

474 Joaquin Road Residential Housing Project Storm Drainage Report

Mammoth Lakes, California
June 17, 2025
for
The Town of Mammoth Lakes
On behalf of
474 Joaquin LLC

BKF Engineers

1646 N. California Blvd., Suite 400
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TABLE OF CONTENTS

A. Introduction	2
B. Analysis Approach	2
C. Hydraulic Analysis and Calculations	3
D. Storm Drain Summary	7
E. References	7

Figures:

Figure 1: Hydraflow Report – 20-year, 24-inch storm drain	5
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Appendices:

Appendix A: Vicinity Map	
Appendix B: Existing & Proposed Conditions Exhibits	
Appendix C: Figures from the 1984 Storm Drainage Design Manual	
Appendix D: Existing Creek 100-Year Peak Flow Map	
Appendix E: Hydraflow Calculations – 50-year & 100-year, 42-inch storm drain	

A. Introduction

The Project is located at 474 Joaquin Road in the Town of Mammoth Lakes east of the Sierra Star Golf Course and encompasses approximately 3.2 acres. It is bounded by Joaquin Road to the east, Meridian Boulevard to the south, Obsidian Residence Club and facilities to the west, and Forest Creek Condominiums to the north (see **Appendix A**). The Project proposes 39 condominium units with two 24-foot driveways with a 26-foot drive aisle. Typical underground utility infrastructure are proposed to serve the project.

Existing Conditions

The site consists of a creek which runs from the southwest corner to the northeast corner of the property. A paved bike path crosses through the property, which wraps around the north, east, and south sides of the site. The majority of the site is undeveloped with a variety of vegetation cover. The site drains from southwest to northeast with average slopes ranging from 4% to 11%. Based on available existing topography, the site receives runoff from the adjacent property to its west. Overland flow from the site and the existing creek discharge at an open-air catchment with a concrete headwall. This catchment detains runoff before ultimately discharging into an existing 36-inch storm drain main, which flows north along Joaquin Road (see **Appendix B**).

Proposed Conditions

The Project consists of two separate storm drain systems. One storm drain system will redirect runoff from the existing creek around and along the south and east sides of the site. A separate storm drain system with storage piping for retention is proposed to capture runoff from on-site improvements and the off-site surface runoff from the west. The project site will maintain its overall drainage pattern of flowing from the southwest to the northeast at an average site slope of 4.5%. The retention pipe will have an ultimate discharge at the existing 36-inch storm drain located at the northeast corner of the site on Joaquin Road (see **Appendix B**).

B. Analysis Approach

Due to the increase in impervious surface, this report summarizes the hydraulic assumptions, site characteristics, and calculations used to determine the appropriate detention system size for managing post-development runoff. The analysis will be based on criteria and design calculation procedures outlined in the Town of Mammoth Lakes' 1984 Storm Drainage and Erosion Control Design Manual (SDECDM), 2005 Storm Drain Master Plan Update, and 2015 Stormwater Master Plan. Final design considerations for the Project ensure the proposed storm drain system is capable of conveying flows from the 20-year exceedance interval, while the proposed retention facility is designed to capture and store the 100-year peak flows in excess of the 20-year event.

Assumptions and Factors used in Analysis

The Project's total acreage meets the criteria for the Town's SDECDM runoff **Procedure A** for calculating peak flows. Procedure A uses a slightly modified version of the rational method.

The formula used is,

$$Q = 1.008 \times A \times C \times P$$

where,

1.008 is a small correction factor,

Q = peak flow/discharge (cubic feet per second, cfs),

A = total tributary area (acres),

C = weighted runoff coefficient, and

P = precipitation intensity (inches/hour)

The following parameters are used for the analysis:

1. **Design Storm** – 20-year exceedance interval for storm drain and 100-year exceedance interval for retention and the existing creek analyses.
2. **Drainage Area** – On-site tributary area = 3.2 acres, off-site tributary area = 1.05 acres; total tributary area = 4.25 acres (0.0066 square miles)
3. **Time of Concentration** – 0.71 hours
4. **Precipitation Intensity** – 1.13 inches/hour
5. **Runoff Coefficient** – 0.9 for roofs and hardscape, 0.8 for aggregate driveways and walks, and 0.0* for landscape; weighted C = 0.55
6. **Manning's Roughness Coefficient** – all storm drain pipes are to be HDPE with a roughness coefficient of 0.013. The 72" storage pipe shall be RCP with a roughness coefficient of 0.012.

*Assumes no anticipated runoff for landscape areas based on historical data for areas with hydrologic soil group A.

Each pipe is designed to have a minimum slope to achieve a minimum velocity of 2-feet per second when flowing half full.

C. Hydraulic Analysis and Calculations

Site Retention and Discharge System

The retention facilities were designed according to the Town's SDECDM procedures for developing hydrographs. The procedure develops the 20- and 100-year runoff hydrographs using parameters found in Procedure A in order to calculate the volumes from each runoff condition.

The following are the calculations:

Overland flow distance, L_0	Overland flow slope, S_0	Channelized length, L_C	Channelized slope, S_C
124	0.05	635	0.02

Time of concentration (overland), t_{co} (see Figure 3-7, Appendix C)	Time of concentration (channelized), t_{cc} (see Figure 3-8, Appendix C)	Watershed time of concentration, t_c (hrs)
0.69	0.016	0.71

Precipitation intensity, P_w (see Figure 3-9, Appendix C)	1-hr design storm precipitation
1.13	0.95

(winter only, 20-year exceedance interval) (winter only, 20-year exceedance interval)

Weighted runoff coefficient, $C = 0.55$

$P = 1.13$ (from above calcs)

$A = 4.25$

$Q = 1.008 \times A \times C \times P$

$Q = 2.64$ Project peak flow for 20-year storm

Using the Hydraflow Express Extension for Autodesk Civil 3D, a minimum pipe size of 24 inches will be required to convey the 20-year exceedance interval for the entire Project's tributary area, assuming high-density polyethylene (HDPE) pipe material while running at a two percent (2.0%) minimum slope and flowing at 75% full. See Figure 1.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc.

Wednesday, Apr 23 2025

24-inch HDPE SD Pipe, 20-year Exceedence Interval

Circular		Highlighted	
Diameter (ft)	= 2.00	Depth (ft)	= 1.39
		Q (cfs)	= 2.640
		Area (sqft)	= 2.34
Invert Elev (ft)	= 7920.00	Velocity (ft/s)	= 1.13
Slope (%)	= 0.02	Wetted Perim (ft)	= 3.95
N-Value	= 0.013	Crit Depth, Yc (ft)	= 0.57
		Top Width (ft)	= 1.84
		EGL (ft)	= 1.41
Calculations			
Compute by:	Known Q		
Known Q (cfs)	= 2.64		

