FIGURE 3

STETSON ENGINEERS INC.

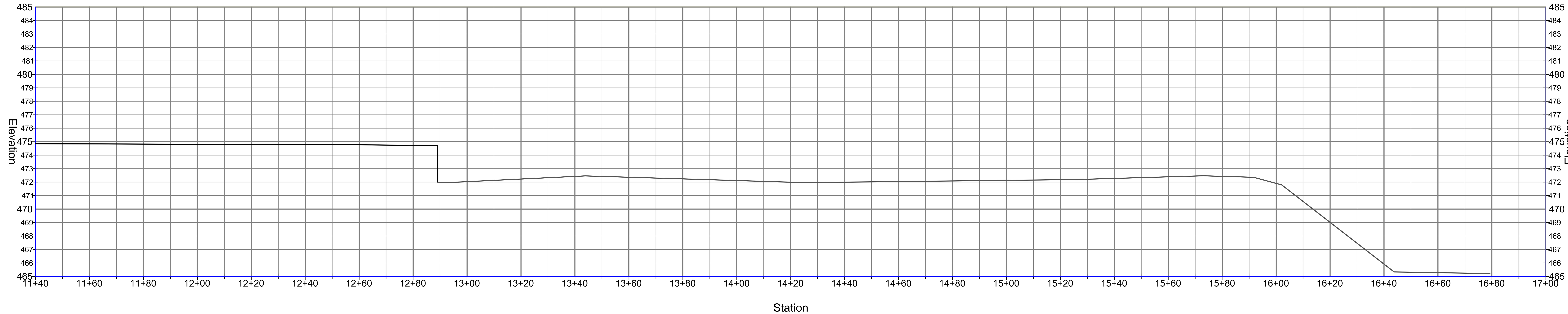
DATE: SEPTEMBER 19, 2022

JN: 2852

PLAN VIEW AND WALL PROFILE (STA 5+40 TO 11+40)

F:\DATA\2852\AutoCAD\Survey\22-9-14.dwg

FIGURE 4



STETSON ENGINEERS INC.

DATE: SEPTEMBER 19, 2022 | JN: 2852

PLAN VIEW AND WALL PROFILE (STA 11+40 TO 17+00)

F:\DATA\2852\AutoCAD\Survey\22-9-14.dwg

Appendix D

As-Built Drawings of Existing Bridge
and LACPW's 60% Designs of Proposed Replacement Bridge

LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION

PLANS FOR BRIDGE

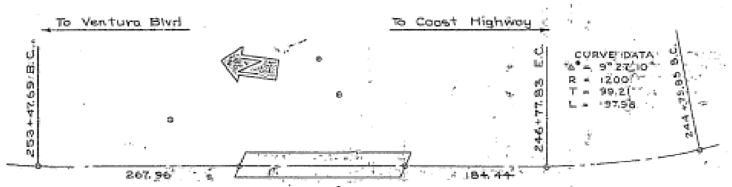
ON

MALIBU CANYON ROAD

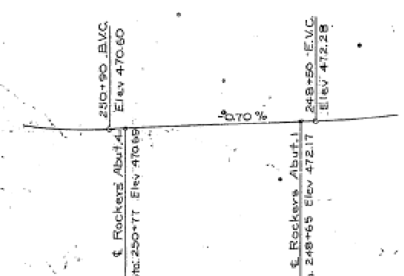
OVER

MALIBU CREEK

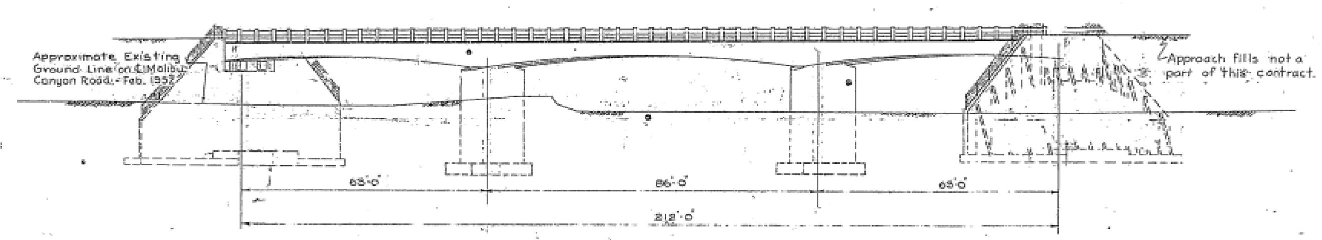
CASH CONTRACT No. 20-850



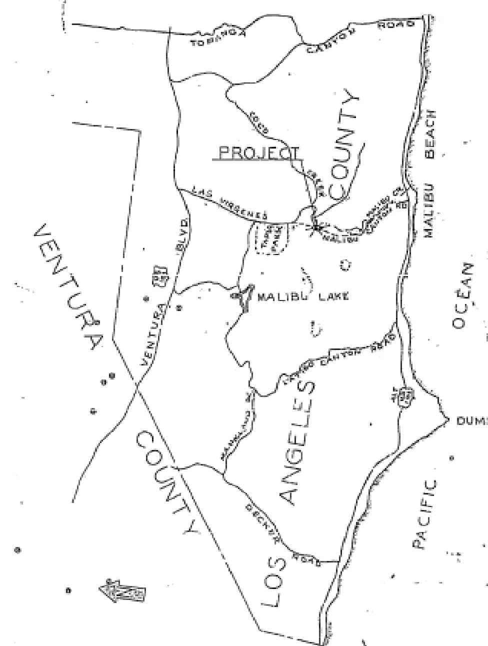
ALIGNMENT



℄ PROFILE

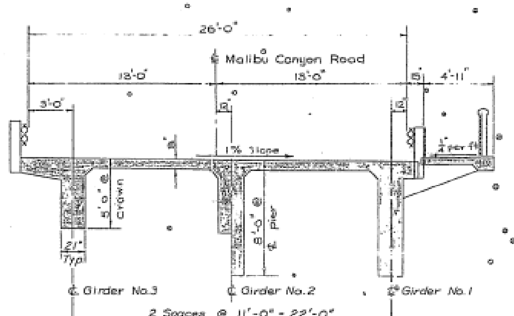


WEST ELEVATION
Scale: 1"=20'

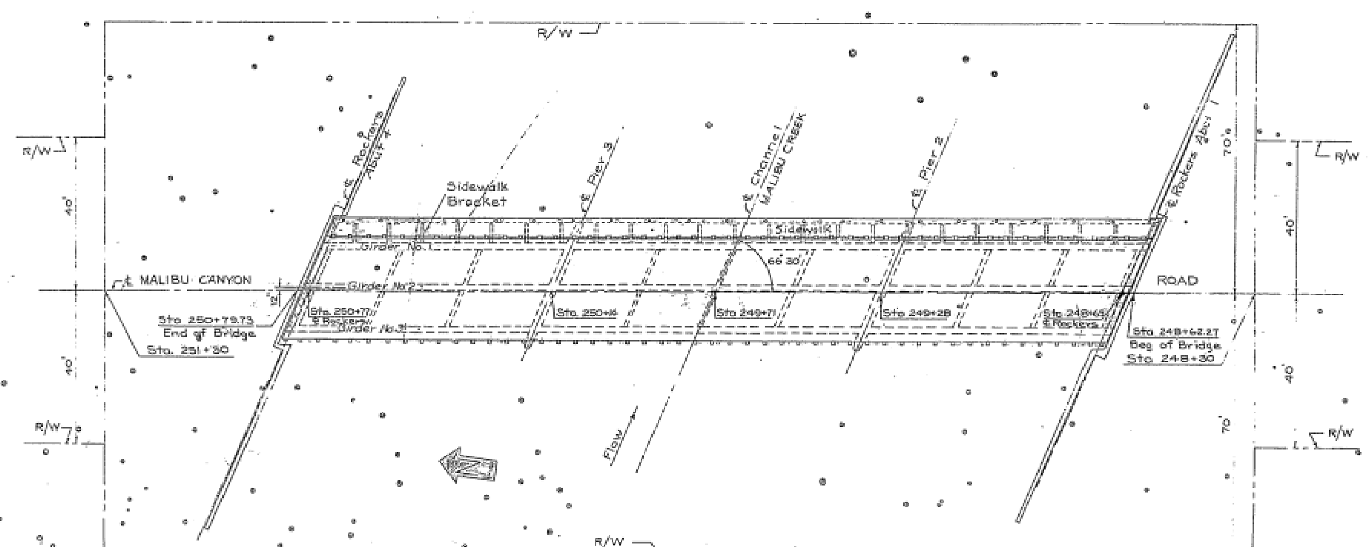


PROJECT LOCATION

GENERAL INDEX	
SHEET No	DESCRIPTION
1	TITLE SHEET
2	DECK ELEV., POUR SEQUENCE, CAMBER, EXIST. CONTOURS
3	PIER AND PIER FOOTINGS
4	ABUTMENT DETAILS
5	GIRDER AND DIAPHRAGM
6	DECK SLAB DETAILS
7	EXP. ARMOR, FENCE, ROCKER, BAR HOOK
8, 9 and 10	GUARD RAIL DETAILS
11	HAND RAIL DETAILS



TYPICAL SECTION
Scale: 3/16"=1'-0"



GENERAL PLAN OF BRIDGE
Scale: 1"=20'

GENERAL NOTES

DESIGN SPECIFICATION: A.A.S.H.O. Standard Specifications for Highway Bridges, Fifth Edition, 1949

Design Loading H20-S16-44

Design Stresses:
f_s = 20,000 p.s.i. (Reinforcing)
f_s = 18,000 p.s.i. (Structural)
fc = 1,000 p.s.i.
n = 10

Dc ıgn Soil Pressures:
At Abutments 5 Tons/sq.ft.
At Piers 3 Tons/sq.ft.

CONSTRUCTION: County of Los Angeles Road Department Standard Specifications and Special Provisions

DATUM: U.S.G.S.

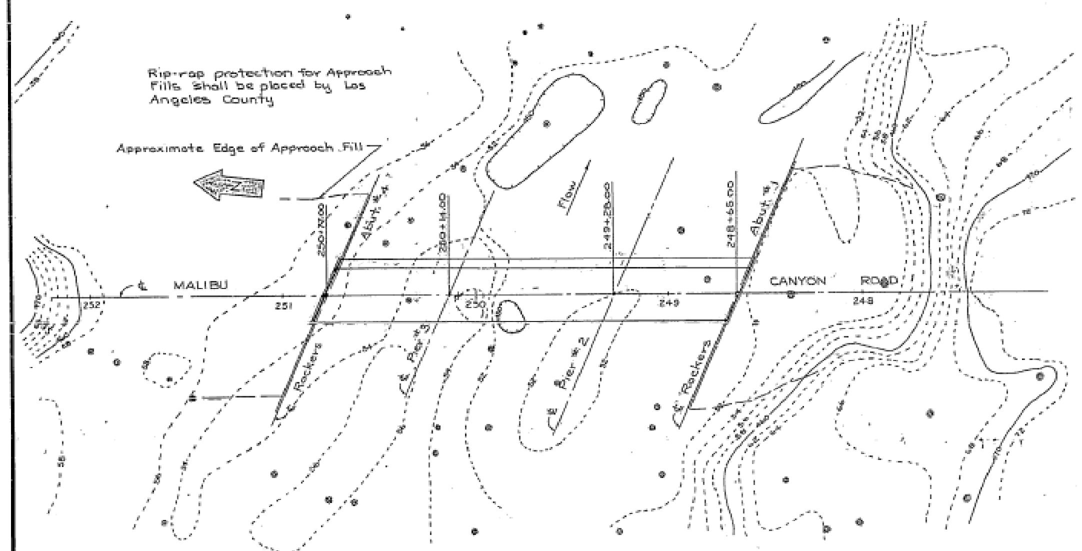
DRAWN J.C. FULLER 9-12-51
CHECKED KULKA 2-27-52

DESIGNED: [signature] C.E. 7447 May 23 '52
Designer Date

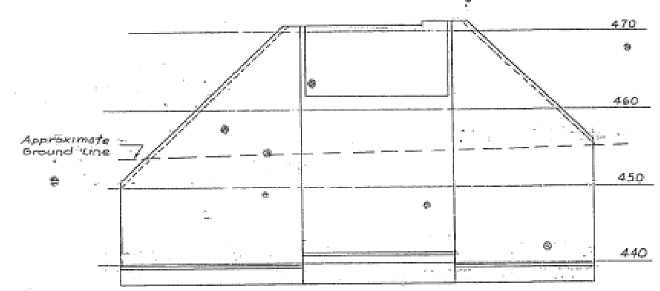
APPROVAL RECOMMENDED: Allen Thompson May 28 1952
Engineer of Design Date

LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD OVER MALIBU CREEK
TITLE SHEET

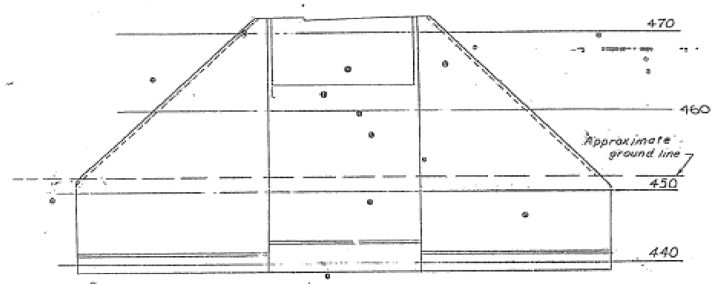
SUBMITTED: A. A. Kamlet 5-23-52 DIVISION ENGINEER DATE
APPROVED: [signature] Kennedy 5/23/52 ROAD COMMISSIONER DATE
JOB No. 20-850
SHT. 1 OF 11
DWG. NO. #602907
C-3229



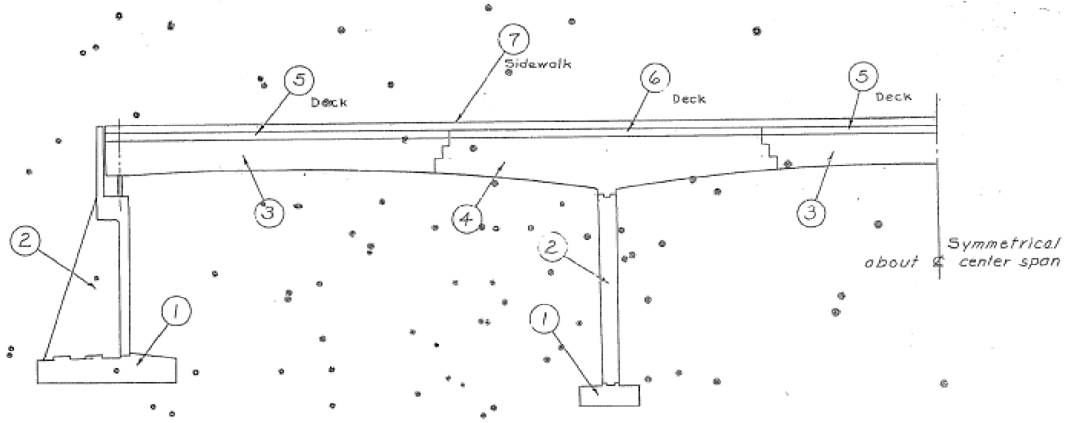
CONTOURS
Based on County Survey of Feb. 1952
Scale: 1"=40'



FRONT FACE ELEVATION - ABUTMENT NO. 4
Scale 1"=20' Horiz.
1"=10' Vert.

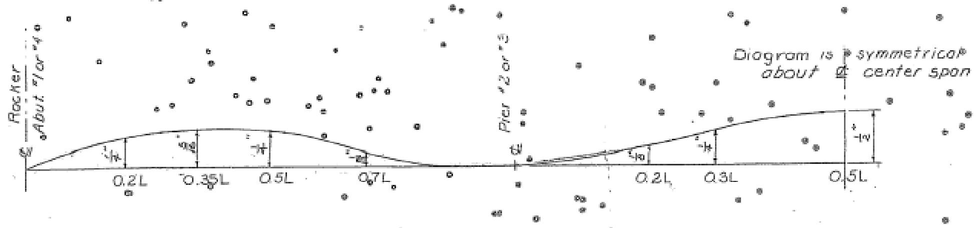


FRONT FACE ELEVATION-ABUTMENT NO. 1
Scale: 1"=20' Horiz.
1"=10' Vert.



SKETCH SHOWING POURING SEQUENCE
No Scale

DECK ELEVATIONS (CAMBER NOT INCLUDED)									
	℄ Malibu Canyon Rd.		℄ Girder #1		℄ Girder #2		℄ Girder #3		Depth of Girder
	Station	Elev.	Station	Elev.	Station	Elev.	Station	Elev.	
℄ Rockers Abut. #1	248+65.00	472.17	248+59.78	472.08	248+64.57	472.16	248+63.35	472.24	
			+66.78	472.03	+71.57	472.11	+76.35	472.19	5.27
			+79.78	471.94	+84.57	472.02	+89.35	472.10	5.00
			249+02.78	471.78	249+07.57	471.86	249+12.35	471.94	5.86
℄ Pier #2	249+28.00	471.73	+22.78	471.64	+27.57	471.72	+32.35	471.80	8.00
			+42.78	471.50	+47.57	471.58	+52.35	471.66	5.86
			+65.78	471.34	+70.57	471.42	+75.35	471.50	5.00
			+88.78	471.18	+93.57	471.26	+98.35	471.34	5.86
℄ Pier #3	250+14.00	471.13	250+08.78	471.04	250+13.57	471.12	250+18.35	471.20	8.00
			+28.78	470.90	+33.57	470.98	+38.35	471.06	5.86
			+51.78	470.74	+56.57	470.82	+61.35	470.90	5.00
			+64.78	470.65	+69.57	470.73	+74.35	470.81	5.27
℄ Rockers Abut. #4	250+77.00	470.69	+71.78	470.60	+76.57	470.68	+81.35	470.76	



CAMBER DIAGRAM
Construction form settlement to be added to above
No Scale

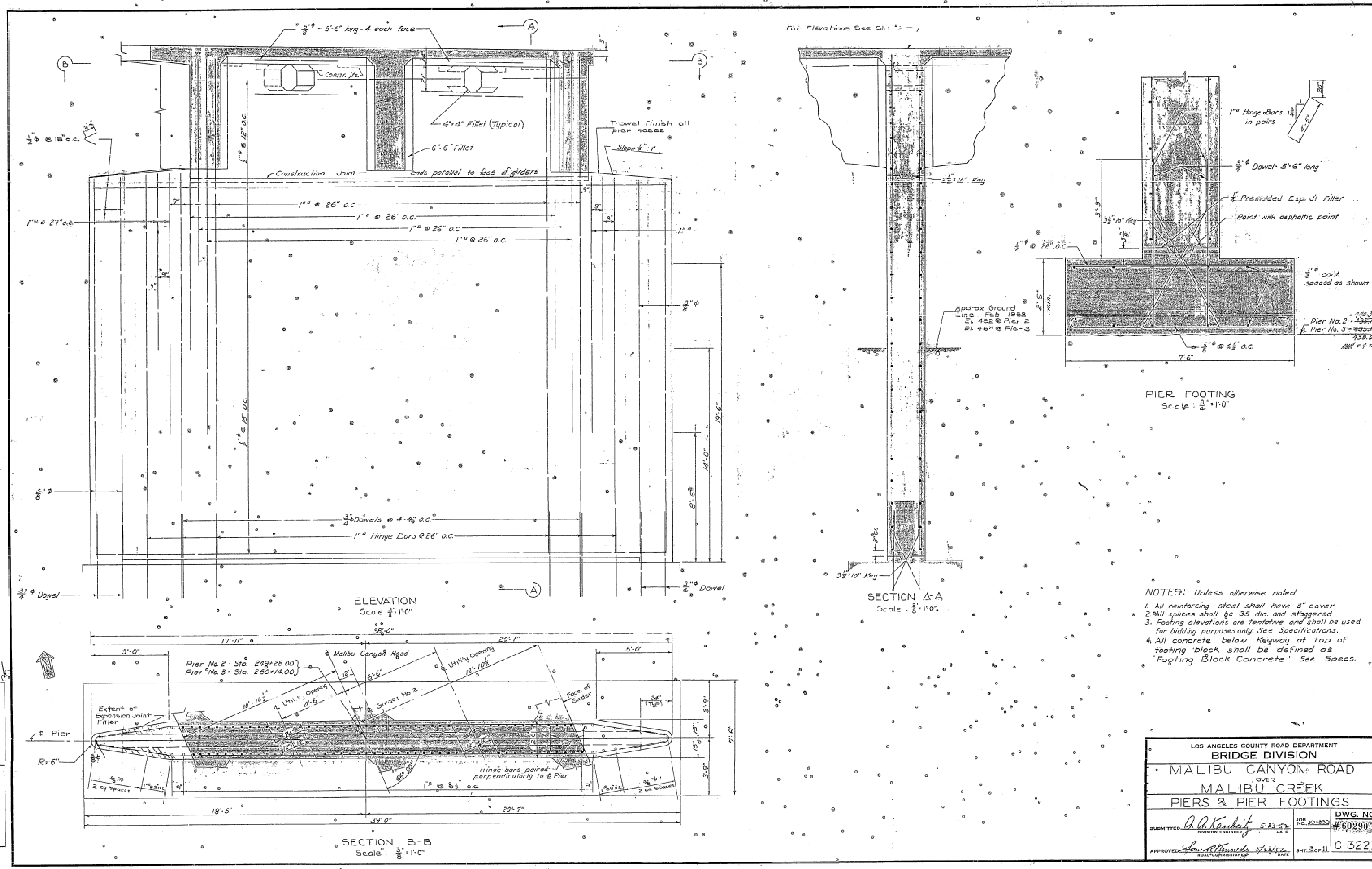
DRAWN W.H.O. Dec 1951 | CHECKED F.K. FEB. 52

LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION

MALIBU CANYON ROAD
OVER
MALIBU CREEK

DECK ELEVATIONS - POURING SEQUENCE
CAMBER - EXISTING CONTOURS

SUBMITTED G. A. Kemberly 5-23-52 (DIVISION ENGINEER, DATE)
APPROVED [signature] 5/23/52 (ROAD COMMISSIONER, DATE)
JOB NO. 20-850
SHT. 2 OF 11
DWG. NO. #602906
C-3228



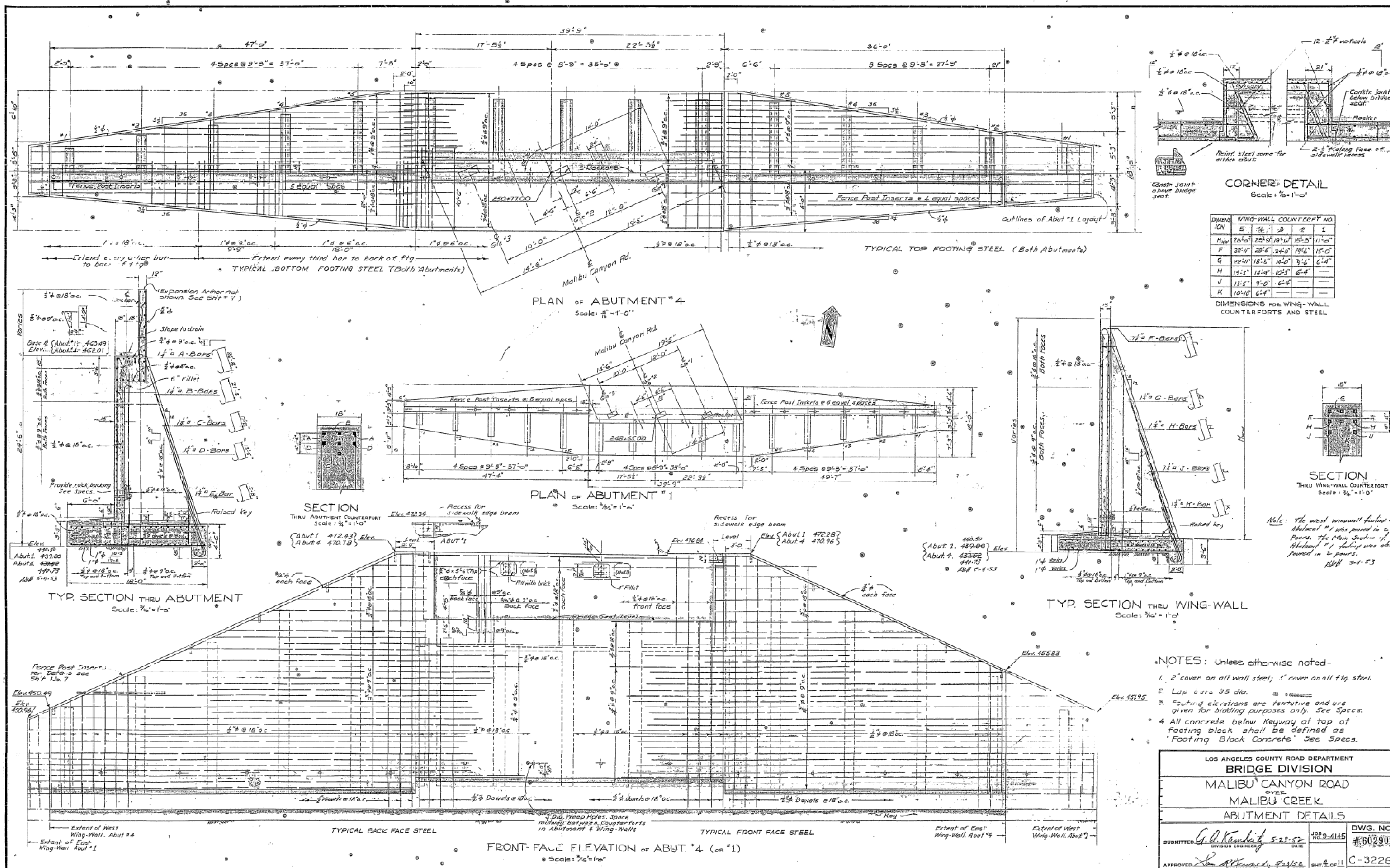
NOTES: Unless otherwise noted

1. All reinforcing steel shall have 3" cover
2. All splices shall be 35 dia. and staggered
3. Footing elevations are tentative and shall be used for bidding purposes only. See Specifications.
4. All concrete below Keyway at top of footing block shall be defined as "Footing Block Concrete" See Specs.

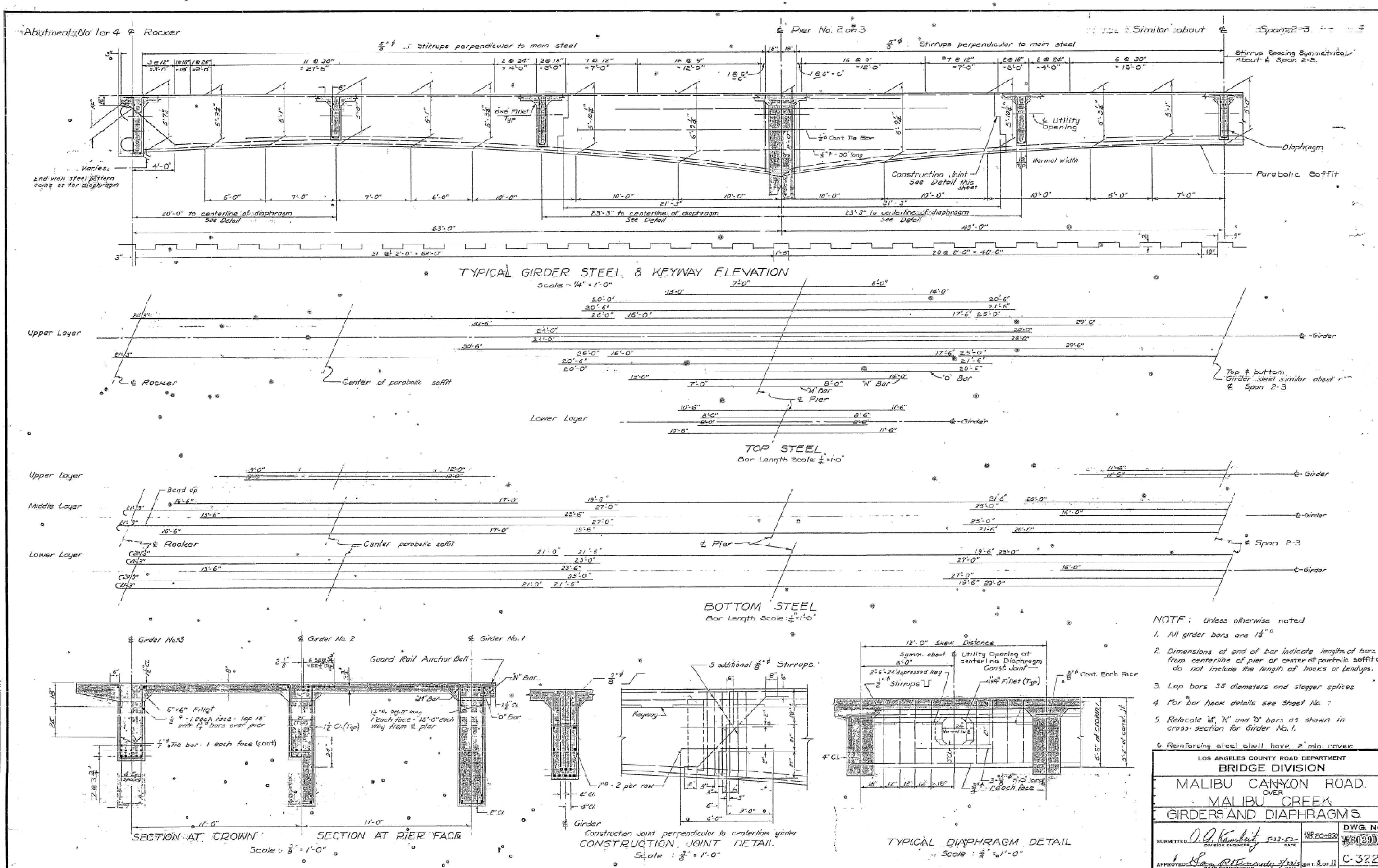
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION

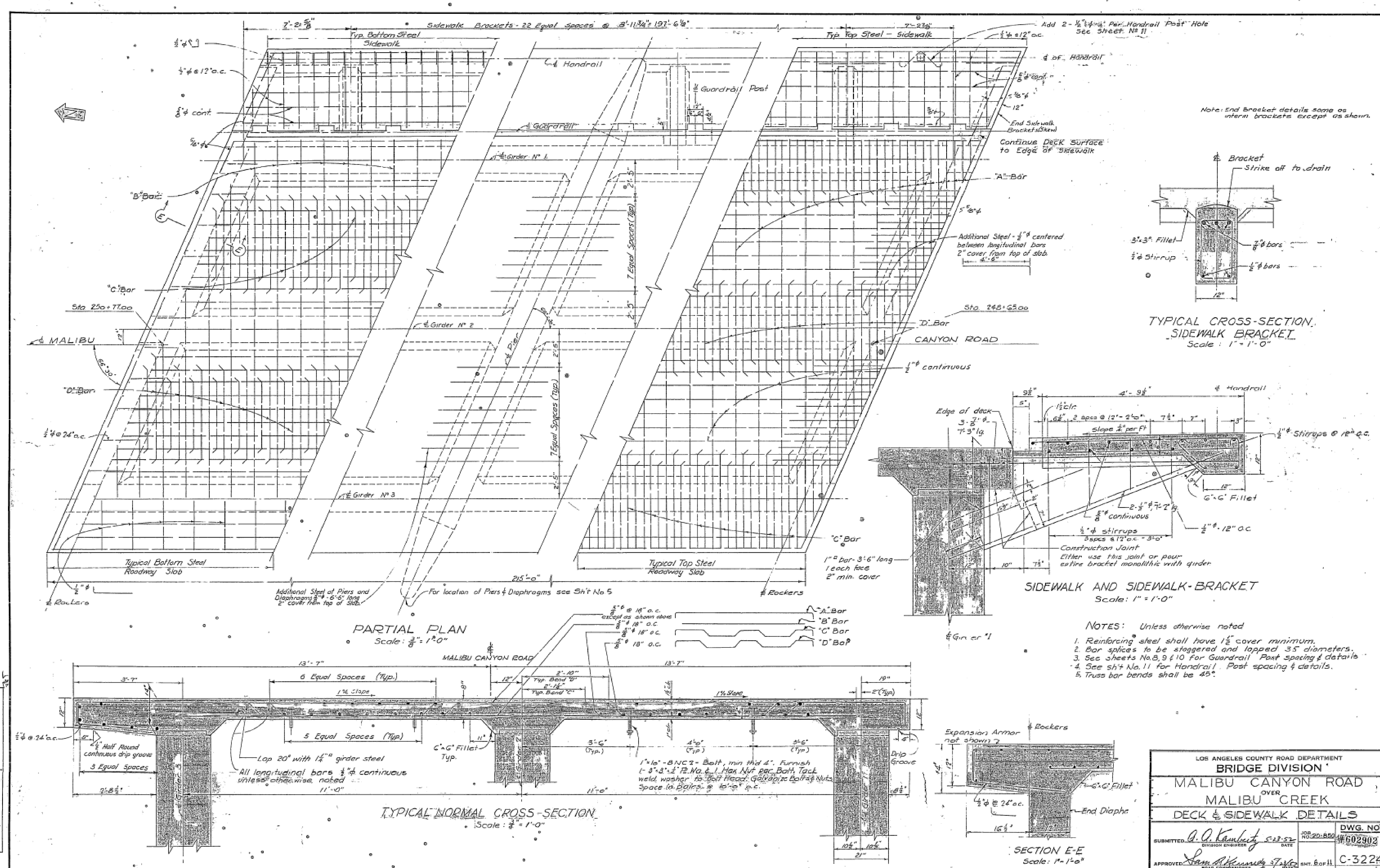
MALIBU CANYON ROAD
OVER
MALIBU CREEK
PIERS & PIER FOOTINGS

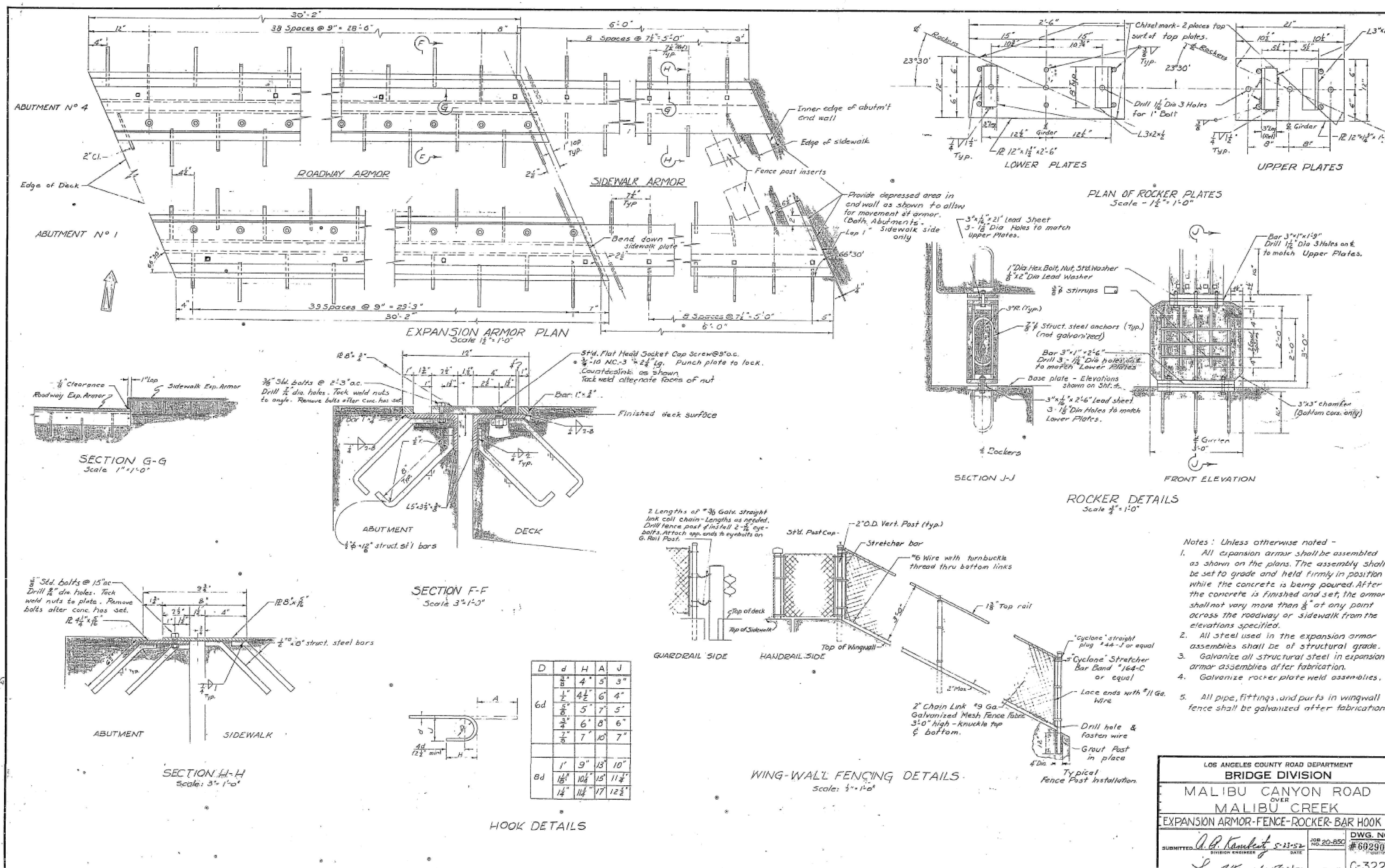
SUBMITTED A. A. Kambitz 5-23-52 DIVISION ENGINEER DATE
APPROVED Sam R. Kennedy 5/23/52 ROAD COMMISSIONER DATE
JOB NO. 20-850 SHT. 3 of 11
DWG. NO. #602905 C-3227



DIMENSION	WING-WALL COUNTERFT NO.				
	5	4	3	2	1
H_{ww}	28'-0"	23'-9"	19'-6"	15'-3"	11'-0"
F	32'-11"	28'-6"	24'-0"	19'-6"	15'-0"
G	22'-8"	18'-5"	14'-0"	9'-6"	6'-4"
H	19'-3"	14'-9"	10'-5"	6'-4"	—
J	13'-5"	9'-0"	6'-4"	—	—
K	10'-10"	6'-4"	—	—	—


TYPICAL GIRDER STEEL & KEYWAY ELEVATION
Scale - 1/4" = 1'-0"
Abutment No 1 or 4 ℄ Rocker
℄ Pier No. 2 or 3
Similar about ℄ Span 2-3
Stirrups perpendicular to main steel
Stirrup Spacing Symmetrical About ℄ Span 2-3.
Diaphragm
Parabolic Soffit
Construction Joint See Detail this sheet
℄ Utility Opening
Normal width
End wall steel pattern same as for diaphragm
20'-0" to centerline of diaphragm See Detail
23'-3" to centerline of diaphragm See Detail
63'-0"
43'-0"
31 @ 2'-0" = 62'-0"
20 @ 2'-0" = 40'-0"
TOP STEEL
Bar Length Scale: 1/8" = 1'-0"
Upper Layer
Lower Layer
℄ Rocker
Center of parabolic soffit
"M" Bar
"N" Bar
"O" Bar
℄ Pier
℄-Girder
Top & bottom Girder steel similar about ℄ Span 2-3
BOTTOM STEEL
Bar Length Scale: 1/8" = 1'-0"
Middle Layer
Bend up
℄ Span 2-3
℄ Girder No. 3
℄ Girder No. 2
℄ Girder No. 1
Guard Rail Anchor Bolt
6"x6" Fillet
1/2" ϕ Tie bar - 1 each face (cont)
SECTION AT CROWN
SECTION AT PIER FACE
Scale: 3/8" = 1'-0"
Construction Joint perpendicular to centerline girder
CONSTRUCTION JOINT DETAIL
Scale: 3/8" = 1'-0"
3 additional 5/8" ϕ Stirrups
Keyway
12'-0" Skew Distance
Symm. about ℄ Utility Opening at centerline Diaphragm
Const. Joint
Fillet (Typ)
Cont. Each Face
TYPICAL DIAPHRAGM DETAIL
Scale: 3/8" = 1'-0"
NOTE: Unless otherwise noted
1. All girder bars are 1 1/4" ϕ
2. Dimensions at end of bar indicate lengths of bars from centerline of pier or center of parabolic soffit and do not include the length of hooks or bendups.
3. Lap bars 35 diameters and stagger splices
4. For bar hook details see Sheet No. 7
5. Relocate "M", "N" and "O" bars as shown in cross-section for Girder No. 1.
6. Reinforcing steel shall have 2" min. cover.
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD OVER MALIBU CREEK
GIRDERS AND DIAPHRAGMS
SUBMITTED 5-13-52 DIVISION ENGINEER
APPROVED ROAD COMMISSIONER
DWG. NO. #602903
C-3225
DRAWN H.I. LEFKOWITZ SEPT. 1951
CHECKED KULKA


PARTIAL PLAN
Scale: 3/8" = 1'-0"
Sidewalk Brackets - 22 Equal Spaces @ 8'-11 3/4" = 197'-6 1/2"
Typ. Bottom Steel Sidewalk
Typ. Top Steel - Sidewalk
Add 2 - 1/2" Ø Per Handrail Post Hole See Sheet No. 11
℄ Handrail
℄ Guardrail Post
℄ Guardrail
℄ Girder No. 1
℄ Girder No. 2
℄ Girder No. 3
℄ Pier
"A" Bar
"B" Bar
"C" Bar
"D" Bar
Sta. 250+77.00
Sta. 248+63.00
℄ MALIBU CANYON ROAD
1/2" Ø continuous
Continue Deck Surface to Edge of Sidewalk
End Sidewalk Bracket (Skew)
Additional Steel - 1/2" Ø centered between longitudinal bars 2" cover from top of slab
Typical Bottom Steel Roadway Slab
Typical Top Steel Roadway Slab
215'-0"
℄ Rockers
Additional Steel at Piers and Diaphragms 5/8" Ø - 6'-6" long 2" cover from top of slab.
For location of Piers & Diaphragms see Sh't No. 5
1" Ø bar - 3'-6" long 1 each face 2" min. cover
7 Equal Spaces (Typ.)
Note: End Bracket details same as internal brackets except as shown.
TYPICAL CROSS-SECTION SIDEWALK BRACKET
Scale: 1" = 1'-0"
℄ Bracket
Strike off to drain
3"x3" Fillet
1/2" Ø Stirrup
7/8" Ø bars
1/2" Ø bars
12"
SIDEWALK AND SIDEWALK-BRACKET
Scale: 1" = 1'-0"
Edge of deck
℄ Handrail
4'-9 1/2"
Slope 1/4" per Ft
1/2" Ø Stirrups @ 18" o.c.
6"x6" Fillet
5/8" Ø continuous
1/2" Ø stirrups
Construction Joint
Either use this joint or pour entire bracket monolithic with girder
1/2" Ø - 12" o.c.
℄ Girder 1
NOTES: Unless otherwise noted
1. Reinforcing steel shall have 1 1/2" cover minimum.
2. Bar splices to be staggered and lapped 35 diameters.
3. See sheets No. 8, 9 & 10 for Guardrail Post spacing & details.
4. See sh't No. 11 for Handrail Post spacing & details.
5. Truss bar bends shall be 45°.
TYPICAL NORMAL CROSS-SECTION
Scale: 3/4" = 1'-0"
MALIBU CANYON ROAD
13'-7"
6 Equal Spaces (Typ.)
5 Equal Spaces (Typ.)
3 Equal Spaces
1% Slope
1/2" Half Round continuous drip groove
Lap 20" with 1 1/4" Ø girder steel
All longitudinal bars 1/2" Ø continuous unless otherwise noted
6"x6" Fillet Typ.
Drip Groove
11'-0"
1"Ø - 8NC2 - Bolt, min thd 4". Furnish 1"-8"x8"x1/2" Pl. Washer & 1 Hex Nut per Bolt. Tack weld washer to bolt head. Galvanize Bolts & Nuts. Space in pairs @ 10'-0" o.c.
"A" Bar
"B" Bar
"C" Bar
"D" Bar
SECTION E-E
Scale: 1" = 1'-0"
Expansion Armor not shown
℄ Rockers
End Diaphr.
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD OVER MALIBU CREEK
DECK & SIDEWALK DETAILS
DWG. NO. 602902
JOB NO. 20-850
SHT. 6 OF 11
C-3224
SUBMITTED DIVISION ENGINEER
APPROVED ROAD COMMISSIONER
DRAWN H.L.L. OCT. 1951 CHECKED F.K. FEB. 52
MALIBU



Notes: Unless otherwise noted -

1. All expansion armor shall be assembled as shown on the plans. The assembly shall be set to grade and held firmly in position while the concrete is being poured. After the concrete is finished and set, the armor shall not vary more than ⅛" at any point across the roadway or sidewalk from the elevations specified.
2. All steel used in the expansion armor assemblies shall be of structural grade.
3. Galvanize all structural steel in expansion armor assemblies after fabrication.
4. Galvanize rocker plate weld assemblies.
5. All pipe, fittings, and parts in wingwall fence shall be galvanized after fabrication.

