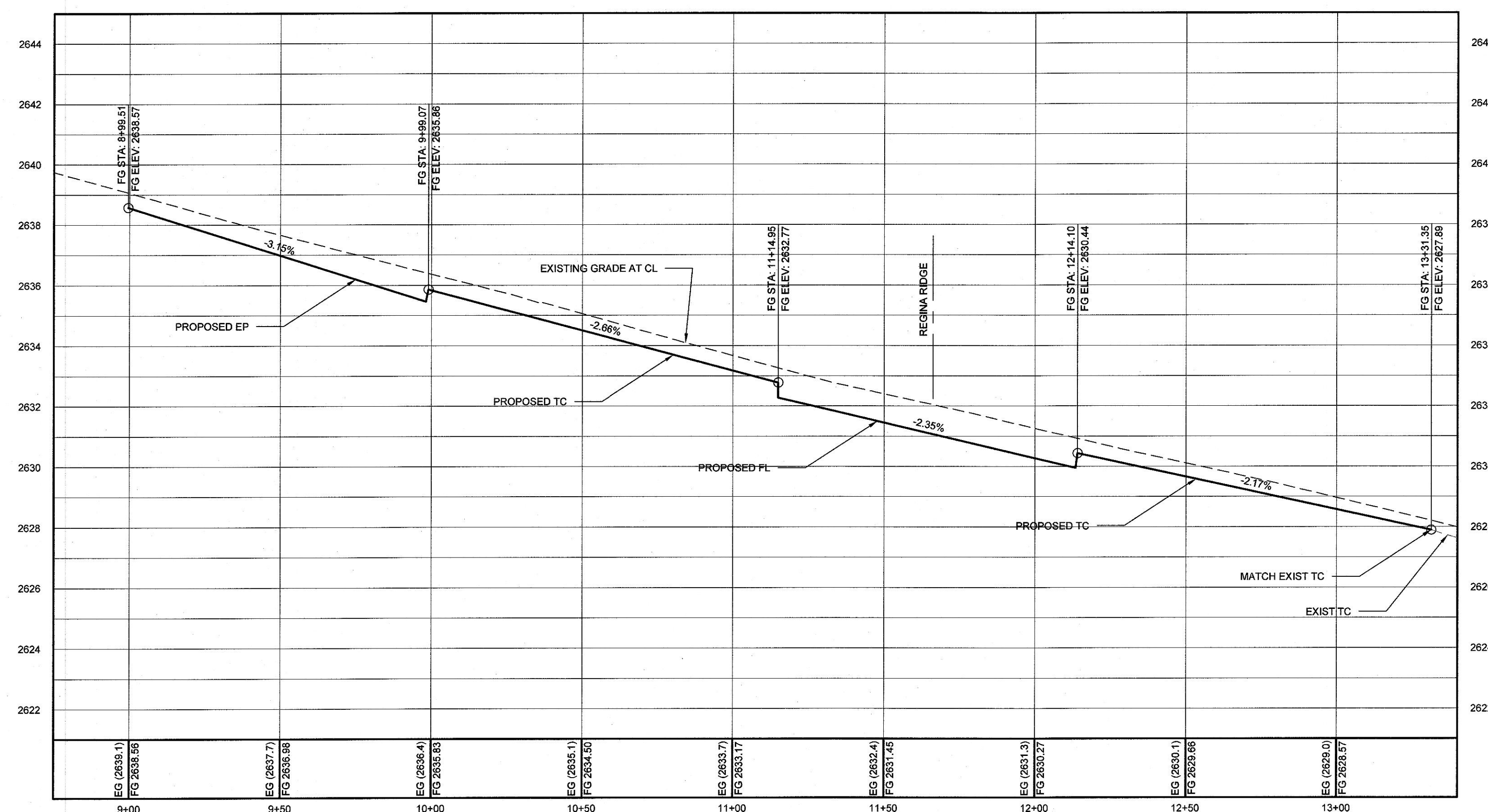