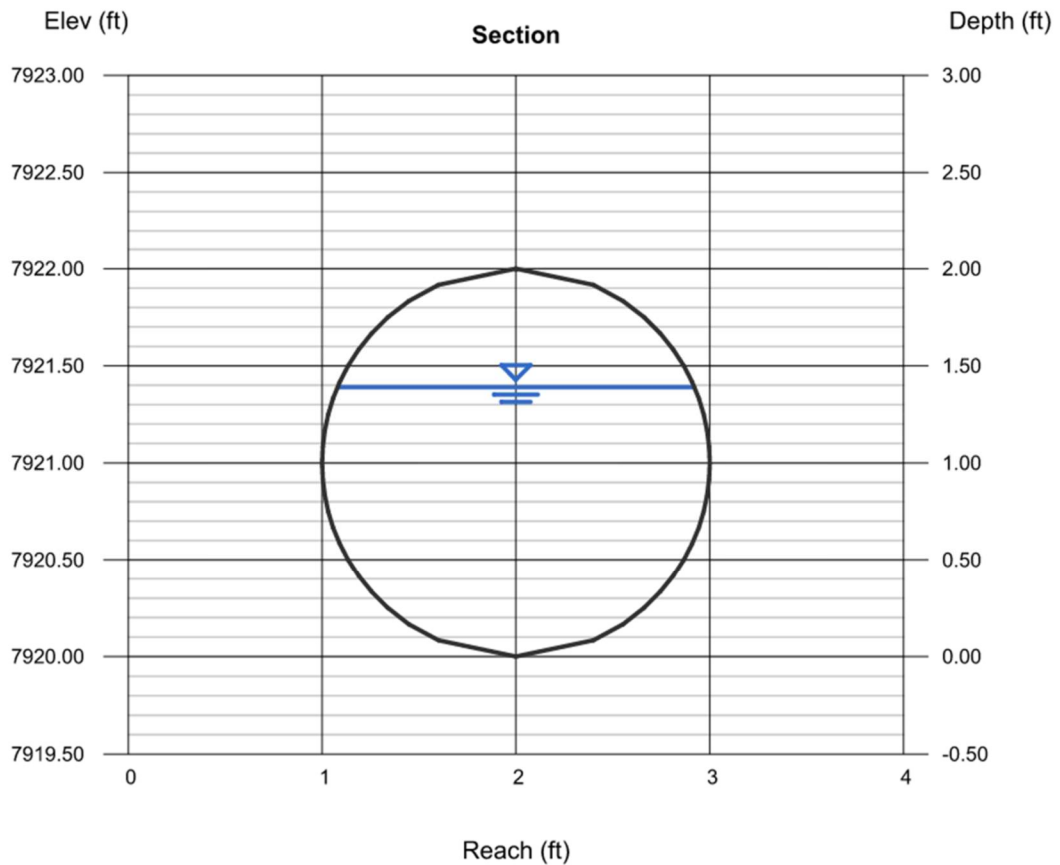


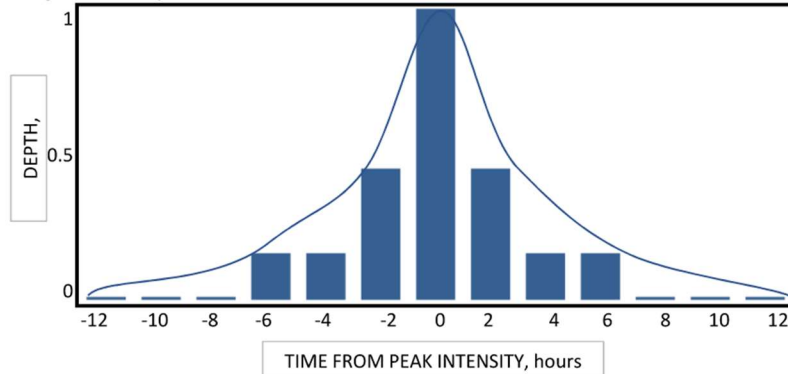
Figure 1.

The Town's 1984 drainage design manual provides guidelines for developing hydrographs for the design of storage facilities. The following are the calculations:

Unit rainfall excess time interval, D (hrs)	Time to peak, T_p (hrs)	Peak flow, q_p (cfs)
0.094	0.47	1.52

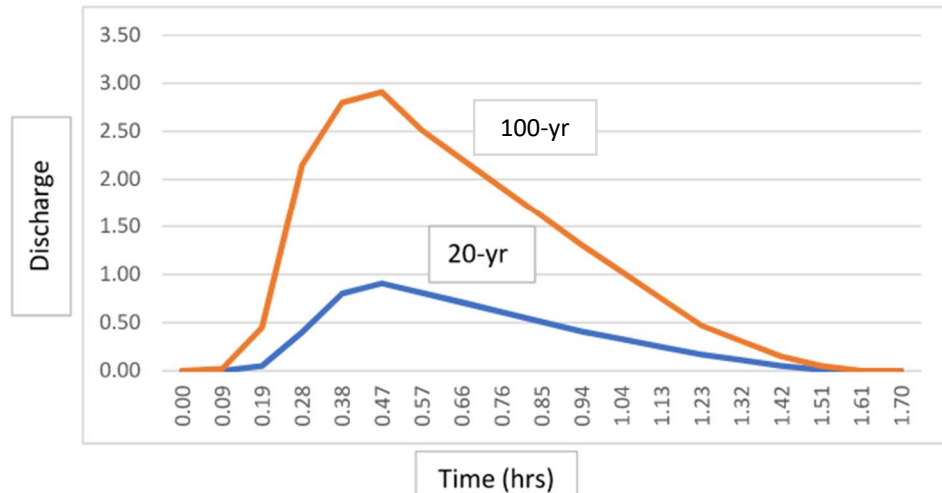
	Winter Precipitation (in)
P20 1 hr	0.95
P20 3 hr	2.00
P20 6 hr	2.90
P20 12 hr	4.00
P20 24 hr	6.40

Rainfall Design Storm Graph



Volume of 20-yr hydrograph (acre-ft)
0.06

Volume of 100-yr hydrograph (acre-ft)
0.20



Required Retention Volume (acre-ft)

0.20-0.06= 0.14 or 6,100 cf (6,098.4 rounded up to nearest 100)

Results:

72" (6-ft) HDPE Storage Pipe

Volume of water per linear foot of pipe

$$\pi(6)^2 / 4 = 28.26 \text{ cf}$$

Linear feet of 72" pipe required: 216

Linear feet of 72" pipe provided: 247

Proposed Storm Drain System – Existing Creek

The hydraulic calculations for the existing creek are based on the findings from the Environmental Assessment (EA) and Draft Environmental Impact Report (EIR) Volume 1 for the Eagle Lodge Base Development Project (September 2006). The EIR conducted a comprehensive analysis on the existing stormwater system. Based on Collection Point CP3.6.6, the 20-year and 100-year design storm flowrates for the Project's onsite creek were determined to be 76 cfs (Q_{50}) and 150 cfs (Q_{100}) (see **Appendix D**). Using the Hydraflow Storm Sewers Extension for Autodesk Civil 3D, the proposed 42-inch storm drain is capable of conveying, at minimum, the 100-year exceedance interval for the runoff from the existing creek (see **Appendix E**).

D. Storm Drain Summary

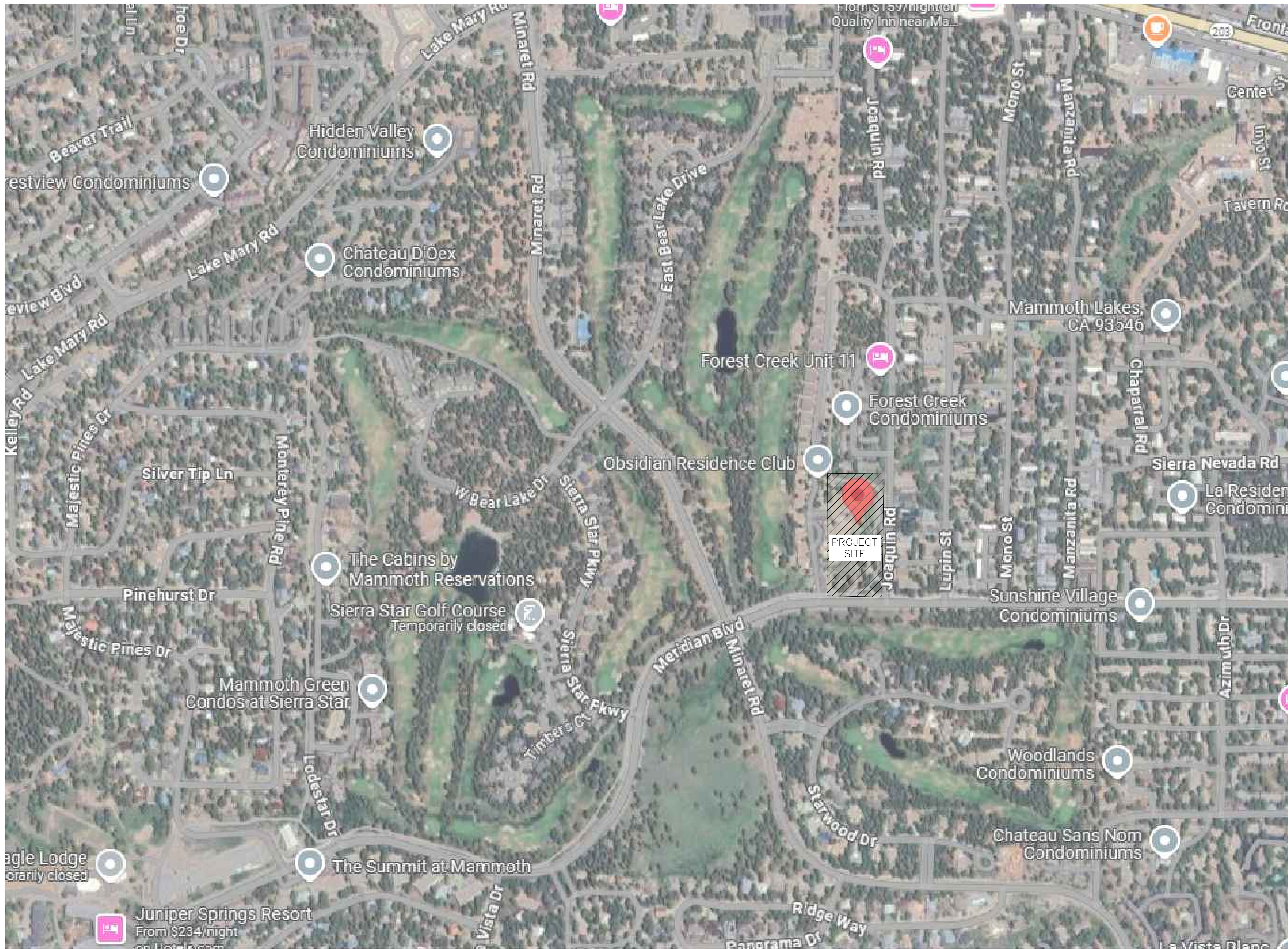
Hydrologic and hydraulic calculations for the proposed storm drain infrastructure and retention facility have been prepared in accordance with the Town's Design Criteria and previously prepared Master Plans or EIRs. The storm drain system is designed to convey flows from the 20-year storm event, while the retention facility is sized to capture and store the 100-year peak flows that exceed the 20-year design capacity.