HOOK DETAILS

D	d	H	A	J
6d	⅜"	4"	5"	3"
	½"	4½"	6"	4"
	⅝"	5"	7"	5"
	¾"	6"	8"	6"
	⅞"	7"	10"	7"
8d	1"	9"	13"	10"
	1⅛"	10¼"	15"	11¼"
	1¼"	11¼"	17"	12½"

LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION

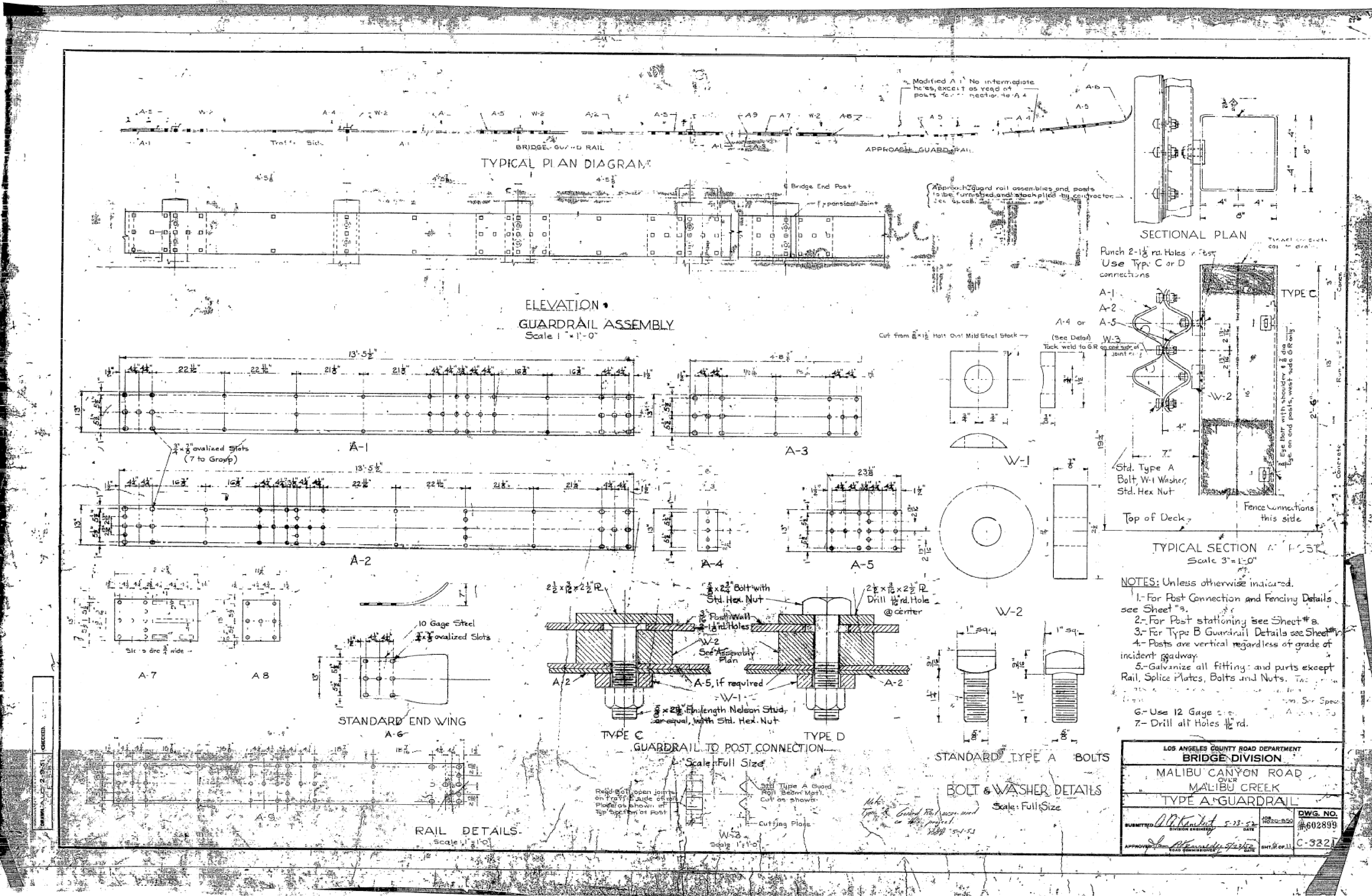
MALIBU CANYON ROAD
OVER
MALIBU CREEK

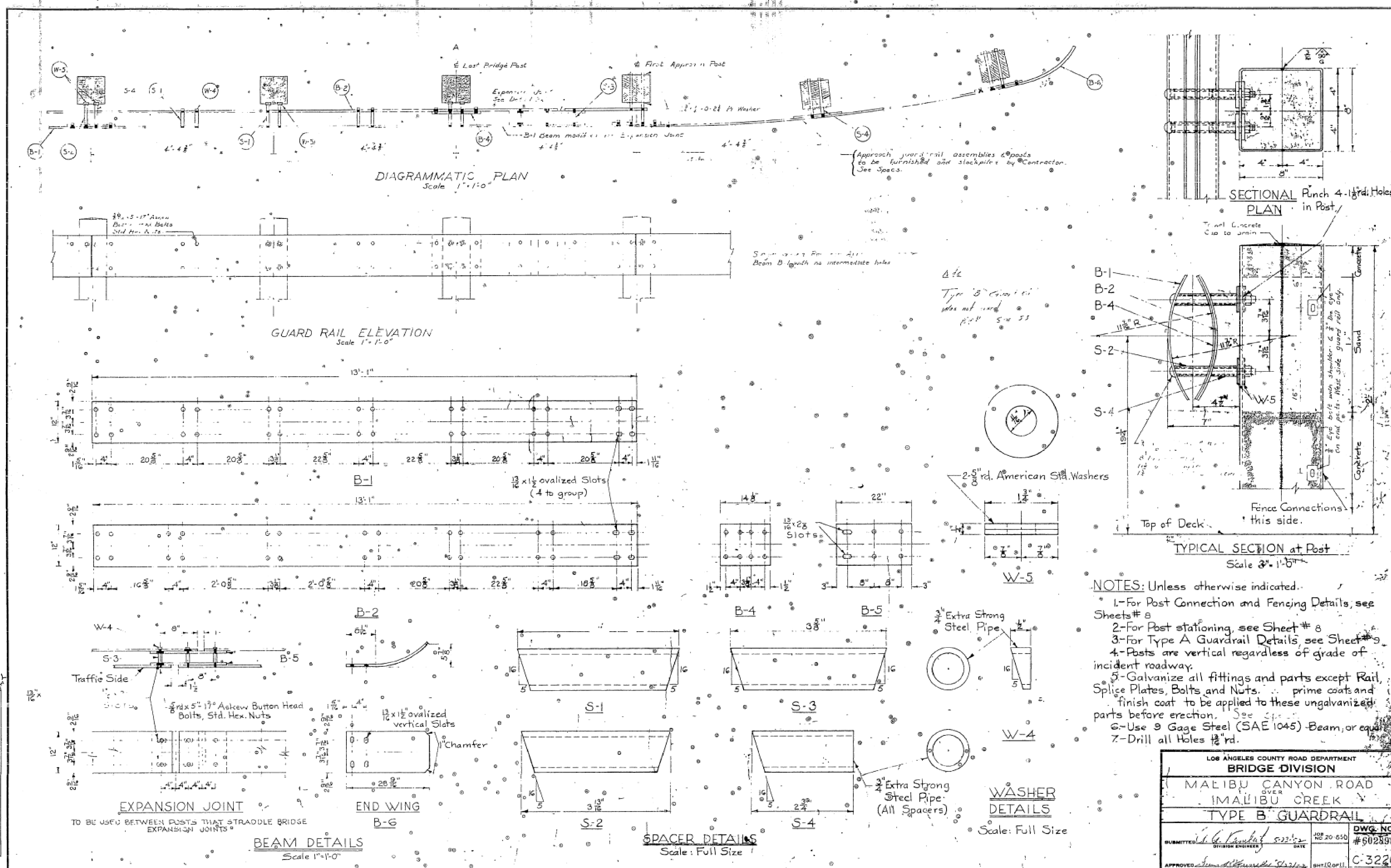
EXPANSION ARMOR-FENCE-ROCKER-BAR HOOK

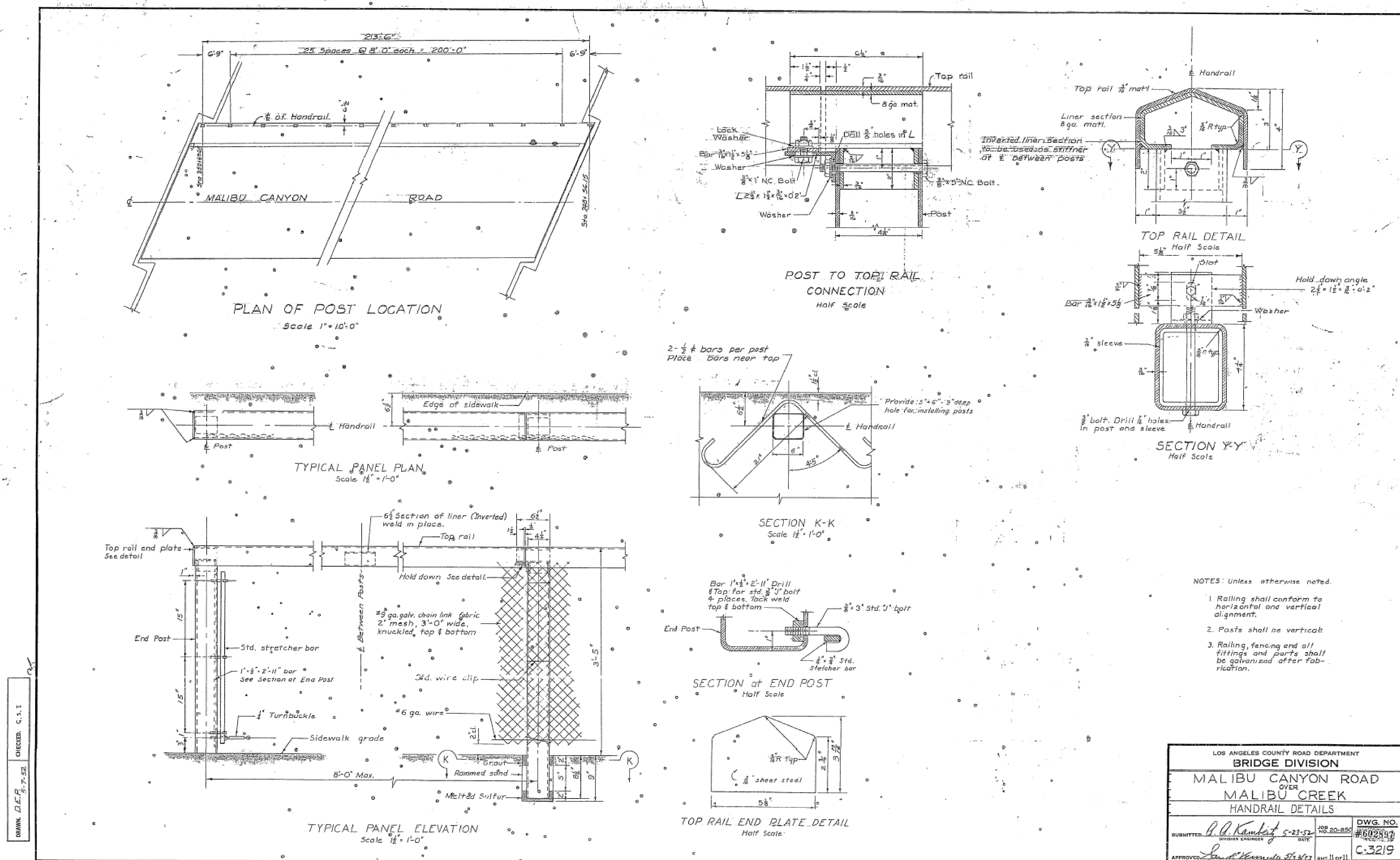
SUBMITTED A. G. Kambeitz 5-23-52 DIVISION ENGINEER DATE
APPROVED Sam R. Kennedy 5/23/52 ROAD COMMISSIONER DATE

JOB NO. 20-850 | SHT. 7 of 11 | DWG. NO. #602901 C-3223

DRAWN H.G. 1-24-52 CHECKED F.K. 2-27-52


TYPICAL PLAN DIAGRAM
BRIDGE GUARD RAIL
APPROACH GUARD RAIL
Traffic Side
Modified A-1: No intermediate holes, except as req'd at posts for connection to A-4
Bridge End Post
Expansion Joint
Approach guard rail assemblies and posts to be furnished and stockpiled by contractor
ELEVATION
GUARDRAIL ASSEMBLY
Scale 1" = 1'-0"
SECTIONAL PLAN
Punch 2-1⅛" rd. Holes in Post
Use Type C or D connections
TYPE C
A-1
A-2
A-3
A-4
A-5
A-7
A 8
W-1
W-2
W-3
¾" x 2" ovalized Slots (7 to Group)
Cut from ⅝" x 1½" Hot Roll Mild Steel Stock
Tack weld to G.R.
Std. Type A Bolt, W-1 Washer, Std. Hex Nut
Top of Deck
Fence Connections this side
TYPICAL SECTION AT POST
Scale 3" = 1'-0"
10 Gage Steel
¾" x 2" ovalized Slots
Slots are ¾" wide
STANDARD END WING
A-6
⅝" x 2¾" Bolt with Std. Hex Nut
Post Wall
1⅛" rd. Holes
See Assembly Plan
A-5, if required
⅝" x 2¾" Fin. length Nelson Stud, or equal, with Std. Hex Nut
Drill 1⅛" rd. Hole @ center
TYPE C
TYPE D
GUARDRAIL TO POST CONNECTION
Scale: Full Size
STANDARD TYPE A BOLTS
BOLT & WASHER DETAILS
Scale: Full Size
NOTES: Unless otherwise indicated.
1.- For Post Connection and Fencing Details see Sheet #9.
2.- For Post stationing see Sheet #8.
3.- For Type B Guardrail Details see Sheet #10.
4.- Posts are vertical regardless of grade of incident roadway.
5.- Galvanize all fittings and parts except Rail, Splice Plates, Bolts and Nuts.
6.- Use 12 Gage
7.- Drill all Holes 1⅛" rd.
Std. Type A Guard Rail Beam Mat'l. Cut as shown.
Cutting Plane
Scale 1" = 1'-0"
RAIL DETAILS
Scale: 1" = 1'-0"
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD
OVER
MALIBU CREEK
TYPE A GUARDRAIL
SUBMITTED
DIVISION ENGINEER
APPROVED
ROAD COMMISSIONER
DATE
DWG. NO.
#602899
C-3821


DIAGRAMMATIC PLAN
Scale 1"=1'-0"
GUARD RAIL ELEVATION
Scale 1"=1'-0"
SECTIONAL PLAN
Punch 4-1 1/8"rd. Holes in Post
TYPICAL SECTION at Post
Scale 3"=1'-0"
Top of Deck
Fence Connections this side.
B-1
B-2
B-4
B-5
B-6
S-1
S-2
S-3
S-4
W-4
W-5
13/16 x 1 1/2 ovalized Slots (4 to group)
2-5/8"rd. American Std. Washers
3/4" Extra Strong Steel Pipe
3/4" Extra Strong Steel Pipe (All Spacers)
Traffic Side
5/8"d x 5"-17° Askew Button Head Bolts, Std. Hex. Nuts
13/16 x 1 1/2 ovalized vertical Slots
Chamfer
EXPANSION JOINT
TO BE USED BETWEEN POSTS THAT STRADDLE BRIDGE EXPANSION JOINTS
END WING
BEAM DETAILS
Scale 1"=1'-0"
SPACER DETAILS
Scale: Full Size
WASHER DETAILS
Scale: Full Size
NOTES: Unless otherwise indicated.
1.-For Post Connection and Fencing Details, see Sheets # 8
2.-For Post stationing, see Sheet # 8
3.-For Type A Guardrail Details, see Sheet # 9
4.-Posts are vertical regardless of grade of incident roadway.
5.-Galvanize all fittings and parts except Rail, Splice Plates, Bolts and Nuts. prime coats and finish coat to be applied to these ungalvanized parts before erection.
6.-Use 9 Gage Steel (SAE 1045) Beam, or equal.
7.-Drill all Holes 13/16"rd.
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD
OVER
MALIBU CREEK
TYPE B GUARDRAIL
SUBMITTED
DIVISION ENGINEER
APPROVED
ROAD COMMISSIONER
DWG. NO.
C-3220

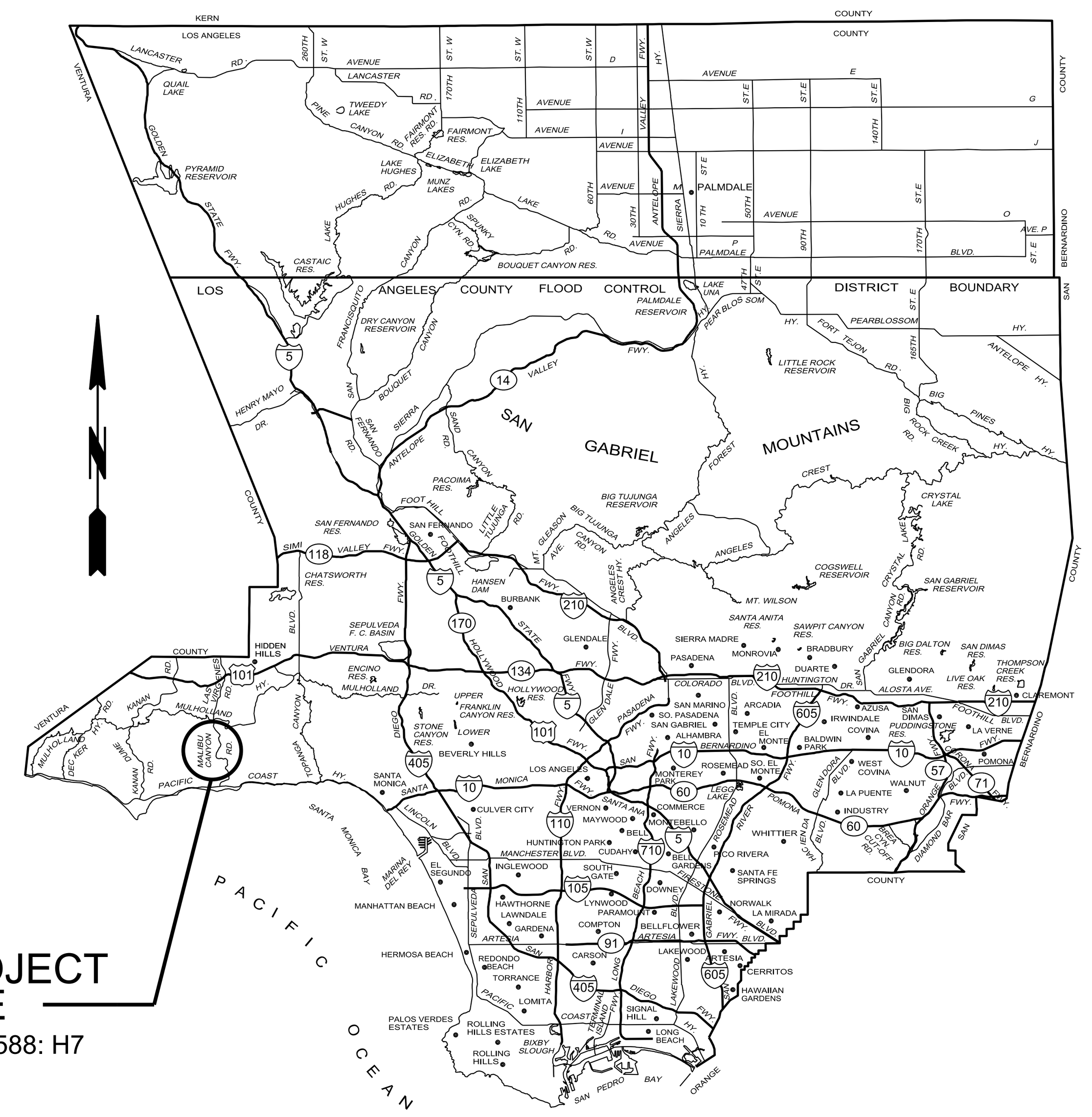


PLAN OF POST LOCATION
Scale 1" = 10'-0"
213'-6"
25 Spaces @ 8'-0" each = 200'-0"
6'-9"
6'-9"
℄ of Handrail
MALIBU CANYON ROAD
TYPICAL PANEL PLAN
Scale 1½" = 1'-0"
Edge of sidewalk
℄ Handrail
℄ Post
TYPICAL PANEL ELEVATION
Scale 1½" = 1'-0"
Top rail end plate See detail
End Post
Std. stretcher bar
¼" Turnbuckle
Sidewalk grade
8'-0" Max.
Top rail
Hold down See detail
#9 ga. galv. chain link fabric 2" mesh, 3'-0" wide, knuckled top & bottom
Std. wire clip
#6 ga. wire
Grout
Rammed sand
Melted Sulfur
POST TO TOP RAIL CONNECTION
Half Scale
Top rail
8 ga. mat.
Lock Washer
Washer
Post
SECTION K-K
Scale 1½" = 1'-0"
2-½ ϕ bars per post Place bars near top
Provide 5"×6"-9" deep hole for installing posts
℄ Handrail
SECTION at END POST
Half Scale
End Post
TOP RAIL END PLATE DETAIL
Half Scale
TOP RAIL DETAIL
Half Scale
℄ Handrail
Liner section 8 ga. matl.
Inverted liner section to be used as stiffner at ℄ between posts
SECTION Y-Y
Half Scale
Hold down angle
Washer
NOTES: Unless otherwise noted.
1. Railing shall conform to horizontal and vertical alignment.
2. Posts shall be vertical.
3. Railing, fencing and all fittings and parts shall be galvanized after fabrication.
LOS ANGELES COUNTY ROAD DEPARTMENT
BRIDGE DIVISION
MALIBU CANYON ROAD
OVER
MALIBU CREEK
HANDRAIL DETAILS
SUBMITTED
DIVISION ENGINEER
5-23-52
APPROVED
ROAD COMMISSIONER
DWG. NO.
#602897
C-3219
SHT. 11 of 11
DRAWN D.E.P. 5-7-52
CHECKED G.S.T.

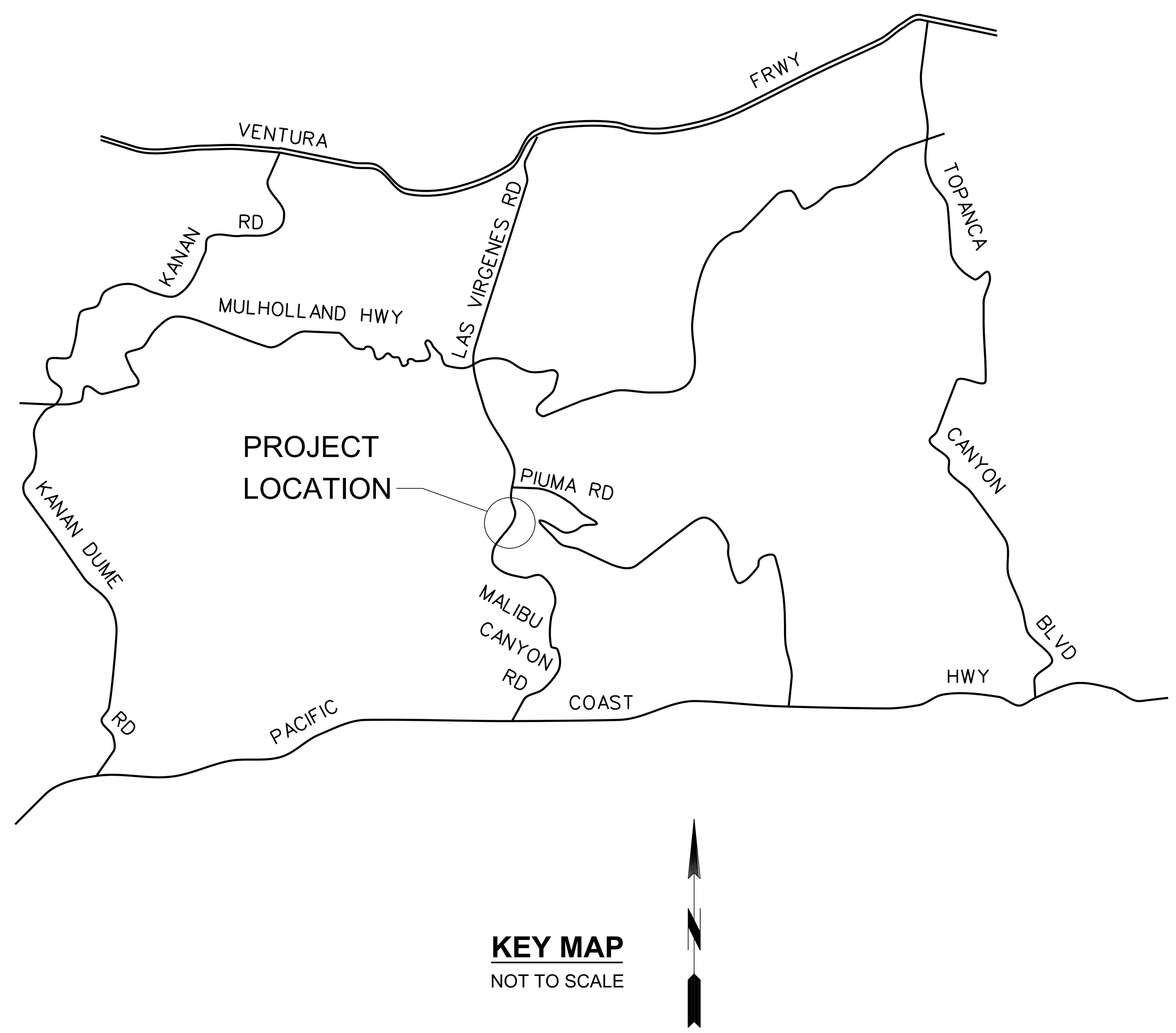
FED ID XXXXXXX

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE
OVER
MALIBU CREEK



LOCATION MAP
NOT TO SCALE



KEY MAP
NOT TO SCALE

INDEX TO PROJECT PLANS

SHEET NUMBER	DESCRIPTION
1	TITLE SHEET
2	GENERAL PLAN
3	STAGE I AND II CONSTRUCTION
4	STAGE III AND IV CONSTRUCTION
5	REMOVAL PLANS
6	DECK CONTOURS
7	FOUNDATION PLAN
8	ABUTMENT PLAN1
9	ABUTMENT PLAN 3
10	ABUTMENT DETAIL
11	PIERS DETAILS
12	TYPICAL SECTION
13	GIRDER LAYOUT 1
14	GIRDER DETAILS
15	PRESTRESSED GIRDER DETAILS
16	GIRDER AND DIAPHRAGM DETAILS
17	LOGS OF BORINGS
PLAN RD	ROADWAY APPROACH PLANS
PLAN TC	TRAFFIC CONTROL PLANS

PRIME CONTRACTOR LICENSE REQUIRED: CLASS XX

DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

811 Know what's **below.** **Call** before you dig.

APPROVED BY: CITY OF XXXXXXXXXX DATE	APPROVED BY MARK PESTRELLA, DIRECTOR OF PUBLIC WORKS DEPUTY DIRECTOR DATE
APPROVED BY: CITY OF XXXXXXXXXX DATE	RECOMMENDED BY: ASSISTANT DEPUTY DIRECTOR DATE
APPROVED BY: CITY OF XXXXXXXXXX DATE	SUBMITTED BY: DESIGN SECTION DATE

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JUNYI ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

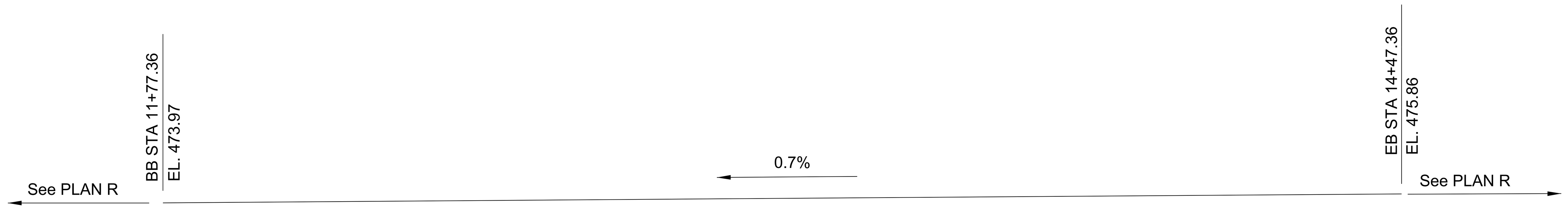
LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE
OVER
MALIBU CREEK
PROJECT ID NO. RDC0014835
TITLE SHEET

BR. NO. 989 | PCA X2310955 | SHEET 1 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-1

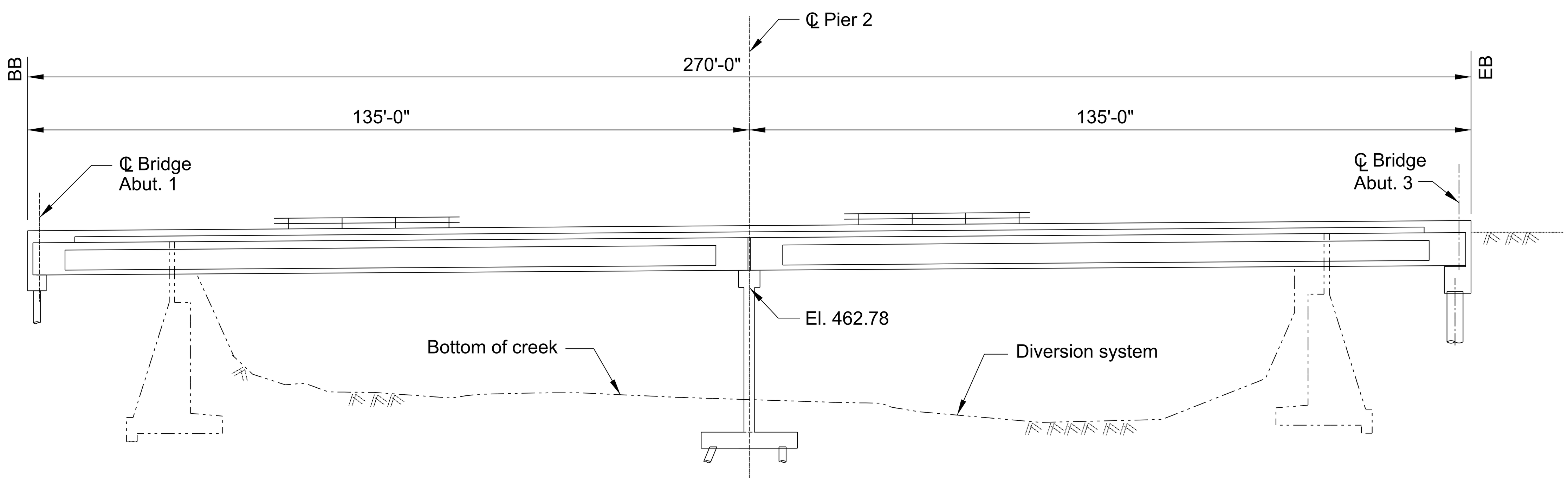
DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



PROFILE GRADE

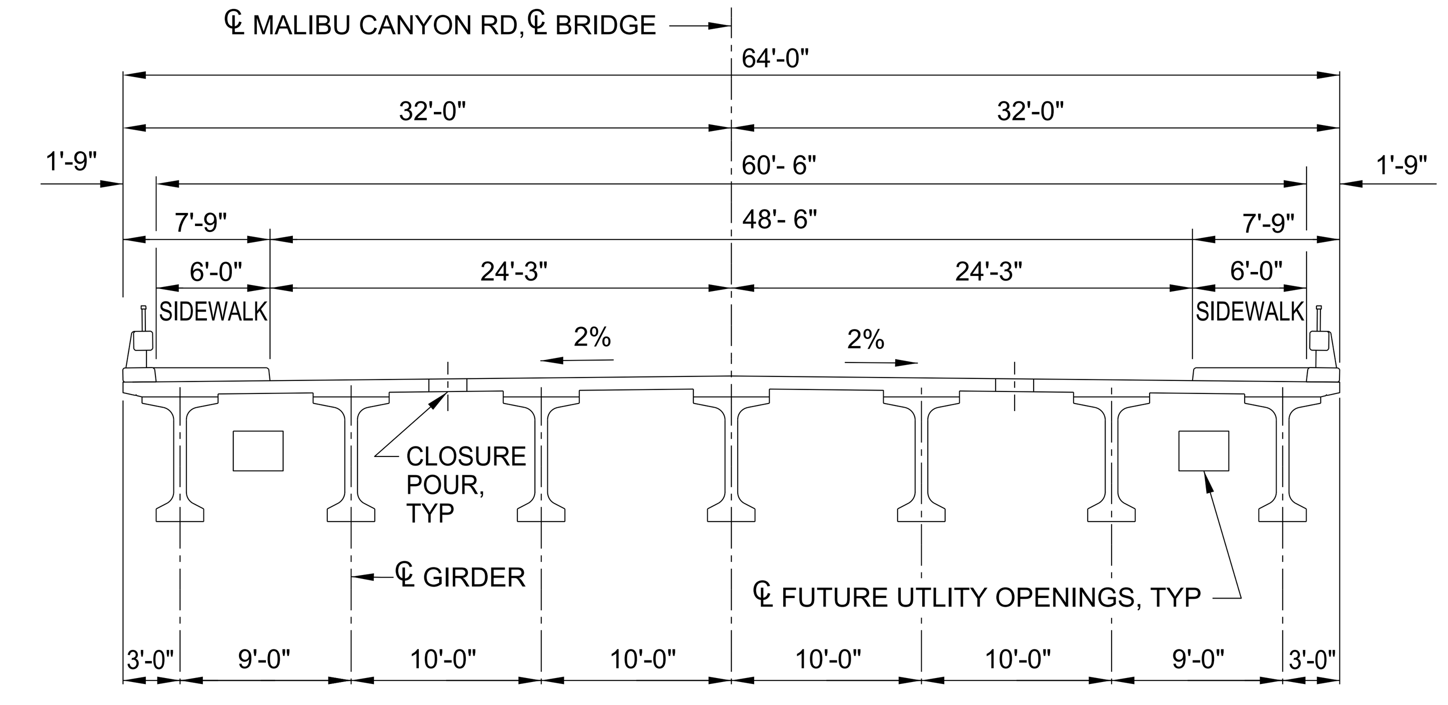
ALONG CENTERLINE OF BRIDGE

SCALE: 1"= 20'-0"



ELEVATION

SCALE: 1"= 20'-0"



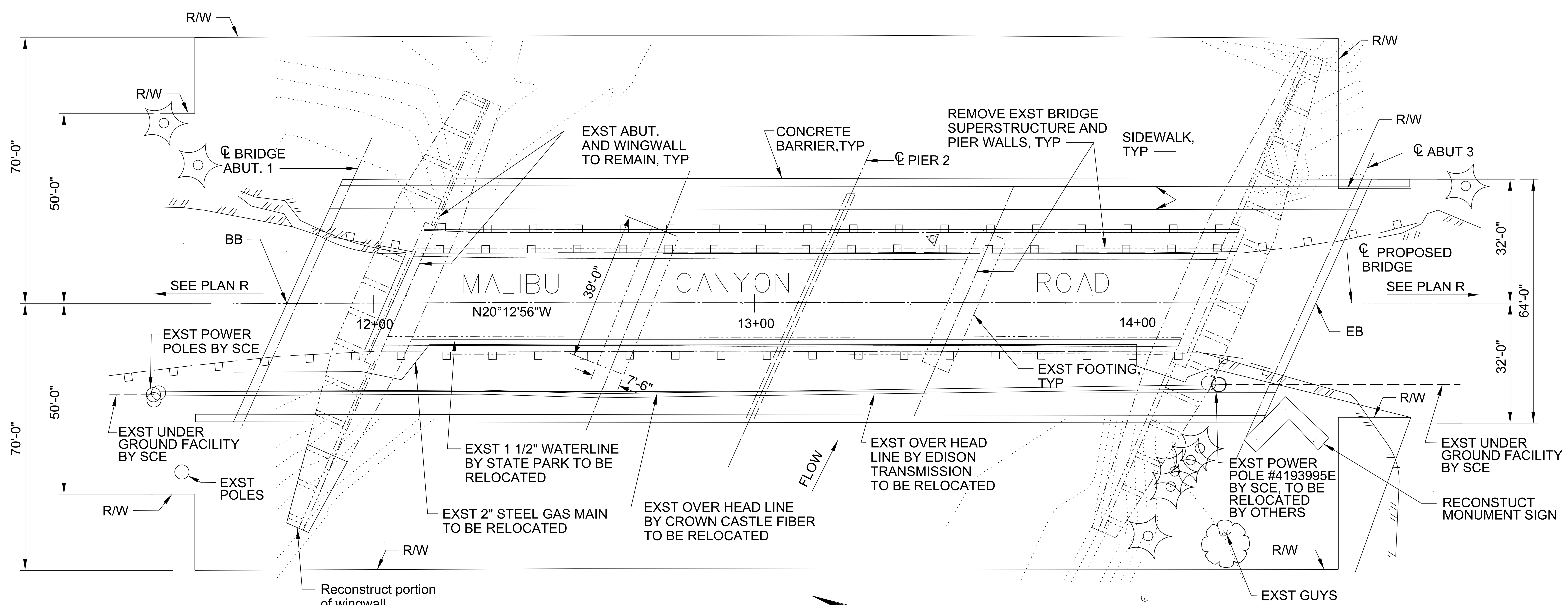
CROSS SECTION

LOOKING NORTH

SCALE: ⅛"=1'-0"

GENERAL NOTES, LOAD AND RESISTANCE FACTOR DESIGN

DESIGN:	AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, FOURTH EDITION AND CALIFORNIA AMENDMENTS.
DEAD LOAD:	INCLUDES 35 PSF FOR FUTURE WEARING SURFACE.
LIVE LOADING:	HL 93 AND PERMIT DESIGN VEHICLE
SEISMIC DESIGN:	CALTRANS SEISMIC DESIGN CRITERIA (SDC), VERSION 1.6, JUNE 2010
SEISMIC LOADING:	PEAK ROCK ACCELERATION = 0.7G
REINFORCED CONCRETE:	FY=60,000 PSI, F'C=3,600 PSI, N=9
DESIGN SOIL PRESSURE:	BASED ON "GEOTECHNICAL INVESTIGATION" PREPARED BY COUNTY OF LOS ANGELES, DEPARTMENT OF PUBLIC WORKS, GEOTECHNICAL AND MATERIALS ENGINEERING DIVISION, DATED AUGUST 4, 2011 ALLOWABLE BEARING PRESSUE = 2500 PSF SLIDING FRICTION COEFFICIENT = 0.27 ALLOWABLE PASSIVE PRESSURE = 250PCF MAXIMUM PASSIVE PRESURE = 2,500 PSF SOIL UNIT WEIGHT = 130 PCF
PILE DESIGN LOAD:	CAST-IN-DRILLED-HOLE CONCRETE PILE, 70 TONS
PRESTRESSED CONCRETE:	SEE "PRESTRESSED GIRDER NOTES" SHEET 9.
CONSTRUCTION:	(MATERIALS & METHODS) STANDARD SPECIFICATIONS - STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION, 2010



PLAN

SCALE: 1"= 20'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

CADD PROJECT FILE NAME: RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER: K. HO

DESIGNER: J. ZHAO

DRAFTER: D. ROJAS

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER — JENNY ZHAO — C 60157 — CIVIL — STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