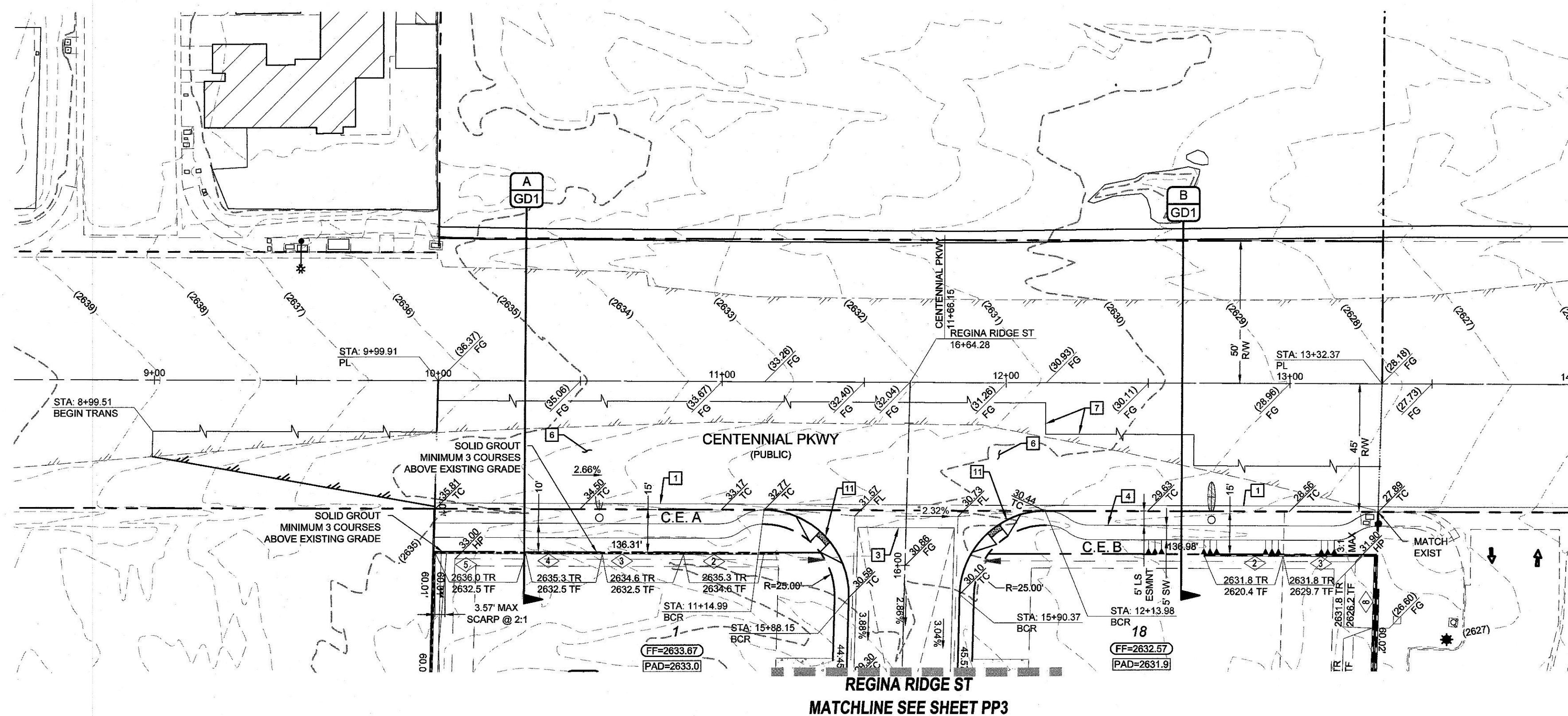