E. References

1. 1984 Storm Drainage and Erosion Control Design Manual
2. 2005 Storm Drain Master Plan Update
3. 2015 Stormwater Master Plan
4. Environmental Assessment and Draft Environmental Impact Report Volume 1 for the Eagle Lodge Base Development Project (September 2006) – Chapter 3.0 Affected Environment and Environmental Consequences, Section 3.13 Stormwater

APPENDIX A

VICINITY MAP




 NOT TO SCALE

VICINITY MAP
 474 JOAQUIN ROAD
 MAMMOTH LAKES, CA
 APRIL 2025

PREPARED BY

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 (925) 940-2200
 www.bkf.com

Rev: Apr 24, 2025 at 3:16pm

APPENDIX B

EXISTING & PROPOSED CONDITIONS EXHIBITS

REVISIONS	DATE

OWNER:
474 JOAQUIN LLC.
 1055 ASHBURY STREET
 SAN FRANCISCO, CA 94117
 E: POORVA.GARGI995@GMAIL.COM

ARCHITECT:
STANLEY SAITOWITZ | NATOMA ARCHITECTS INC.
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 JOSEPH YOUNG
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 E: JYOUNG@BKF.COM

LEGEND

	PROPERTY LINE
	BUILDING LINE
	EDGE OF PAVEMENT
	FLOW LINE
	ROAD CENTER LINE
	SANITARY SEWER LINE
	STORM LINE
	DRAIN INLET
	FIRE HYDRANT
	HOSE BIB
	PROPANE TANK
	SEWER MANHOLE
	UTILITY POLE
	WATER VALVE BOX

ABBREVIATIONS

APN ASSESSOR PARCEL NUMBER
 HOA HOME OWNER ASSOCIATION

NOTES

- BOUNDARY INFORMATION SHOWN HEREON IS RECORD, FOR PLANNING PURPOSES ONLY AND WILL NEED TO BE VERIFIED..
- AREA: 3.22 ACRES MORE OR LESS
 APN: 033-170-003-000, 033-170-004-000 AND 033-170-005-000
 ADDRESS: 474 JOAQUIN ROAD, MAMMOTH LAKES, CA 93546
 OWNER: 474 JOAQUIN LLC, A CALIFORNIA LIMITED LIABILITY COMPANY.
 1055 ASHBURY STREET SAN FRANCISCO, CA 94117
 CIVIL ENGINEER/SURVEYOR: BKF ENGINEERS
 1646 N. CALIFORNIA BLVD., SUITE 400 WALNUT CREEK, CA 94596
 CONTACT: JOSEPH YOUNG, ASSOCIATE PRINCIPAL
 PHONE: (925) 940-2240
 ZONING: RESIDENTIAL MULTI-FAMILY 2
- ALL DISTANCES AND DIMENSIONS ARE IN FEET AND DECIMALS THEREOF.
- THE UTILITIES SHOWN ON THIS PLAN ARE DERIVED FROM SURFACE OBSERVATIONS AND RECORD DATA ARE APPROXIMATE ONLY. NO WARRANTY IS IMPLIED AS TO THE ACTUAL LOCATION, SIZE OR PRESENCE OF ANY UTILTY SHOWN OR ANY ADDITIONAL UTILITY LINES NOT SHOWN ON THIS PLAN.
- RECORD INFORMATION SHOWN HEREON IS BASED ON A PRELIMINARY TITLE REPORT REPORT PREPARED BY INYO-MONO TITLE COMPANY DATED MARCH 13, 2024, ORDER NUMBER IMT-00015208-M.

DESCRIPTION

PARCELS 4, 5 AND 6 OF SIERRA VALLEY SITES TRACT NO. 2, IN THE TOWN OF MAMMOTH LAKES, COUNTY OF MONO, STATE OF CALIFORNIA, AS PER MAP RECORDED JULY 29, 1969, IN BOOK 1 AT PAGES 1, 2 AND 2A OF ASSESSMENT MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

UTILITY COORDINATION

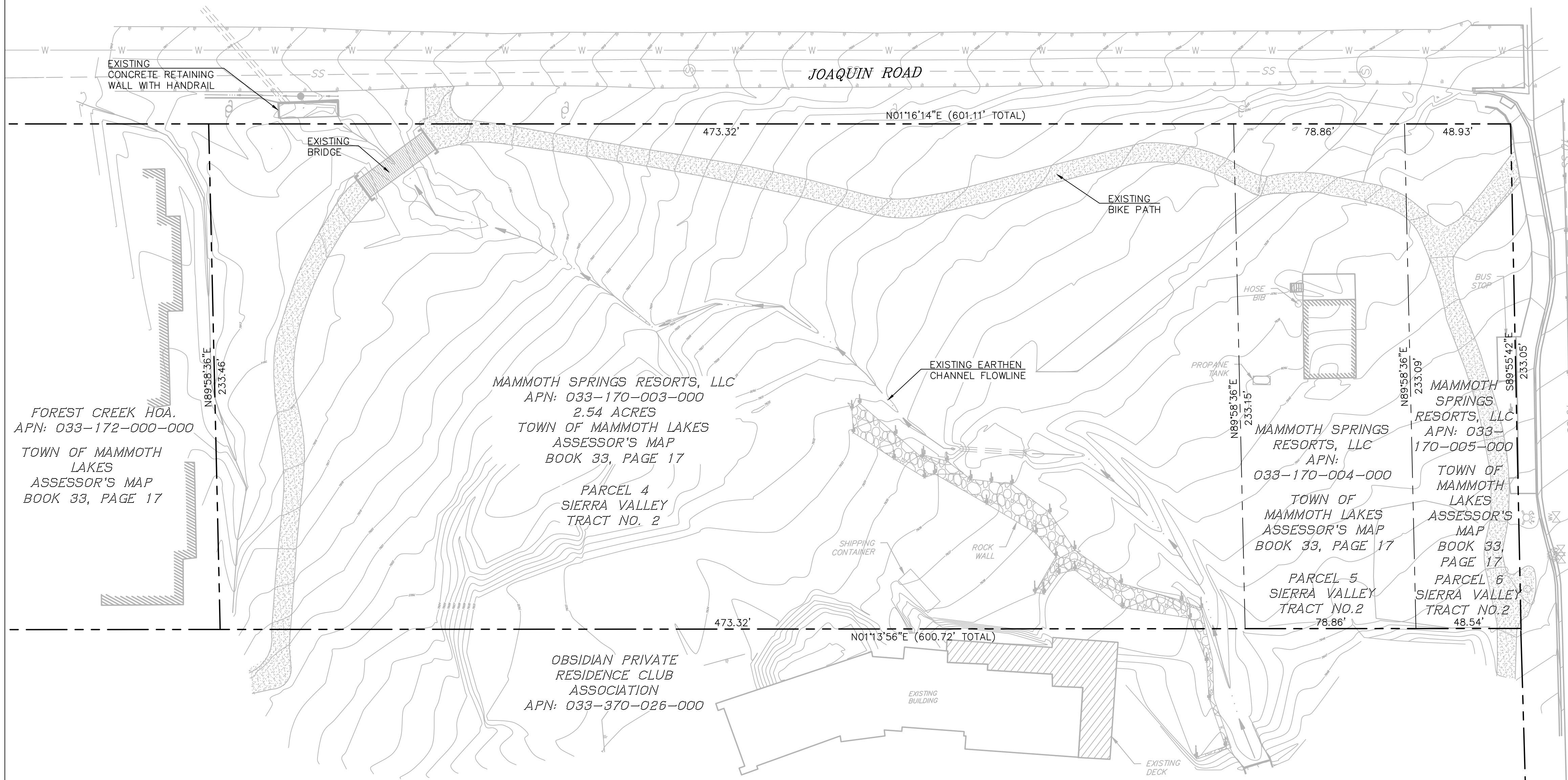
UTILITY COORDINATION:
 CABLE/INTERNET: AT&T, VERIZON
 ELECTRIC: SOUTHERN CALIFORNIA EDISON
 FIRE PROTECTION: MAMMOTH LAKES FIRE PROTECTION DISTRICT
 GAS: AMERIGAS
 SEWER: MAMMOTH COMMUNITY WATER DISTRICT
 TELEPHONE: FRONTIER COMMUNICATIONS
 WATER: MAMMOTH COMMUNITY WATER DISTRICT