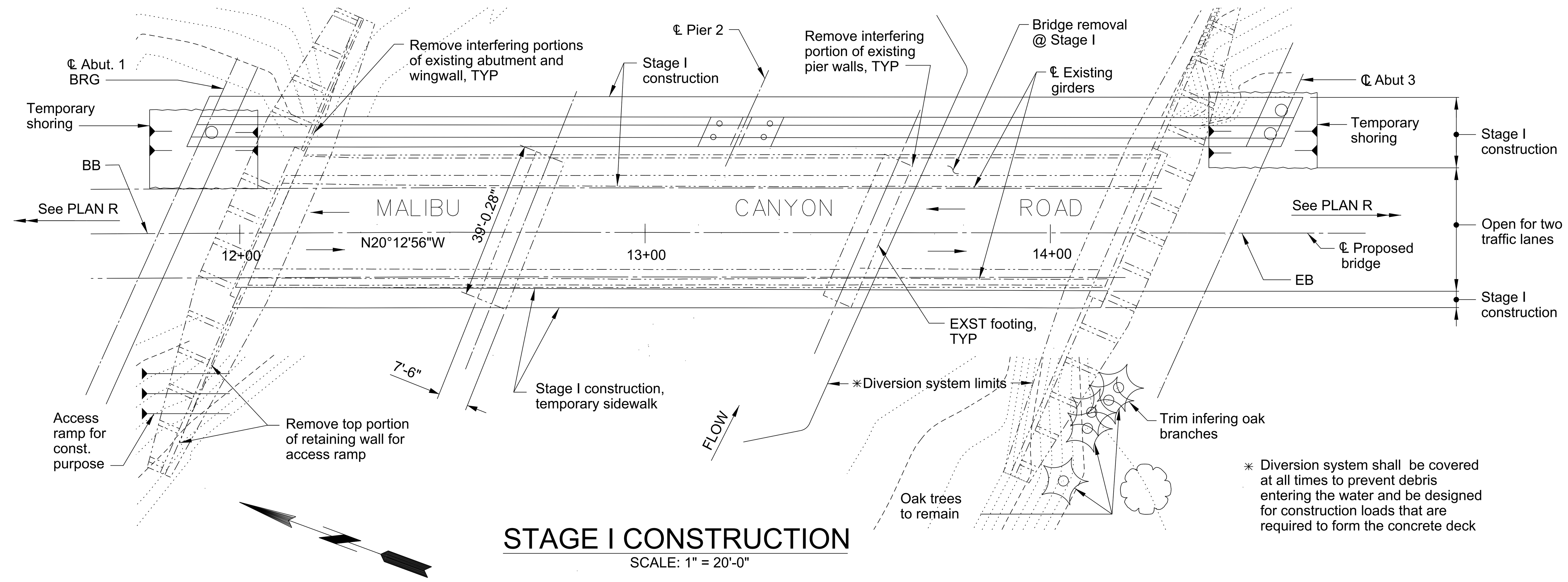
GENERAL PLAN, GENERAL NOTES

BR. NO. 989 | PCA X2310955 | SHEET 2 OF 17

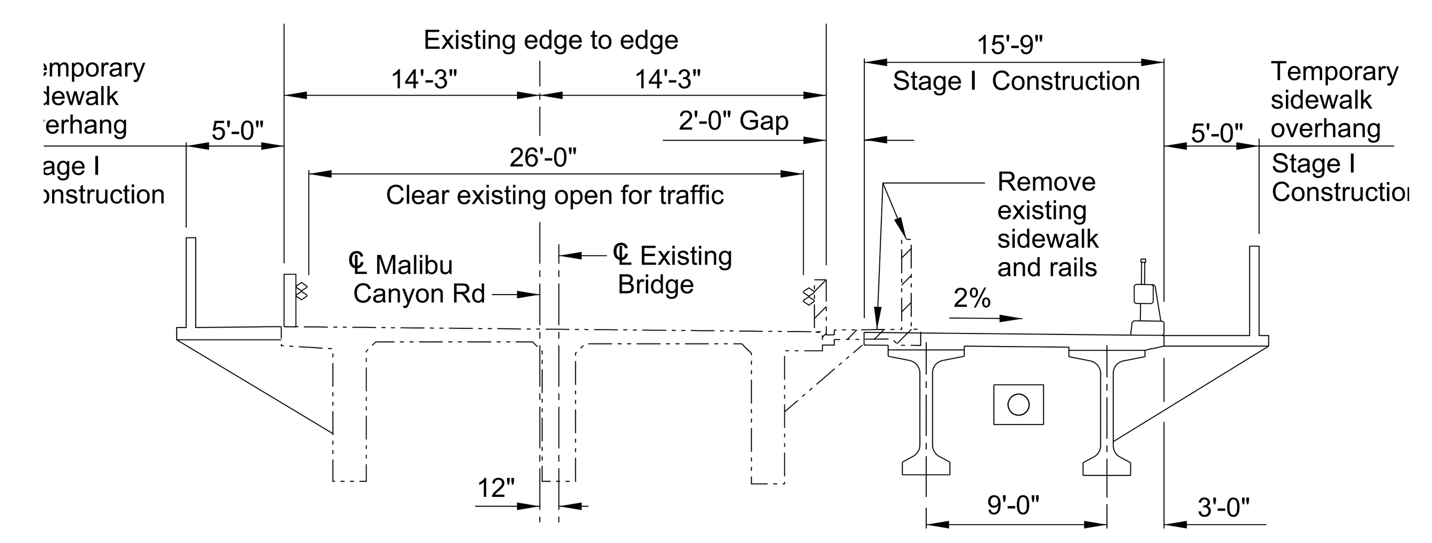
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020

S-2

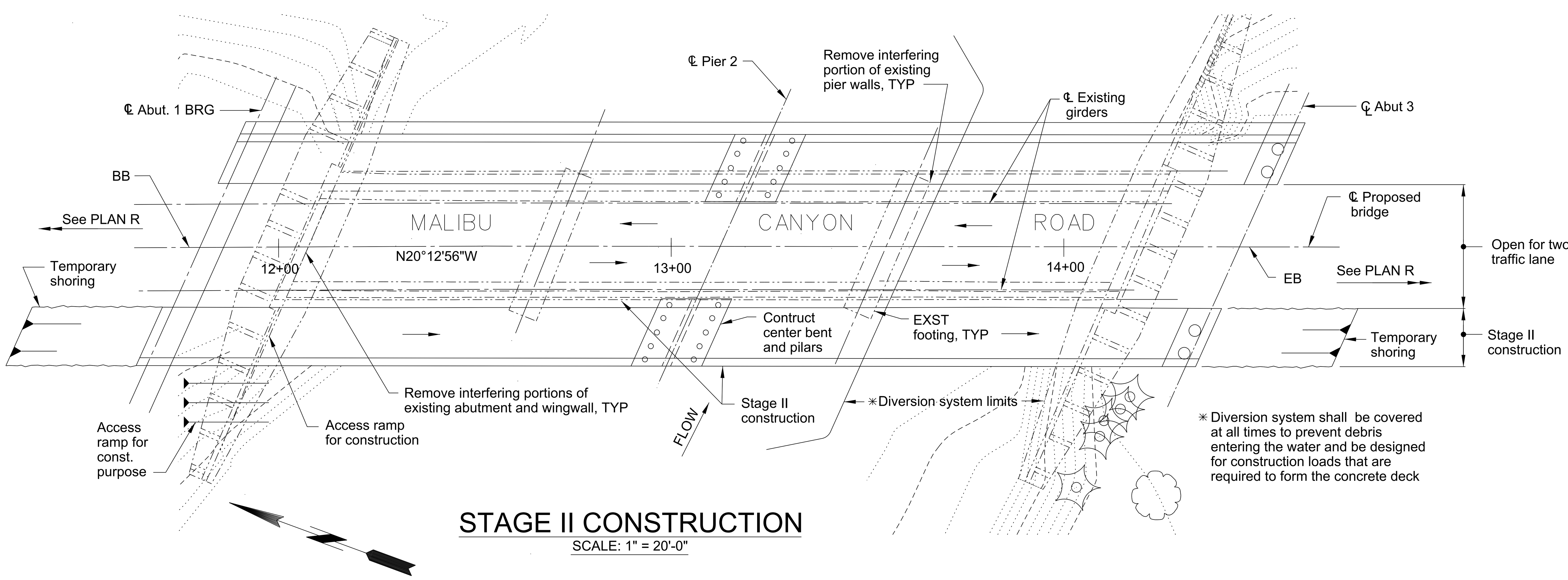
DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



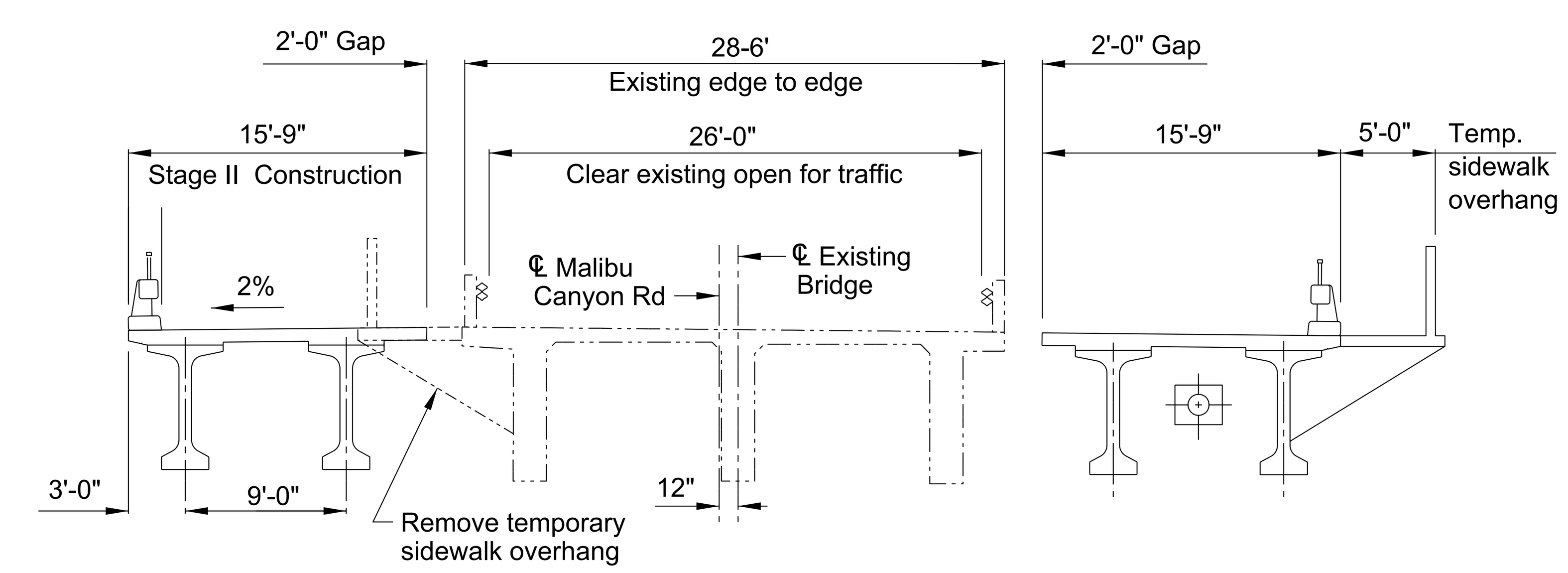
STAGE I CONSTRUCTION
SCALE: 1" = 20'-0"



STAGE I CONSTRUCTION
(MAINTAIN TWO LANE TRAFFIC AT ALL TIMES DURING CONSTUCTION)
SCALE: 1/8" = 1'-0"



STAGE II CONSTRUCTION
SCALE: 1" = 20'-0"



STAGE II CONSTRUCTION
(MAINTAIN TWO LANE TRAFFIC AT ALL TIMES DURING CONSTUCTION)
SCALE: 1/8" = 1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

CADD PROJECT FILE NAME: RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK
CHECKER: K. HO
DESIGNER: J. ZHAO
DRAFTER: D. ROJAS

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

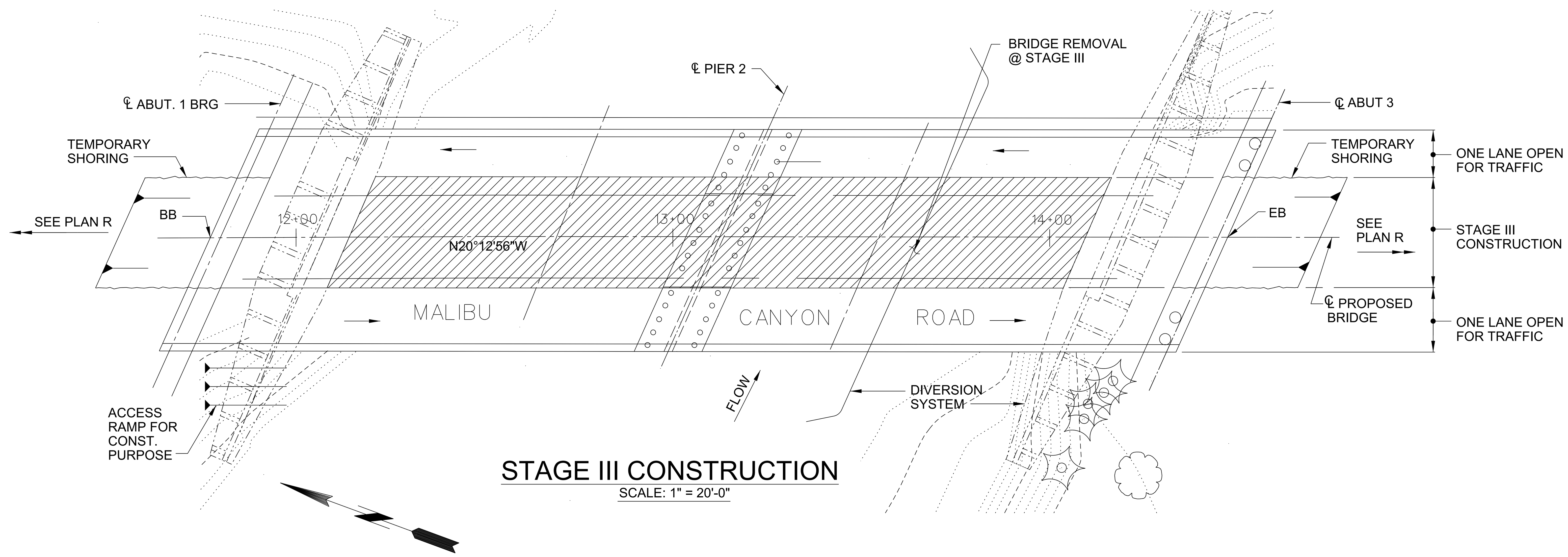
MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835
STAGES I AND II CONSTRUCTION

BR. NO. 989 | PCA X2310955 | SHEET 3 OF 17

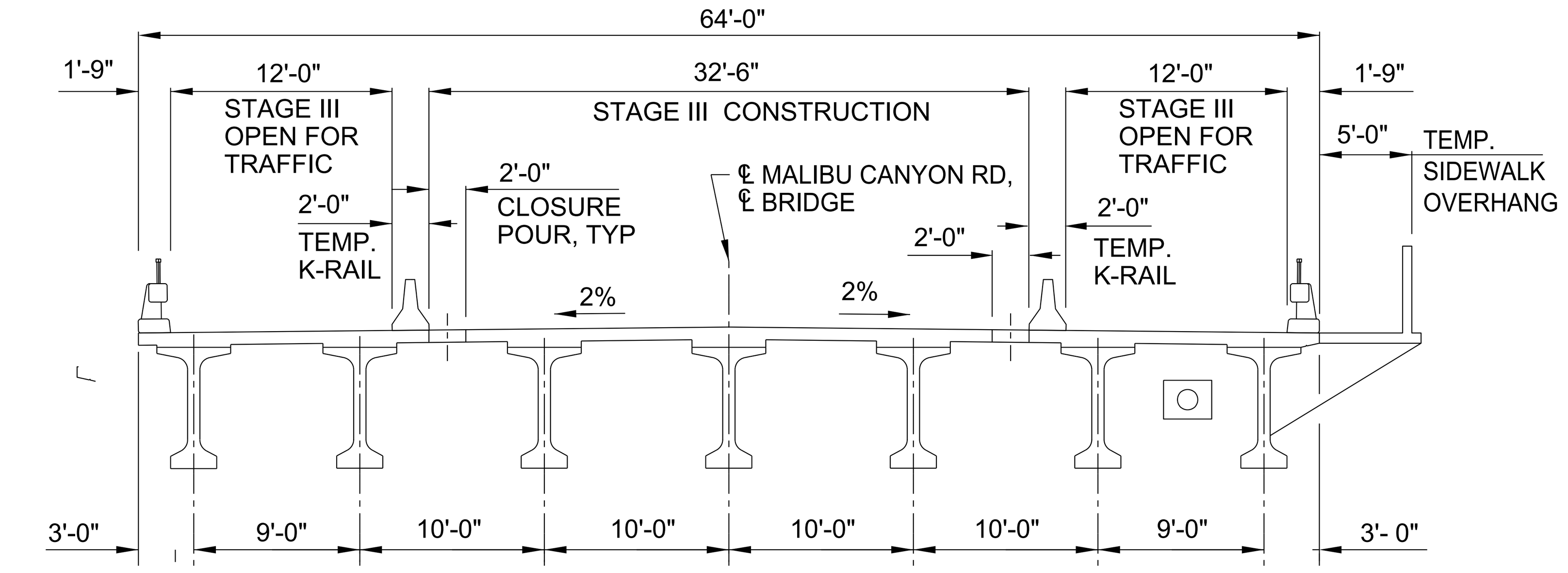
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-3

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



STAGE III CONSTRUCTION

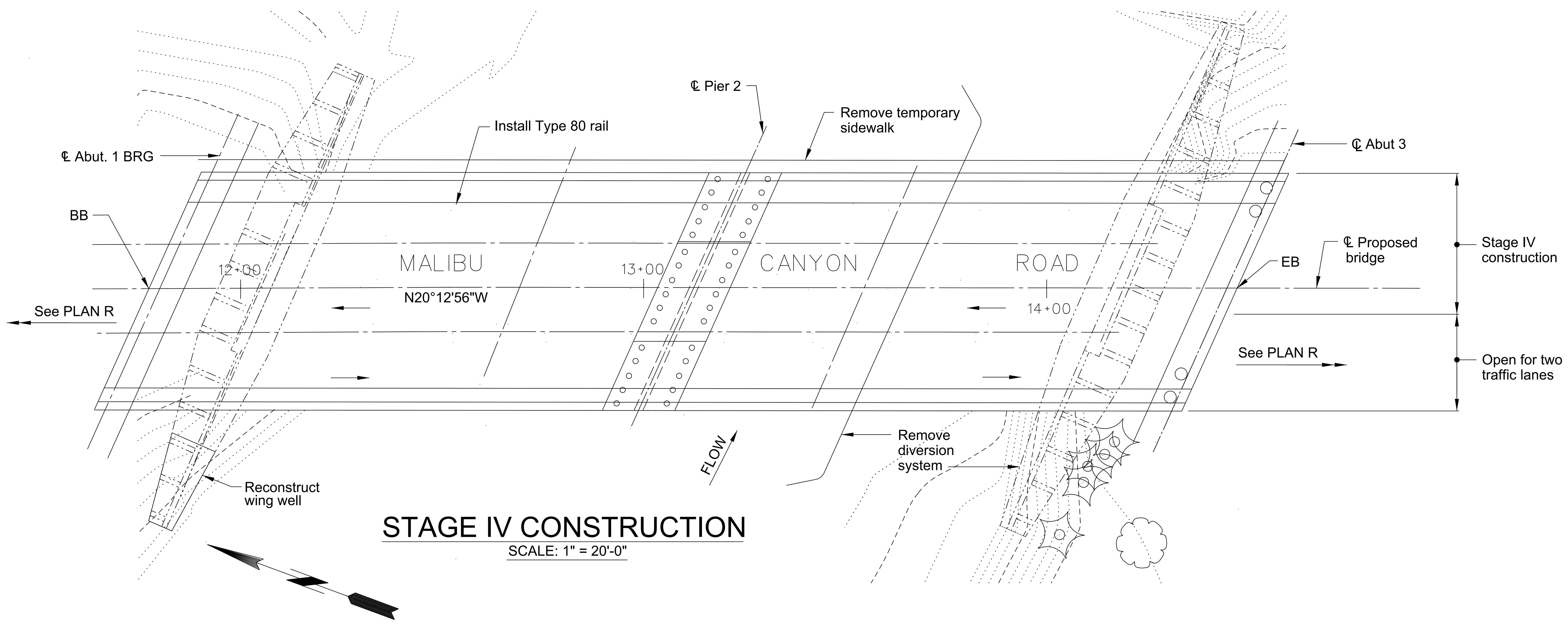
SCALE: 1" = 20'-0"



STAGE III CONSTRUCTION

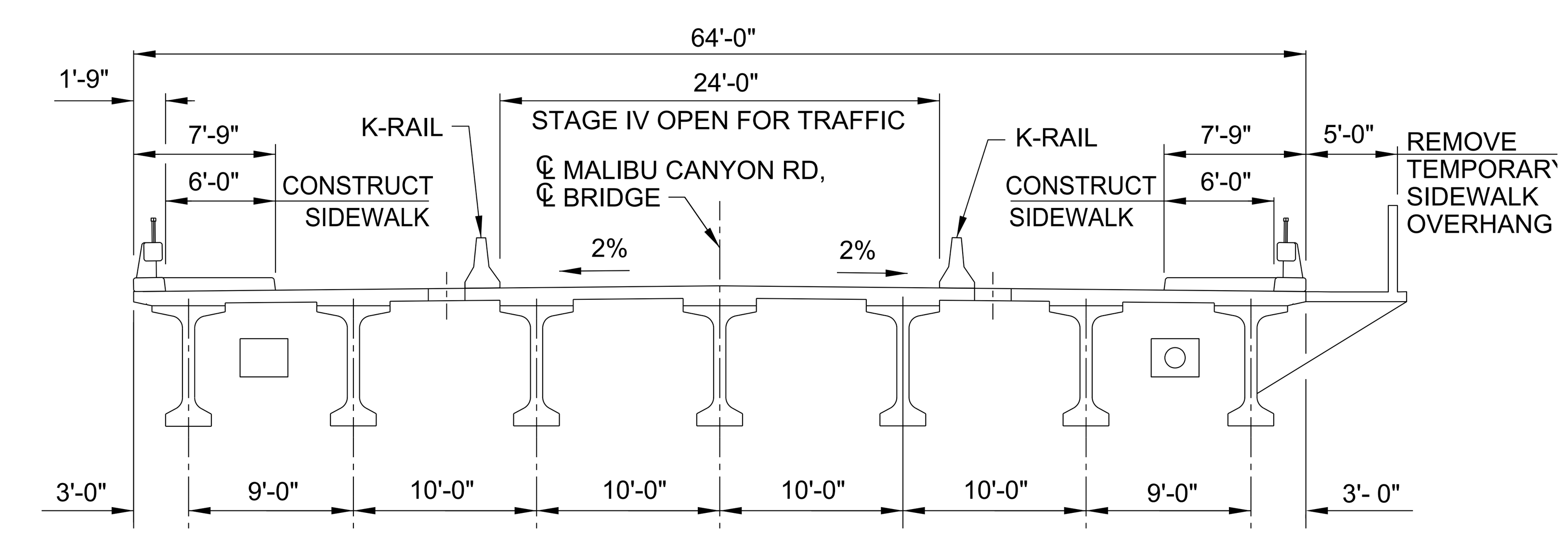
(MAINTAIN TWO LANE TRAFFIC AT ALL TIMES DURING CONSTUCTION)

SCALE: 1/8" = 1'-0"



STAGE IV CONSTRUCTION

SCALE: 1" = 20'-0"



STAGE IV CONSTRUCTION

(MAINTAIN TWO LANE TRAFFIC AT ALL TIMES DURING CONSTUCTION)

SCALE: 1/8" = 1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER K. HO

DESIGNER J. ZHAO

DRAFTER D. ROJAS

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

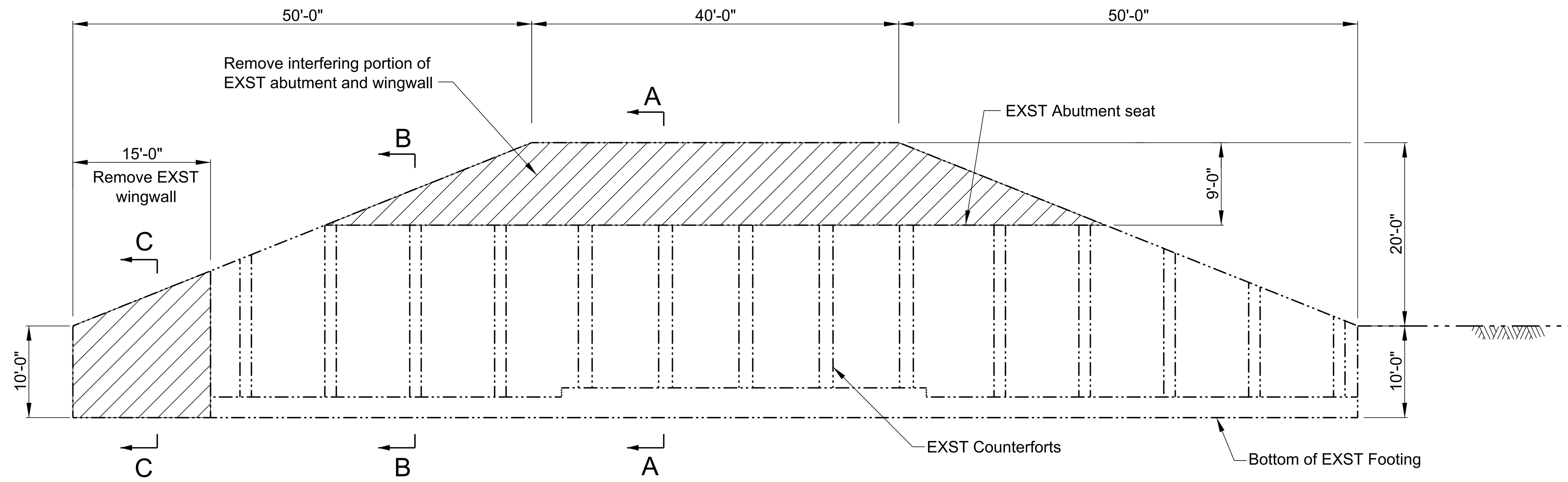
STAGES III AND IV CONSTRUCTION

BR. NO. 989 | PCA X2310955 | SHEET 4 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020

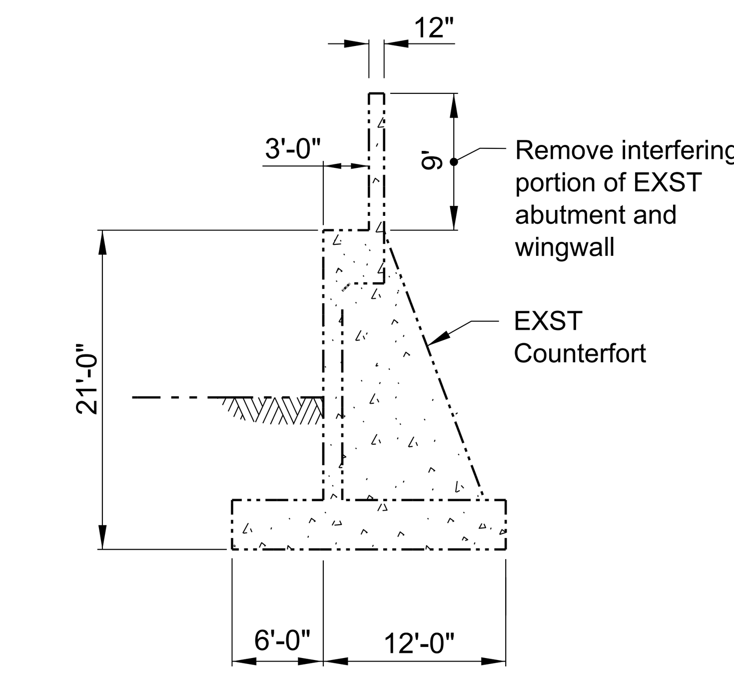
S-4

DATE: $DATE$ TIME: $TIME$ FILE: $FILE$



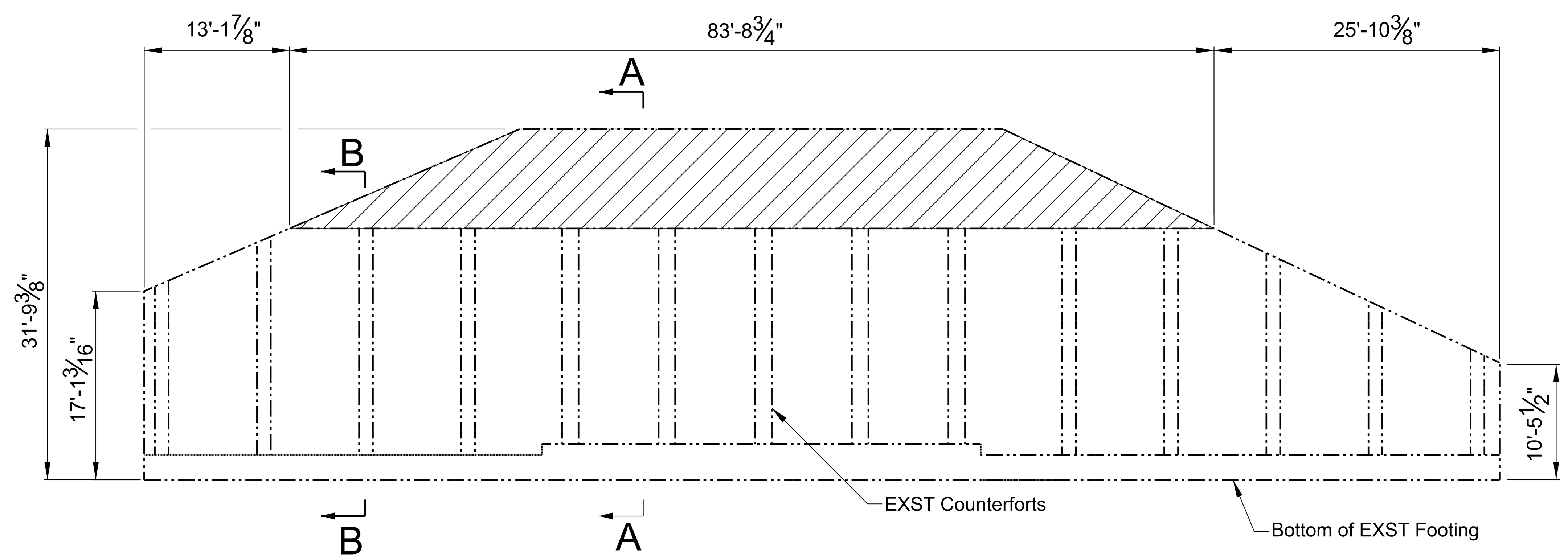
EXST ABUTMENT ADJACENT TO ABUTMENT I

1" = 10'



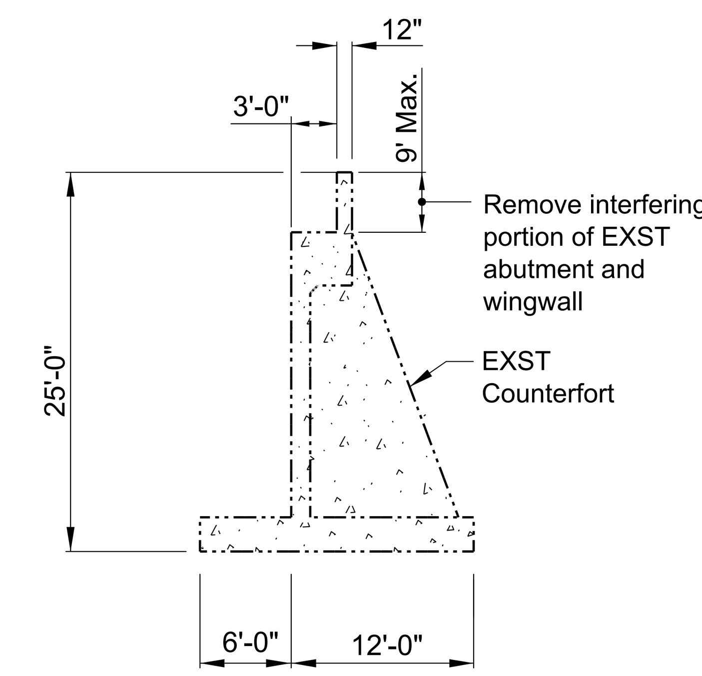
SECTION A-A

1" = 10'



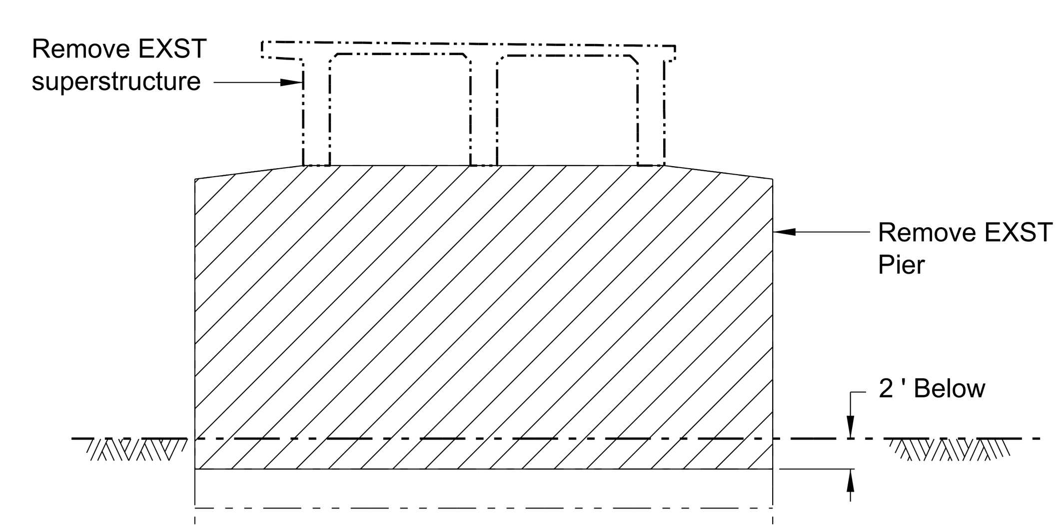
EXST ABUTMENT ADJACENT TO ABUTMENT III

1" = 10'



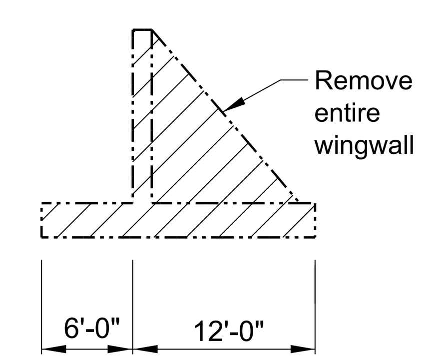
SECTION B-B

1" = 10'



EXST PIER REMOVAL PLAN

1" = 10'



SECTION C-C

1" = 10'

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD
DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DRAFTER D. ROJAS
DESIGNER J. ZHAO
CHECKER K. HO
CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE
OVER
MALIBU CREEK

PROJECT ID NO. RDC00114835

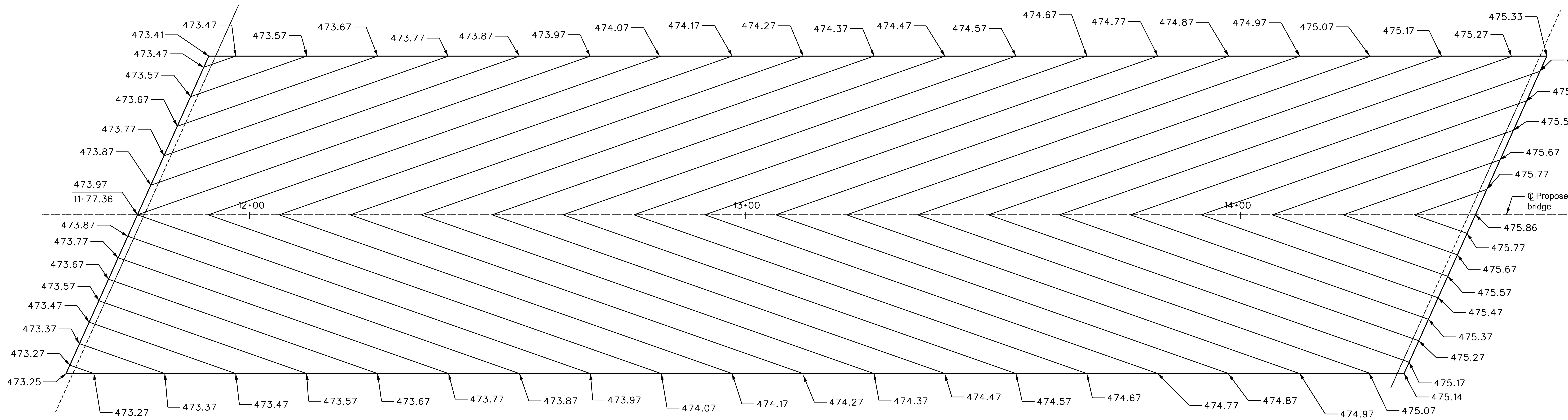
REMOVAL PLAN

BR. NO. 989 | PCA X2310955 | SHEET 5 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-5

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

FED ID XXXXXXX



PLAN

SCALE: 1" = 10'-0"

NOTES:

1. X=14.3' INTERVALS ALONG STATION LINE.
2. CONTOURS ARE AT TOP OF DECK AND DO NOT INCLUDE CAMBER.
3. CONTOURS INTERVALS IS 0.10' .
4. SEE PLAN R BEYOND BRIDGE

INDEX TO STANDARD PLANS

CALIFORNIA DEPARTMENT OF TRANSPORTATION(CALTRANS)
STANDARD PLANS, DATED 2010

STANDARD PLAN SHEET NO
DETAIL NO

A62C	LIMIT OF PAYMENT FOR EXCAVATION AND BACKFILL - BRIDGE
B0-1	BRIDGE DETAILS
B0-3	BRIDGE DETAILS
B0-5	BRIDGE DETAILS
B0-13	BRIDGE DETAILS
B2-3	16" AND 24" CAST-IN-DRILLED HOLE CONCRETE PILE
B3-1A	RETAINING WALL TYPE 1 (CASE 1)
B3-4A	RETAINING WALL TYPE 5 (CASE 1)
B3-5	RETAINING WALL DETAILS NO.1
B3-6	RETAINING WALL DETAILS NO.2
B6-21	JOINT SEALS (MAXIMUM MOVEMENT RATING = 2 IN)
B7-1	BOX GIRDER DETAILS
B7-10	UTILITY OPENING-BOX GIRDER
B8-5	CAST-IN-PLACE PRESTRESSED GIRDER DETAILS
B11-7	CHAIN LINK RAILING
B11-47	CABLE RAILING
B11-54	CONCRETE BARRIER TYPE 26
B14-5	WATER SUPPLY LINE

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

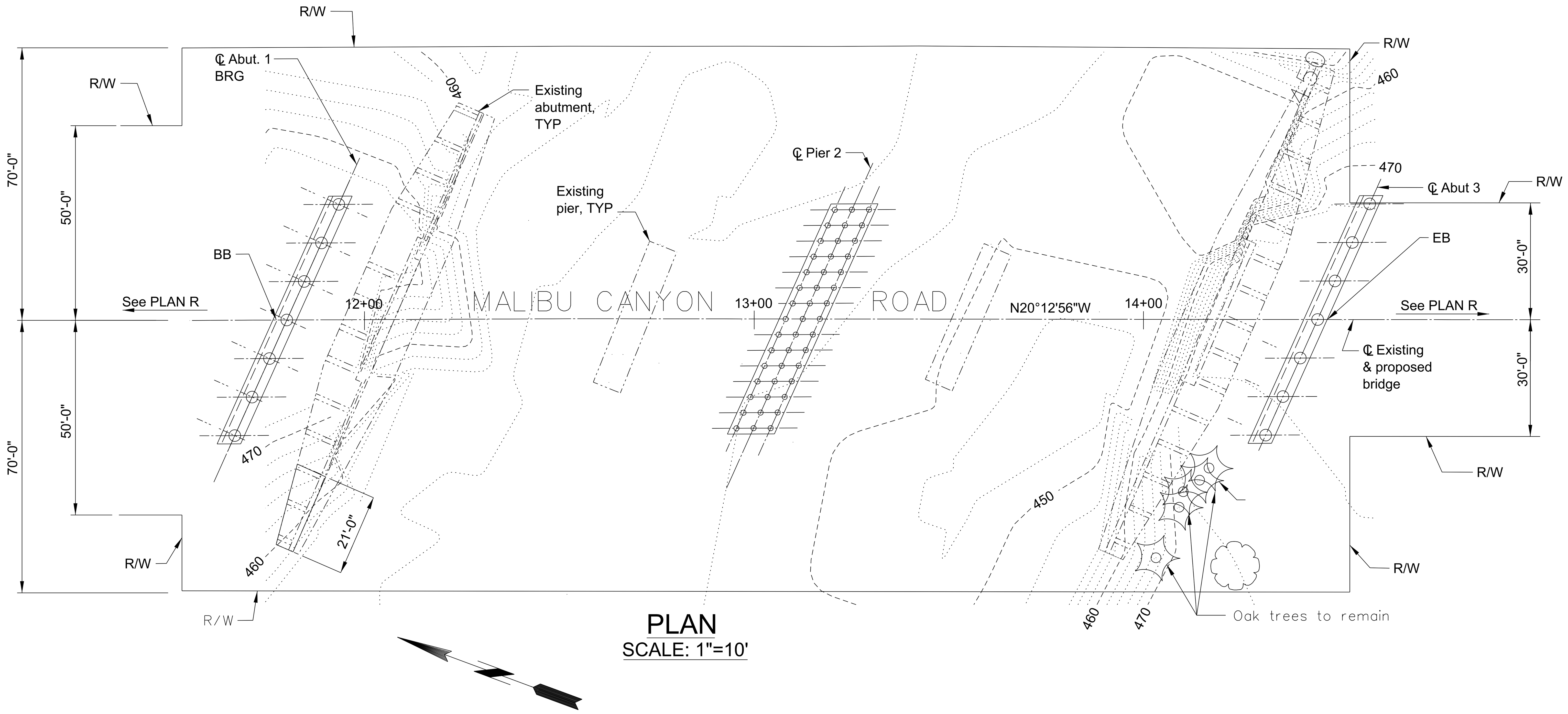
DECK CONTOURS

BR. NO. 989 | PCA X2310955 | SHEET 6 OF 17

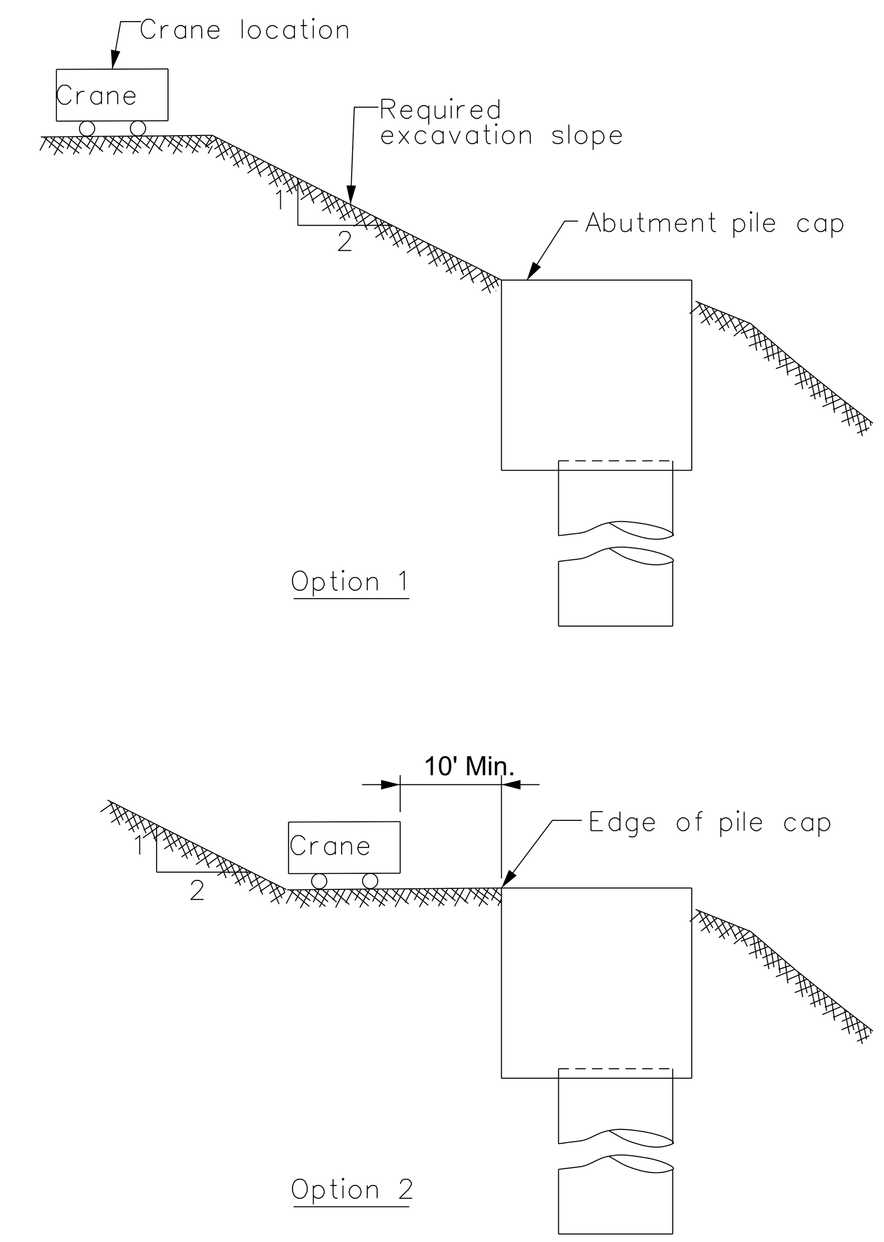
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/20/2020 S-6

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

FED ID XXXXXXX



PLAN
SCALE: 1"=10'



SURCHARGE LOAD CONDITION

NTS

Note: Contractor can use either option during erection of precast girder. See Geotechnical Investigation Report.