Avoid overhead power line contact. It's costly.

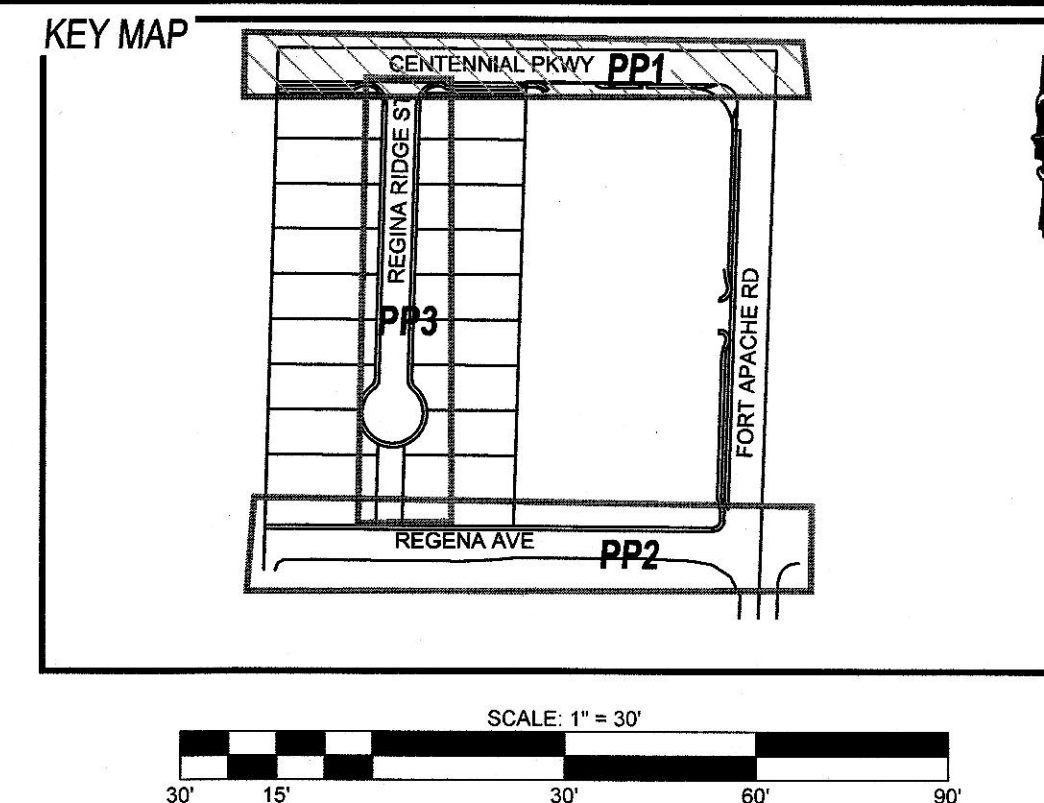
Call
before you
Overhead
1-702-227-2929

BY: _____
DEVELOPMENT AND FLOOD CONTROL _____ DA _____





CENTENNIAL PKWY (PUBLIC) - PROFILE



GEOTECHNICAL

FIRM NAME
FIRM ADDRESS
LAS VEGAS, NV 89XXX
(702) XXX-XXXX

REPORT NO: XXXXX
DATE: XX/XX/XX

CONSTRUCTION NOTES

- 1 24" L-TYPE CURB & GUTTER (USD #216)
- 2 INSTALL 30" MODIFIED ROLL CURB AND GUTTER (CCAUSD #217.1)
- 3 8.0' CROSS GUTTER (USD #228)
- 4 5.0' SIDEWALK (USD #234)
- 5 2" AC PAVEMENT OVER 4" TYPE II PER SOILS REPORT (HTE XXXX)
- 6 5.5" AC PAVEMENT OVER 6" TYPE II PER SOILS REPORT (HTE XXXX)
- 7 SAWCUT & MATCH EXISTING AC PAVEMENT (USD #500.3)
- 8 INSTALL CONCRETE VALLEY GUTTER (SEE G/D01)
- 9 INSTALL SIDEWALK UNDERDRAIN (CCAUSD #236)
- 10 L-CURB CUT AND GUTTER (SEE MGD1)
- 11 SIDEWALK RAMP USING TRUNCATED DOMES OR EQUIVALENT (USD #235 CASE 1A) 15' BY 5'
- 12 SIDEWALK RAMP USING TRUNCATED DOMES OR EQUIVALENT (USD #235) A=8'

UTILITY DISCLAIMER

EXISTING UTILITY LOCATIONS SHOWN HEREIN ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR EXISTING LOCATIONS.