BASIS OF BEARINGS

BEARINGS SHOWN HEREON ARE BASED ON SIERRA VALLEY SITES TRACT NO.2, IN THE TOWN OF MAMMOTH LAKES, COUNTY OF MONO, STATE OF CALIFORNIA, RECORDED JULY 29, 1969, IN BOOK 1 AT PAGES 1, 2 AND 2A OF ASSESSMENT MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BENCH MARK

TEMPORARY BENCH PER TOWN DATUM: MAGNETIC NAIL AND WASHER STAMPED: "LS 8441" AT SOUTHWEST CORNER.
 ELEVATION=8022.83



FOREST CREEK HOA.
 APN: 033-172-000-000
 TOWN OF MAMMOTH LAKES
 ASSESSOR'S MAP
 BOOK 33, PAGE 17

MAMMOTH SPRINGS RESORTS, LLC
 APN: 033-170-003-000
 2.54 ACRES
 TOWN OF MAMMOTH LAKES
 ASSESSOR'S MAP
 BOOK 33, PAGE 17

PARCEL 4
 SIERRA VALLEY
 TRACT NO. 2

OBSIDIAN PRIVATE
 RESIDENCE CLUB
 ASSOCIATION
 APN: 033-370-026-000

MAMMOTH SPRINGS
 RESORTS, LLC
 APN:
 033-170-004-000
 TOWN OF
 MAMMOTH LAKES
 ASSESSOR'S MAP
 BOOK 33,
 PAGE 17

PARCEL 5
 SIERRA VALLEY
 TRACT NO.2
 78.86'

MAMMOTH
 SPRINGS
 RESORTS, LLC
 APN: 033-
 170-005-000
 TOWN OF
 MAMMOTH
 LAKES
 ASSESSOR'S
 MAP
 BOOK 33,
 PAGE 17

PARCEL 6
 SIERRA VALLEY
 TRACT NO.2
 48.54'

474 JOAQUIN RD
 MAMMOTH LAKES, CA 93546

SHEET TITLE:

EXISTING CONDITIONS

SET: PLANNING SET

DATE: 2025-0613

SCALE:

DRAWN: SSJNAI

SHEET NO:

TTM2

REVISIONS	DATE

OWNER:
474 JOAQUIN LLC.
 1055 ASHBURY STREET
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 T: 925.940.2210
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LEGEND

- FIRE WATER LINE
- SANITARY SEWER LINE
- DOMESTIC WATER LINE
- JOINT TRENCH LINE
- STORM DRAIN LINE
- STORM DRAIN MANHOLE
- SANITARY SEWER MANHOLE
- FIRE HYDRANT
- POST INDICATOR VALVE
- BACKFLOW PREVENTER
- WATER METER
- STORM DRAIN CATCH BASIN

NOTES

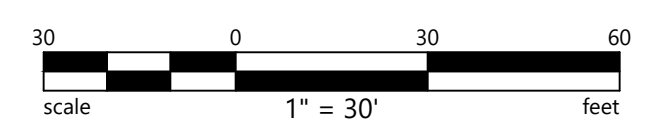
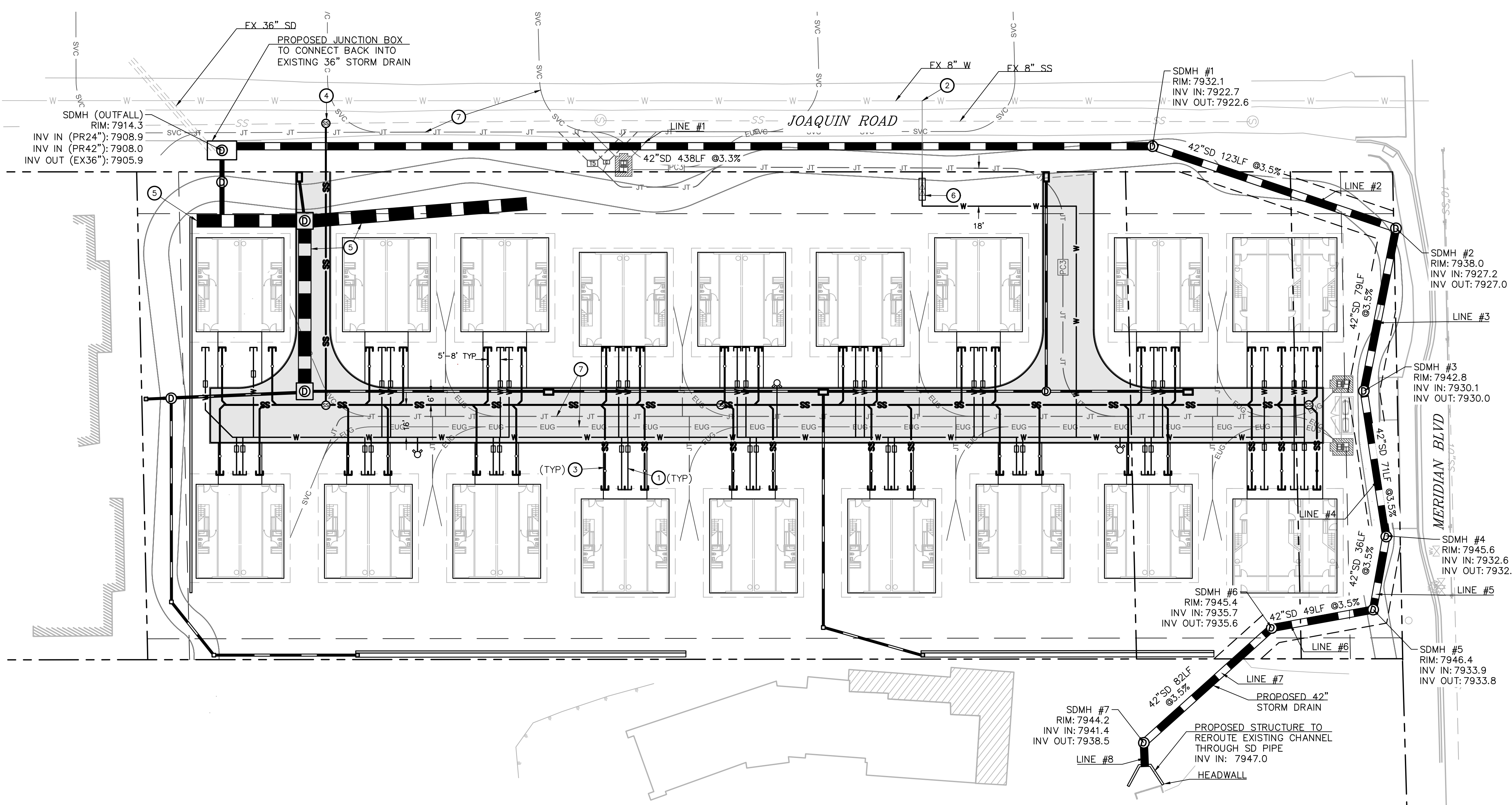
- PER TOWN OF MAMMOTH LAKES STORMWATER MASTER PLAN 2015 THERE IS NO NPDES MS4 PERMIT REQUIRED DUE TO A POPULATION OF LESS THAN 10,000 RESIDENTS.
- PER THE MAMMOTH STORM DRAIN MASTER PLAN THE TOWN ENTERED A MEMORANDUM OF UNDERSTANDING WITH THE LOHANTAN REGIONAL WATER QUALITY CONTROL BOARD, THE MEMO REQUIRES ALL NEW DEVELOPMENTS MUST RETAIN ON-SITE RUNOFF PRODUCED FROM A 1-HOUR 20-YEAR STORM EVENT.
- RETENTION SYSTEM SHOWN IS SIZED TO RETAIN VOLUME OF STORM RUNOFF PER NOTE 2 ABOVE.
- DESIGN RAINFALL DEPTH FOR THE 20 YEAR FREQUENCY EVENT IS 1 INCH PER THE 2005 MAMMOTH LAKES STORM DRAIN MASTER PLAN UPDATE (PAGE 70, FOOTNOTE 10).
- THE UTILITIES SHOWN ON THIS PLAN ARE DERIVED FROM RECORD DATA AND/OR SURFACE OBSERVATION AND ARE APPROXIMATE ONLY. ACTUAL LOCATION AND SIZE, TOGETHER WITH THE PRESENCE OF ANY ADDITIONAL UTILITY LINES NOT SHOWN ON THIS PLAN TO BE VERIFIED IN THE FIELD.
- ORDER OF WORK WITHIN THE PUBLIC RIGHT OF WAY SHALL BE PHASED SUCH THAT CLOSURE OF PUBLIC FACILITIES ARE MINIMIZED.