Notes:

1. Existing topography shall be verified in the field by the contractor.
2. Existing contours and elevations are based on a Los Angeles County, Department of Public Works survey of Malibu Canyon Road over Malibu Creek Bridge Dated XXXX, 2018.
3. Bottom of footing elevations indicated thus: ▭

PILE DATA TABLE

Location	Tip Elevation	Allowable Compression	Allowable Tension
Abutment 1	XXX	416Kips	572Kips
Pier 2	XXX	416Kips	289.5Kips
Abutment 3	XXX	416Kips	289.5Kips

See survey file

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

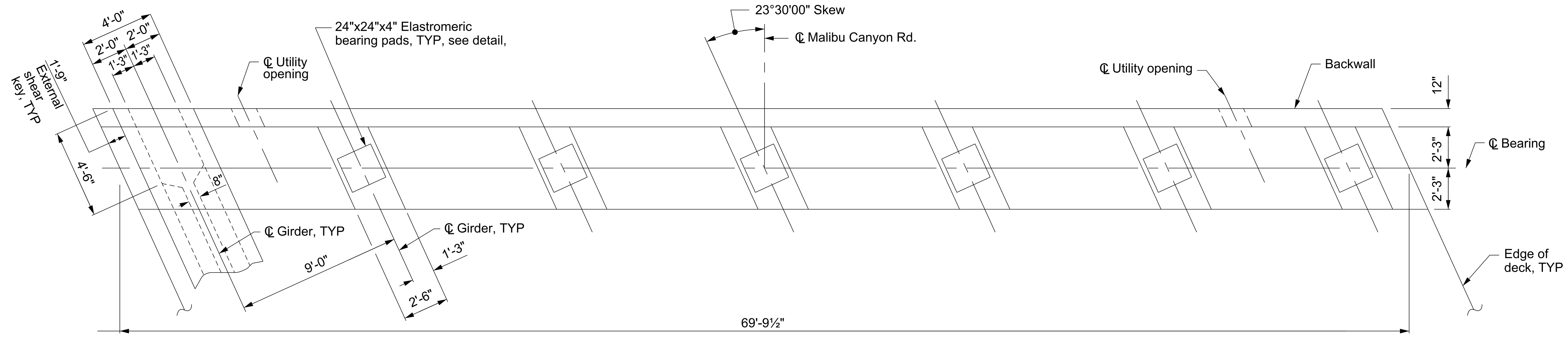
PROJECT ID NO. RDC00114835

FOUNDATION PLAN

BR. NO. 989 | PCA X2310955 | SHEET 7 OF 17

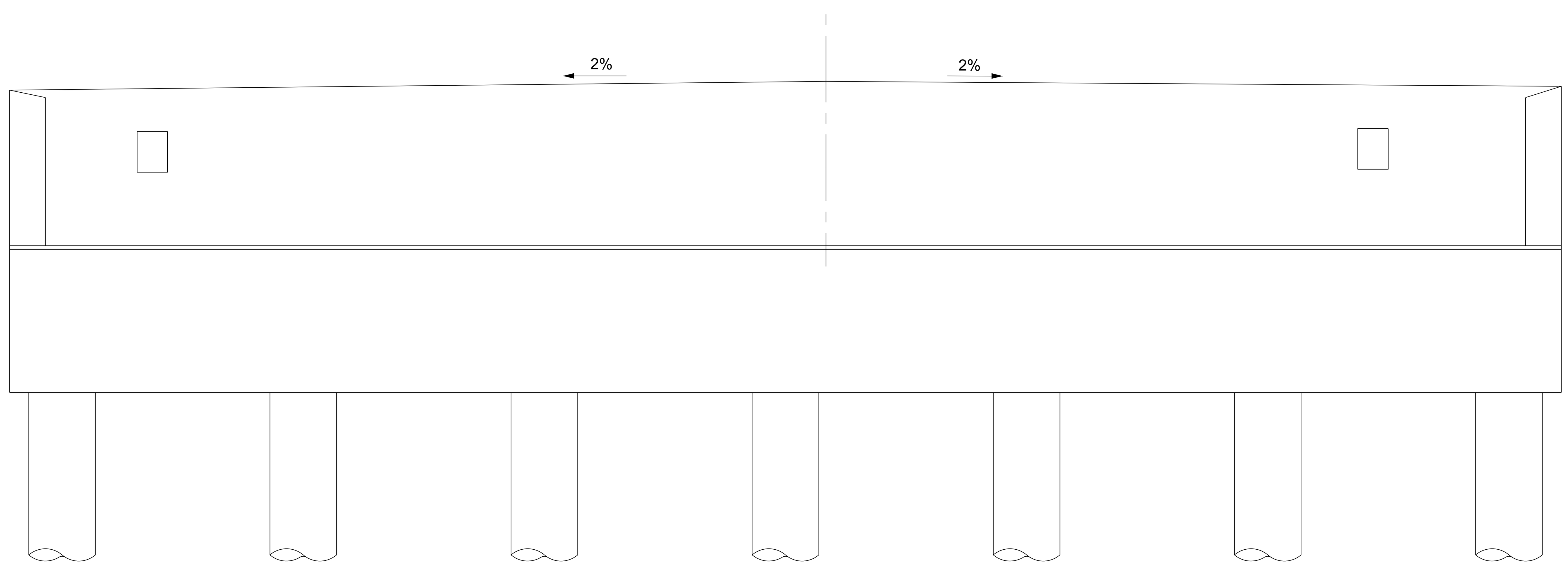
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-7

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



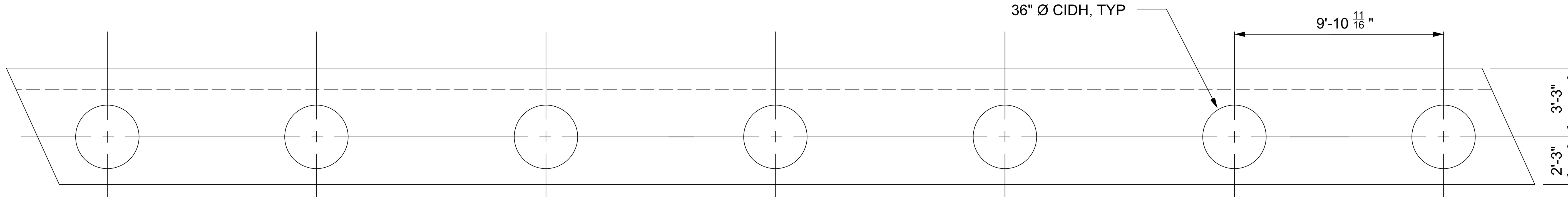
ABUTMENT PLAN

SCALE: ¼" = 1'-0"



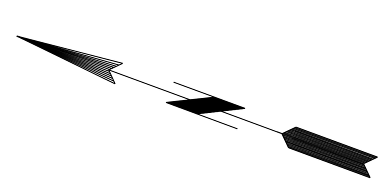
ABUTMENT ELEVATION

SCALE: ¼" = 1'-0"



FOOTING PLAN

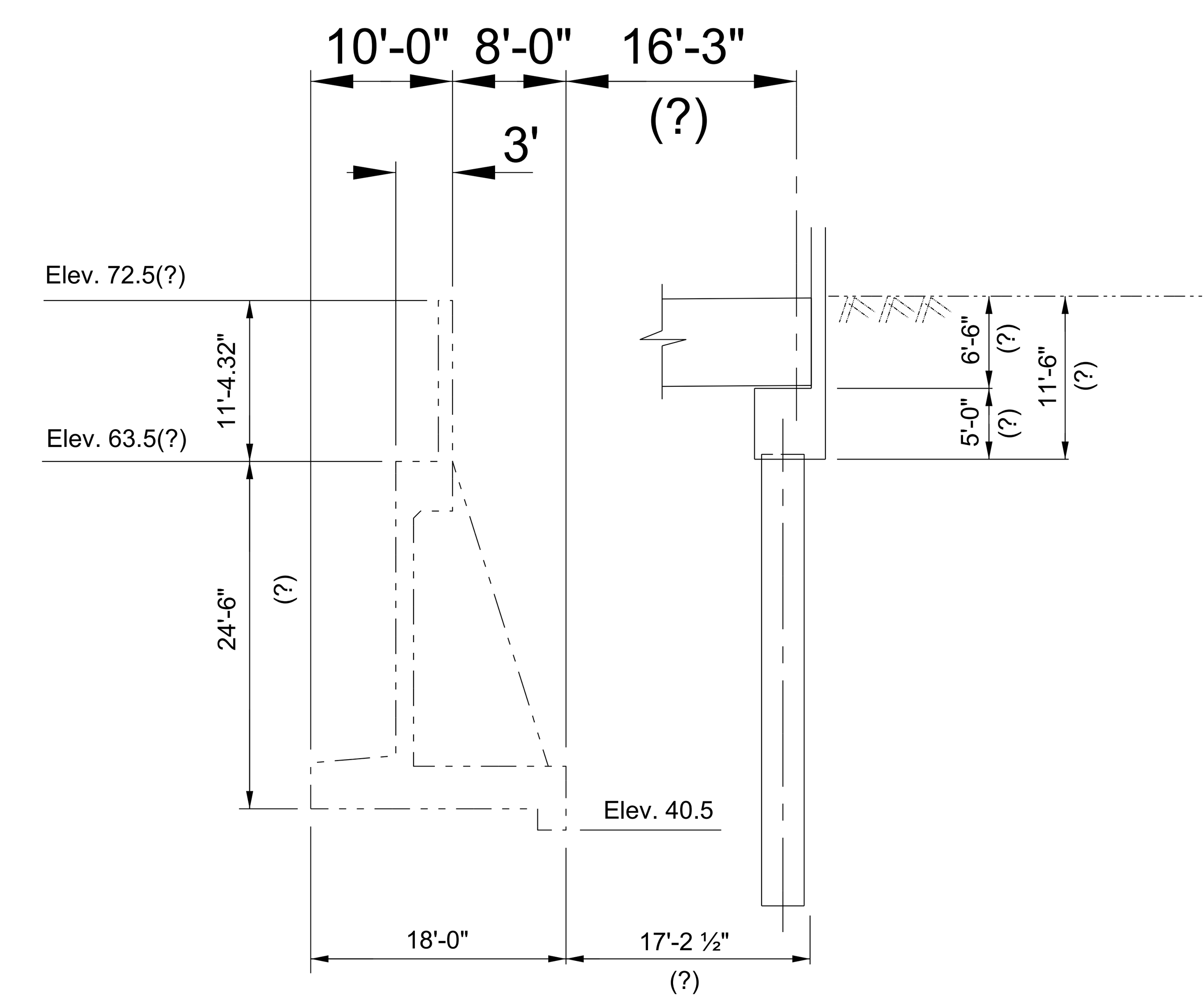
SCALE: ¼" = 1'-0"



BEARING SEAT ELEVATION		
GIRDER	ABUTMENT 1	ABUTMENT 3
G-1		
G-2		
G-3		
G-4		
G-5		
G-6		
G-7		

NOTES - Unless othervise indicated:

1. Refer to "Girder Layout" Sheet for girder location.
2. Bearing seat elevation are top of concrete and are located at the intersection of centerline bearing and centerline girder.
3. Reinforcing steel shall have 2" cover in walls and 3" cover in footing.
4. Premolded joint filler should be fastened with 8 d galvanized nails @ 12" O.C. staggered.
5. Reinforcing steel shall be continuous through construction joints.
6. Bearing seats shall be aligned parallel to roadway centerline and



DETAIL

SCALE: 1"=20'

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

ABUTMENT 1 PLAN

BR. NO. 989 | PCA X2310955 | SHEET 8 OF 17

CADD PROJECT FILE NAME: RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER: K. HO

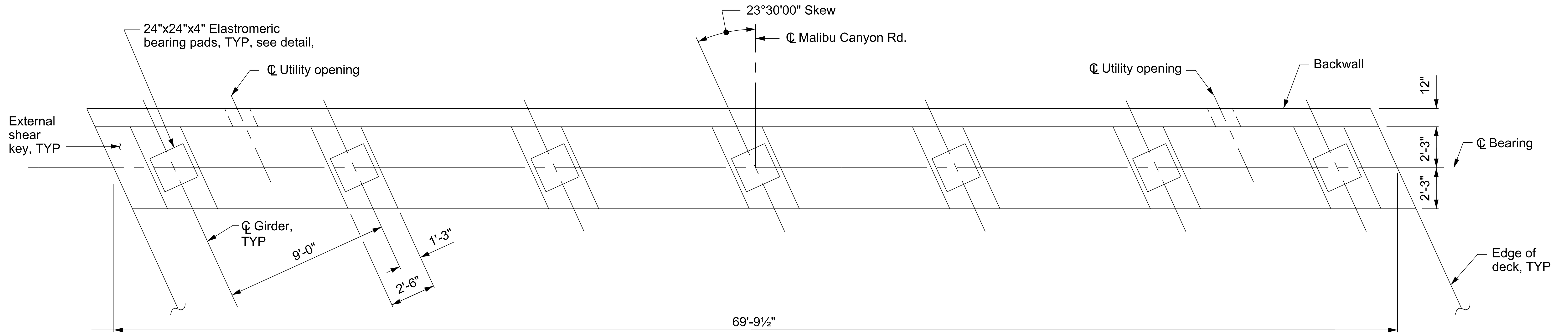
DESIGNER: J. ZHAO

DRAFTER: D. ROJAS

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020

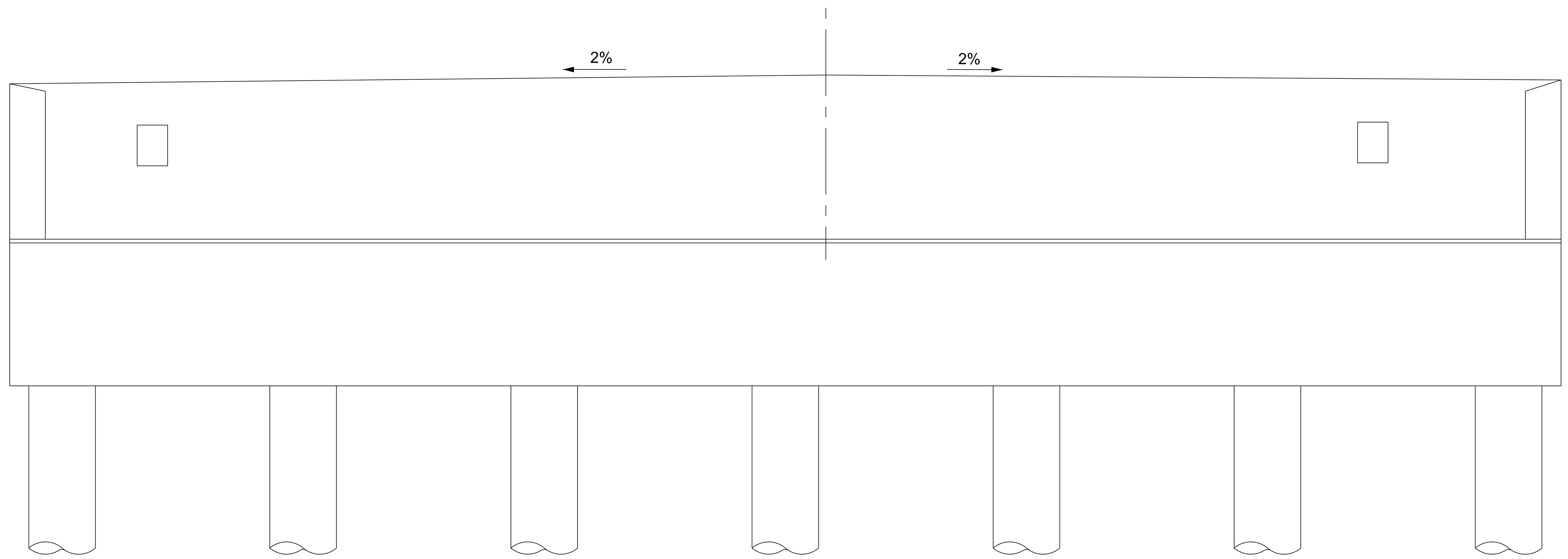
S-8

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



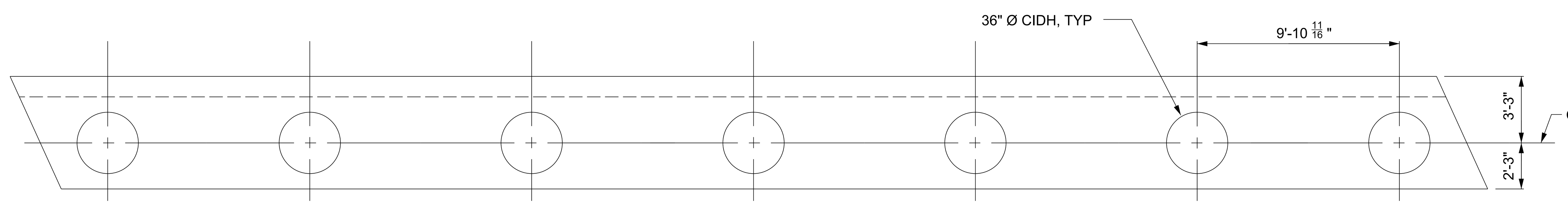
ABUTMENT PLAN

SCALE: ¼" = 1'-0"



ABUTMENT ELEVATION

SCALE: ¼" = 1'-0"



FOOTING PLAN

SCALE: ¼" = 1'-0"

CADD PROJECT FILE NAME
RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER
K. HO

DESIGNER
J. ZHAO

DRAFTER
D. ROJAS

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD
DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
JENNY ZHAO
C 60157
CIVIL
STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE
OVER
MALIBU CREEK

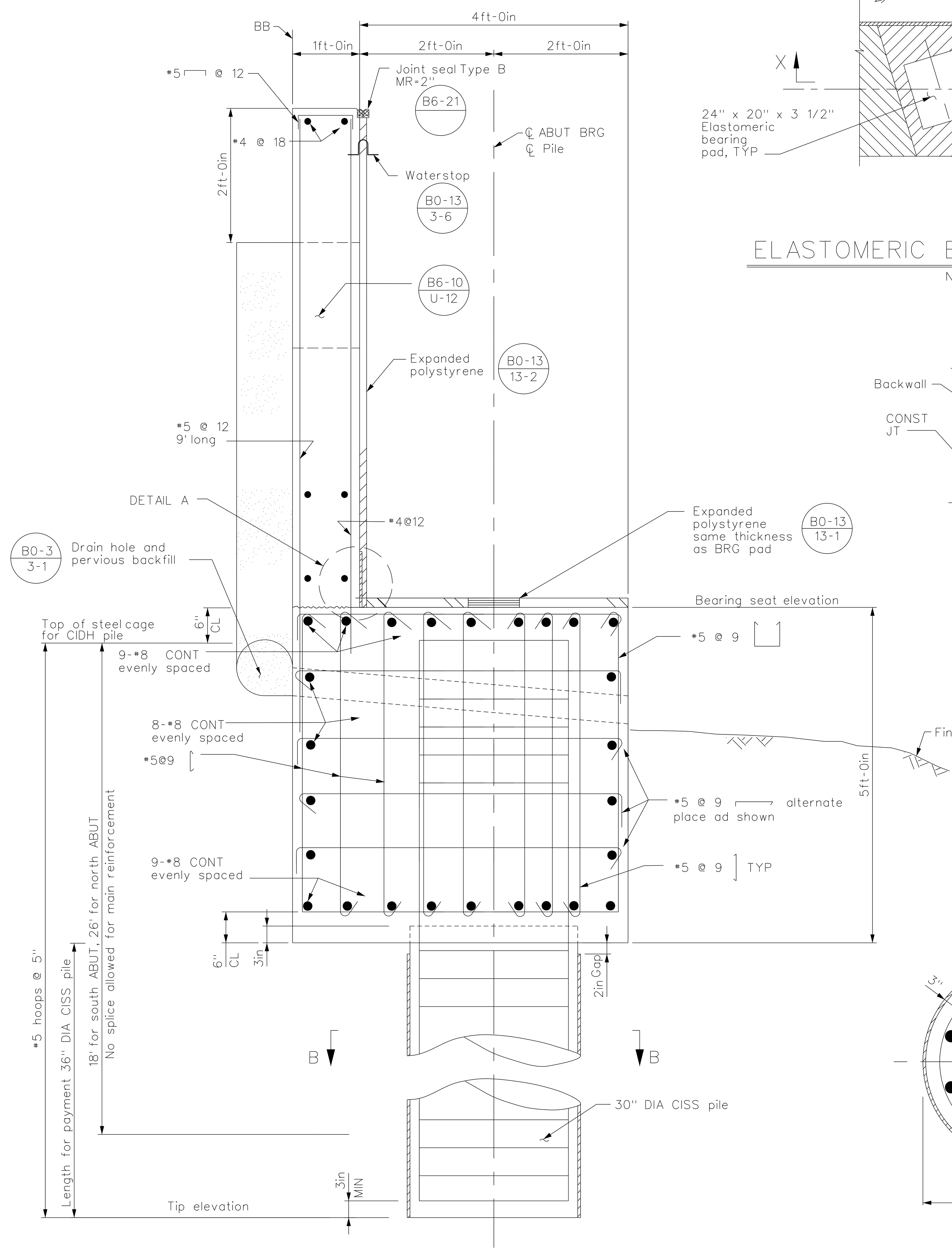
PROJECT ID NO. RDC00114835
ABUTMENT 3 PLAN

BR. NO. 989 | PCA X2310955 | SHEET 9 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE
DATE: 8/18/2020

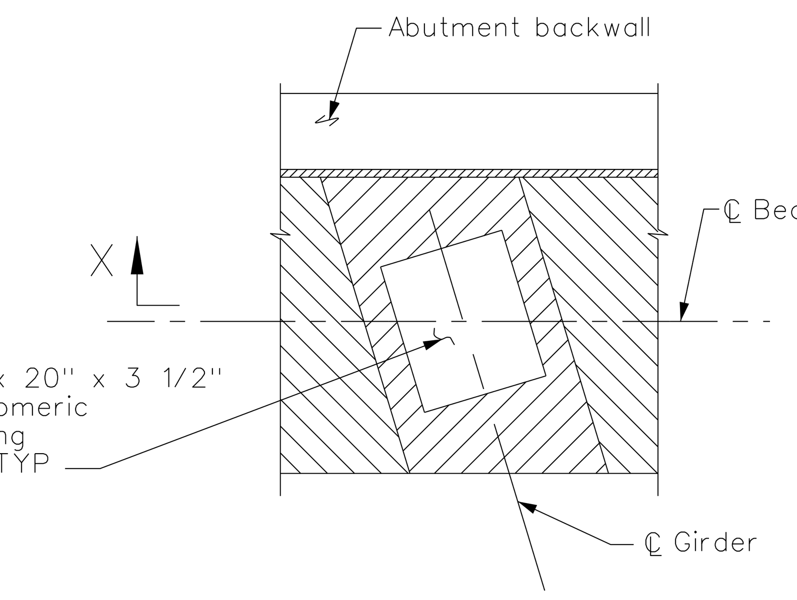
S-9

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



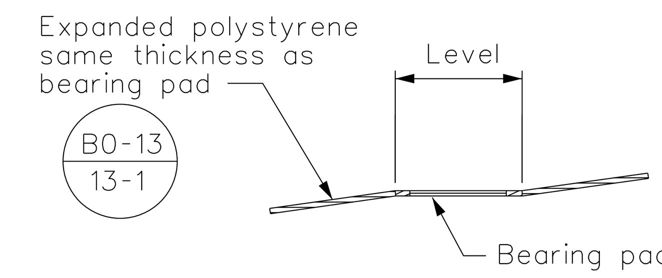
TYPICAL ABUTMENT SECTION

1" = 1'-0"



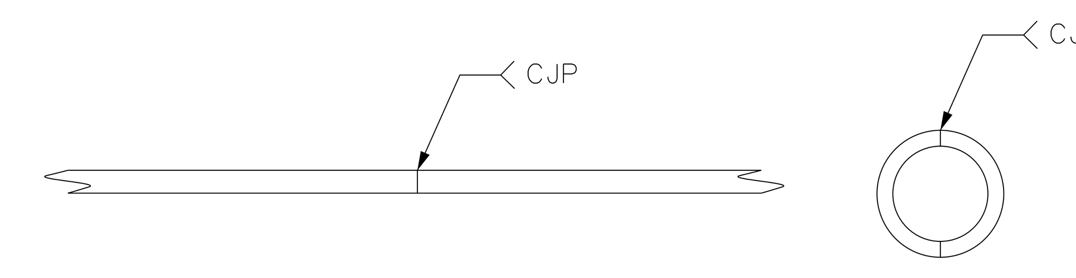
ELASTOMERIC BEARING PAD DETAIL

No scale



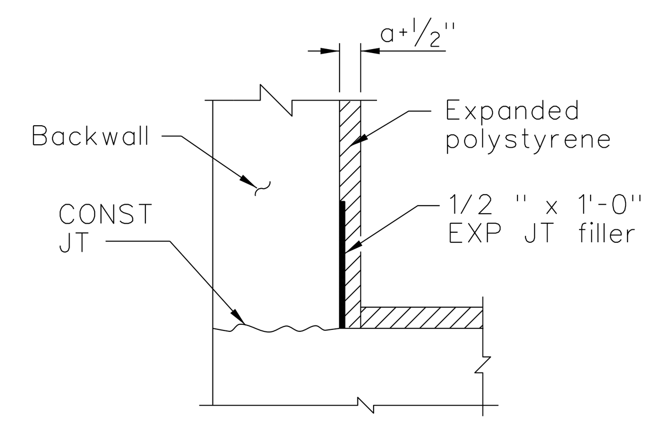
SECTION X-X

No scale



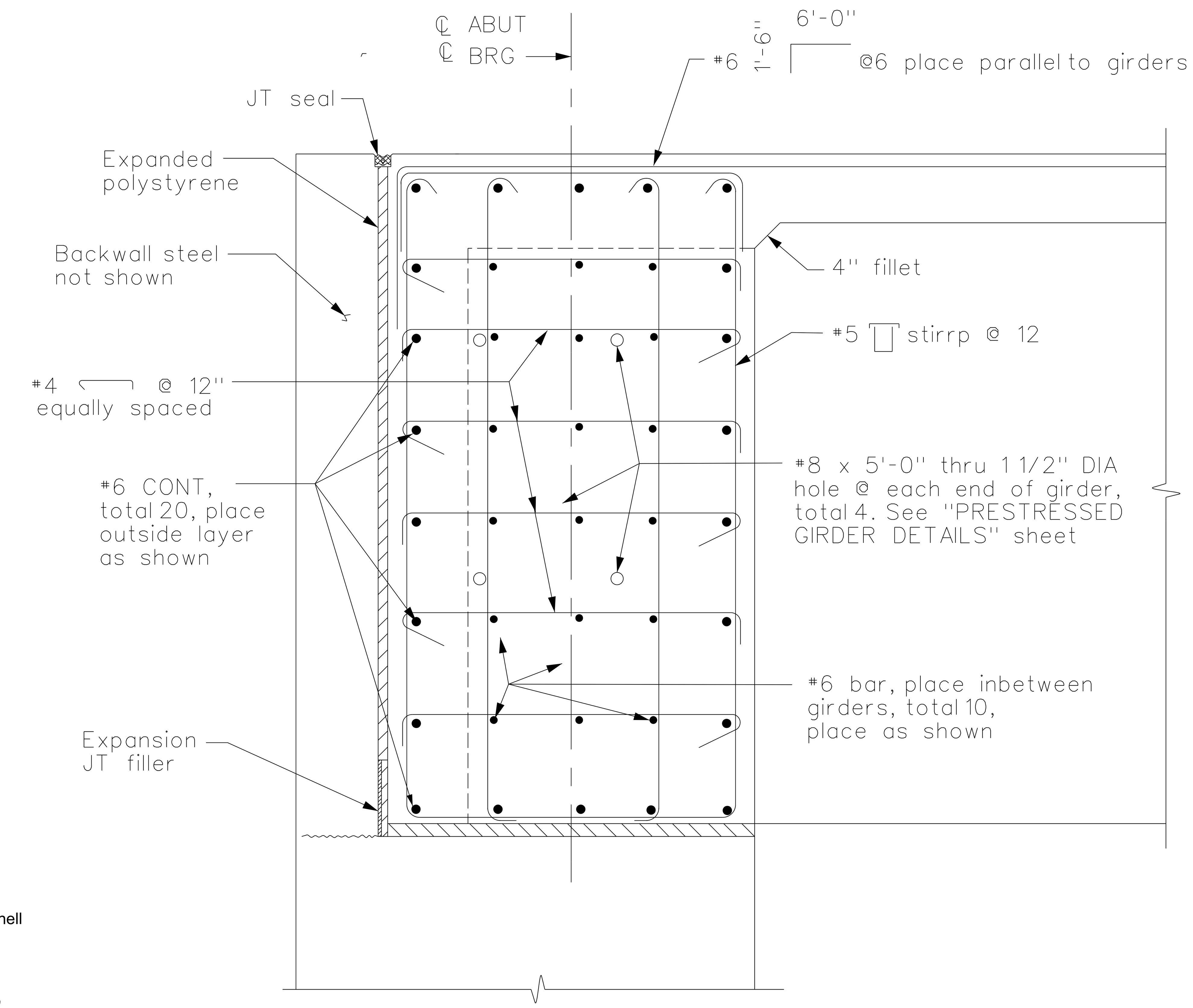
ULTIMATE BUTT WELDED CONTINUOUS HOOP DETAIL

No scale



DETAIL A

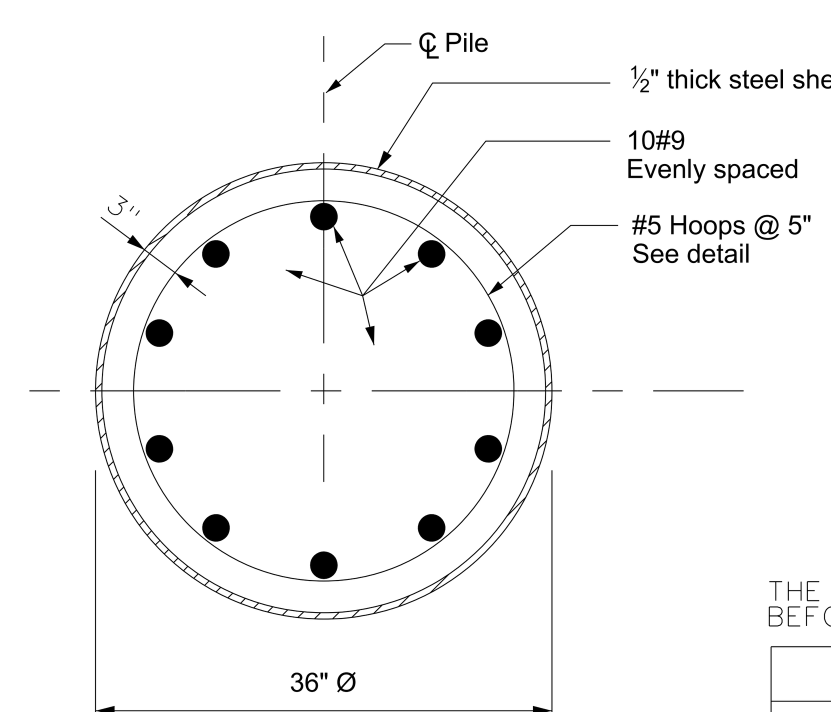
No scale



TYPICAL END DIAPHRAGM SECTION

¾" = 1'-0"

See Sheet 9 for additional details for end diaphragms and shear keys.



SECTION B-B

1" = 1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

ABUTMENT DETAIL

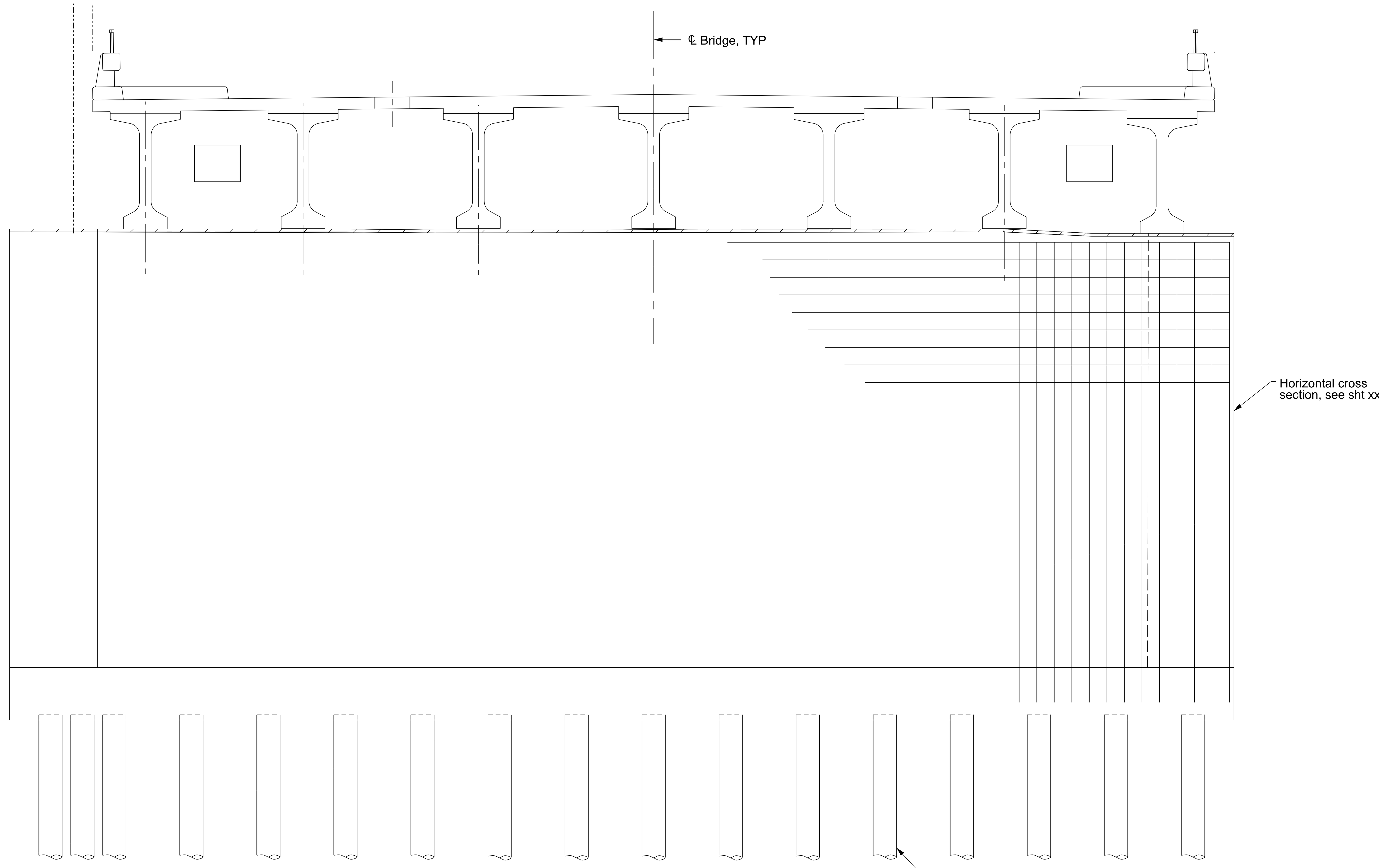
BR. NO. 989	PCA X2310955	SHEET 10 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-10

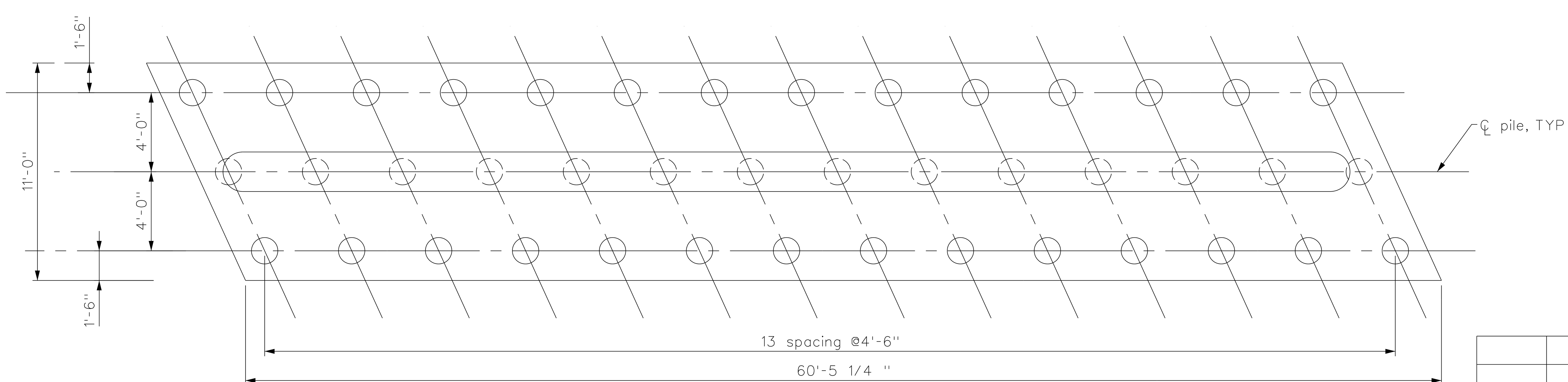
DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

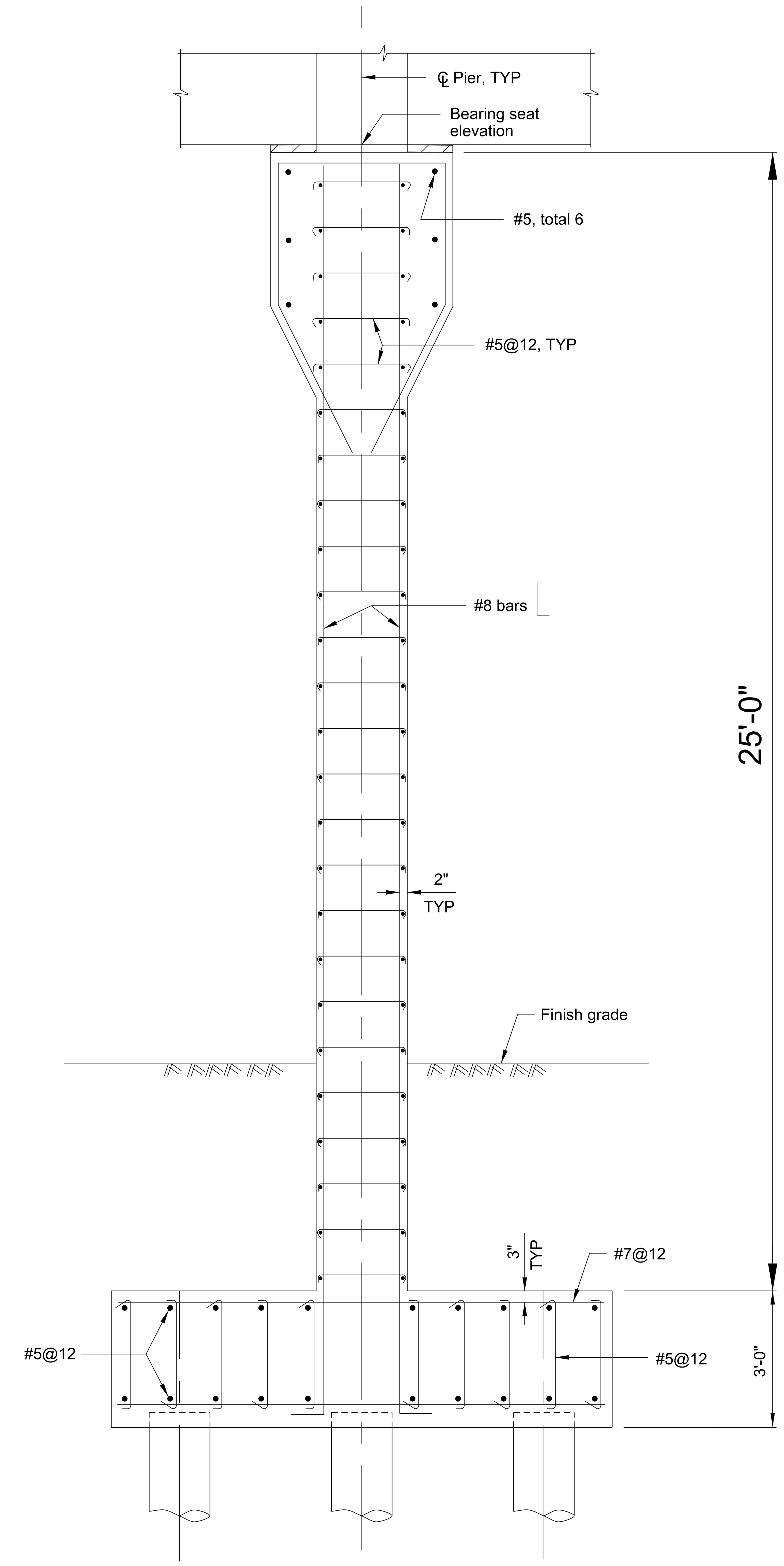
FED ID XXXXXXX



PIER ELEVATION
SCALE: 1/4" = 1'-0"