LINE AND CURVE DATA

FOR LINE AND CURVE DATA TABLES, SEE THE GRADING PLAN SHEETS FOR THIS PROJECT.

PROFILE NOTES

ADD XX00 FEET TO ALL GRADE TAGS TO GET ACTUAL ELEVATION.

ALL PRIVATE STREETS AND DRAINAGE EASEMENTS ARE TO BE PRIVATELY OWNED AND MAINTAINED BY THE HOMEOWNERS ASSOCIATION (H.O.A.).

ALL WORK TO BE PERFORMED OUTSIDE OF THE PROJECT BOUNDARY AND ON PRIVATE PROPERTY SHALL NOT BE PERFORMED UNTIL WRITTEN PERMISSION AND EASEMENTS HAVE BEEN OBTAINED FROM THE OFFSITE OWNER AND GIVEN TO GOVERNING ENTITY.

BENCHMARK

RIVET AND SQUARE ALUMINUM PLATE IN A CONCRETE MONUMENT, 50' NORTH AND 40' WEST
OF CENTENNIAL PKWY AND FORT APACHE RD. STATION: 1C9019SES
ELEVATION (FEET): 2618.96 (798.258 METERS)

ACCEPTANCE OF PLANS

SOUTHWEST GAS CORPORATION

APPROVED FOR CONSTRUCTION

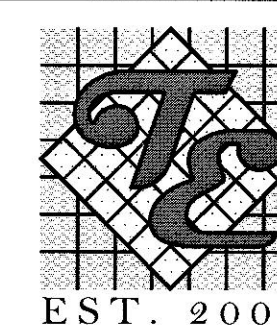
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
FIRST APPROVED DATE _____ PROJECT# 122XXX
LVVWD APPROVED FIRE FLOW: XXXX GPM AT 20 PSI RESIDUAL

ACCEPTANCE OF PLANS FOR FILING

BY: _____
DEVELOPMENT AND FLOOD CONTROL

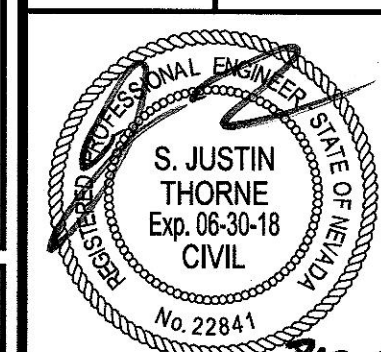
ADAVEN HOMES
3425 CLIFF SHADOWS PKWY
LAS VEGAS, NV 89129
(702) 365-8588 FAX:

ANEY & ENGINEERING
6030 S. JONES BOULEVARD
LAS VEGAS, NV 89118
(702) 362-8844 FAX: (702) 362-5233



**CENTENNIAL & FORT APACHE
A RESIDENTIAL SUBDIVISION**

PLAN AND PROFILE



DATE: 7/26/2018

SCALE: 1"=30'

JOB NO: ADV-17-086

DESIGNED BY:	CHECKED BY:
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SHEET NAME:

PP1

SHEET NUMBER: **6** of **8**

FILE NAME: S:\ACTIVE\ADAVEN HOMES\ADV-17-086 - FORT APACHE & CENTENNIAL\ENG\IPS\PRODUCTION\DWGS\ADV17086_SHT_PP.DWG