KEY NOTES

- DOMESTIC WATER METER & CONNECTION TO BUILDING (TYP)
- DOMESTIC WATER POINT OF CONNECTION TO EXISTING WATER MAIN
- SANITARY SEWER CONNECTION TO BUILDING (TYP)
- SANITARY SEWER POINT OF CONNECTION TO EXISTING SANITARY MAIN
- 60" STORM DRAIN RETENTION PIPE
- DOMESTIC WATER BACKFLOW PREVENTER
- SEE JOINT TRENCH PLANS

ABBREVIATIONS

- INV INVERT
- LF LINEAR FEET
- SD STORMDRAIN
- SDMH STORMDRAIN MANHOLE



474 JOAQUIN RD
 MAMMOTH LAKES, CA 93546

SHEET TITLE:
PRELIMINARY UTILITIES AND DRAINAGE PLAN

SET:	PLANNING SET
DATE:	2025-0613
SCALE:	
DRAWN:	SSJNAI

SHEET NO:
TTM6

APPENDIX C

FIGURES FROM THE 1984 STORM DRAINAGE DESIGN MANUAL

Figure 3-7
Overland Flow T_{co} Component

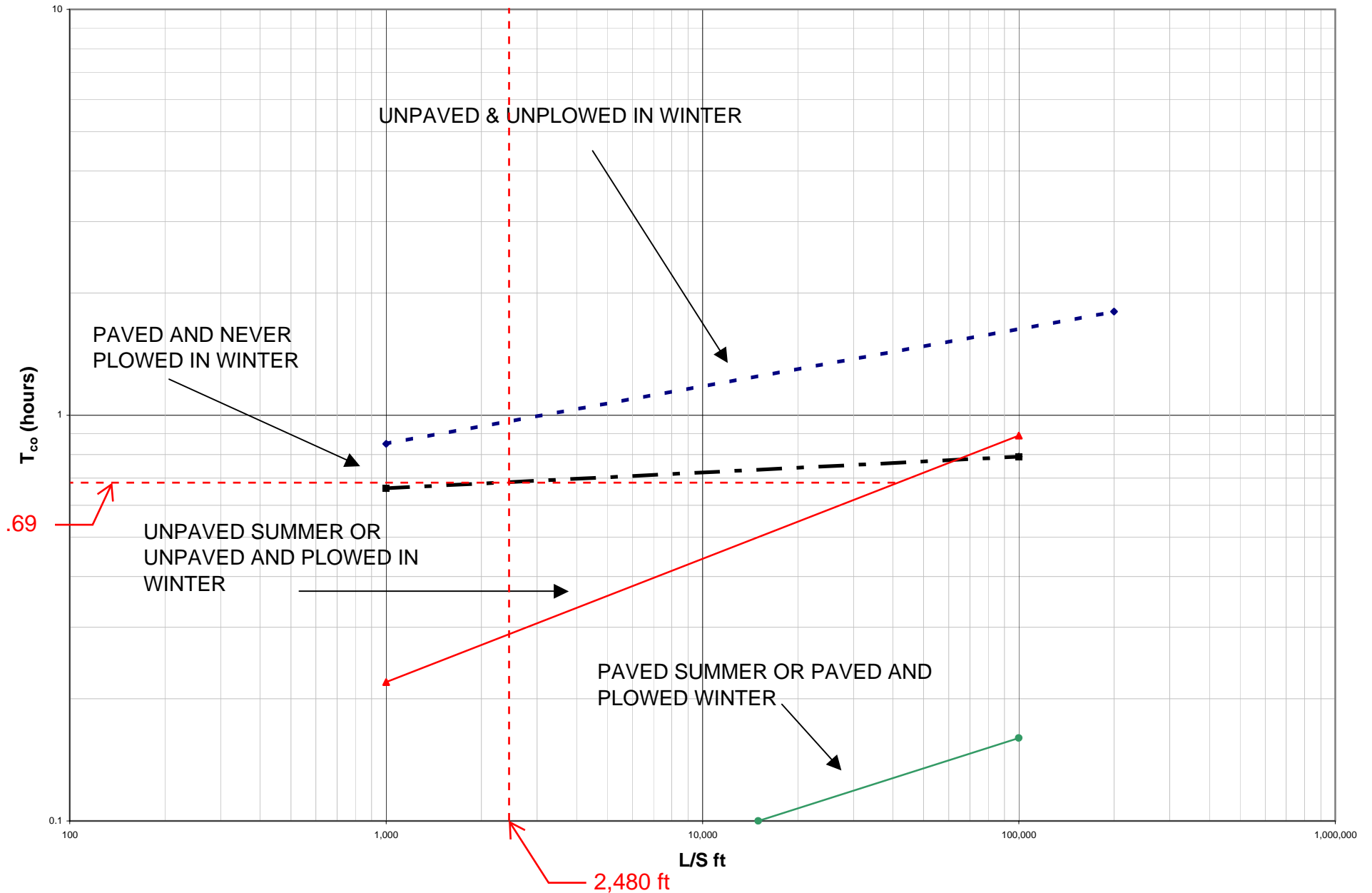
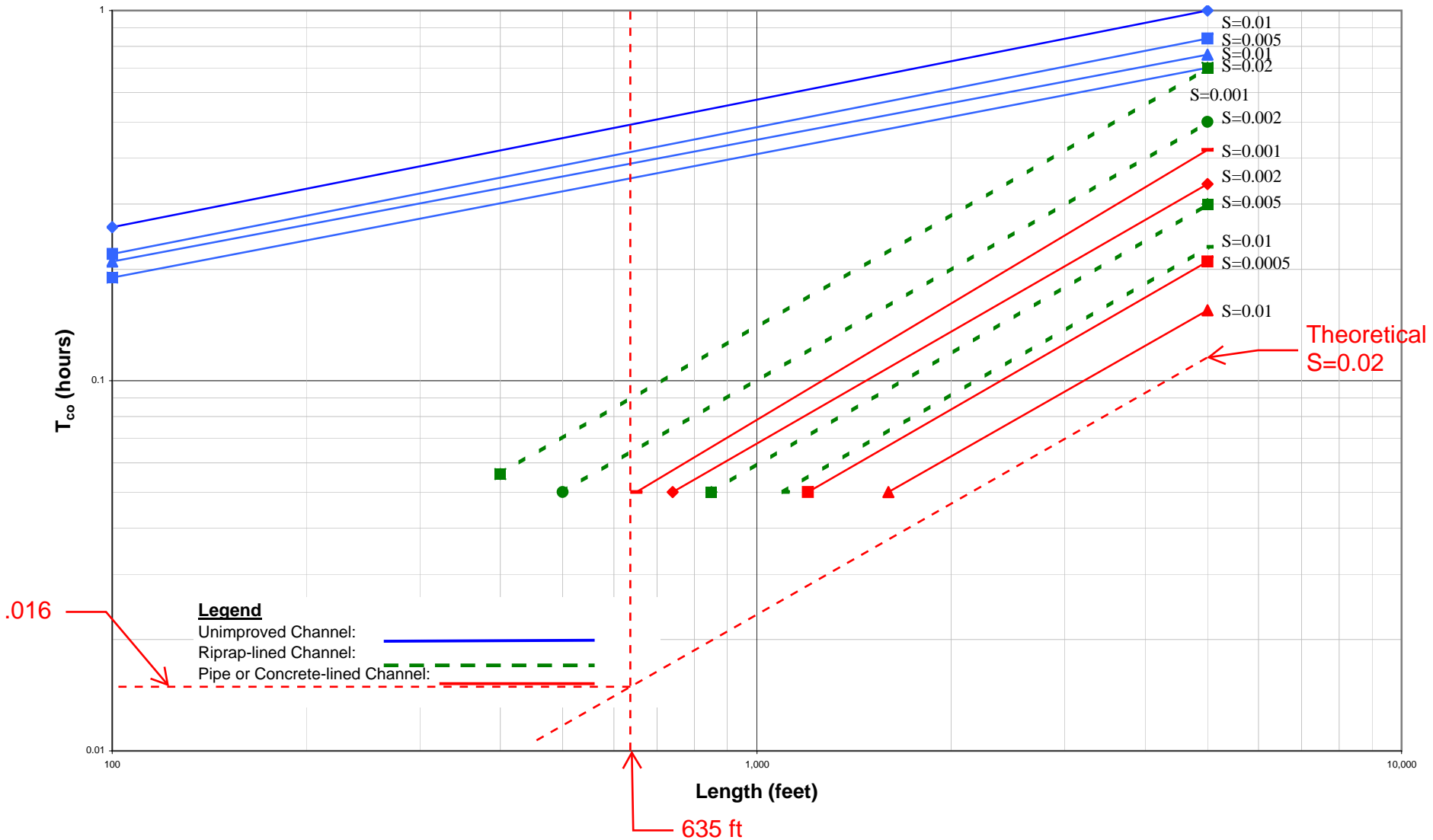
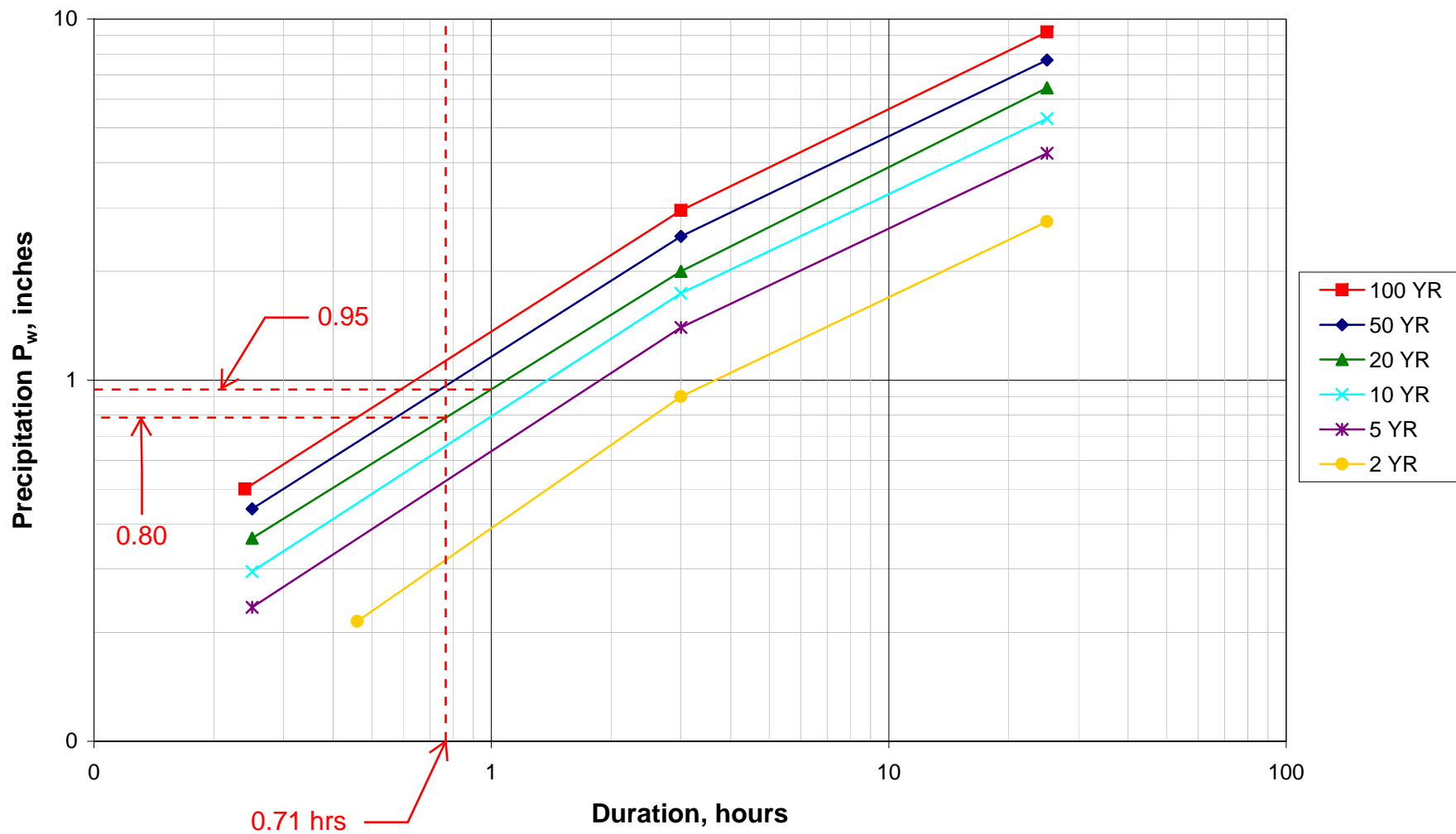