FOOTING PLAN
SCALE: 1/4" = 1'-0"



CROSS SECTION
SCALE: 1/8" = 1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION
		REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

PIER DETAILS

BR. NO. 989 | PCA X2310955 | SHEET 11 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-11

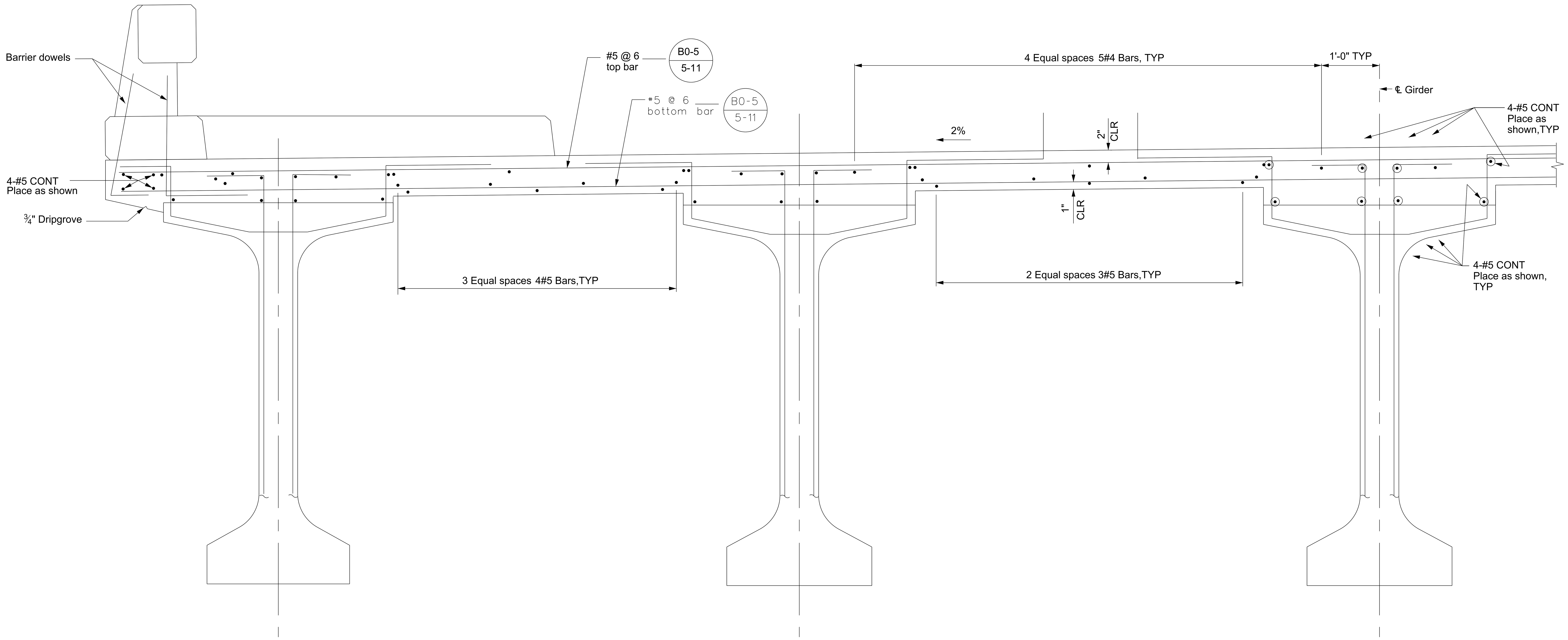
CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER K. HO

DESIGNER J. ZHAO

DRAFTER D. ROJAS

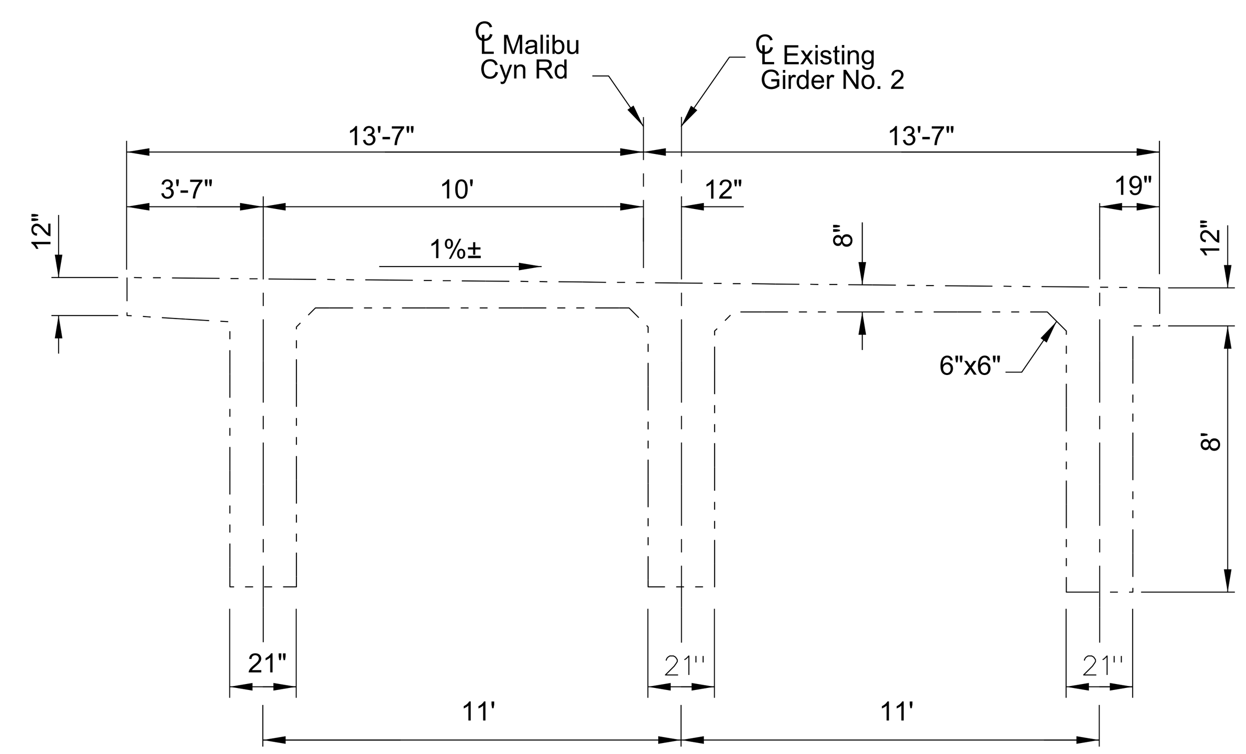
DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



(Not all stirrup shown for clarity)

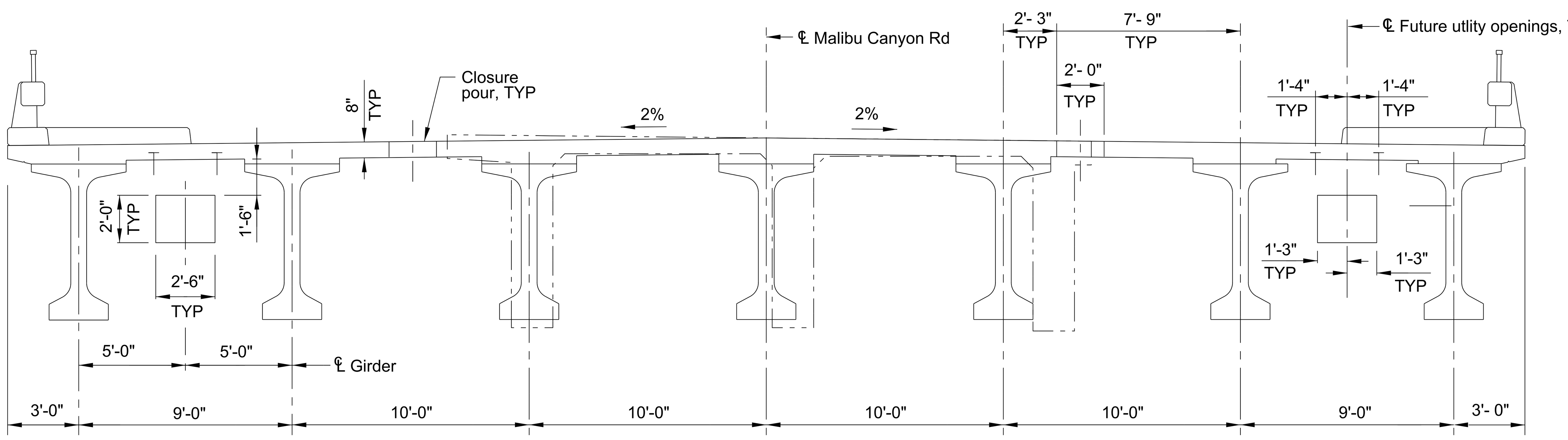
PARTIAL SECTION

SCALE: 1"=1'-0"



EXISTING TYPICAL SECTION

SCALE: ¼"=1'-0"



* UTILITY HANGERS SHALL CONSIST OF 1" DIAMETER x 9" BOLTS IN PAIRS @ 10'±. EMBED 5" IN CONCRETE. BOLT 1" - 8UNC - 2, TREAD 6". FURNISH 2 NUTS PER BOLT. ALL PARTS TO BE GALVANIZED.

TYPICAL SECTION

SCALE: ¼"=1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

CADD PROJECT FILE NAME: RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER: K. HO

DESIGNER: J. ZHAO

DRAFTER: D. ROJAS

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

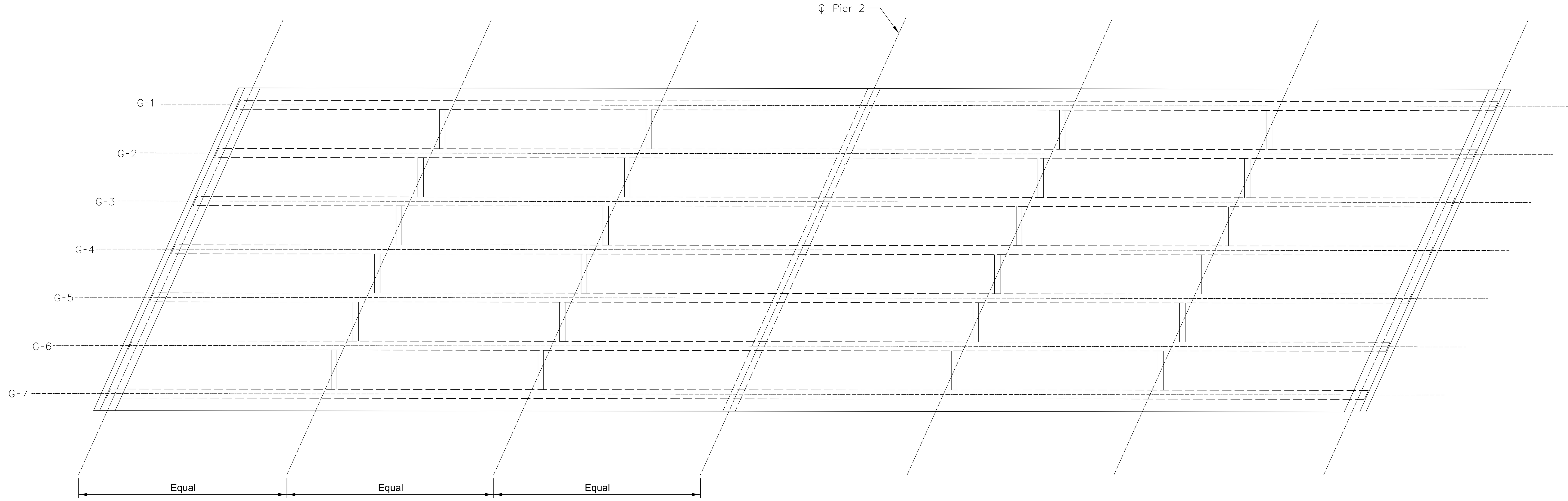
TYPICAL SECTION

BR. NO. 989 | PCA X2310955 | SHEET 12 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020

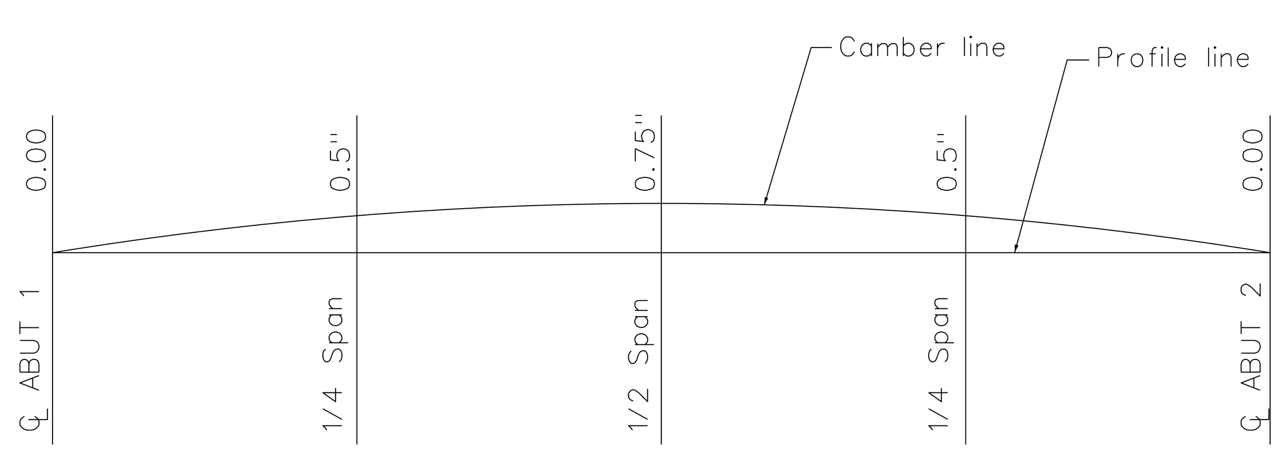
S-12

DATE: $DATE$ TIME: $TIME$ FILE: $FILE$



GIRDER LAYOUT

1"=10'



CAMBER DIAGRAM

NTS

Note: Does not include allowance for false work settlement.

PRESTRESSED GIRDER NOTES

Low Relaxation Strand: 270 ksi
P-jack: 13,400 kips
Anchor set: 3/8"
Assumed total losses: 30.5 ksi
Concrete: f'ci=3,500 psi @ time of stressing
f'c=5,000 psi @ 28 days

Contractor shall submit elongation calculations based on initial stress [x] =0.98 times jacking stress. Stress shall be performed from EITHER end. Distribution of stress force (PJack) between girders shall not exceed the ratio of 3:2. Maximum final force variation between girders shall not exceed 800 kips.

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

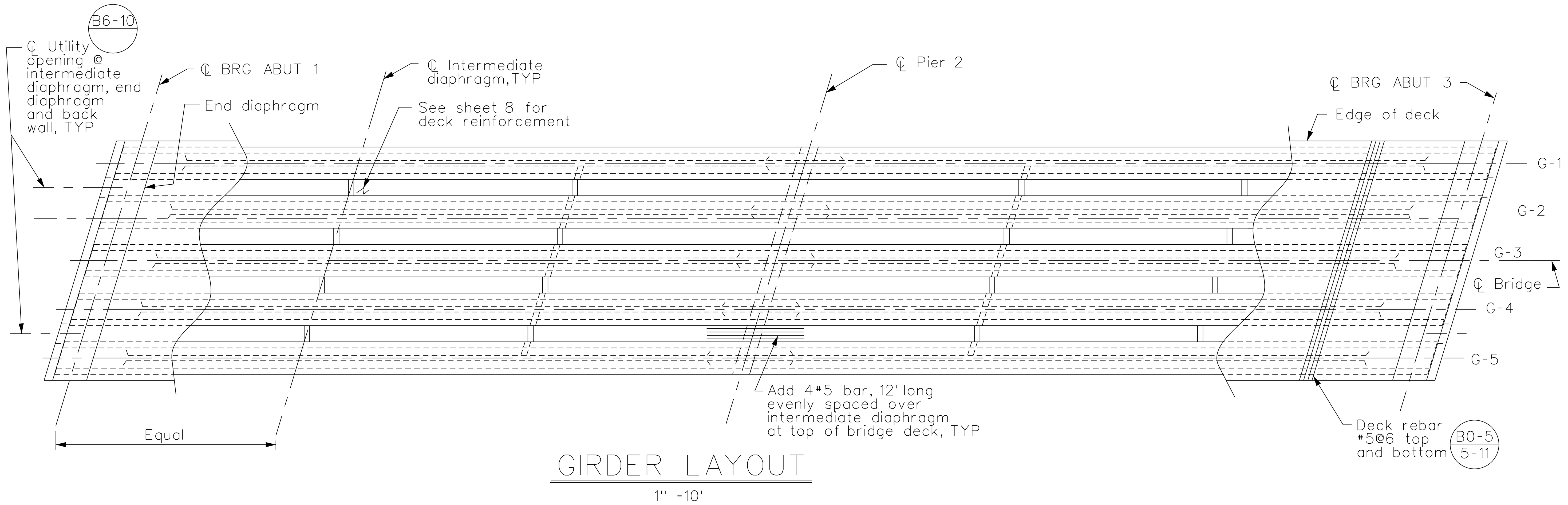
DECK CONTOURS

BR. NO. 989 | PCA X2310955 | SHEET 6 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-

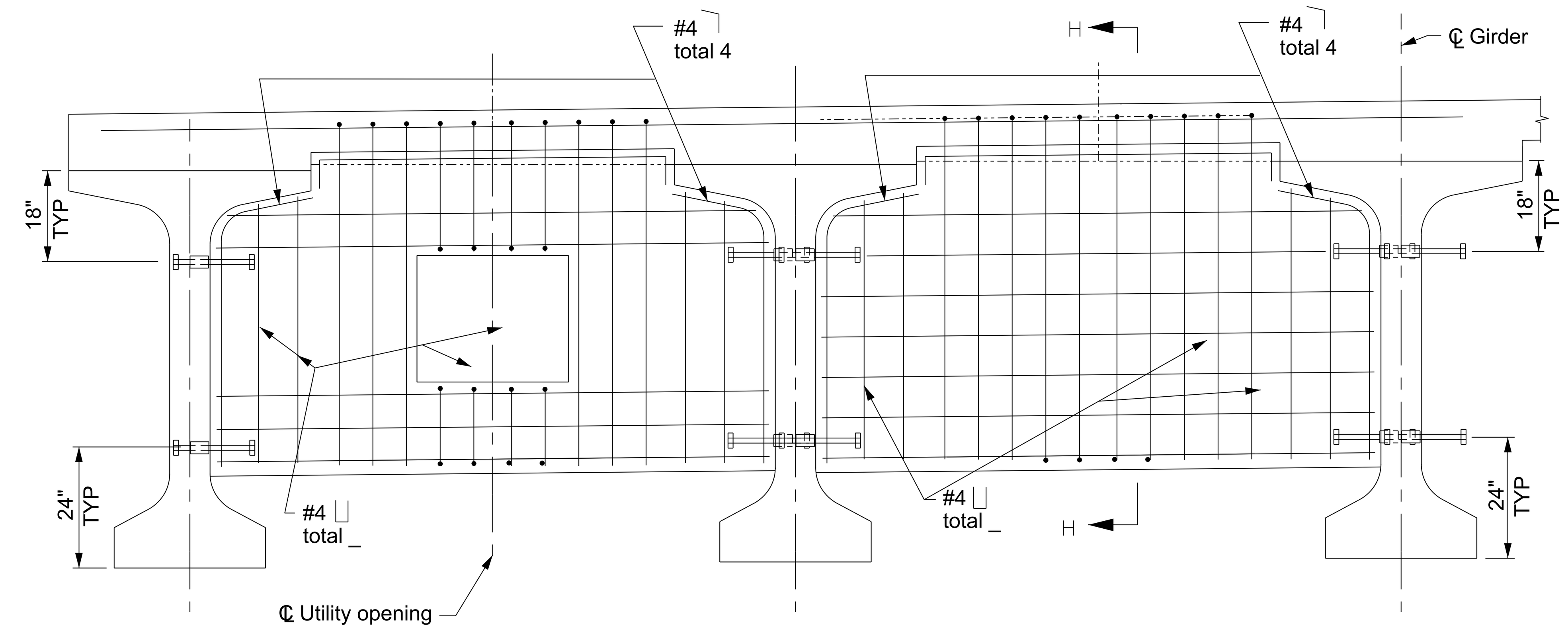
DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



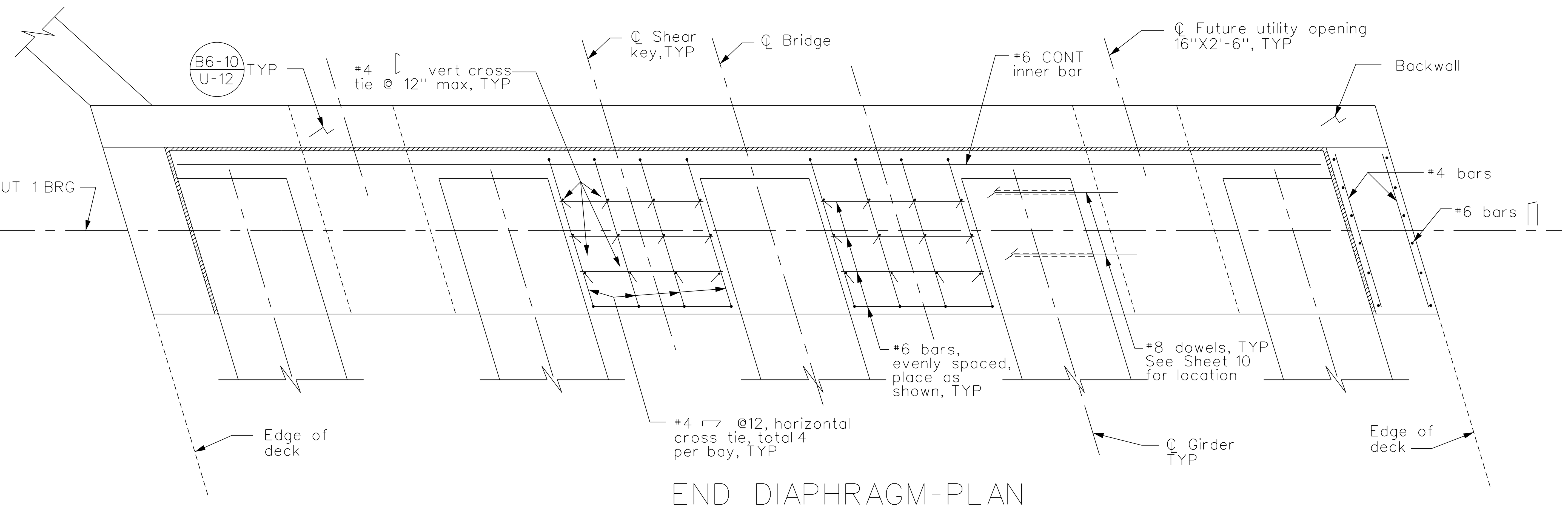
GIRDER LAYOUT

1" =10'



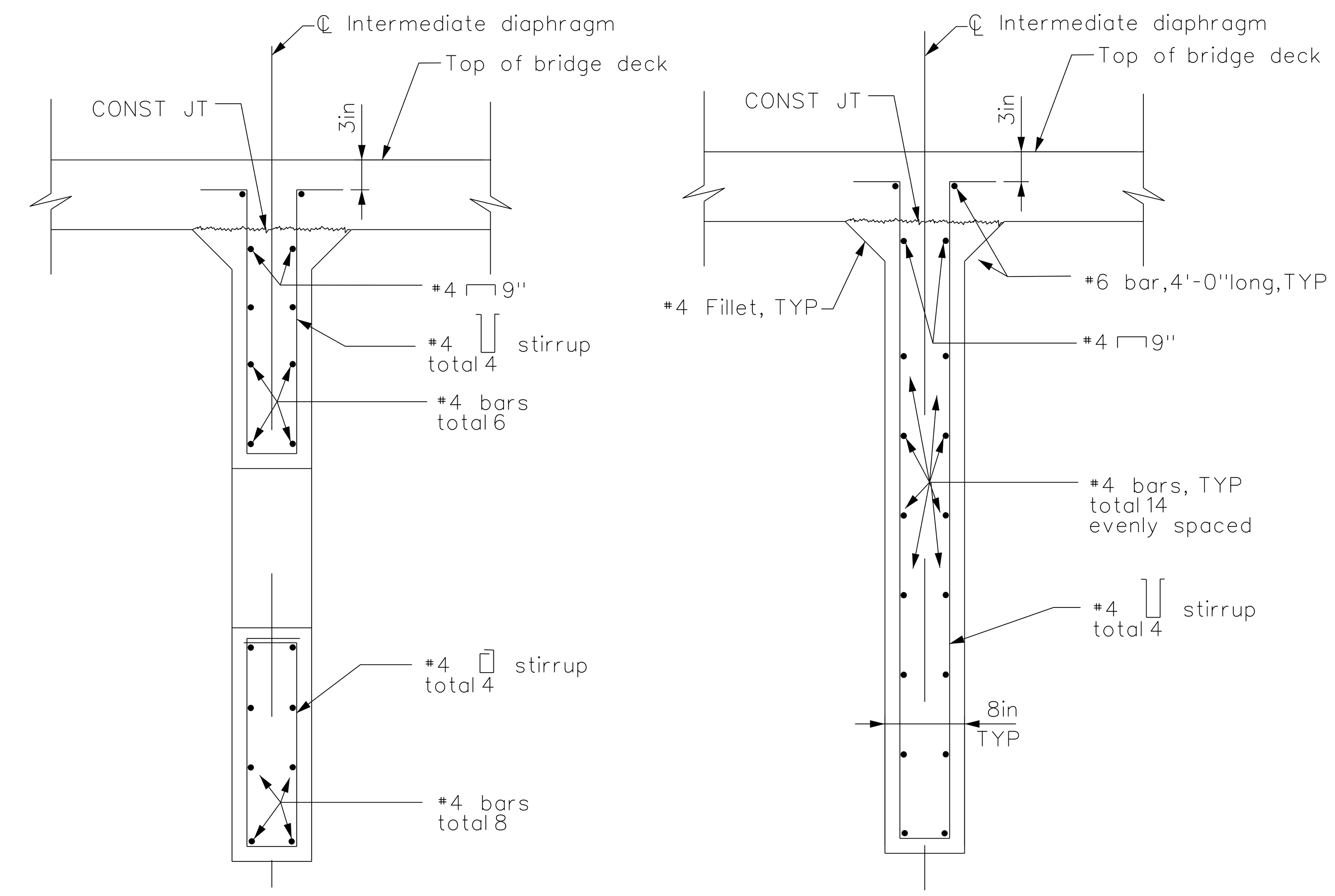
INTERMEDIATE DIAPHRAGM

SCALE: 1/2"=1'-0"



END DIAPHRAGM-PLAN

½" = 1'-0"

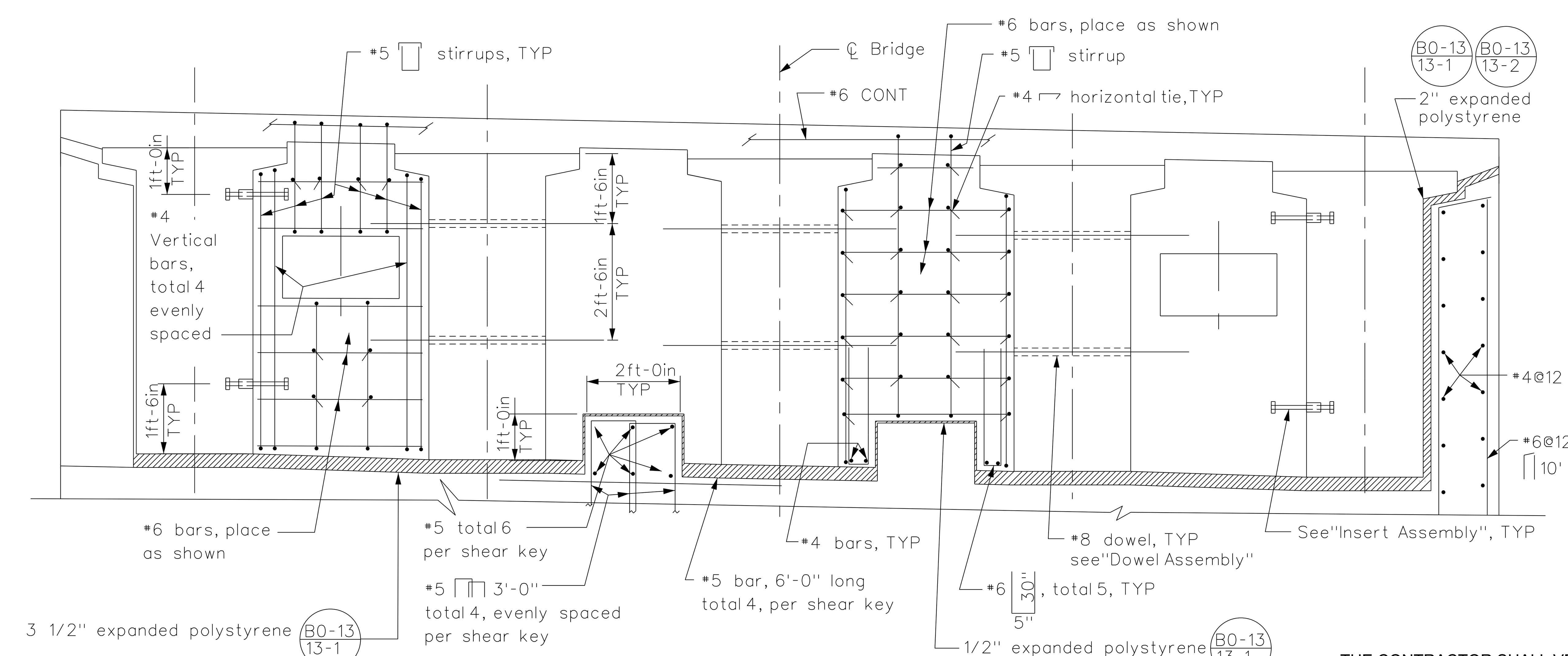


SECTION I-I

1"=1'-0"

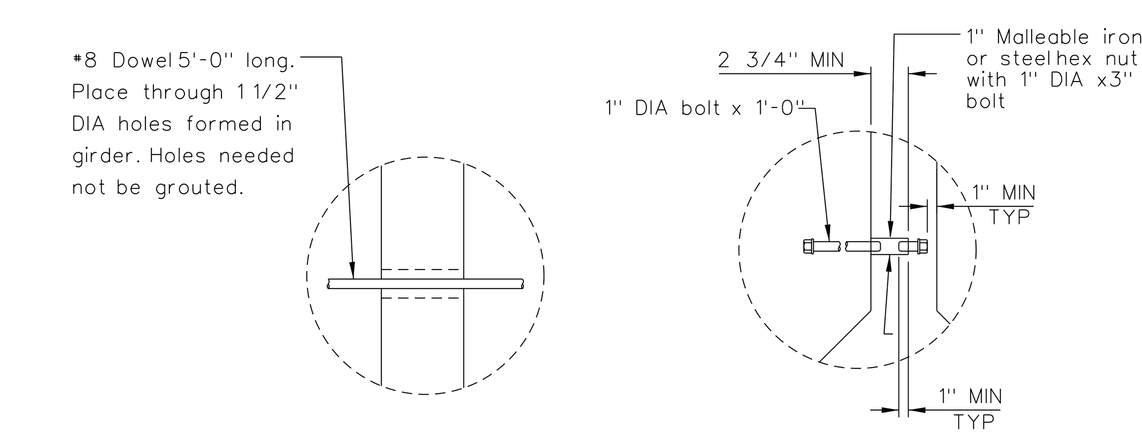
SECTION H-H

1"=1'-0"



END DIAPHRAGM ELEVATION

½" = 1'-0"



DOWEL ASSEMBLY

NO SCALE

INSERT ASSEMBLY

NO SCALE

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

GIRDER DETAILS

BR. NO. 989	PCA X2310955	SHEET 14 OF 17

CADD PROJECT FILE NAME: RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

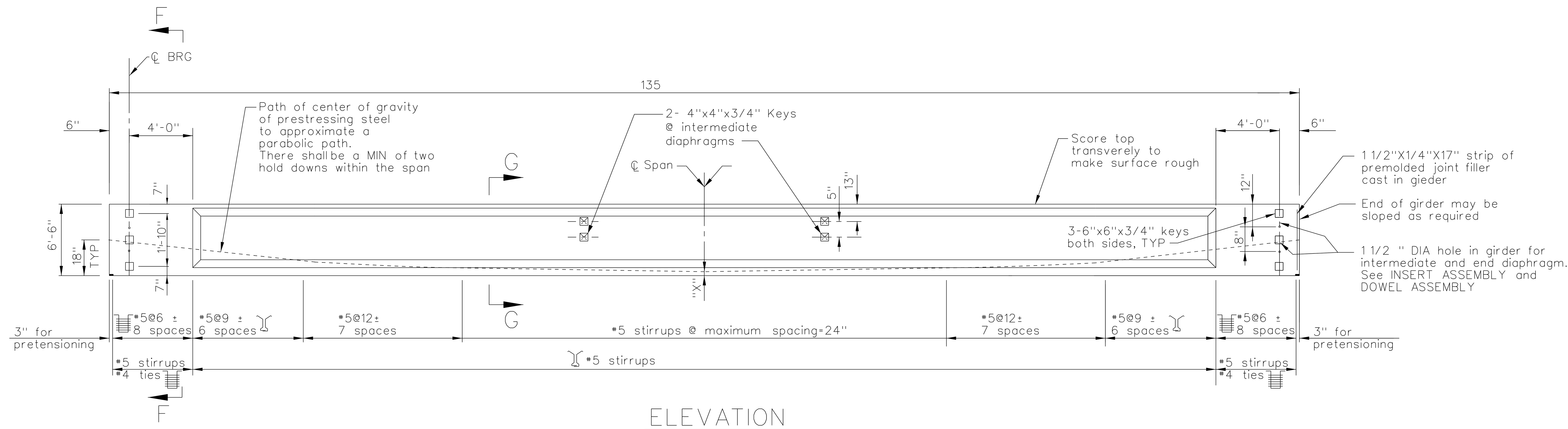
CHECKER: K. HO

DESIGNER: J. ZHAO

DRAFTER: D. ROJAS

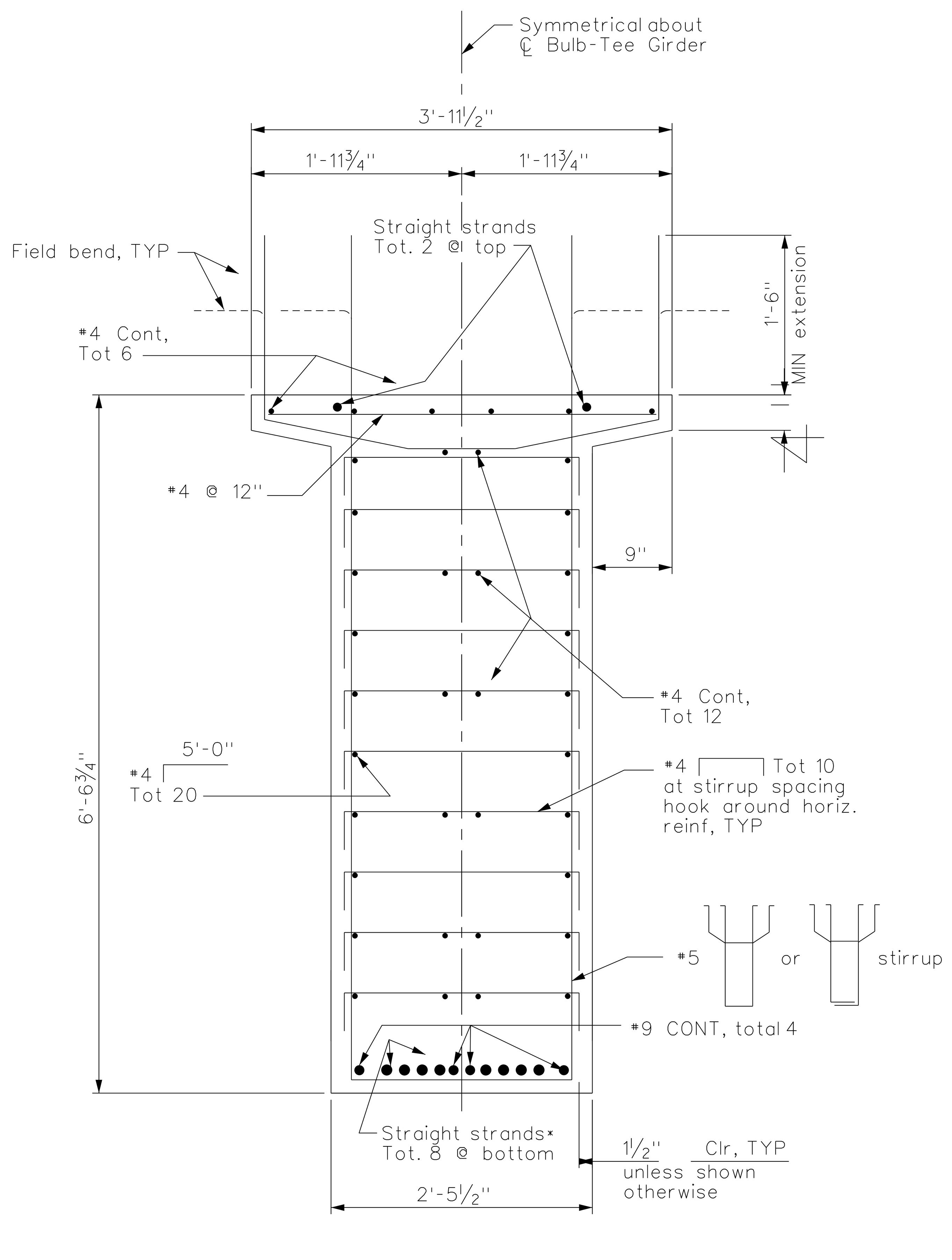
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-14

DATE: $DATE$ TIME: $TIME$ FILE: $FILE$



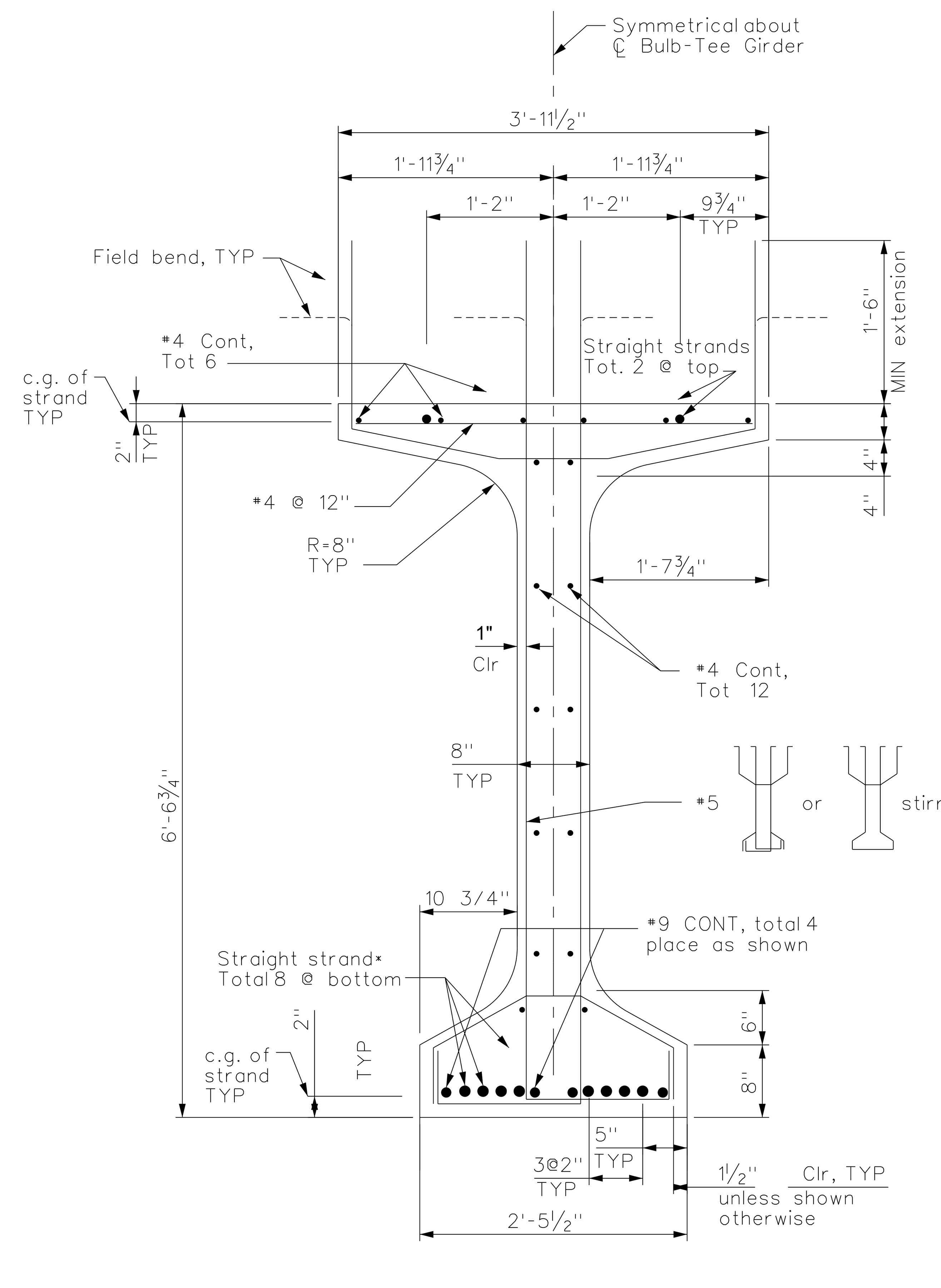
ELEVATION

NO SCALE



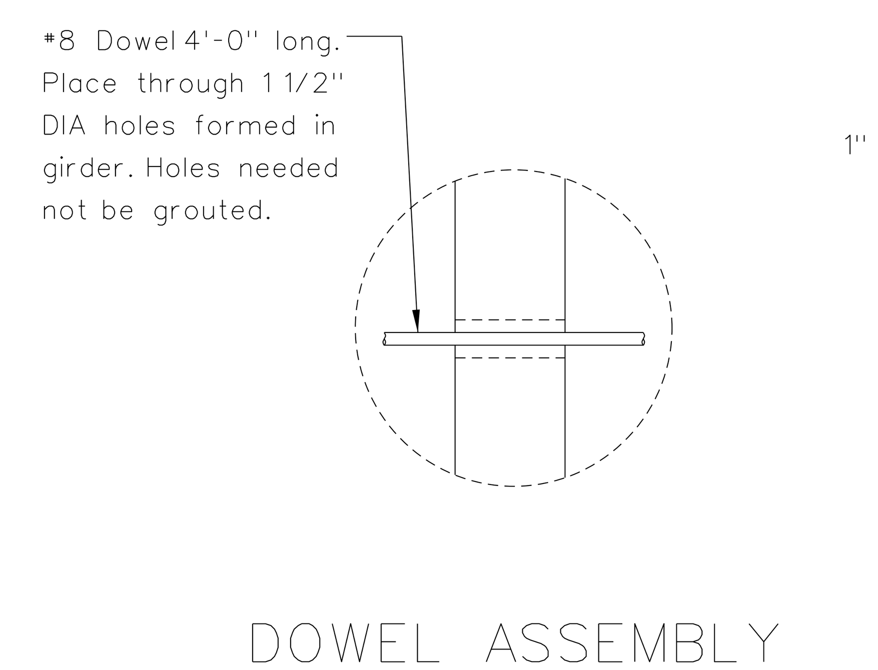
SECTION F-F

1" =1'-0"