Figure 3-8
Channel Flow T_{cc} Component



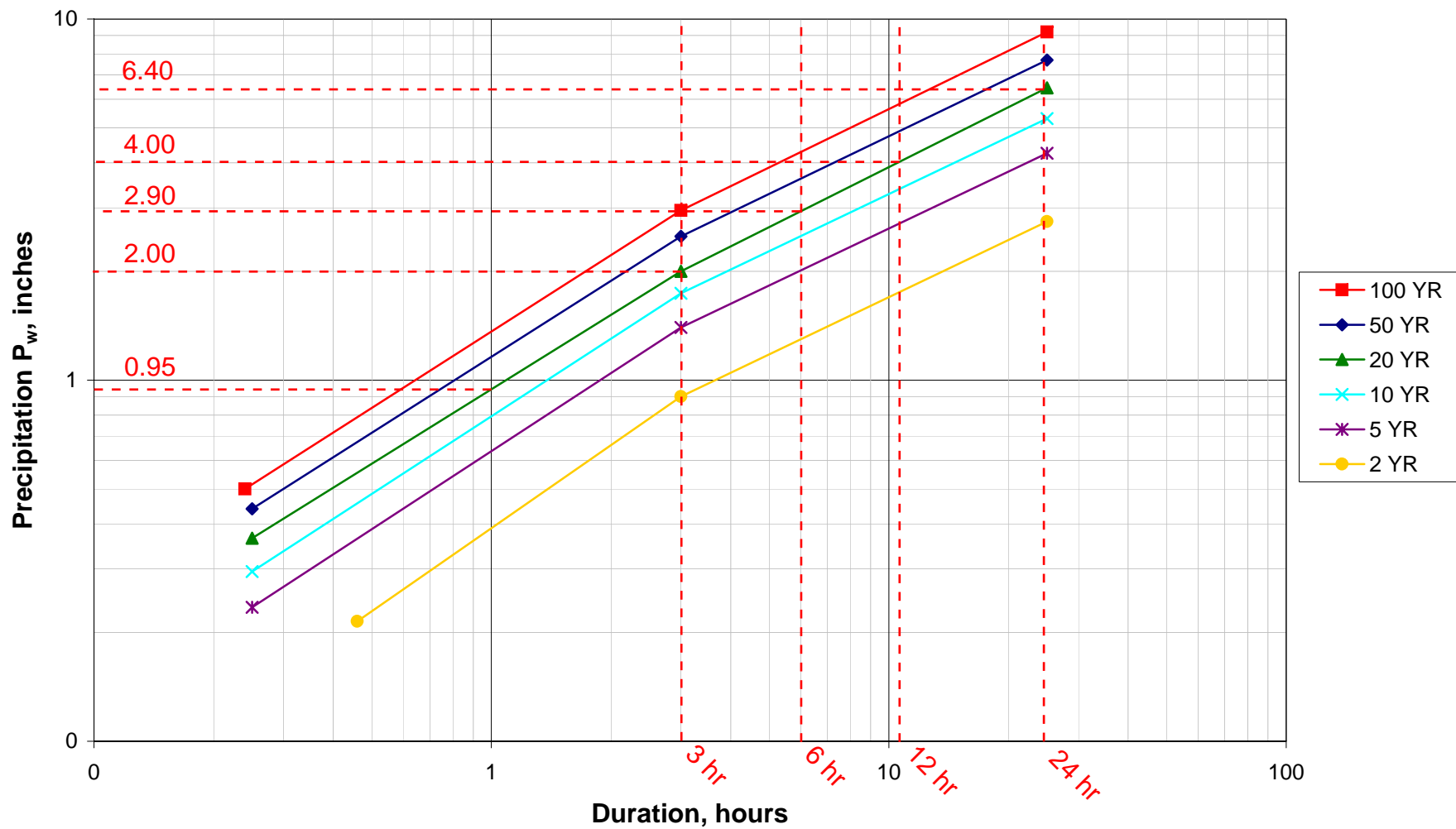
Used for 20-year peak flow calculations

Figure 3-9 Winter Precipitation Design Curve, P_w



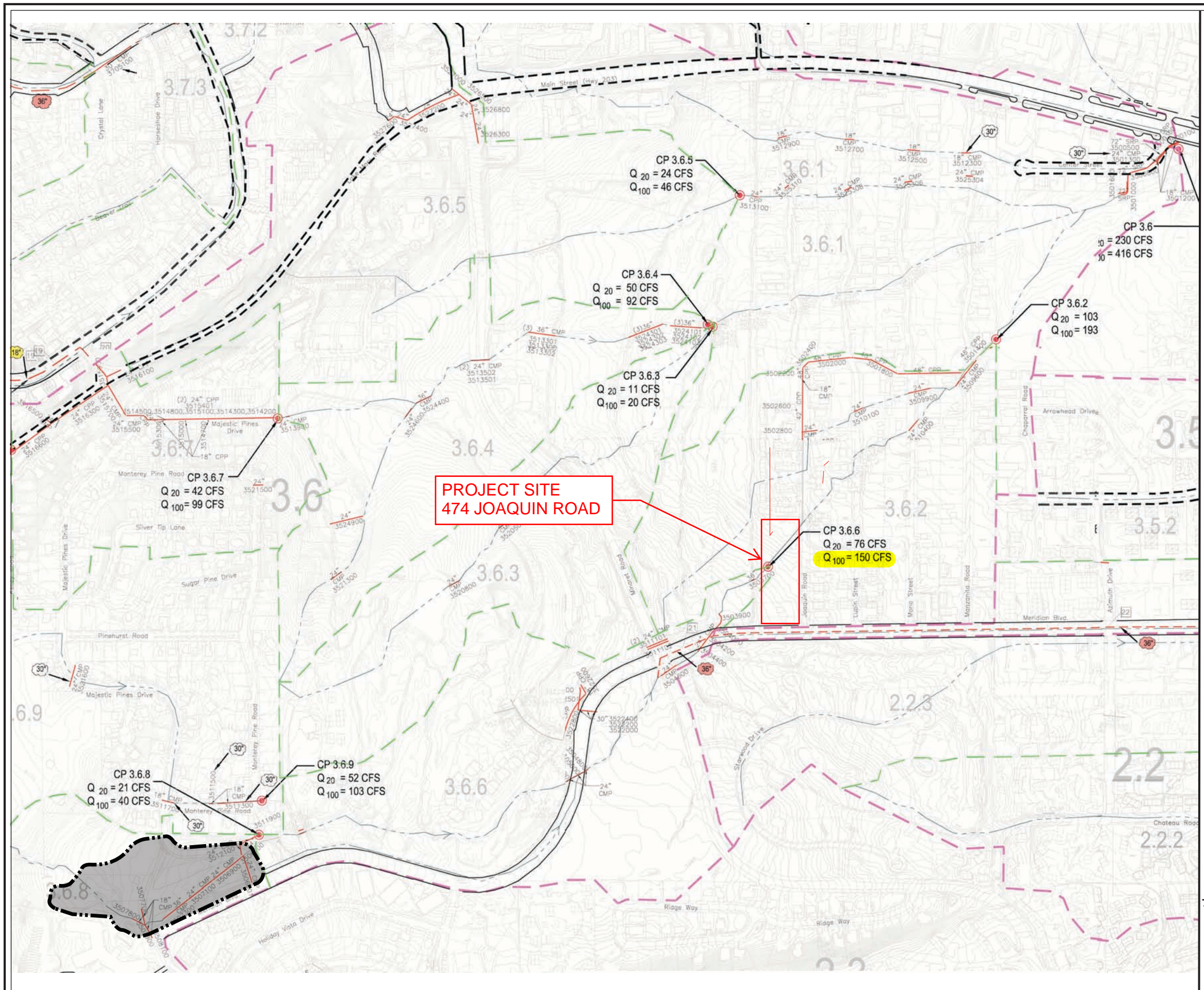
Used for 20-year hydrograph analysis

Figure 3-9 Winter Precipitation Design Curve, P_w



APPENDIX D

EXISTING CREEK 100-YEAR PEAK FLOW MAP



LEGEND

- MAJOR WATERSHED BOUNDARY
 - DETAILED DRAINAGE WATERSHED BOUNDARIES
 - FLOWLINE
 - STORM DRAIN, EXISTING
 - STORM DRAIN, RECOMMENDED
 - CURB AND GUTTER, EXISTING
 - CURB AND GUTTER, RECOMMENDED
 - WATERSHED COLLECTION POINT, CP
 - 30" RECOMMENDED PIPE REPLACEMENT OR NEW PIPE. (RED SHADING = PRIORITY 1, YELLOW SHADING = PRIORITY 2)
 - 10 NEW PIPE ID
-
- Project Area Boundary



Figure 48
Existing Drainage Facilities

Source: Town of Mammoth Lakes, PCR Services, 2006

APPENDIX E

HYDRAFLOW CALCULATIONS – 50-YEAR & 100-YEAR, 42-INCH STORM DRAIN ANALYSIS

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	438.187	0.000	MH	0.00	0.00	0.00	0.0	7908.00	3.33	7922.60	42	Cir	0.011	0.37	7931.00	Line 1
2	1	122.948	18.640	MH	0.00	0.00	0.00	0.0	7922.70	3.50	7927.00	42	Cir	0.011	0.99	7938.00	Line 2
3	2	79.298	82.541	MH	0.00	0.00	0.00	0.0	7927.20	3.53	7930.00	42	Cir	0.011	0.39	7941.30	Line 3
4	3	70.495	-19.949	MH	0.00	0.00	0.00	0.0	7930.10	3.40	7932.50	42	Cir	0.011	0.38	7946.00	Line 4
5	4	35.506	18.958	MH	0.00	0.00	0.00	0.0	7932.60	3.38	7933.80	42	Cir	0.011	0.95	7946.00	Line 5
6	5	49.300	69.525	MH	0.00	0.00	0.00	0.0	7933.90	3.45	7935.60	42	Cir	0.011	0.58	7945.10	Line 6
7	6	82.257	-31.639	MH	0.00	0.00	0.00	0.0	7935.70	3.40	7938.50	42	Cir	0.011	0.81	7944.20	Line 7
8	7	11.343	-50.471	Hdwl	76.00	0.00	0.00	0.0	7941.40	49.37	7947.00	42	Cir	0.011	1.00	7947.00	Line 8

Project File: 474Joaquin_Creek-Channel_hydraflow.stm

Number of lines: 8

Date: 6/17/2025

50-year Design Storm - Q=76 cfs

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	SDMH 1	Manhole	7931.00	Cir	4.00	4.00	42	Cir	7922.60	42	Cir	7922.70
2	SDMH 2	Manhole	7938.00	Cir	4.00	4.00	42	Cir	7927.00	42	Cir	7927.20
3	SDMH 3	Manhole	7941.30	Cir	4.00	4.00	42	Cir	7930.00	42	Cir	7930.10
4	SDMH 4	Manhole	7946.00	Cir	4.00	4.00	42	Cir	7932.50	42	Cir	7932.60
5	SDMH 5	Manhole	7946.00	Cir	4.00	4.00	42	Cir	7933.80	42	Cir	7933.90
6	SDMH 6	Manhole	7945.10	Cir	4.00	4.00	42	Cir	7935.60	42	Cir	7935.70
7	SDMH 7	Manhole	7944.20	Cir	4.00	4.00	42	Cir	7938.50	42	Cir	7941.40
8	OPEN INLET	OpenHeadwall	7947.00	n/a	n/a	n/a	42	Cir	7947.00			

Project File: 474Joaquin_Creek-Channel_hydraflow.stm	Number of Structures: 8	Run Date: 6/17/2025
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Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Line 1	76.00	42	Cir	438.187	7908.00	7922.60	3.332	7911.39	7925.33	n/a	7925.33	End	Manhole
2	Line 2	76.00	42	Cir	122.948	7922.70	7927.00	3.497	7925.33	7929.73	n/a	7929.73	1	Manhole
3	Line 3	76.00	42	Cir	79.298	7927.20	7930.00	3.531	7929.73	7932.73	n/a	7932.73	2	Manhole
4	Line 4	76.00	42	Cir	70.495	7930.10	7932.50	3.404	7932.73	7935.23	n/a	7935.23	3	Manhole
5	Line 5	76.00	42	Cir	35.506	7932.60	7933.80	3.379	7935.23	7936.53	n/a	7936.53	4	Manhole
6	Line 6	76.00	42	Cir	49.300	7933.90	7935.60	3.449	7936.53	7938.33	n/a	7938.33	5	Manhole
7	Line 7	76.00	42	Cir	82.257	7935.70	7938.50	3.404	7938.33	7941.23	n/a	7941.23	6	Manhole
8	Line 8	76.00	42	Cir	11.343	7941.40	7947.00	49.371	7942.11	7949.73	n/a	7949.73	7	OpenHeadwall