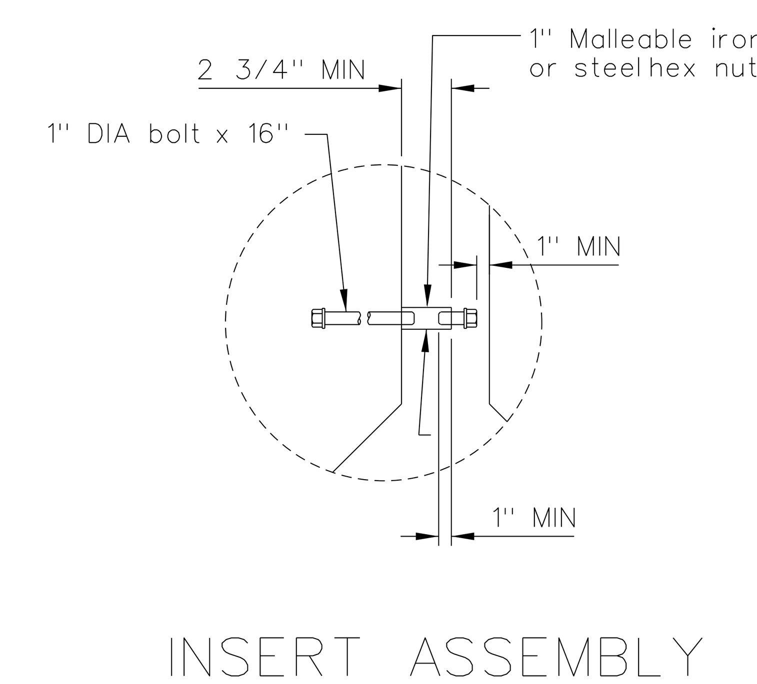
SECTION G-G

1" =1'-0"



DOWEL ASSEMBLY

NO SCALE



INSERT ASSEMBLY

NO SCALE

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER JENNY ZHAO C 60157 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

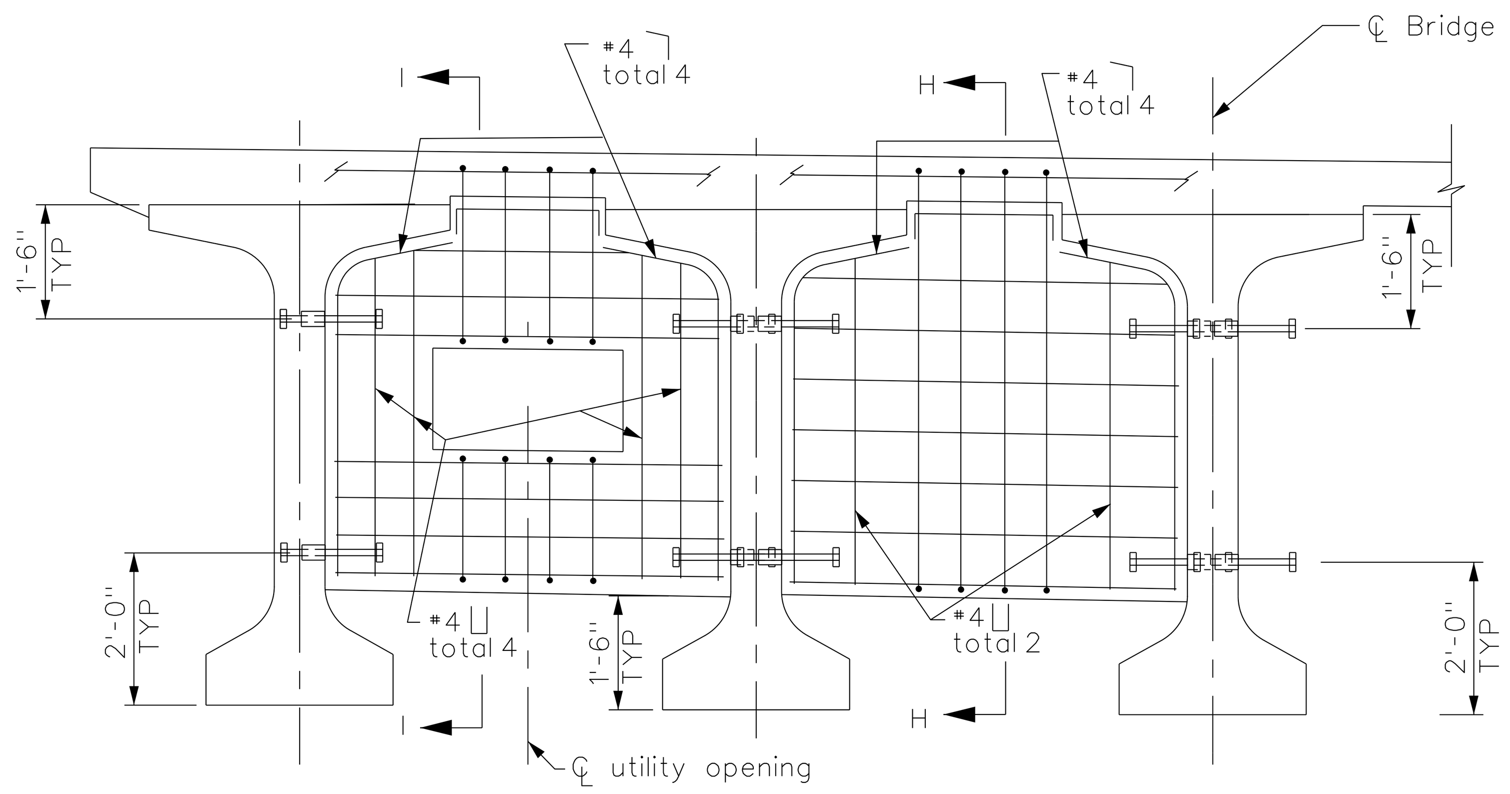
PRESTRESSED GIRDER DETAILS

BR. NO. 989 | PCA X2310955 | SHEET 15 OF 17

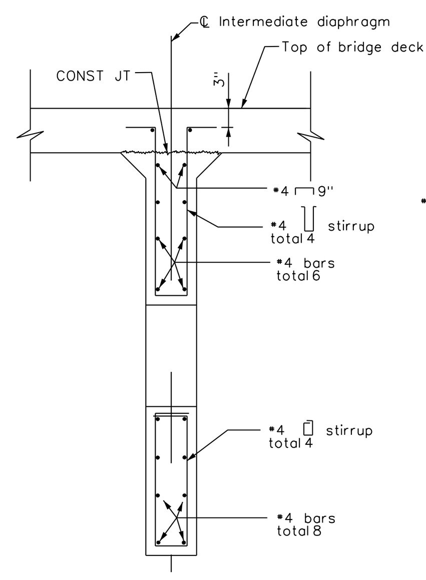
60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: 8/18/2020 S-15

DRAFTER D. ROJAS | DESIGNER J. ZHAO | CHECKER K. HO | CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

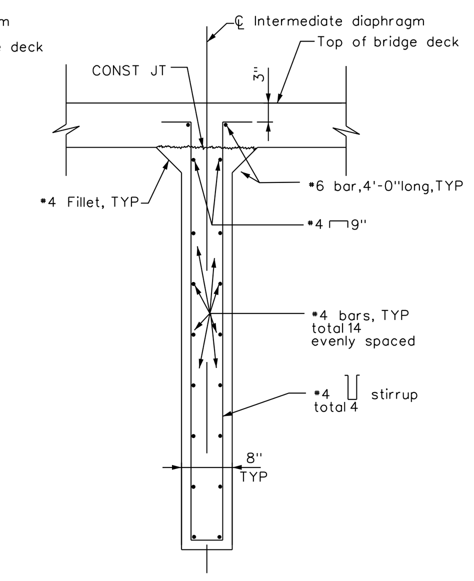
DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$



INTERMEDIATE DIAPHRAGM
1/2"=1'-0"



SECTION I-I
1"=1'-0"

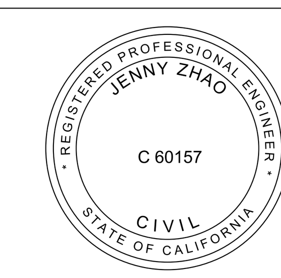


SECTION H-H
1"=1'-0"

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS
BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION

REVISIONS



PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE OVER MALIBU CREEK

PROJECT ID NO. RDC00114835

GIRDER AND DIAPHRAGM DETAILS

BR. NO. 989 | PCA X2310955 | SHEET 16 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE
DATE: 8/18/2020

S-16

DRAFTER D. ROJAS
DESIGNER J. ZHAO
CHECKER K. HO
CADD PROJECT FILE NAME RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

FED ID XXXXXXX

LOGS OF BORINGS

CADD PROJECT FILE NAME
RDC0014835 MALIBU CANYON ROAD OVER MALIBU CANYON CREEK

CHECKER
K. HO

DESIGNER
J. ZHAO

DRAFTER
D. ROJAS

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS
BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
JENNY ZHAO
C 60157
CIVIL
STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD BRIDGE
OVER
MALIBU CREEK

PROJECT ID NO. RDC00114835
LOGS OF BORNINGS

BR. NO. 989 | PCA X2310955 | SHEET 17 OF 17

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE
DATE: 8/18/2020

S-17

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

CONSTRUCTION LEGEND

- (3) ASPHALT CONCRETE CURB
- (8) ASPHALT CONCRETE PAVEMENT
- (9) ASPHALT CONCRETE PAVEMENT, ON BASE MATERIAL
- (18) DRAINAGE SYSTEM AS SHOWN ON PLANS
- (30) RETAINING WALL PER STD PLAN XXX
- (32) THRIE BEAM BARRIER STANDARD BARRIER RAILING SECTION AND, MIDWEST GUARDRAIL SYSTEM TRANSITION RAILING PER STD PLAN A78A AND A77U4
- (33) MIDWEST GUARDRAIL SYSTEM PER STANDARD PLAN A77L1 AND A77Q1
- (34) GUARDRAIL END TREATMENT SYSTEM. WITH STEEL POSTS AND PLASTIC BLOCK
- (35) REMOVE AND DISPOSE OF EXISTING GUARDRAIL (SYSTEM COMPLETE)
- (36) RAILING DELINEATOR PER STANDARD PLAN A77N4
- (37) CHAIN LINK FENCE, 5' HIGH
- (38) CRASH CUSHION

CONSTRUCTION SYMBOLS

(#)	INDICATES WORK PER CONSTRUCTION LEGEND	
(ltr)	CURVE DATA SHOWN IN TABLE ON PLAN	
( ) 2" P4	ABOVE LINE:	INDICATES THE TYPE OF STANDARD OR THICKNESS OF SURFACE MATERIAL IN INCHES, STANDARD PLAN VARIABLES; CURB RAMP CASE, TYPE, SECTION AND DETAIL; OR TREE PLANTING CASE
( ) 5" CMB	BELOW LINE:	REFERENCE TO DETAIL OR THICKNESS OR BASE MATERIAL IN INCHES OR TREE WELL CASE
(#) A x B / 4" CMB	ABOVE LINE:	A = LENGTH PARALLEL TO CURB B = LENGTH PERDICULAR TO CURB

ABBREVIATIONS

ABBREVIATION	WORD OR WORDS
AC	ASPHALT CONCRETE
BC	BEGINING OF CURVE
BCR	BEGINING OF CURB RETURN
BM	BENCH MARK
CL	CENTER LINE
CMB	CRUSHED MISCELLANEOUS BASE
CMP	CORRUGATED METAL PIPE
CONST	CONSTRUCT, CONSTRUCTION
CY	CUBIC YARD
DIA	DIAMETER
EC	END OF CURVE
ECR	END OF CURB RETURN
EL	ELEVATION
EXST	EXISTING
FL	FLOW LINE
H	HORIZONTAL
L	LENGTH
LACPW	LOS ANGELES COUNTY PUBLIC WORKS
MAX	MAXIMUM
MIN	MINIMUM
SF	SQUARE FOOT
SPPWC	STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION
STA	STATION
STD	STANDARD
R/W	RIGHT OF WAY
TYP	TYPICAL
V	VERTICAL
W	WIDTH

CONSTRUCTION NOTES

1. PRIME CONTRACTOR LICENSE REQUIRED: CLASS A OR C12
2. STANDARD PLANS REFERENCED ARE PER THE STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION (SPPWC) UNLESS OTHERWISE NOTED.
3. REPLACE AND RELOCATE TRAFFIC SIGNAL AND STREET LIGHTING PULL BOXES AFFECTED AND CONSTRUCTION PAYMENT WILL BE MADE AT THE CONTRACT UNIT PRICE FOR NO. 6 PULL BOX.
4. ELEVATIONS SHOWN ARE IN FEET BASED ON MALIBU 2008 ADJUSTMENT NAVD 1988 DATUM.
5. WITHIN THE PROJECT LIMITS, THE CONTRACTOR SHALL INSTALL A BLUE RAISED RETROREFLECTIVE PAVEMENT MARKER (RPM) ON THE FINISHED SURFACE AT EACH FIRE HYDRANT LOCATION PER CALIFORNIA 2014 MUTCD PART 3 - FIGURE 3B-102 (CA), AS DESCRIBED IN THE SPECIAL PROVISIONS.

GUARDRAIL NOTES

1. THE GUARDRAIL LENGTH AND LOCATION ARE MEASURED ALONG THE FACE OF THE RAILING, UNLESS OTHERWISE SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER.
2. THE PROPOSED TERMINAL SYSTEM SHALL BE INSTALLED IN A STRAIGHT FLARE OVER THE ENTIRE LENGTH AND SHALL NOT BE INSTALLED ON A PARABOLIC CURVE.
3. FOR INSTALLATION OF TERMINAL SYSTEMS, BLACK AND YELLOW RETROREFLECTIVE STRIPED SHEETING SHALL BE ADHERED TO THE APPROACH END OF THE GUARDRAIL. THE STRIPES SHALL BE SLOPED DOWN AT AN ANGLE OF 45 DEGREES TOWARDS THE SIDE OF THE ROADWAY ON WHICH TRAFFIC IS TO PASS. THE SHEETING SHALL BE CONSISTENT WITH THE DESIGN PATTERN, COLORS, AND DIRECTION OF A TYPE "P(CA)" OBJECT MARKER PER CALIFORNIA MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) 2014 EDITION, SECTION 2C.63 AND 2C.65.
4. EACH TERMINAL SYSTEM INSTALLED MUST BE IDENTIFIED BY PAINTING THE TYPE OF THE TERMINAL SYSTEM IN NEAT BLACK LETTERS AND FIGURES 2 INCHES HIGH ON THE BACKSIDE OF THE RAIL ELEMENT BETWEEN SYSTEM POST NUMBERS 4 AND 5.
5. INSTALL DELINEATORS PER CALTRANS STANDARD PLANS A77N4 & A73C, CLASS 1, TYPE F AS SHOWN ON PLAN.

STANDARD PLANS

STANDARD PLAN FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION

120-2	CURB AND GUTTER - BASIN

LA COUNTY DPW STANDARD PLANS, 2000 EDITION

3015	RURAL CATCH BASIN

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD PLANS (2018 EDITION)

A77L1	MIDWEST GUARDRAIL SYSTEM STANDARD RAILING SECTION (WOOD POST WITH WOOD BLOCK)
A77N4	MIDWEST GUARDRAIL SYSTEM - TYPICAL RAILING DELINEATION
A77Q1	MIDWEST GUARDRAIL SYSTEM - TYPICAL LAYOUTS FOR STRUCTURE APPROACH - (TYPE 12B LAYOUT)
A77U4	MIDWEST GUARDRAIL SYSTEM - TRANSITION RAILING (TYPE WB-31) - (BLOCKOUT ATTACHMENT)
A78A	THRIE BEAM BARRIER - STANDARD BARRIER RAILING SECTION (WOOD POST WITH WOOD BLOCK) - (SINGLE THRIE BEAM BARRIER)

REFERENCES

SURVEY FIELD NOTES:	PWFB 1407, PG 560
FINAL MATERIALS TEST REPORT:	LAB NO XXXXX

UTILITIES

WATER:	LAS VIRGENES MUNICIPAL WATER DISTRICT (LVMWD) PEPPERDINE - TAPIA FORCE MAIN (P-TFM)
POWER:	SOUTHERN CALIFORNIA EDISON - TRANSMISSION/DISTRIBUTION (SCE-T/D)
GAS:	SOUTHERN CALIFORNIA GAS - DISTRIBUTION (SCG-D)
TELEPHONE:	CROWN CASTLE (CC)
SEWER:	PEPPERDINE - TAPIA FORCE MAIN (P-TFM)

TOPOGRAPHY LEGEND

EXISTING TOPOGRAPHY / PROPOSED IMPROVEMENTS

- CURB
- CURB AND GUTTER
- GUTTER
- PAVEMENT CONCRETE
- AC
- CURB RAMP
- BUILDING
- FENCE
- GUY POLE
- DRIVEWAY
- FIRE HYDRANT
- GUY WIRE
- MANHOLE
- POLE
- R/W LINE
- PULL BOX
- SIDEWALK — SHADED IF NOT CONTINUOUS
- SIGNAL CONTROL BOX
- SIGNAL FLASHING
- TRAFFIC
- STREET LIGHT
- PALM TREE
- OAK TREE
- OTHER TREE
- VALVE
- VAULT

AC PAVEMENT CLASS AND GRADE LEGEND

P1 C2-PG 64-10 B-PG 64-10	P3 B-PG 64-10
P2 C2-PG 64-10	P4 D2-PG 64-10

DRAFTER A TORRES | DESIGNER S KIM | CHECKER R SIAGIAN | CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

SUBMITTED BY: | DESIGN TEAM III | DATE

DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER | DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD
OVER MALIBU CREEK (53C0620)

PROJECT ID NO. RDC0014835
NOTES AND REFERENCES

DWG XX-X-XXX.X | SHEET 1 OF 7

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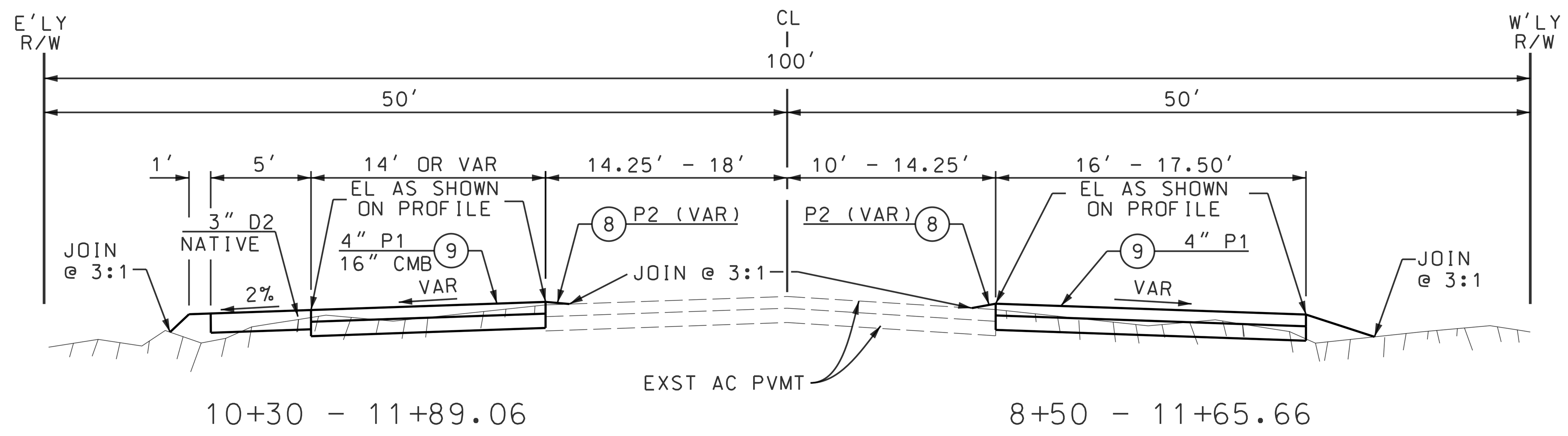

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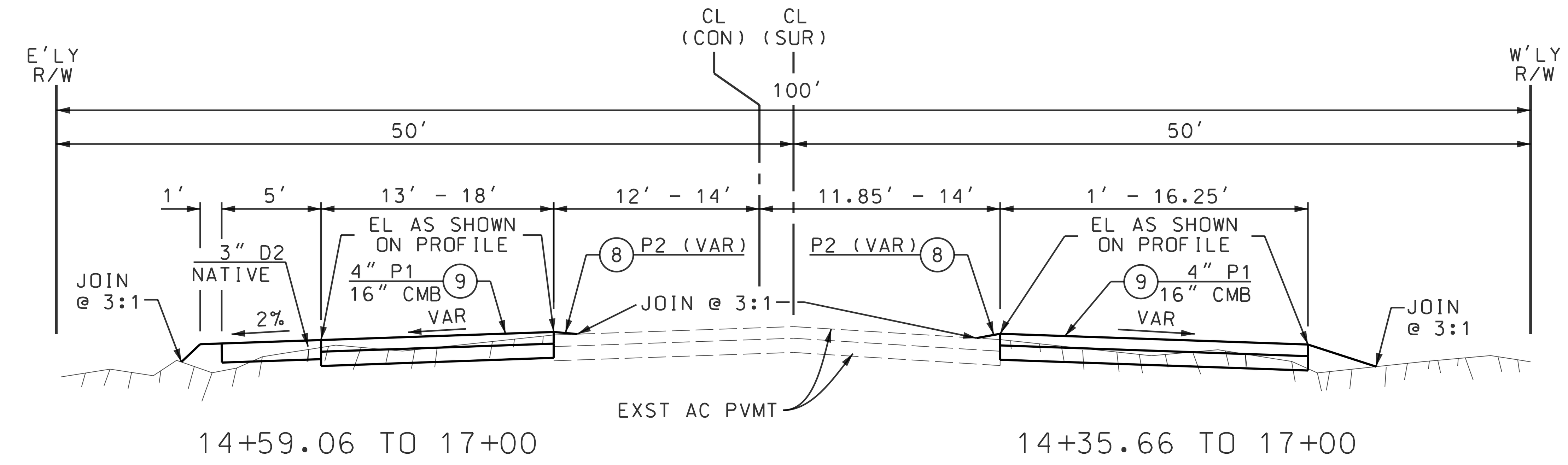
PHASE I
NO SCALE



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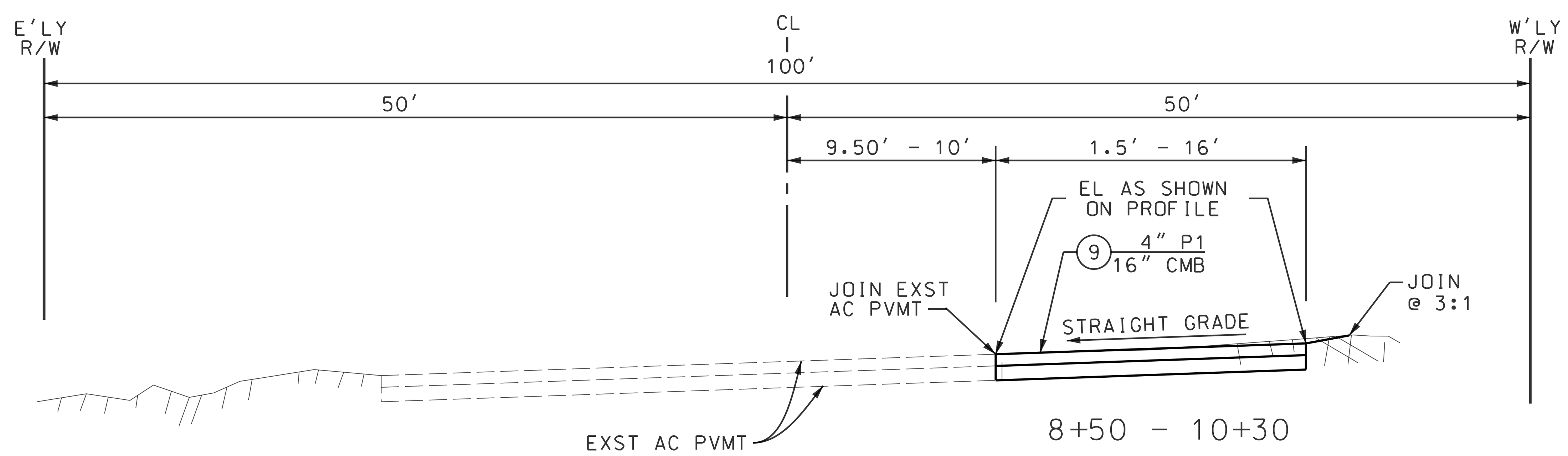

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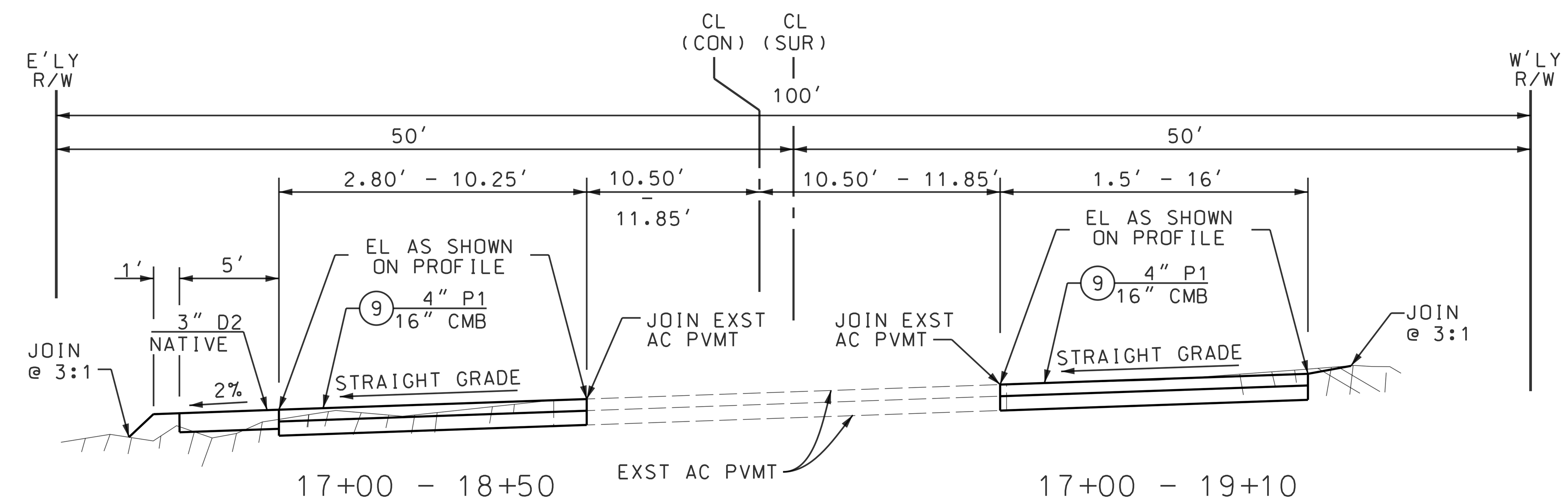

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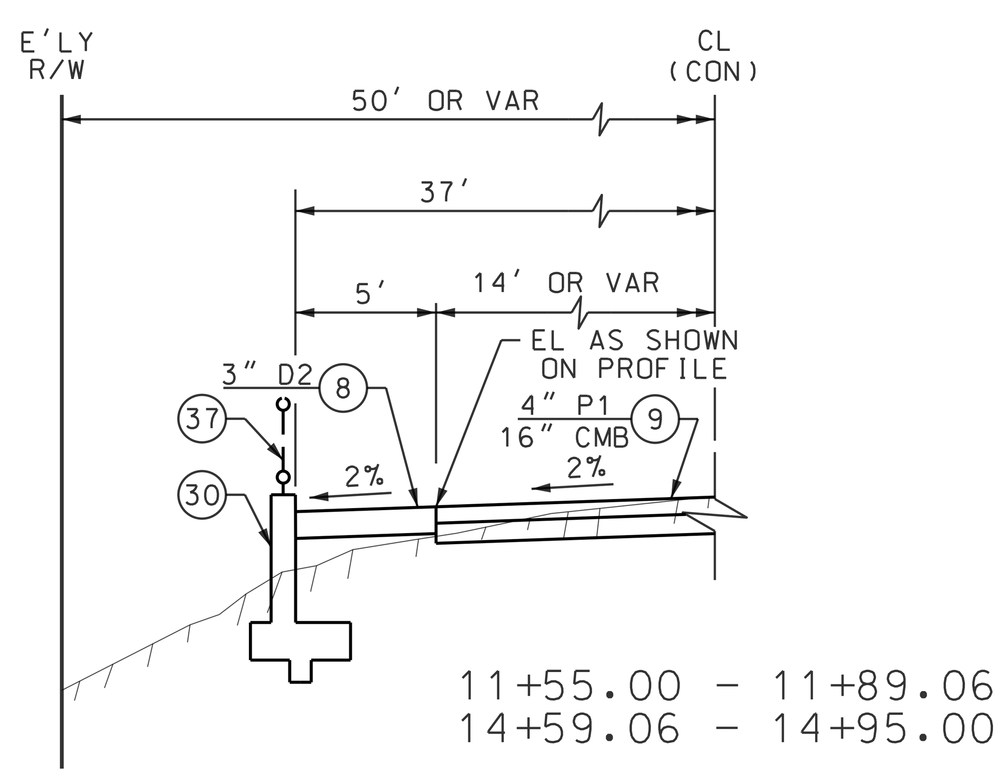

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DATE	MARK	DESCRIPTION
REVISIONS		

REGISTERED PROFESSIONAL ENGINEER SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER
MALIBU CREEK (53C0620)

PROJECT ID NO. RDC0014835

TYPICAL SECTIONS AND DETAILS

DWG XX-X-XXX.X SHEET 2 OF 7

DRAFTER A TORRES
DESIGNER S KIM
CHECKER R SIAGIAN
CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

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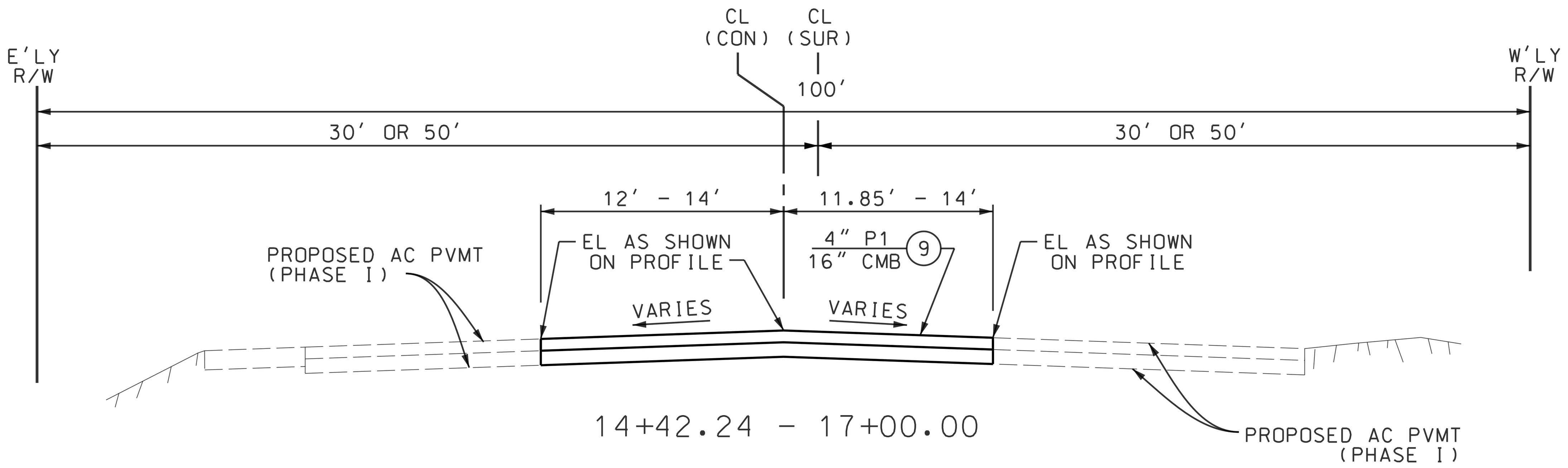

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PHASE II
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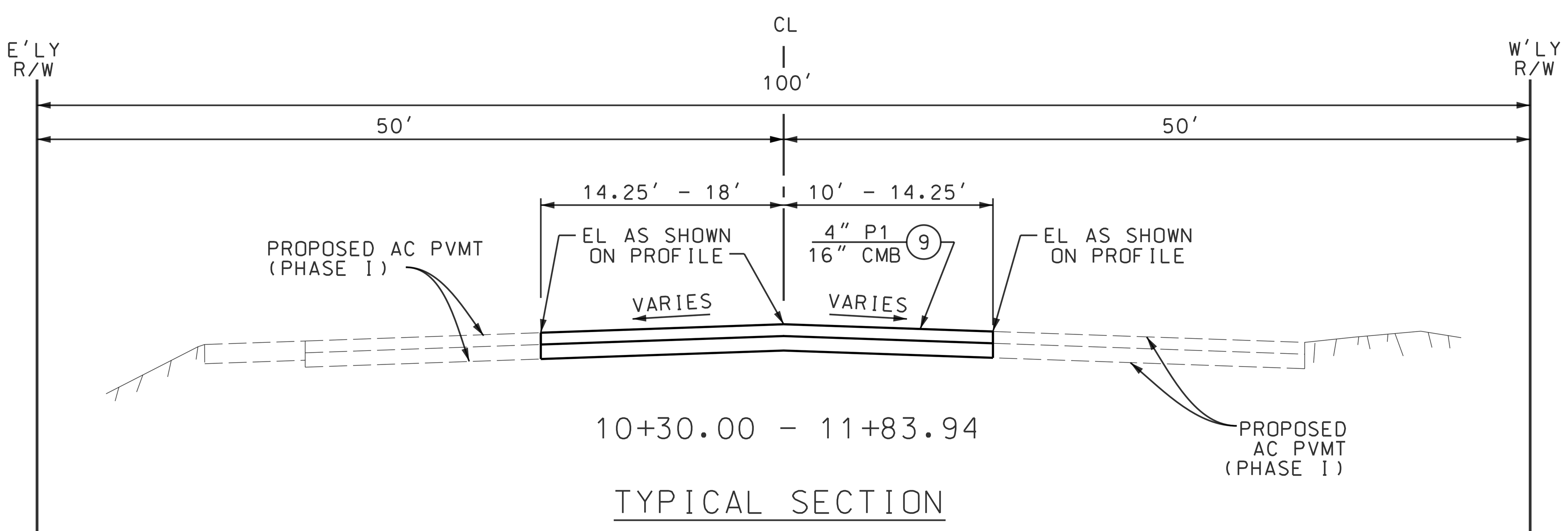

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DRAFTER A TORRES
DESIGNER S KIM
CHECKER R SIAGIAN
CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

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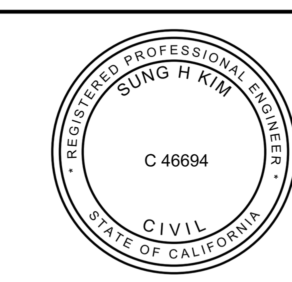
REVISIONS		



PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER MALIBU CREEK (53C0620)

PROJECT ID NO. RDC0014835

TYPICAL SECTIONS AND DETAILS

DWG XX-X-XXX.X SHEET 3 OF 7

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DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

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SCALE: HOR. 1"= 20' VER. 1"= 2'

POINT No. 103, (11+41.03)

PWFB 1407, PAGE 563
SET MAG NAIL & DPW
WASHER 18FT E/O CL
MALIBU CYN RD 100 FT
S/O CL PIUMA RD
ELEV= 473.13
NAVD'88 (MALIBU 2003)

CURVE DATA

CURVE	RADIUS (FT)	CENTRAL ANGLE DEG	MIN	SEC	LENGTH (FT)	TANGENT (FT)
(A)	35.00	96	47	59	59.13	39.42

PLAN
SCALE: 1" = 20'
12.50 0 25 50

DRAFTER A TORRES
DESIGNER S KIM
CHECKER R SIAGIAN
CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

DATE	MARK	DESCRIPTION

REVISIONS

SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA REGISTERED PROFESSIONAL ENGINEER

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER MALIBU CREEK (53C0620)

PHASE I

PROJECT ID NO. RDC0014835

PLAN AND PROFILE

DWG XX-X-XXX.X

SHEET 4 OF 7

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: $DATE$

PLAN TC

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

CURVE DATA

CURVE	RADIUS (FT)	CENTRAL ANGLE DEG	MIN	SEC	LENGTH (FT)	TANGENT (FT)
B	1,200	09	27	07	197.96	99.21
C	2,800	09	27	10	461.95	231.50
D	15.00	92	40	57	24.26	15.72
E	25.00	69	31	30	30.34	17.35

DATE	MARK	DESCRIPTION
		REVISIONS

REGISTERED PROFESSIONAL ENGINEER SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER MALIBU CREEK (53C0620)

PHASE I

PROJECT ID NO. RDC0014835

PLAN AND PROFILE

DWG XX-X-XXX.X

SHEET 5 OF 7

CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

CHECKER R SIAGIAN

DESIGNER S KIM

DRAFTER A TORRES

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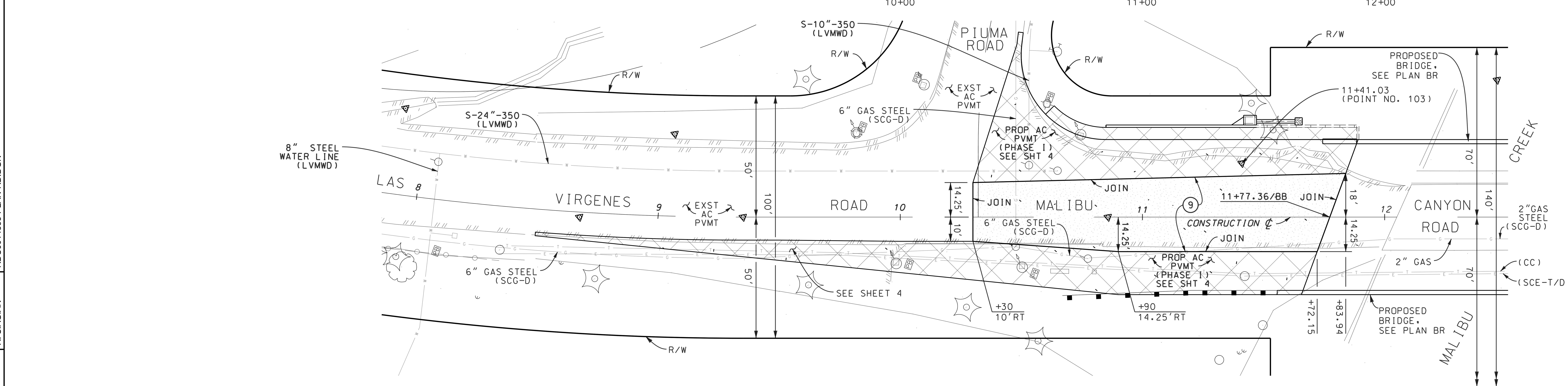

POINT No. 103, (11+41.03)

PWFB 1407, PAGE 563
SET MAG NAIL & DPW
WASHER 18FT E/O CL
MALIBU CYN RD 100 FT
S/O CL PIUMA RD
ELEV= 473.13
NAVD'88 (MALIBU 2003)

DATE	MARK	DESCRIPTION

REVISIONS

REGISTERED PROFESSIONAL ENGINEER SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER MALIBU CREEK (53C0620)

PHASE II

PROJECT ID NO. RDC0014835

PLAN AND PROFILE

DWG XX-X-XXX.X

SHEET 6 OF 7

DRAFTER A. TORRES | DESIGNER S. KIM | CHECKER R. SIAGIAN | CADD PROJECT FILE NAME RDC0014835-PLAN-RD.DGN

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PLAN RD

DATE: $DATE$ TIME: $TIME$ FILE: $FILE$

SCALE: HOR. 1"= 20' VERT. 1"= 2'

POINT No. 101, (17+24.23)

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WASHER 18FT W/O CL
MALIBU CYN RD 250 FT
S/O CL MALIBU CRK
ELEV= 483.45
NAVD'88 (MALIBU 2003)

CURVE DATA

CURVE	RADIUS (FT)	CENTRAL ANGLE DEG	MIN	SEC	LENGTH (FT)	TANGENT (FT)
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C	2,800	09	27	10	461.95	231.50

DATE	MARK	DESCRIPTION
		REVISIONS

DRAFTER A. TORRES
DESIGNER S. KIM
CHECKER R. SIAGIAN
CADD PROJECT FILE NAME

REGISTERED PROFESSIONAL ENGINEER SUNG H KIM C 46694 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

LOS ANGELES COUNTY PUBLIC WORKS

MALIBU CANYON ROAD OVER MALIBU CREEK (53C0620)

PHASE II
PROJECT ID NO. RDC0014835
PLAN AND PROFILE

DWG XX-X-XXX.X SHEET 7 OF 7

60% PRELIMINARY PLANS UNOFFICIAL AND SUBJECT TO CHANGE DATE: $DATE$

PLAN RD

DATE: $DATE$ TIME: $TIME$ FILE: $FILEL$

Appendix E

Historical Annual Peak Flows at F130-R Gage

RUNOFF – STREAM GAGING STATION PEAK FLOW

MALIBU CREEK below Cold Creek.
STATION NO. F130-R

Season	Daily CFS			Total Runoff (Acre-feet)	Peak Flow	
	Maximum	Minimum	Mean		Date	CFS
1930-31	*	*	*	1,920*	Feb 04	723
1931-32	1,770	+	20.2	14,670	Feb 09	3,100
1932-33	1,100	0.1	12.7	9,190	Jan 19	4,460
1933-34	3,160	0.1	17.1	12,370	Jan 01	9,650
1934-35	511	+	8.6	6,220		N.D.
1935-36	92	0	3.2	2,310	Feb 23	147
1936-37	1,680	0	33.1	23,940	Feb 14	2,760
1937-38	5,090E	0.2	47.1	34,100	Mar 02	10,000E
1938-39	139	0	6.4	4,630	Dec 20	331
1939-40	335	+	8.4	6,100	Feb 02	690
1940-41	2,200	0.1	101	73,220	Feb 20	3,620
1941-42	32	0.1	2.5	1,820	Dec 28	140
1942-43	5,370	0.1	65.8	47,600	Jan 22	12,200
1943-44	3,400	0.7	41.6	30,170	Feb 22	7,700
1944-45	210	0.2	5.8	4,240	Feb 02	516
1945-46	267	0.1	5.2	3,800	Mar 30	506
1946-47	142	0.1	5.3	3,820	Nov 13	980
1947-48	15	+	0.2	177	Mar 24	113
1948-49	1	+	0.1	90	May 18	1
1949-50	64	0	0.7	477	Feb 06	674
1950-51	0	0	0.1	56	Jan 11	3
1951-52	6,720	0	80.2	58,200	Mar 15	13,600
1952-53	81	+	4	2,940	Nov 15	322
1953-54	655	0.1	6.9	4,990	Feb 13	2,250
1954-55	16	0.1	1	758	Jan 18	45
1955-56	1,260	0.1	6.5	4,680	Jan 26	3,600
1956-57	12	+	0.6	444	Feb 23	46
1957-58	1,630	+	43.7	31,660	Apr 03	4,260
1958-59	114	0.1	2.1	1,510	Jan 06	3,180
1959-60	17	+	0.7	504	Apr 27	84
1960-61	2	+	0.1	99	Jan 26	8
1961-62	3,920	+	36.3	26,150	Feb 10	7,060
1962-63	24	+	1	701	Mar 16	104

M Data missing
* Record incomplete
E Estimate
N.D. Not determined
** Record not computed
+ Less than 0.05 acre feet or less than 0.05 cfs, but greater than 0

RUNOFF – STREAM GAGING STATION PEAK FLOW

MALIBU CREEK below Cold Creek.
STATION NO. F130-R

Season	Daily CFS			Total Runoff	Peak Flow	
	Maximum	Minimum	Mean	(Acre-feet)	Date	CFS
1963-64	17	+	0.5	384	Jan 22	65
1964-65	148	+	2.2	1,560	Apr 09	521
1965-66	7,060	0.2	51.8	37,520	Dec 29	20,600
1966-67	2,710	0.9	35.5	25,700	Jan 24	10,200
1967-68	1,350	1	18.5	13,430	Mar 08	3,830
1968-69	24,200	1.4	166	119,900	Jan 25	33,800
1969-70	368	0.5	9.9	7,200	Mar 04	1,150
1970-71	1,480	1.2	23.7	17,300	Dec 19	7,390
1971-72	582	0.9	6	4,340	Dec 27	2,120
1972-73	3,340	0.8	35.1	25,400	Feb 11	7,480
1973-74	2,240	2.7	22	15,910	Jan 07	5,100
1974-75	519	2.3	15.2	11,020	Dec 04	2,670
1975-76	163	1.1	5.4	3,910	Feb 09	339
1976-77	315	1.1	6.9	4,980	Jan 07	597
1977-78	7,620	1.7	112.4	80,990	Mar 04	19,400
1978-79	1,220	2.3	46.4	33,408	Mar 27	4,420
1979-80	*	*	*	*	Feb 16	*
1980-81	357	1.7	13.5	9,832	Mar 05	910
1981-82	400	2.2	13.9	10,031	Mar 17	676
1982-83	7,720	2.7	121.8	88,148	Mar 01	24,200
1983-84	758	2.5	24.1	17,411	Dec 25	1,840
1984-85	588	0.9	16.6	12,002	Dec 19	880
1985-86	1,480	1.4	39.3	27,881	Feb 15	5,880
1986-87	216	0.5	8.6	6,236	Nov 18	653
1987-88	559	0.6	24	17,337	Feb 28	1,680
1988-89	257	1.6	12.3	8,876	Feb 09	441
1989-90	*	*	*	*		*
1990-91	982	0.8	20.5	14,872	Mar 19	3,150
1991-92	5,850	2	92.7	67,330	Feb 10	23,300
1992-93	*	*	*	*		*
1993-94	880	0.9	16.7	11,090	Feb 20	2,450
1994-95	4,530	3.1	97.8	68,700	Mar 11	15,700
1995-96	637	1.5	12.9	9,395	Feb 21	1,220

M Data missing
* Record incomplete
E Estimate
N.D. Not determined
** Record not computed
+ Less than 0.05 acre feet or less than 0.05 cfs, but greater than 0

RUNOFF – STREAM GAGING STATION PEAK FLOW

MALIBU CREEK below Cold Creek.
STATION NO. F130-R

Season	Daily CFS			Total Runoff (Acre-feet)	Peak Flow	
	Maximum	Minimum	Mean		Date	CFS
1996-97	807	3.2	43.1	31,180	Dec 09	1,800
1997-98	4,020	2.4	113	81,700	Feb 07	19,100
1998-99	134	2.8	10.3	7,430	Apr 11	761
1999-00	701	1.4	22.6	16,440	Feb 23	2,380
2000-01	3,950	0.6	53.8	38,920	Mar 06	10,900
2001-02	93	0.9	10.6	7,670	Nov 24	413
2002-03	1,979	1.9	25.9	18,761	Feb 12	5,410
2003-04	1,470	1.2	13	9,442	Feb 26	5,130
2004-05	7,330	1.3		103,000	Jan 09	12,700
2005-06	845	3.1	31.9	23,120	Jan 02	2,586
2006-07	80	0.7	10.1	7,309	Feb 22	189
2007-08	1,940	0.9	32.4	23,510	Jan 27	3,851
2008-09	521	0.8	13.4	9,710	Feb 16	1,350
2009-10	816	1.97	27	19,530	Jan 20	2,970
2010-11	2,010	1.94	40.8	29,530	Mar 20	6,490
2011-12	320	0.86	11.9	8,660	Apr 13	1,030
2012-13	148	0.95	8.14	5,890	Jan 24	296
2013-14	646	0.9	7.07	5,120	Feb 28	1,550
2014-15	554	1.26	9.36	6,780	Dec 12	2,130
2015-16	174	0.68	6.51	4,720	Jan 05	496
2016-17	3,180	1.41	45.7	33,090	Feb 17	16,900
2017-18	219	1.16	7.14	5,170	Mar 21	775
2018-19	1,590	1.75	53.1	38,420	Feb 02	7,940
2019-20	680	2.29	23.5	17,040	Dec 26	2,300
2020-21	186	2.6	9.29	6,730	Dec 28	526

M Data missing
* Record incomplete
E Estimate
N.D. Not determined
** Record not computed
+ Less than 0.05 acre feet or less than 0.05 cfs, but greater than 0

Appendix F

Rivertech 1990 Flood Study

DUPLICA

FLOODPLAIN EVALUATION STUDY FOR MALIBU CREEK NEAR THE TAPIA WATER RECLAMATION FACILITY

Prepared For:

Katsura Consulting Engineers
2284 S. Victoria Avenue, Suite 2A
Ventura, CA 93003

Prepared By:

Rivertech Inc.
23332 Mill Creek Drive, Suite 100
Laguna Hills, CA 92653
(714) 586-6121

RIVERTECH INC

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1.0 INTRODUCTION

The Tapia Water Reclamation Facility is located in Los Angeles County on the south bank of Malibu Creek, just upstream of the Malibu Canyon Road Bridge (see Figure 1.1). Across from the plant is a park which becomes partially flooded during high flows. Along the low flow channel of Malibu Creek is an intermittent corridor of willow vegetation.

A floodplain delineation study was performed by the Los Angeles County Flood Control District in 1965. This study indicated that the Tapia Water Reclamation Facility was outside of the floodplain boundary except for some storage buildings on the northwest corner of the plant (see Figure 1.2). Subsequent to this study, a floodwall was constructed on this part of the site so that the entire facility would be outside of the floodplain.

In December, 1989, Rivertech, Inc. was contacted in order to perform additional floodplain evaluation studies for Malibu Creek near the Tapia Water Reclamation Facility. The objective of this study is to provide an updated analysis of the floodplain elevation which addresses the following factors:

1. The effect of upstream development in the Malibu Creek Watershed on the design hydrology.

2. The effect of willow vegetation along the low flow channel on the floodplain elevation.

3. The effect of debris blockage at the Malibu Canyon Road bridge on the floodplain elevation.

By addressing each one of these factors, an updated floodplain boundary will be determined. This will then be compared to the existing bank elevations along the Tapia Water Reclamation Facility to determine if additional flood protection measures are required.

The structure of this report is first an outline of background information on Malibu Creek and the surrounding watershed. Second is a discussion of the design hydrology. Third is an evaluation of channel vegetation impacts. Fourth is the computation of floodplain elevations. This is followed by a list of study conclusions.

Figure 1.1 Location Map

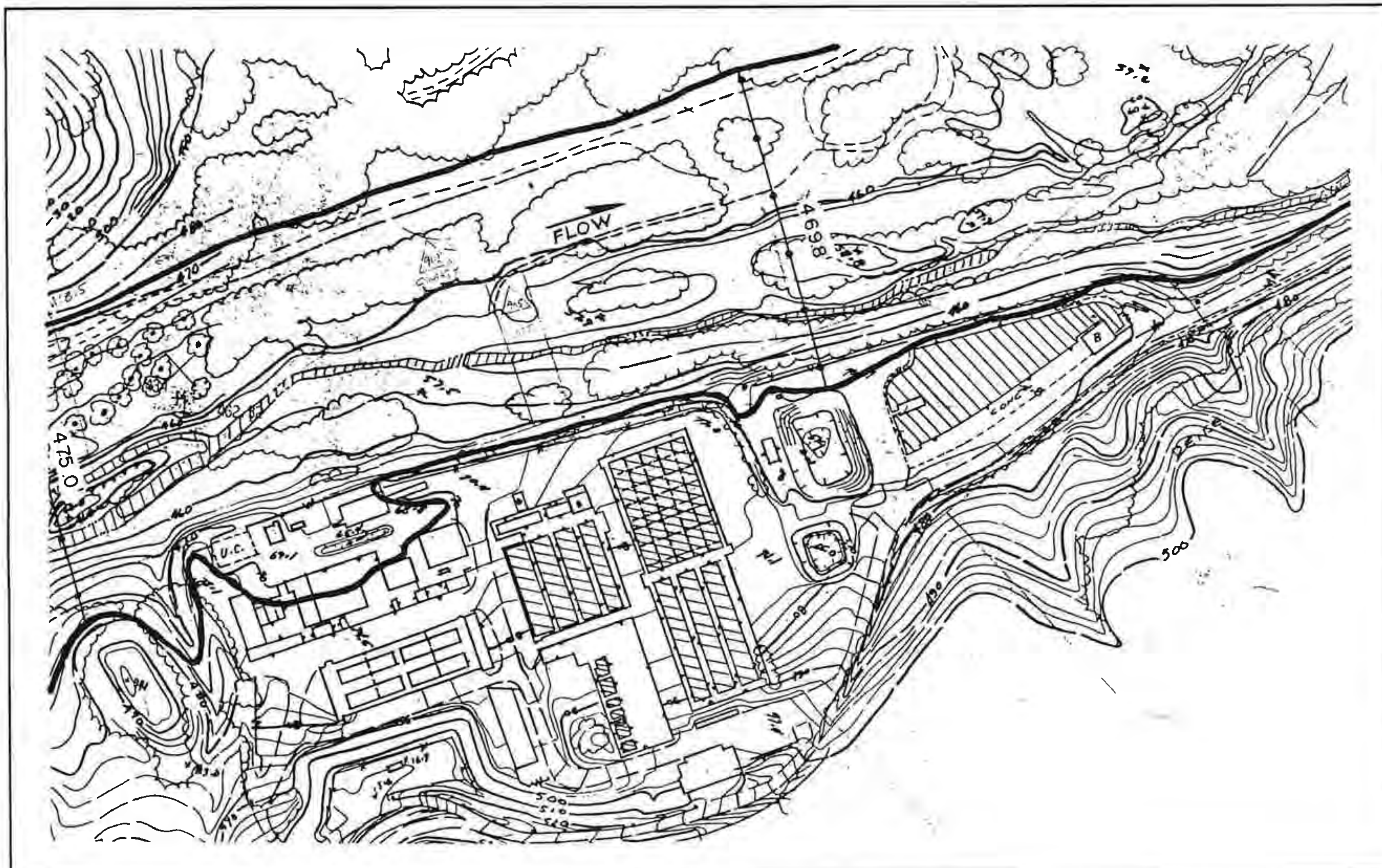


Figure 1.2 Floodplain Boundary from Los Angeles County Flood Control District.

2.0 MALIBU CREEK BACKGROUND INFORMATION

The Malibu Creek watershed covers approximately 120 square miles in Los Angeles and Ventura Counties (see Plate 1). Most of the drainage area is comprised of steep undeveloped terrain. The State Highway 101 corridor in the north part of the basin is the focus of the vast majority of the development that will occur in the watershed. The southern part of the basin is much steeper and precludes high density development. Most of this area will be left in its natural state or will have large residential lots which do not increase runoff to any significant degree.

The Tapia Water Reclamation Facility is located on the south bank of Malibu Creek just upstream of the Malibu Canyon Road bridge. The facility is approximately 5 miles upstream of the coast. Approximately 3 miles upstream of the coast is a dam and a reservoir which are completely filled with sediment deposits. The spillway crest elevation of this dam is 289 feet. All hydraulic analysis done in this study starts the dam because it acts as a hydraulic control.

Figure 2.1 shows a profile plot of the Malibu Creek streambed. The abandoned dam is the reference point for the stations on the profile plot. There are two reservoirs (Century and Malibu) upstream of the Tapia facility. Also, at approximately Station 75+00, there is a noticeable change in the slope of the riverbed. Downstream from this point, the average slope is 3.1%. Upstream from this point, the average slope is 0.5%.

Figure 2.2 shows an enlarged profile plot of the streambed in the vicinity of the Tapia facility. In general, flow depths can reach 16 to 18 feet before overtopping the south bank. The Malibu Canyon Road bridge is at Station 98+40. The bridge has three spans and two concrete piers in the channel.

Across the channel from the water reclamation facility is Tapia Park. A portion of this park is flooded during large events. The flood overbank area of the park consists of sparse perennial grasses and scattered sycamore trees. The willow vegetation in the Malibu Creek Channel does not spread to the overbank area because of park maintenance and seasonal use by park-goers.

The local watershed near the Tapia Water Reclamation Facility is effectively undeveloped. The terrain is very steep and covered with sagebrush and native grasses. Historical floods in the area occasionally remove the channel vegetation. This happened at least two times recently. Once in 1969 and again in 1983. The watershed area for Malibu Creek at the Malibu Canyon Road bridge is approximately 95 square miles. Plate 1 shows a map of the watershed boundary. the watershed is primarily in Los Angeles County with the northwest corner extending into Ventura County. The majority of land area which drains into Malibu Creek is in the Santa Monica Mountains National Recreation Area. The Highway 101 corridor is the focus of urbanization within the watershed. There are also several small reservoirs along Malibu Creek around which residential development will congregate.

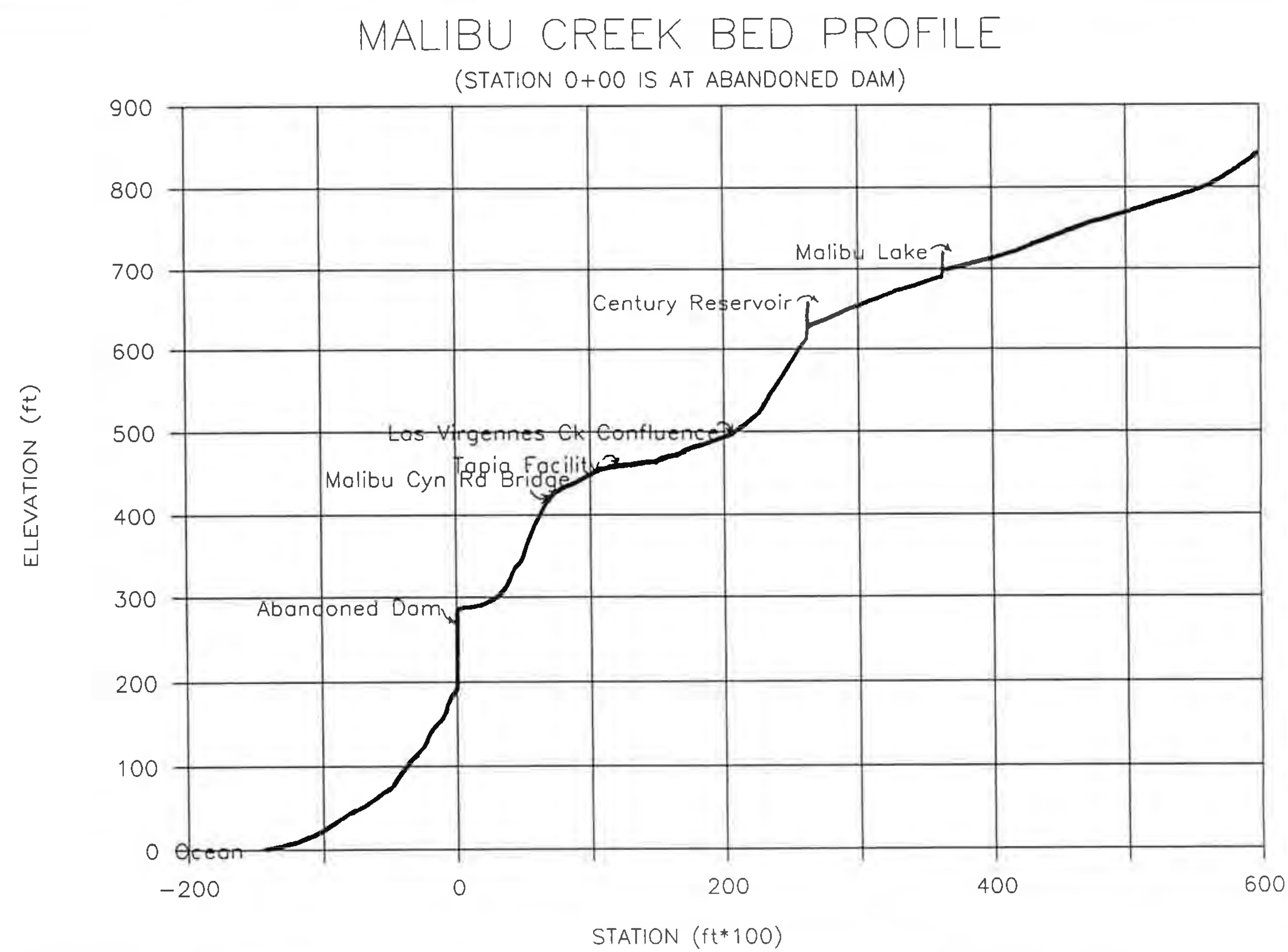


Figure 2.1 Malibu Creek Streambed Profile.

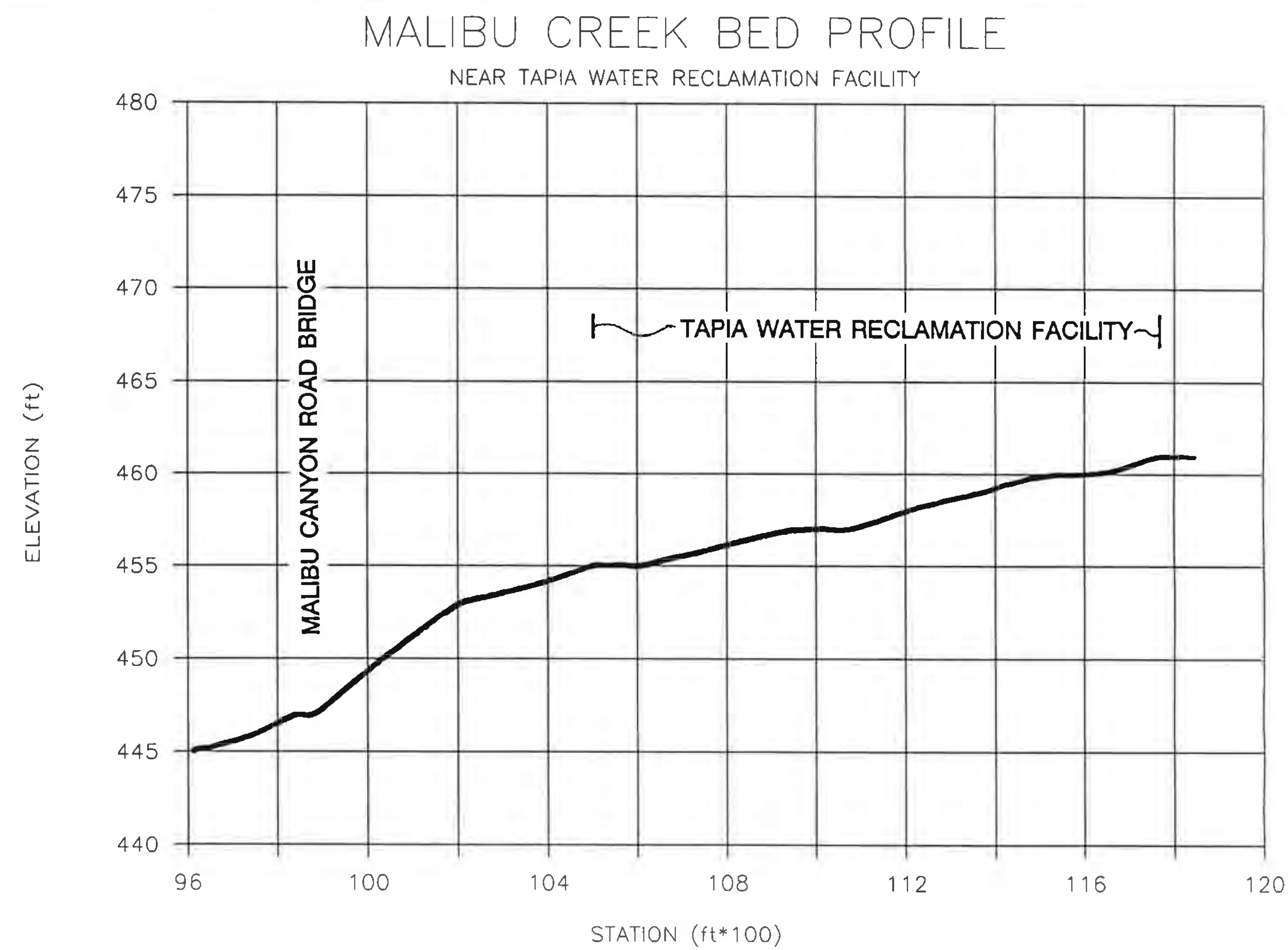


Figure 2.2 Malibu Creek Bed Profile near Tapia Water Reclamation Facility.

3.0 HYDROLOGY

As part of this study, the design hydrology was investigated. Typically, flood plain boundaries are determined using the 100-year discharge or the discharge which has a one percent probability of occurring in any particular year. This discharge is usually determined by a regression analysis of measured peak historical discharges. In Los Angeles County, the adopted design discharge is the computed runoff for the Capitol Storm Event. This storm event has an approximate 50-year recurrence interval or a two percent chance of occurring in any particular year. The peak runoff rate from this storm is know as the capitol flood. In general, the computed capitol flood discharge is much higher than the 100-year discharge determined by the regression analysis of gaged stream flow data. Before the capitol flood discharge is used for design purposes, an adjustment is made to account for increased runoff caused by a burned watershed and for flow bulking caused by entrainment of sediment.

Both the U.S. Army Corps of Engineers and the Federal Emergency Management Agency (FEMA) use the 100-year discharge for flood plain analysis. In order to arrive at a conservative determination of the floodplain boundary for Malibu Creek, and to be in conformance with Los Angeles County regulations, the burned and bulked condition capitol flood discharge will be used for this study.

3.1 Existing Studies

The Los Angeles County Flood Control District performed a floodplain study for Malibu Creek in 1965. Floodplain Map Nos. 104-ML-8 and 104-ML-9 were obtained from the county. The maps indicate that the design discharge for Malibu Creek near the Tapia Water Reclamation Facility is 41,800 cfs. this discharge was verified through a telephone conversation with Mr. Paul Cornish of the Hydrology Section, Los Angeles County Department of Public Works. The discharge includes the effects of future development in the watershed as well as the effects of burning and sediment bulking

3.2 Verification of Design Discharge

Because the hydrologic calculations referenced above are not available for public review, a simple verification study was performed using the current Los Angles County and Ventura County Land Use Plans to determine the ultimate amount of development in the watershed. Three conditions were examined: 1) The 1990 existing amount= of development, 2) The ultimate amount of development, and 3) The ultimate amount of development with burning and sediment bulking adjustments.

3.2.1 Procedures for 1990 Condition

The location of the concentration point is on Malibu Creek just above the confluence of Cold Creek. The drainage area at this point on the stream is 95.0 square miles. Malibu Creek watershed is a valley surrounded by coastal mountains. Elevations range from 460 ft. at the outlet of the basin to 2,500 ft. in the mountains.

The HEC-1 flood hydrograph package is used to develop hydrographs for the Malibu Creek Watershed. The 24-hour capitol precipitation event is calculated by using the rainfall plates in the Los Angeles county Hydrology Manual. The storm total depth was computed to be 10.0 inches. The storm pattern was taken directly from the rainfall mass curves presented in the Los Angeles County Hydrology Manual.

Loss rates for existing conditions are estimated by using the infiltration tables in the hydrology manual, which are based on different soil types and rainfall intensities. An average loss rate of 0.35 inches/hr was selected for the basin based on existing soils and land cover. Percent imperviousness under 1990 conditions in the basin was estimated at 6 percent.

The SCS unit hydrograph was utilized to transform rainfall excess into runoff. The SCS unit graph procedure requires an estimation of the watershed Lag. Lag is defined as being 60 percent of the time of concentration. (t_c):

$$Lag = 0.6\ t_c$$

The time of concentration (t_c) of the basin is estimated by evaluating the hydraulically most remote flow path in the watershed. This flow path includes overland flow, shallow channel flow, and main channel flow. The time of concentration is estimated to be 6.7 hours. Therefore, watershed Lag = 4.0 hours. Baseflow flow is assumed to be around 65 cfs at the beginning of the event. The magnitude of the baseflow will have little effect on the peak flow results for this event.

3.2.2 Procedures for Ultimate Development Condition

Future land use is estimated from the Malibu/Santa Monica development policy map and the Ventura County general Plan, south half. A new percent impervious is estimated to be approximately 20 percent of the basin. The watershed Lag is reduced to account for the increase in impervious area. The new Lag was computed as Lag = 3.6 hours. A rainfall loss rate of 0.35 in/hr is used.

The third analysis is to evaluate future land use conditions with additional assumptions that the watershed had recently experienced forest fires and sediment bulking occurs. This assumption results in decreased loss rates. A loss rate of 0.25 inches/hr is used for this analysis.

3.2.3 Results of Hydrologic Verification

Existing and future condition models were developed with the HEC-1 flood hydrograph package. the results of the three scenarios are shown in table 3.1

Table 3.1 Peak Flow Results

1990 Conditions	Future Land Use	Future Land use Burned Watershed Sediment Bulking
32,081 cfs	36,859 cfs	41,704 cfs

A plot of the three hydrographs is shown in Figure 3.1. The HEC-1 input and output data sets are included as an appendix to this report.

3.3 February, 1980 Flood

The period of record flood occurred on Malibu Creek in mid-February, 1980. Measured streamflow at Los Angeles County Station F130-R indicated a peak instantaneous discharge of 34,000 cfs upstream in Malibu Creek adjacent to the Tapia facility and 42,000 cfs downstream from the Cold Creek confluence. The Cold Creek drainage area is approximately 10 square miles compared to 95 square for Malibu Creek but for the 1980 flood, it contributed approximately 20% of the total discharge.

3.4 Conclusion

The future land use/burned condition discharge of 41,704 cfs is in very close agreement with the 41,800 cfs computed by Los Angeles County. This study will use 41,800 cfs as the design discharge for flood plain determination. In order to incorporate measured gage data from the 1980 flood, the discharge will be increased to 52,250 cfs at the Cold Canyon confluence. This allows for an inflow from Cold Creek that is 20% of the total discharge. The total discharge includes the effects of all existing and future urbanization in the watershed as well as the effects of forest fires and sediment bulking.

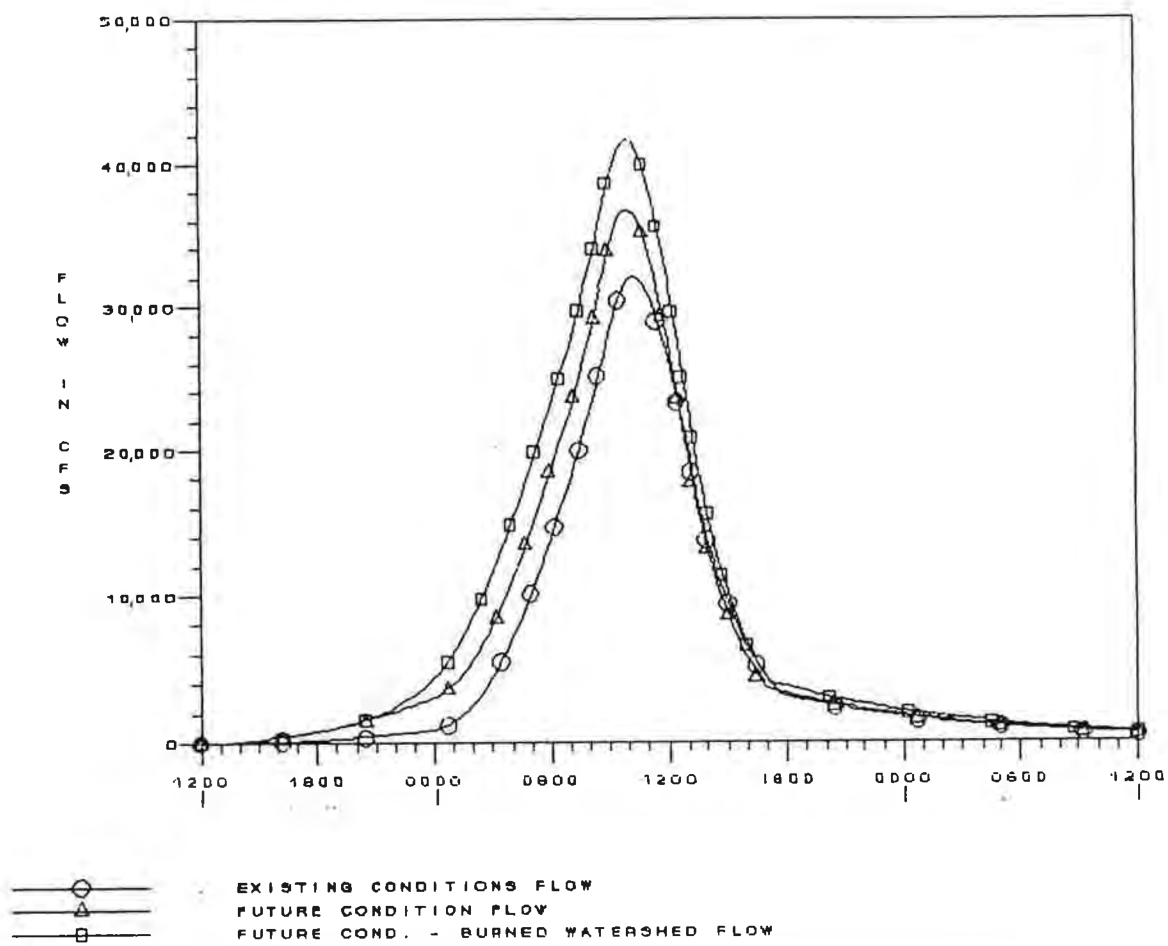


Figure 3.1 Results of Hydrologic Verification Study.

4.0 DETERMINATION OF CHANNEL ROUGHNESS

Channel roughness and related factors cause energy loss in flowing water which results in an increase in flow depth. The degree to which energy loss occurs in a channel is usually expressed as a Manning's *n* value. This ranges from 0.015 for a concrete channel to 0.1 or higher for a channel with dense vegetation throughout. Typically Manning's *n* values are determined by qualitative judgement based on field observations. For this study, a method developed by the Federal Highway Administration is used which provides a more direct and systematic technique for determining Manning's *n* values.

4.1 Description of Manning's *n* Value Determination

The technique outlined here was first described in a Federal Highway Administration report entitled Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains, prepared in 1984. The procedure is as follows:

1. Select a channel reach for study.

2. Divide the reach longitudinally into a main channel, a left, and a right flood plain overbank.

3. Select a base value n_b for a straight uniform, smooth channel in native materials.

4. Add a value n_1 to adjust for the effect of bed surface irregularities.

5. Add a value n_2 to adjust for variations in shape and size of the channel cross section.

6. Add a value n_3 to adjust for flow obstructions.

7. Add a value n_4 to adjust for vegetation other than that vegetation treated as a flow obstruction (For example, if n_3 is used to account for flow obstructions caused by trees in the channel, then n_4 needs only to account for bed contact vegetation).

8. Add a value n_5 to account for channel meandering.

9. Characterize the left and right floodplain overbank by repeating steps 3 through 8 or by using the vegetation density technique.

4.2 Description of Existing Channel Roughness Characteristics

The study reach for the detailed Manning's *n* determination is from the Malibu Canyon Road Bridge on the downstream end to a point approximately 200 feet upstream of the

Tapia Water Reclamation Facility. Downstream from the bridge, the channel becomes very steep and experiences supercritical flow (See Figure 2.1). Since critical depth is the minimum depth used in natural channel floodplain boundary analysis, the Manning's n values downstream of the bridge do not need to be determined to a high degree of accuracy.

Figure 4.1 shows a photograph of the study area with the water reclamation facility in the foreground. The Malibu Canyon Road Bridge is on the extreme right of the photo. The willow trees just beyond the plant are in the center of the channel. The larger trees beyond the willows are in Tapia Park which is in the Malibu Creek flood plain.

Figure 4.2 shows a close-up view of the bridge looking downstream. Currently, there is only minor vegetation growing under the bridge. A row of willow trees is growing on both sides of the low-flow channel all the way up to the bridge.

Figure 4.3 shows a typical view of the north flood plain overbank in Tapia Park. There is a clear delineation between the willow growth and the park. Figure 4.4 and 4.5 show a typical view of the main channel. Although there is dense willow growth along each edge of the low flow channel, flow is unobstructed in the center of the channel. Figure 4.6 shows an example of willow growth creating a debris blockage. This particular blockage is about 3 feet high. Such obstructions to flow are the main factor in determining the effect of vegetation on channel roughness. Figure 4.7 shows the typical soil type for both the main channel and the northern flood plain overbank. The soil is fairly compacted with a small amount of contact vegetation. Closer to the low flow channel, the soil has a higher content of gravel and rock. the southern bank along the reclamation facility has and approximate 2:1 slope and is covered with riprap.

4.3 Determination of Manning's *n* Values

For the main channel, 3 transect surveys were performed in order to determine the percentage of flow obstruction caused by the willow vegetation. The location of these transects are shown on Plate 2, the floodplain boundary maps. The percentage of maximum obstructed flow is listed below:

Transect No. 1 = 26%
Transect No. 2 = 33%
Transect No. 3 = 35%
Average Flow Obstruction = 32%

According to the technique referenced above, the adjustment to account for a flow obstruction of 32% is approximately n_3 = 0.025. The base n_b value for the main channel is 0.026. The channel is fairly smooth with few irregularities thus n_1 = 0.003. There is

Figure 4.1 Photograph of Study Area

Figure 4.2 Malibu Canyon Road Bridge Looking Downstream

Figure 4.3 North Overbank Floodplain

Figure 4.4   Typical Main Channel Vegetation

Figure 4.5   Typical Main Channel Vegetation

Figure 4.6 Debris Blockage Caused by Willow Growth

Figure 4.7 Typical Overbank Soil

virtually no change in the section width, therefore n_2 = 0.0. Other than willows, the main channel has a moderate amount of contact vegetation therefore n_4 = 0.010. There is no meandering for this river so n_5 = 0.0. The total value for the existing Manning's *n* 0.064. Willow growth will continue to occur in the main channel. It is estimated that the value of Manning's could increase by 50% within 5 to 10 years if no large floods occur to thin out the vegetation. Thus, for future conditions, a Manning's *n* value of 0.10 is used for the main channel.

The south bank, along the Tapia Water Reclamation Facility is covered with riprap and has little vegetation. For existing conditions, Manning's *n* = 0.035. For future conditions, if vegetation begins to grow on the riprap, this value is increased by 20% to 0.042. For the north overbank/floodplain region in Tapia Park, a vegetation density method was used to account for the presence of trees. The trees were counted and their average diameter was measured. Without the trees, the base value of Manning's *n* = 0.033. The vegetation density method relates the percentage of floodplain area obstructed by trees to the change in roughness. This value varies from 0.008 to 0.011. Thus the total Manning's *n* for the north floodplain overbank varied from 0.041 to 0.044. Because the park has a maintenance program and receives heavy public use, the value of Manning's *n* for this area is not expected to increase in the future.

The selection of *n* values is summarized below:

	Existing	Future
Main Channel	0.064	0.100
South Bank	0.035	0.042
North Bank (Tapia Park)	0.041 to 0.044	0.041 to 0.044

4.4 Debris Effects at the Bridge

The County of Los Angeles requires the addition of 2 feet to the pier width of a bridge in order to account for debris accumulation in the hydraulic analysis. For high flows, the cumulative effect of debris can be accounted for by increasing the pier width. This decreases the available flow area and increases the head loss resulting in higher water surface elevations upstream. For this study, to simulate a reasonable maximum amount of debris accumulation, 4 feet is added to the width of each bridge pier for the existing conditions. For future conditions, 6 feet is added to the width of each pier to account for a potential increase in the amount of debris.

During the course of this study, the issue arose of whether or not the bridge opening can be completely blocked by debris. If this occurred, then all the water would flow over the top of the bridge roadway in a weir-like fashion and no water would go through the opening. An examination of the upstream sources of debris, the design of the bridge opening, and the flow hydraulics indicate that a complete blockage of the bridge opening at Malibu Canyon Road is extremely unlikely. First, the primary type of debris is vegetation. Even very dense vegetative debris is still permeable and will allow a substantial amount of water to flow through it. Thus it is unlikely that such debris will completely seal off the bridge opening. Large boulders could also create a blockage but the stream cannot transport boulders of sufficient size due to the flatness of the upstream channel slope. Second, the bridge consists of two fifty foot wide spans and one eighty foot wide span. In order for a debris blockage to form that can withstand the hydrostatic pressure of the flow, the probable mechanism would be for several trees of sufficient length to get caught against two bridge piers. Other debris would then get trapped against these trees eventually forming a semi-permeable wall. This process would have to happen for each of the three bridge openings. From field inspections in the upstream channel, no trees of sufficient length to block the bridge openings were found. Because of these considerations, the pier width increase method will be used to provide a realistic, conservative estimate of the effect of debris blockage at the bridge.

5.0 HYDRAULIC ANALYSIS

The computer program HEC-2 is used to determine steady state backwater profiles for both existing and future conditions. There are places within the study reach that have a supercritical flow regime. Critical depth is computed for each section in supercritical flow regimes. For flood plain determinations in natural channels, critical depth is usually the lowest flow depth used. The hydraulic analysis starts at the spillway of the abandoned reservoir (Section 0+00) at the downstream end. Malibu Canyon Road Bridge is at Section 98+40. The Tapia Water Reclamation Facility starts at Section 106+10 and ends at Section 117+60.

The design discharge of 41,800 cfs upstream of Cold Canyon and 52,250 downstream of Cold Canyon is used for both the existing and future conditions. The Manning's roughness values used in the analysis are discussed in Chapter 4. The results of the analysis are shown in Table 5.1 for existing conditions and in Table 5.2 for future conditions. The discharge, flow depth, water surface elevation, bed elevation, and mean channel flow velocity are given for each cross section. Plate 2 shows the flood boundaries for both the existing and future conditions. In general, the downstream or western part of the facility has adequate protection from floods. The upstream or east end of the facility has a low spot near Section 115.15. For both existing and future conditions, some flooding occurs. This part of the plant consists primarily of utility buildings, however, so flooding would not result in an introduction of wastewater into Malibu Creek. The maximum computed water surface elevation at the upstream end of the plant (Section 117.60) is 475.77' for existing conditions and 477.38' for ultimate conditions. Figure 5.1 shows a water surface profile plot for Malibu Creek near the Tapia Water Reclamation Facility. The water surface profile computed by Los Angeles County is also shown on this figure for comparison purposes.

5.1 High Water Mark Correlation

Based on verbal communication with water district staff, two high water mark elevations were determined for the February, 1980 flood. The first is an elevation of approximately 470' near section 100.3. This was derived from the observation that the plant access road was under 1 to 3 feet of standing water during the peak of flooding. Furthermore, the Malibu Canyon Road bridge which has a top of road elevation of 472' was not overtopped. Roll waves in the center of channel did strike the bridge and splash up onto the roadway but a general overtopping did not occur. The second high water mark location is at the upstream or west end of the plant. A photograph of the storage building in this part of the plant showed the water line about 3 feet above the finish grade elevation of 470'. This would make the high water mark approximately 473'. The ultimate condition water surface matches the downstream high water mark of 470' quite closely. It is several feet higher than the upstream high water mark of 473' however. The reason is that there was very little in-channel vegetation during the February, 1980 flood. The ultimate condition analysis assumes that much more vegetation is in place resulting in a higher n value and therefore the computed water surface is higher than the observed upstream high water mark.