Project File: 474Joaquin_Creek-Channel_hydraflow.stm

Number of lines: 8

Run Date: 6/17/2025

NOTES: Known Qs only

50-year Design Storm - Q=76 cfs

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	42	76.00	7908.00	7911.39	3.39	8.04	7.97	1.39	7912.78	0.000	438.187	7922.60	7925.33	2.73**	8.04	9.46	1.39	7926.72	0.000	0.000	n/a	0.37	n/a
2	42	76.00	7922.70	7925.33	2.63	7.74	9.82	1.39	7926.72	0.000	122.948	7927.00	7929.73	2.73**	8.04	9.46	1.39	7931.12	0.000	0.000	n/a	0.99	n/a
3	42	76.00	7927.20	7929.73	2.52	7.43	10.23	1.39	7931.12	0.000	79.298	7930.00	7932.73	2.73**	8.04	9.46	1.39	7934.12	0.000	0.000	n/a	0.39	n/a
4	42	76.00	7930.10	7932.73	2.63	7.74	9.82	1.39	7934.12	0.000	70.495	7932.50	7935.23	2.73**	8.04	9.46	1.39	7936.62	0.000	0.000	n/a	0.38	n/a
5	42	76.00	7932.60	7935.23	2.63	7.74	9.82	1.39	7936.62	0.000	35.506	7933.80	7936.53	2.73**	8.04	9.46	1.39	7937.92	0.000	0.000	n/a	0.95	n/a
6	42	76.00	7933.90	7936.53	2.63	7.74	9.82	1.39	7937.92	0.000	49.300	7935.60	7938.33	2.73**	8.04	9.46	1.39	7939.72	0.000	0.000	n/a	0.58	n/a
7	42	76.00	7935.70	7938.33	2.63	7.74	9.82	1.39	7939.72	0.000	82.257	7938.50	7941.23	2.73**	8.04	9.46	1.39	7942.62	0.000	0.000	n/a	0.81	n/a
8	42	76.00	7941.40	7942.11	0.71*	1.41	53.95	1.39	7943.50	0.000	11.343	7947.00	7949.73	2.73**	8.04	9.46	1.39	7951.12	0.000	0.000	n/a	1.00	n/a

Project File: 474Joaquin_Creek-Channel_hydraflow.stm

Number of lines: 8

Run Date: 6/17/2025

Notes: * depth assumed; ** Critical depth. ; c = cir e = ellip b = box

50-year Design Storm - Q=76 cfs

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	438.187	0.000	MH	0.00	0.00	0.00	0.0	7908.00	3.33	7922.60	42	Cir	0.011	0.37	7931.00	Line 1
2	1	122.948	18.640	MH	0.00	0.00	0.00	0.0	7922.70	3.50	7927.00	42	Cir	0.011	0.99	7938.00	Line 2
3	2	79.298	82.541	MH	0.00	0.00	0.00	0.0	7927.20	3.53	7930.00	42	Cir	0.011	0.39	7941.30	Line 3
4	3	70.495	-19.949	MH	0.00	0.00	0.00	0.0	7930.10	3.40	7932.50	42	Cir	0.011	0.38	7946.00	Line 4
5	4	35.506	18.958	MH	0.00	0.00	0.00	0.0	7932.60	3.38	7933.80	42	Cir	0.011	0.95	7946.00	Line 5
6	5	49.300	69.525	MH	0.00	0.00	0.00	0.0	7933.90	3.45	7935.60	42	Cir	0.011	0.58	7945.10	Line 6
7	6	82.257	-31.639	MH	0.00	0.00	0.00	0.0	7935.70	3.40	7938.50	42	Cir	0.011	0.81	7944.20	Line 7
8	7	11.343	-50.471	Hdwl	150.00	0.00	0.00	0.0	7941.40	49.37	7947.00	42	Cir	0.011	1.00	7947.00	Line 8

Project File: 474Joaquin_Creek-Channel_hydraflow.stm

Number of lines: 8

Date: 6/17/2025

100-year Design Storm - Q=150 cfs

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	SDMH 1	Manhole	7931.00	Cir	4.00	4.00	42	Cir	7922.60	42	Cir	7922.70
2	SDMH 2	Manhole	7938.00	Cir	4.00	4.00	42	Cir	7927.00	42	Cir	7927.20
3	SDMH 3	Manhole	7941.30	Cir	4.00	4.00	42	Cir	7930.00	42	Cir	7930.10
4	SDMH 4	Manhole	7946.00	Cir	4.00	4.00	42	Cir	7932.50	42	Cir	7932.60
5	SDMH 5	Manhole	7946.00	Cir	4.00	4.00	42	Cir	7933.80	42	Cir	7933.90
6	SDMH 6	Manhole	7945.10	Cir	4.00	4.00	42	Cir	7935.60	42	Cir	7935.70
7	SDMH 7	Manhole	7944.20	Cir	4.00	4.00	42	Cir	7938.50	42	Cir	7941.40
8	OPEN INLET	OpenHeadwall	7947.00	n/a	n/a	n/a	42	Cir	7947.00			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Line 1	150.0	42	Cir	438.187	7908.00	7922.60	3.332	7911.39	7925.99	1.43	7925.99	End	Manhole
2	Line 2	150.0	42	Cir	122.948	7922.70	7927.00	3.497	7925.99	7930.39	3.82	7930.39	1	Manhole
3	Line 3	150.0	42	Cir	79.298	7927.20	7930.00	3.531	7930.39	7933.39	1.50	7933.39	2	Manhole
4	Line 4	150.0	42	Cir	70.495	7930.10	7932.50	3.404	7933.39	7935.89	1.46	7935.89	3	Manhole
5	Line 5	150.0	42	Cir	35.506	7932.60	7933.80	3.379	7935.89	7937.19	3.66	7937.19	4	Manhole
6	Line 6	150.0	42	Cir	49.300	7933.90	7935.60	3.449	7937.19	7938.99	2.24	7938.99	5	Manhole
7	Line 7	150.0	42	Cir	82.257	7935.70	7938.50	3.404	7938.99	7941.89	3.12	7941.89	6	Manhole
8	Line 8	150.0	42	Cir	11.343	7941.40	7947.00	49.371	7942.41	7950.39	3.85	7950.39	7	OpenHeadwall

Project File: 474Joaquin_Creek-Channel_hydraflow.stm

Number of lines: 8

Run Date: 6/17/2025

NOTES: Known Qs only

100-year Design Storm - Q=150 cfs

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	42	150.0	7908.00	7911.39	3.39	9.53	15.74	3.85	7915.25	0.000	438.18	7922.60	7925.99	3.39**	9.53	15.75	3.85	7929.84	0.000	0.000	n/a	0.37	1.43
2	42	150.0	7922.70	7925.99	3.29	9.38	15.99	3.85	7929.84	0.000	122.94	7927.00	7930.39	3.39**	9.53	15.75	3.85	7934.24	0.000	0.000	n/a	0.99	3.82
3	42	150.0	7927.20	7930.39	3.19	9.19	16.31	3.85	7934.24	0.000	79.29	7930.00	7933.39	3.39**	9.53	15.75	3.85	7937.24	0.000	0.000	n/a	0.39	1.50
4	42	150.0	7930.10	7933.39	3.29	9.38	15.99	3.85	7937.24	0.000	70.49	7932.50	7935.89	3.39**	9.53	15.75	3.85	7939.74	0.000	0.000	n/a	0.38	1.46
5	42	150.0	7932.60	7935.89	3.29	9.38	15.99	3.85	7939.74	0.000	35.50	7933.80	7937.19	3.39**	9.53	15.75	3.85	7941.04	0.000	0.000	n/a	0.95	3.66
6	42	150.0	7933.90	7937.19	3.29	9.38	15.99	3.85	7941.04	0.000	49.30	7935.60	7938.99	3.39**	9.53	15.75	3.85	7942.84	0.000	0.000	n/a	0.58	2.24
7	42	150.0	7935.70	7938.99	3.29	9.38	15.99	3.85	7942.84	0.000	82.25	7938.50	7941.89	3.39**	9.53	15.75	3.85	7945.74	0.000	0.000	n/a	0.81	3.12
8	42	150.0	7941.40	7942.41	1.00*	2.28	65.68	3.85	7946.26	0.000	11.34	7947.00	7950.39	3.39**	9.53	15.75	3.85	7954.24	0.000	0.000	n/a	1.00	3.85

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100-year Design Storm - Q=150 cfs