5.2 Complete Debris Blockage of the Bridge

The effect on the water surface elevation of a complete debris blockage at the bridge as discussed in Section 4.4 was analyzed as part of the scope of work for this project. The bridge roadway was treated as a critical depth weir and no water was allowed to flow through the bridge opening. The top of the bridge roadway is at an approximate elevation of 472', more than 20 feet above the channel bed. The resulting water surface elevation upstream from the bridge is virtually flat with an approximate average water surface elevation of 481'. The blocked bridge acts as a dam and creates a ponding effect upstream which results in large flow depths and very small flow velocities.

5.3 Effect of Channel Maintenance on the Water Surface Profile

In order to estimate the effect of an in-channel maintenance program two additional water surface profiles were calculated. Both assume ultimate discharge conditions. The first case is for removal of 100% of the willow tree vegetation in the channel reducing the n value from 0.100 to 0.040. The removal of trees starts at the Malibu Canyon Road bridge and ends at the upstream end of the plant. There is a decrease in water surface elevation of approximately 4 feet at the upstream end of the plant and about 1 foot at the downstream end of the plant. This profile is shown as a dash-dot line on Figure 5.1. The second case is for the removal of 50% of the willow tree vegetation in the main channel reducing the n value from 0.100 to 0.070. There is a decrease in water surface elevation of approximately 2 feet at the upstream end of the plant and less than one foot at the downstream end. For vegetation removal of 25% there is virtually no difference in computed water surface elevations when compared to the ultimate water surface with no vegetation removal. Based on this analysis, channel maintenance adjacent to the plant can reduce the water surface elevations by 2 to 4 feet at the upstream end of the plant. There is only a small effect on the water surface elevation at the downstream end of the plant.

Table 5.1 Results of Existing Conditions Hydraulic Analysis.

SECTION NUMBER	DISCHARGE (cfs)	FLOW DEPTH (ft)	WATER SURFACE ELEVATION (ft)	RIVER BED ELEVATION (ft)	CHANNEL FLOW VEL. (ft/s)
.00	52250.00	14.02	303.02	289.00	21.20
1.50	52250.00	23.37	309.37	286.00	11.40
3.00	52250.00	23.29	309.29	286.00	12.95
7.50	52250.00	20.07	308.07	288.00	21.91
14.50	52250.00	25.15	315.15	290.00	13.25
20.50	52250.00	19.99	313.99	294.00	22.51
28.00	52250.00	20.37	320.37	300.00	23.59
35.00	52250.00	20.08	328.08	308.00	23.47
43.00	52250.00	17.43	353.43	336.00	22.02
48.50	52250.00	34.78	378.78	344.00	32.69
54.25	52250.00	23.74	393.74	370.00	24.05
59.50	52250.00	21.73	413.73	392.00	23.42
65.20	52250.00	23.32	435.32	412.00	25.12
77.00	52250.00	17.98	451.98	434.00	21.78
86.00	41800.00	21.12	461.12	440.00	8.00
91.00	41800.00	18.99	460.99	442.00	13.96
93.50	41800.00	19.11	463.11	444.00	11.28
96.10	41800.00	19.12	464.12	445.00	11.04
97.00	41800.00	17.35	463.35	446.00	15.84
97.60	41800.00	17.90	463.90	446.00	16.16
98.40	41800.00	17.13	464.13	447.00	15.92
98.78	41800.00	18.21	465.21	447.00	14.78
99.33	41800.00	19.60	467.60	448.00	9.31
100.40	41800.00	18.28	468.28	450.00	7.39
102.00	41800.00	15.67	468.67	453.00	7.02
103.60	41800.00	15.00	469.00	454.00	7.55
104.95	41800.00	14.41	469.41	455.00	7.83
106.10	41800.00	14.36	469.36	455.00	8.50
107.90	41800.00	14.10	470.10	456.00	11.15
109.40	41800.00	14.17	471.17	457.00	11.09
110.65	41800.00	15.25	472.25	457.00	9.64
112.15	41800.00	14.92	472.92	458.00	10.80
113.65	41800.00	15.09	474.09	459.00	10.19
115.15	41800.00	14.89	474.89	460.00	10.11
116.45	41800.00	15.45	475.45	460.00	10.32
117.60	41800.00	14.77	475.77	461.00	11.72
118.50	41800.00	15.41	476.41	461.00	10.60

Table 5.2 Results of Ultimate Condition Hydraulic Analysis.

SECTION NUMBER	DISCHARGE (cfs)	FLOW DEPTH (ft)	WATER SURFACE ELEVATION (ft)	RIVER BED ELEVATION (ft)	CHANNEL FLOW VEL. (ft/s)
.00	52250.00	14.02	303.02	289.00	21.20
1.50	52250.00	23.79	309.79	286.00	9.66
3.00	52250.00	23.91	309.91	286.00	11.09
7.50	52250.00	22.20	310.20	288.00	17.28
14.50	52250.00	25.91	315.91	290.00	11.75
20.50	52250.00	22.78	316.78	294.00	18.07
28.00	52250.00	22.71	322.71	300.00	19.14
35.00	52250.00	21.02	329.02	308.00	21.11
43.00	52250.00	17.21	353.21	336.00	21.54
48.50	52250.00	33.28	377.28	344.00	29.75
54.25	52250.00	23.64	393.64	370.00	23.59
59.50	52250.00	21.59	413.59	392.00	22.90
65.20	52250.00	23.21	435.21	412.00	23.82
77.00	52250.00	19.58	453.58	434.00	19.03
86.00	41800.00	21.70	461.70	440.00	5.89
91.00	41800.00	20.47	462.47	442.00	11.36
93.50	41800.00	20.79	464.79	444.00	8.32
96.10	41800.00	20.99	465.99	445.00	7.92
97.00	41800.00	19.98	465.98	446.00	9.88
97.60	41800.00	20.53	466.53	446.00	10.14
98.40	41800.00	18.91	465.91	447.00	14.44
98.78	41800.00	19.82	466.82	447.00	13.65
99.33	41800.00	20.56	468.56	448.00	6.72
100.40	41800.00	19.71	469.71	450.00	5.01
102.00	41800.00	16.96	469.96	453.00	4.82
103.60	41800.00	16.31	470.31	454.00	5.22
104.95	41800.00	15.78	470.78	455.00	5.51
106.10	41800.00	15.85	470.85	455.00	4.97
107.90	41800.00	15.33	471.33	456.00	8.05
109.40	41800.00	15.56	472.56	457.00	8.01
110.65	41800.00	16.54	473.54	457.00	6.95
112.15	41800.00	16.45	474.45	458.00	7.64
113.65	41800.00	16.61	475.61	459.00	7.26
115.15	41800.00	16.44	476.44	460.00	7.15
116.45	41800.00	17.07	477.07	460.00	6.59
117.60	41800.00	16.38	477.38	461.00	7.37
118.50	41800.00	17.10	478.10	461.00	7.12

6.0 CONCLUSIONS

Based upon the results of this study the following conclusions are made.

1. The design discharge of 41,800 cfs upstream of Cold Creek and 52,250 cfs downstream of Cold Creek adequately portrays the runoff from the capitol flood with the ultimate amount of development in the Malibu Creek watershed. It also includes the effects of burns and sediment bulking.

2. The presence of willow vegetation in the Malibu Creek low-flow channel increases the computed water surface elevation above those shown on the Los Angeles County Floodplain Maps.

3. The Malibu Canyon Road bridge piers will trap debris during a flood resulting in head loss and a higher upstream water surface elevation. Complete blockage of the bridge opening by debris is unlikely, however because of the absence of trees with sufficient length to be trapped by the bridge piers.

4. For existing and ultimate conditions, the downstream (east) part of the Tapia Water Reclamation facility has sufficient protection from floods. Some flooding will occur on the upstream (west) side of the facility. This part of the plant consists primarily of utility buildings, however, so flooding would not result in an introduction of wastewater into Malibu Creek. The maximum computed water surface elevation at the upstream end of the plant (Section 117.60) is 475.77' for existing conditions and 477.38' for ultimate conditions.

5. The computed water surface profiles are in general agreement with high water marks observed during the February, 1980 flood.

6. Based on the analysis for willow tree removal, channel maintenance adjacent to the plant can reduce the water surface elevations by 2 to 4 feet at the upstream end of the plant for willow tree removal percentages of 50% and 100% respectively. There is only a small effect on the water surface elevation at the downstream end of the plant.

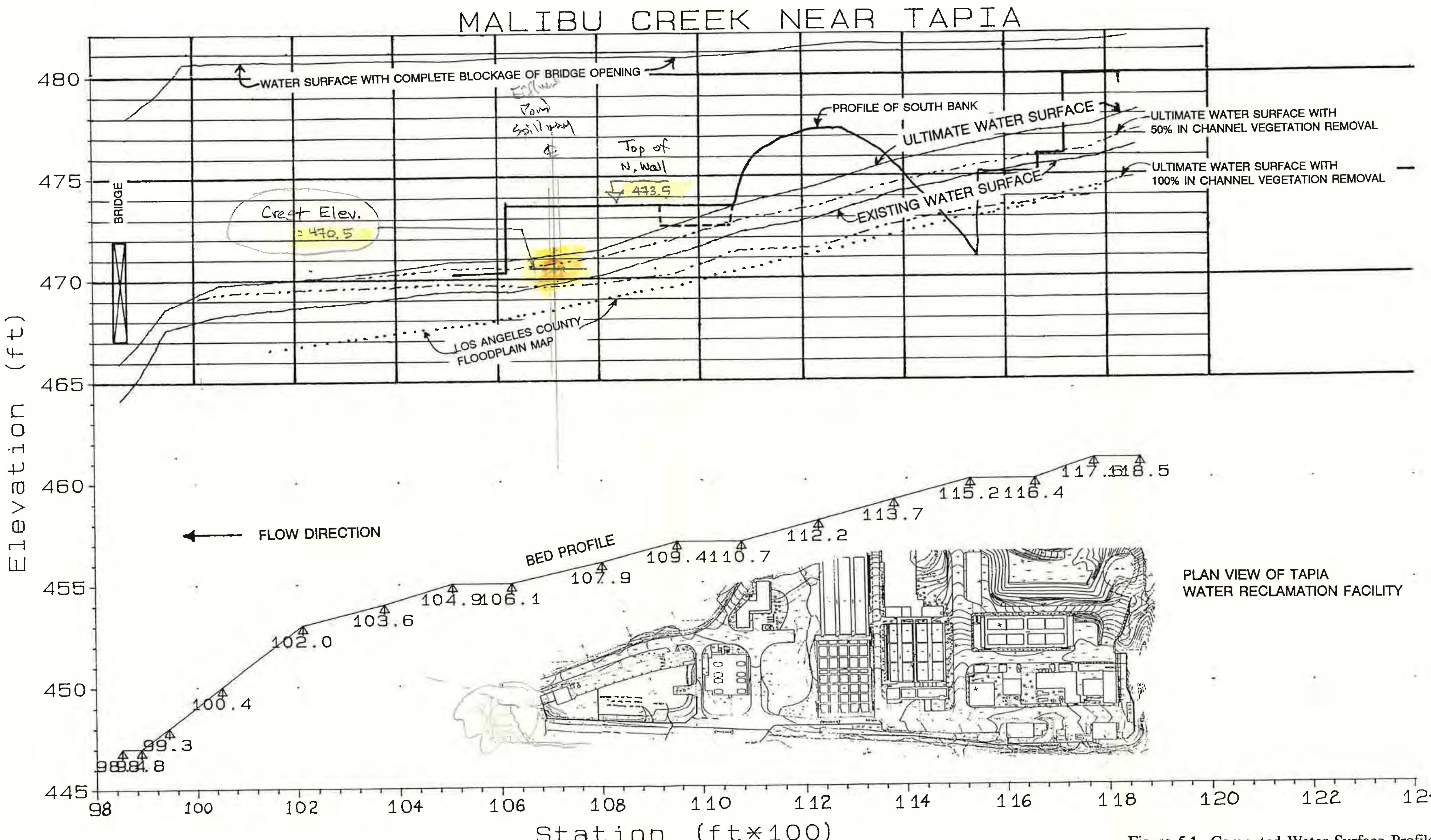
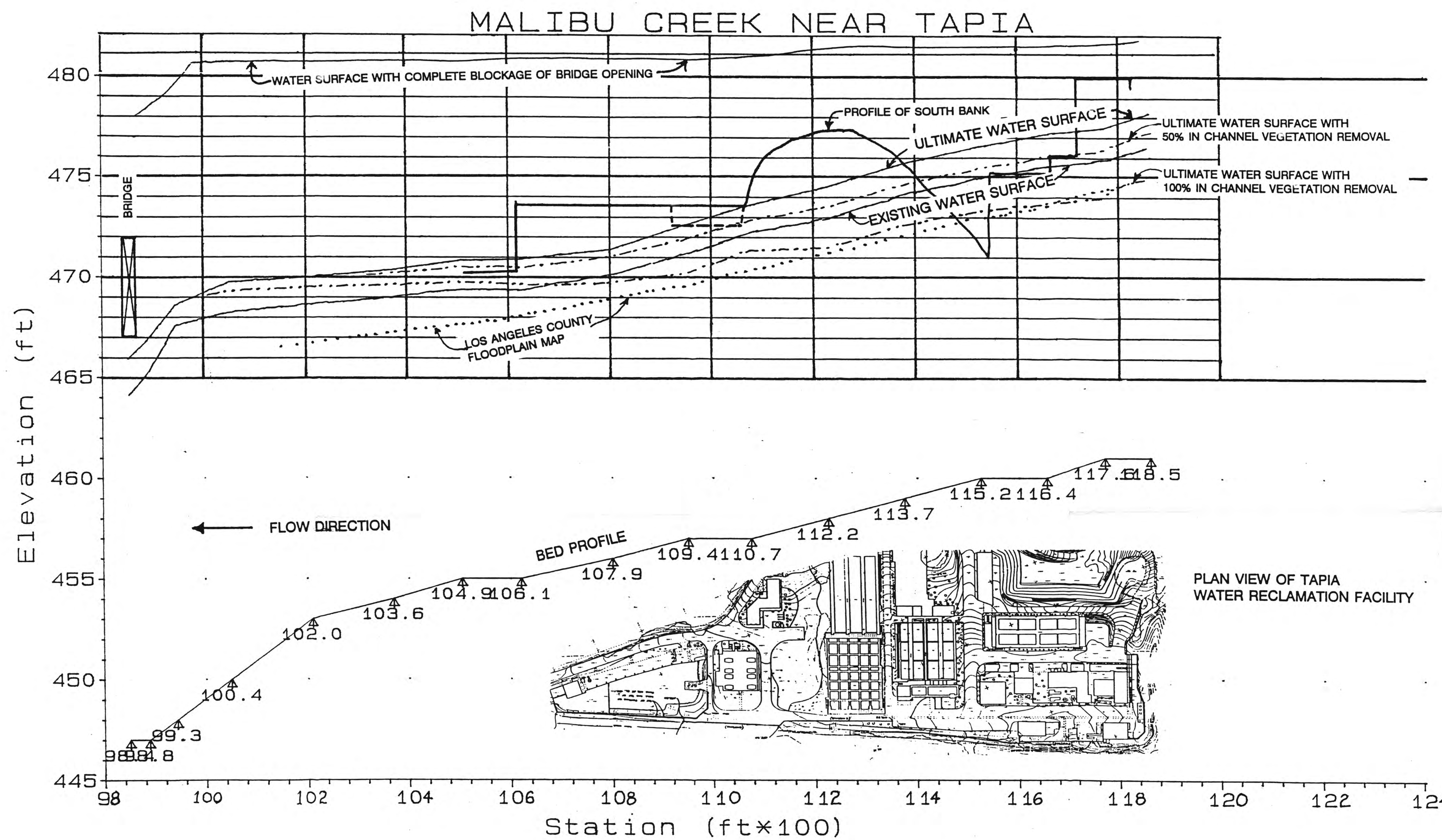


Figure 5.1 Computed Water Surface Profile Plots.


MALIBU CREEK NEAR TAPIA
WATER SURFACE WITH COMPLETE BLOCKAGE OF BRIDGE OPENING
PROFILE OF SOUTH BANK
ULTIMATE WATER SURFACE
ULTIMATE WATER SURFACE WITH 50% IN CHANNEL VEGETATION REMOVAL
ULTIMATE WATER SURFACE WITH 100% IN CHANNEL VEGETATION REMOVAL
EXISTING WATER SURFACE
BRIDGE
LOS ANGELES COUNTY FLOODPLAIN MAP
FLOW DIRECTION
BED PROFILE
PLAN VIEW OF TAPIA WATER RECLAMATION FACILITY
Elevation (ft)
Station (ft*100)
480
475
470
465
460
455
450
445
98
100
102
104
106
108
110
112
114
116
118
120
122
124
98.5
98.8
99.3
100.4
102.0
103.6
104.9
106.1
107.9
109.4
110.7
112.2
113.7
115.2
116.4
117.6
118.5

APPENDIX 1

MALIBU CREEK HYDRAULIC ANALYSIS FOR EXISTING CHANNEL CONDITION

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1*************************************************************          **************************************
 *  WATER SURFACE PROFILES                                  *          *  U.S. ARMY CORPS OF ENGINEERS
 *  VERSION OF SEPTEMBER 1988                               *          *  THE HYDROLOGIC ENGINEERING CENTER
 *  ERROR: 01,02,03                                         *          *  609 SECOND STREET, SUITE D
 *  UPDATED:  SEPTEMBER 1989                                *          *  DAVIS, CALIFORNIA 95616-4687
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 *************************************************************          **************************************


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                                  X     X  X        X                        X
                                  XXXXXXX  XXXX     X          XXXXX    XXXXX
                                  X     X  X        X                  X
                                  X     X  X        X     X            X
                                  X     X  XXXXXXX   XXXXX             XXXXXXX
 END OF BANNER
1
    6/14/90       6:12:55                      EXISTING                                     PAGE    1


                                                                  THIS RUN EXECUTED  6/14/90     6:12:55
 ******************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -   01,02,03
   MODIFICATION -
 ******************************************************


 T1   MALIBU CREEK EXISTING CONDITIONS.  RIVERTECH, FEB., 1990
 T2   ALL CROSS SECTIONS LOOKING DOWNSTREAM.
 T3         MALIBU CREEK  (e)

 J1   ICHECK     INQ      NINV      IDIR      STRT     METRIC    HVINS      Q       WSEL      FQ

        0         2         0         0        -1         0         0        0       294       0

 J2   NPROF     IPLOT     PRFVS     XSECV     XSECH      FN       ALLDC     IBW     CHNIM    ITRACE

        1         0        -1         0         0         0        -1        0         0        0


 NC     0.040       0.040      0.040        0.1        0.3
 QT         1       52250
 X1      0.00           4        100        277          0          0          0
 GR       305         100        289        101        289        276        305       277

 X1      1.50           8        260        390        100        200        150
 GR       320         100        300        160        292        260        288       320       286       350
 GR       286         390        298        440        320        480

 X1      3.00           9        230        360        150        160        150
 GR       320         100        300        140        292        230        286       290       286       315
 GR       290         360        298        370        300        410        320       430

 X1      7.50           8        135        240        400        500        450
 GR       320         100        290        135        288        140        288       155       290       170
 GR       292         240        302        285        320        440

 X1     14.50           9        210        360        750        650        700
 GR       320         100        304        120        306        180        306       210       290       250
 GR       290         265        292        305        296        360        320       405

 X1     20.50           9        140        260        550        650        600
 GR       330         100        300        140        296        160        294       180       294       200
 GR       296         210        300        260        310        290        330       320

 X1     28.00           6        135        230        700        800        750
 GR       330         100        300        135        300        175        304       230       310       250
 GR       330         300
1
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 X1     35.00           8        150        260        700        750        700
 GR       340         100        310        150        308        160        310       170       312       200
 GR       310         230        310        260        340        300

 X1     43.00           6        150        280        800        800        800
 GR       360         100        340        150        336        180        336       210       338       280
 GR       360         320

 X1     48.50           5        145        170        550        550        550
 GR       380         100        350        135        344        145        344       170       380       200

 X1     54.25           6        130        230        425        425        425
 GR       400         100        380        130        370        160        370       190       380       230
 GR       400         270

 X1     59.50           6        140        245        525        525        525
```

GR	420	100	400	140	392	160	392	205	400	245
GR	420	290								
X1	65.20	7	145	230	570	570	570			
GR	460	100	420	130	414	145	412	165	414	190
GR	420	230	460	280						
X1	77.00	6	145	285	1180	1180	1180			
GR	470	100	440	145	434	220	434	270	440	285
GR	470	370								
QT	1	41800								
NC	0.040	0.040	0.050							
X1	86.00	12	310	470	900	600	700			
GR	470	100	460	250	450	310	440	360	440	425
GR	450	470	460	490	460	520	452	570	452	760
GR	454	840	470	880						
X1	91.00	10	215	370	500	450	500			
GR	480	100	460	140	450	215	444	250	442	315
GR	442	345	450	370	463	410	464	730	480	790
X1	93.50	12	270	435	290	160	250			
GR	480	100	470	130	460	145	458	210	448	270
GR	444	330	444	395	450	435	463	470	463	685
GR	470	745	480	790						
X1	96.10	11	305	505	290	230	260			
GR	480	100	460	140	460	235	454	305	450	360
GR	445	430	445	460	456	505	460	540	470	650
GR	480	700								

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X1	97.00	13	325	490	110	85	90			
GR	480	100	466	135	462	190	460	280	456	325
GR	454	355	450	435	446	465	446	485	450	490
GR	460	530	470	600	480	720				
X1	97.60	14	355	520	60	60	60			
GR	480	100	470	130	462	175	460	285	456	355
GR	454	390	454	415	452	440	446	485	446	510
GR	448	520	462	521	470	680	480	735		
X1	98.40	18	100	302	40	40	40			
GR	468	100	454	100.1	454	125	452	130	452	156
GR	468	156.1	468	162.9	452	163	450	190	448	220
GR	447	239	468	239.1	468	245.9	447	246	448	265
GR	450	275	448	301.9	468	302				
X1	98.78	0			38	38	38			
NC	0.040	0.035	0.050							
X1	99.33	16	490	645	55	55	55			
GR	480	100	472	265	470	415	468	435	455	435.1
GR	450	480	448	490	448	505	450	570	450	635
GR	448	645	448	660	462	685	466	700	470	800
GR	480	900								
NC	0.041	0.035	0.064							
X1	100.40	16	535	680	70	120	107			
GR	480	100	470	200	466	255	462	350	460	480
GR	454	500	450	535	450	570	452	595	450	680
GR	450	695	460	710	464	735	470	755	472	810
GR	480	850								
X1	102.00	14	480	670	80	160	160			
GR	480	100	472	190	462	260	460	330	458	425
GR	456	450	454	480	454	550	453	650	454	670
GR	466	710	470	720	470	760	480	780		
X1	103.60	15	475	685	130	130	160			
GR	480	100	472	210	464	260	462	290	460	395
GR	458	455	456	475	456	520	454	645	454	665
GR	456	685	460	705	468	720	468	775	480	780
X1	104.95	16	515	750	135	135	135			
GR	480	100	470	280	464	350	462	380	460	490
GR	458	515	456	600	456	640	455	675	455	685
GR	456	695	456	750	462	780	468	790	468	835
GR	480	865								

1

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X1	106.10	13	640	695	115	115	115			
GR	480	100	472	190	470	280	466	360	460	455
GR	458	485	456	550	456	640	455	670	455	685
GR	456	695	472	725	480	726				
X1	107.90	10	340	510	160	190	180			
GR	480	100	470	140	466	195	460	320	456	340
GR	456	390	456	495	458	510	472	530	480	531
X1	109.40	14	295	485	150	150	150			
GR	480	100	468	135	466	180	462	270	460	295
GR	458	300	457	315	457	340	458	400	458	470

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GR     460      485      470      500      472      520      480      521

X1  110.65       12      300      480      125      125      125
GR     480      100      470      140      466      195      460      275      458      300
GR     457      315      457      340      458      365      458      445      460      480
GR     470      510      480      511

NC   0.044    0.035    0.064
X1  112.15       12      355      535      150      150      150
GR     480      100      470      215      468      250      462      315      460      355
GR     458      380      458      415      460      470      462      535      476      580
GR     478      660      480      661

X1  113.65       11      295      480      150      150      150
GR     480      100      470      165      468      200      462      275      460      295
GR     459      335      459      359      460      370      462      480      474      525
GR     480      526

X1  115.15       10      280      450      150      150      150
GR     480      100      470      145      468      180      466      195      462      280
GR     460      300      460      350      462      450      470      475      480      476

X1  116.45       10      350      445      130      130      130
GR     480      100      470      170      468      195      464      280      461      350
GR     460      405      460      440      462      445      468      475      480      476

X1  117.60       10      310      395      115      115      115
GR     480      100      472      125      468      160      466      250      462      310
GR     461      340      461      370      462      395      472      435      480      436

X1  118.50       11      275      390       90       90       90
GR     480      100      472      125      468      175      468      250      466      275
GR     462      295      461      360      461      390      462      415      466      430
GR     480      460
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

 *PROF 1

 CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
0
 CCHV=      .100 CEHV=      .300
 *SECNO   .000
 3720 CRITICAL DEPTH ASSUMED
      .000     14.02    303.02    303.02    294.00    309.99      6.98       .00       .00    305.00
    52250.        0.    52250.        0.        0.     2465.        0.        0.        0.    305.00
       .00       .00     21.20       .00      .000      .040      .000      .000    289.00    100.12
   .011668        0.        0.        0.         0        16         0       .00    176.75    276.88
0
 *SECNO 1.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.70

     1.500     23.37    309.37    302.41       .00    311.03      1.66       .51       .53    292.00
    52250.    11691.    31557.     9002.     1468.     2768.      986.       13.        1.    286.00
       .00      7.96     11.40      9.13      .040      .040      .040      .000    286.00    131.90
   .001599      100.      150.      200.         4        11         0       .00    328.77    460.67
0
 *SECNO 3.000
     3.000     23.29    309.29    303.73       .00    311.45      2.16       .27       .15    292.00
    52250.    11721.    35717.     4813.     1283.     2758.      608.       30.        2.    290.00
       .01      9.14     12.95      7.92      .040      .040      .040      .000    286.00    121.41
   .002078      150.      150.      160.         3        19         0       .00    297.88    419.29
0
 *SECNO 7.500

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
     7.500     20.07    308.07    308.07       .00    314.52      6.44      1.60      1.28    290.00
    52250.     2212.    41140.     8898.      191.     1878.      657.       68.        5.    292.00
       .01     11.61     21.91     13.54      .040      .040      .040      .000    288.00    113.91
   .007487      400.      450.      500.         0        15         0       .00    223.39    337.30
0
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

 *SECNO 14.500
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3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.84
   14.500     25.15   315.15   309.59      .00   317.53     2.38     2.60      .41   306.00
   52250.     7455.   42299.    2495.     961.    3192.     344.     126.       9.    296.00
      .03      7.76    13.25     7.26     .040     .040     .040     .000   290.00   106.07
  .002221      750.     700.     650.        3        5        0      .00   289.83   395.90
0
 *SECNO 20.500

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   20.500     19.99   313.99   313.99      .00   321.33     7.34     2.30     1.49   300.00
   52250.     1384.   47019.    3846.     130.    2088.     282.     174.      12.    300.00
      .04     10.61    22.51    13.66     .040     .040     .040     .000   294.00   121.35
  .008219      550.     600.     650.        0       15        0      .00   174.63   295.98
0
 *SECNO 28.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   28.000     20.37   320.37   320.37      .00   328.06     7.69     6.04      .10   300.00
   52250.     3116.   43055.    6080.     242.    1825.     402.     217.      15.    304.00
      .05     12.87    23.59    15.13     .040     .040     .040     .000   300.00   111.24
  .007851      700.     750.     800.        0        5        0      .00   164.69   275.92
0
 *SECNO 35.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   35.000     20.08   328.08   328.08      .00   335.91     7.83     5.82      .04   310.00
   52250.     3695.   45732.    2823.     272.    1948.     218.     257.      18.    310.00
      .06     13.57    23.47    12.96     .040     .040     .040     .000   308.00   119.87
  .008699      700.     700.     750.        0        5        0      .00   164.23   284.10
0
1
     6/14/90        6:12:55                                                                         PAGE    7

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST


 *SECNO 43.000

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   43.000     17.43   353.43   353.43      .00   360.42     6.99     6.85      .08   340.00
   52250.     2603.   47008.    2638.     225.    2135.     216.     303.      21.    338.00
      .07     11.56    22.02    12.20     .040     .040     .040     .000   336.00   116.44
  .008435      800.     800.     800.        0       11        0      .00   191.61   308.05
0
 *SECNO 48.500

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   48.500     34.78   378.78   378.78      .00   390.28    11.50     4.16     1.35   344.00
   52250.    16124.   28419.    7707.     801.     869.     504.     333.      23.    344.00
      .07     20.13    32.69    15.30     .040     .040     .040     .000   344.00   101.43
  .006819      550.     550.     550.        0       17        0      .00    97.55   198.98
0
 *SECNO 54.250

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   54.250     23.74   393.74   393.74      .00   402.23     8.49     3.11      .30   380.00
   52250.     1493.   48668.    2089.     142.    2024.     189.     355.      24.    380.00
      .08     10.55    24.05    11.07     .040     .040     .040     .000   370.00   109.39
  .007887      425.     425.     425.        0       19        0      .00   148.08   257.48
0
 *SECNO 59.500

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   59.500     21.73   413.73   413.73      .00   421.68     7.95     4.12      .05   400.00
   52250.     2077.   47803.    2370.     188.    2042.     212.     384.      26.    400.00
      .08     11.02    23.42    11.18     .040     .040     .040     .000   392.00   112.54
  .007823      525.     525.     525.        0       11        0      .00   163.35   275.89
0
1
     6/14/90        6:12:55                                                                         PAGE    8

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST
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 *SECNO 65.200

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    65.200     23.32    435.32    435.32       .00    444.33      9.01      4.58       .32    414.00
    52250.     6962.    43654.     1633.      363.     1738.      147.      415.       28.    420.00
       .09     19.18     25.12     11.13      .040      .040      .040      .000    412.00    118.51
   .008261      570.      570.      570.         0         8         0       .00    130.65    249.16
0
 *SECNO 77.000

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    77.000     17.98    451.98    451.98       .00    458.99      7.01      9.94       .20    440.00
    52250.     1082.    48946.     2222.      108.     2247.      203.      480.       32.    440.00
       .11     10.05     21.78     10.93      .040      .040      .040      .000    434.00    127.03
   .008599     1180.     1180.     1180.         0        15         0       .00    191.92    318.95
0
 *SECNO 86.000

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.89

    86.000     21.12    461.12    456.27       .00    461.90       .78      2.29       .62    450.00
    41800.     1786.    23228.    16786.      376.     2904.     2857.      547.       38.    450.00
       .13      4.74      8.00      5.87      .040      .050      .040      .000    440.00    233.22
   .001545      900.      700.      600.         3        10         0       .00    624.57    857.80
0
 *SECNO 91.000

 3301 HV CHANGED MORE THAN HVINS

1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .54

    91.000     18.99    460.99    457.47       .00    463.77      2.78      1.27       .60    450.00
    41800.     3951.    36349.     1500.      450.     2603.      186.      599.       43.    450.00
       .14      8.78     13.96      8.07      .040      .050      .040      .000    442.00    138.02
   .005209      500.      500.      450.         3        15         0       .00    265.79    403.81
0
 *SECNO 93.500

 3301 HV CHANGED MORE THAN HVINS

    93.500     19.11    463.11    457.80       .00    464.87      1.76      1.00       .10    448.00
    41800.     7304.    32858.     1638.      881.     2913.      255.      620.       45.    450.00
       .15      8.29     11.28      6.42      .040      .050      .040      .000    444.00    140.33
   .003147      290.      250.      160.         3        15         0       .00    545.61    685.94
0
 *SECNO 96.100
    96.100     19.12    464.12    460.91       .00    465.79      1.66       .90       .01    454.00
    41800.     6532.    33301.     1967.      908.     3017.      308.      645.       48.    456.00
       .16      7.20     11.04      6.39      .040      .050      .040      .000    445.00    131.75
   .003739      290.      260.      230.         2        15         0       .00    453.62    585.37
0
 *SECNO 97.000

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .61

    97.000     17.35    463.35    463.05       .00    466.88      3.52       .53       .56    456.00
    41800.     4186.    32379.     5235.      467.     2045.      374.      653.       49.    450.00
       .16      8.97     15.84     14.00      .040      .050      .040      .000    446.00    171.27
   .010045      110.       90.       85.         3        15         0       .00    382.26    553.53
0
 *SECNO 97.600
    97.600     17.90    463.90    463.71       .00    467.50      3.59       .60       .02    456.00
    41800.     7415.    34233.      153.      743.     2119.       45.      657.       50.    448.00
       .16      9.98     16.16      3.40      .040      .050      .040      .000    446.00    164.30
   .009882       60.       60.       60.         2         8         0       .00    394.52    558.82
0
1
     6/14/90       6:12:55                                                                        PAGE   10


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST
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*SECNO 98.400

3265 DIVIDED FLOW

   98.400     17.13    464.13    461.64       .00    468.07      3.94       .47       .10    468.00
   41800.        0.    41800.        0.        0.     2625.        0.      660.       50.    468.00
      .16       .00     15.92       .00      .000      .050      .000      .000    447.00    100.03
  .014062       40.       40.       40.         2        15         0       .00    188.27    301.98
0
*SECNO 98.780

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

   98.780     18.21    465.21    461.64       .00    468.60      3.39       .48       .05    468.00
   41800.        0.    41800.        0.        0.     2828.        0.      662.       50.    468.00
      .16       .00     14.78       .00      .000      .050      .000      .000    447.00    100.02
  .011327       38.       38.       38.         3        15         0       .00    188.30    301.99
0
*SECNO 99.330

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.36

   99.330     19.60    467.60    459.94       .00    469.02      1.42       .22       .20    448.00
   41800.     8042.    26378.     7380.      865.     2833.      695.      667.       50.    448.00
      .16      9.30      9.31     10.62      .040      .050      .035      .000    448.00    435.00
  .002042       55.       55.       55.         3        14         0       .00    305.00    740.01
0
*SECNO 100.400
  100.400     18.28    468.28    462.97       .00    469.27       .99       .21       .04    450.00
   41800.    16080.    18770.     6950.     2181.     2539.      660.      677.       51.    450.00
      .17      7.37      7.39     10.53      .041      .064      .035      .000    450.00    223.79
  .002231       70.      107.      120.         1        21         0       .00    525.44    749.23
0
1
     6/14/90        6:12:55                                                                        PAGE   11


   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST


*SECNO 102.000
  102.000     15.67    468.67    463.15       .00    469.58       .91       .30       .01    454.00
   41800.    18806.    19972.     3022.     2312.     2847.      356.      693.       53.    454.00
      .17      8.13      7.02      8.50      .041      .064      .035      .000    453.00    213.33
  .002471       80.      160.      160.         2        11         0       .00    503.34    716.67
0
*SECNO 103.600
  103.600     15.00    469.00    464.27       .00    470.01      1.02       .40       .03    456.00
   41800.    16603.    22015.     3182.     1937.     2914.      350.      711.       54.    456.00
      .18      8.57      7.55      9.09      .041      .064      .035      .000    454.00    228.77
  .003176      130.      160.      130.         0        14         0       .00    546.64    775.42
0
*SECNO 104.950
  104.950     14.41    469.41    465.00       .00    470.49      1.07       .46       .02    458.00
   41800.    13274.    24268.     4258.     1549.     3100.      423.      727.       56.    456.00
      .18      8.57      7.83     10.07      .041      .064      .035      .000    455.00    286.83
  .003648      135.      135.      135.         2        14         0       .00    551.71    838.54
0
*SECNO 106.100

3301 HV CHANGED MORE THAN HVINS

  106.100     14.36    469.36    466.12       .00    471.14      1.77       .44       .21    456.00
   41800.    33791.     6546.     1464.     3037.      770.      168.      739.       57.    456.00
      .18     11.13      8.50      8.74      .041      .064      .035      .000    455.00    292.64
  .003974      115.      115.      115.         2        15         0       .00    427.43    720.07
0
*SECNO 107.900
  107.900     14.10    470.10    467.13       .00    472.05      1.95       .86       .05    456.00
   41800.    14165.    26567.     1068.     1246.     2383.      105.      754.       59.    458.00
      .19     11.37     11.15     10.20      .041      .064      .035      .000    456.00    139.58
  .006829      160.      180.      190.         2        15         0       .00    387.71    527.29
0
*SECNO 109.400
  109.400     14.17    471.17    468.34       .00    473.11      1.94      1.05       .00    460.00
   41800.    12579.    28213.     1008.     1101.     2544.       99.      767.       60.    460.00
      .19     11.43     11.09     10.16      .041      .064      .035      .000    457.00    125.77
  .007204      150.      150.      150.         2        15         0       .00    385.88    511.65
0
1
     6/14/90        6:12:55                                                                        PAGE   12


   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST


*SECNO 110.650
```

```
   110.650     15.25    472.25    468.21       .00    473.88      1.63       .74       .03    458.00
    41800.    14628.    24819.     2353.     1315.     2574.      218.      778.       61.    460.00
       .19     11.13      9.64     10.81      .041      .064      .035      .000    457.00    131.01
   .004969      125.      125.      125.         2        15         0       .00    379.21    510.22
0
 *SECNO 112.150
   112.150     14.92    472.92    469.79       .00    474.83      1.91       .87       .08    460.00
    41800.    13742.    26038.     2020.     1178.     2411.      192.      792.       63.    462.00
       .20     11.66     10.80     10.53      .044      .064      .035      .000    458.00    181.40
   .006808      150.      150.      150.         2        15         0       .00    388.71    570.11
0
 *SECNO 113.650
   113.650     15.09    474.09    470.43       .00    475.79      1.71       .94       .02    460.00
    41800.    12967.    25936.     2897.     1176.     2546.      274.      805.       64.    462.00
       .20     11.03     10.19     10.57      .044      .064      .035      .000    459.00    138.43
   .005841      150.      150.      150.         2        15         0       .00    386.58    525.01
0
 *SECNO 115.150
   115.150     14.89    474.89    471.00       .00    476.67      1.78       .85       .02    462.00
    41800.    14506.    24378.     2915.     1304.     2411.      223.      819.       65.    462.00
       .21     11.13     10.11     13.05      .044      .064      .035      .000    460.00    123.01
   .005529      150.      150.      150.         2        19         0       .00    352.48    475.49
0
 *SECNO 116.450
   116.450     15.45    475.45    471.95       .00    477.43      1.98       .70       .06    461.00
    41800.    23019.    14816.     3965.     1975.     1435.      316.      830.       66.    462.00
       .21     11.65     10.32     12.55      .044      .064      .035      .000    460.00    131.84
   .005319      130.      130.      130.         2        15         0       .00    343.78    475.62
0
 *SECNO 117.600

 3301 HV CHANGED MORE THAN HVINS

   117.600     14.77    475.77    473.39       .00    478.31      2.54       .71       .17    462.00
    41800.    22110.    14401.     5290.     1720.     1228.      352.      840.       67.    462.00
       .21     12.85     11.72     15.03      .044      .064      .035      .000    461.00    113.21
   .007248      115.      115.      115.         2        15         0       .00    322.26    435.47
0
1
     6/14/90        6:12:55                                                                                    PAGE    13


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 118.500
   118.500     15.41    476.41    474.25       .00    478.90      2.49       .58       .01    466.00
    41800.    12434.    17798.    11567.     1217.     1680.      675.      847.       68.    461.00
       .21     10.22     10.60     17.13      .044      .064      .035      .000    461.00    111.21
   .005858       90.       90.       90.         2        15         0       .00    341.10    452.31
0
1
     6/14/90        6:12:55                                                                                    PAGE    14


                                                                         THIS RUN EXECUTED  6/14/90      6:13: 7

 **************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -   01,02,03
   MODIFICATION -
 **************************************************

 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

   MALIBU CREEK  (e)

 SUMMARY PRINTOUT TABLE  150
```

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	289.00	52250.00	303.02	303.02	309.99	116.68	21.20	2465.07	4837.1
*	1.500	150.00	.00	.00	286.00	52250.00	309.37	302.41	311.03	15.99	11.40	5221.97	13065.7
	3.000	150.00	.00	.00	286.00	52250.00	309.29	303.73	311.45	20.78	12.95	4649.05	11461.8
*	7.500	450.00	.00	.00	288.00	52250.00	308.07	308.07	314.52	74.87	21.91	2725.43	6038.3
*	14.500	700.00	.00	.00	290.00	52250.00	315.15	309.59	317.53	22.21	13.25	4495.95	11086.8
*	20.500	600.00	.00	.00	294.00	52250.00	313.99	313.99	321.33	82.19	22.51	2500.45	5763.5
*	28.000	750.00	.00	.00	300.00	52250.00	320.37	320.37	328.06	78.51	23.59	2468.95	5896.9
*	35.000	700.00	.00	.00	308.00	52250.00	328.08	328.08	335.91	86.99	23.47	2438.53	5601.9
*	43.000	800.00	.00	.00	336.00	52250.00	353.43	353.43	360.42	84.35	22.02	2576.87	5689.1
*	48.500	550.00	.00	.00	344.00	52250.00	378.78	378.78	390.28	68.19	32.69	2174.11	6327.5

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	54.250	425.00	.00	.00	370.00	52250.00	393.74	393.74	402.23	78.87	24.05	2354.06	5883.51
*	59.500	525.00	.00	.00	392.00	52250.00	413.73	413.73	421.68	78.23	23.42	2442.05	5907.45
*	65.200	570.00	.00	.00	412.00	52250.00	435.32	435.32	444.33	82.61	25.12	2247.29	5748.62
*	77.000	1180.00	.00	.00	434.00	52250.00	451.98	451.98	458.99	85.99	21.78	2558.34	5634.56
*	86.000	700.00	.00	.00	440.00	41800.00	461.12	456.27	461.90	15.45	8.00	6137.66	10635.11
*	91.000	500.00	.00	.00	442.00	41800.00	460.99	457.47	463.77	52.09	13.96	3239.40	5791.60
	93.500	250.00	.00	.00	444.00	41800.00	463.11	457.80	464.87	31.47	11.28	4049.31	7451.28

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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	96.100	260.00	.00	.00	445.00	41800.00	464.12	460.91	465.79	37.39	11.04	4232.88	6835.88
*	97.000	90.00	.00	.00	446.00	41800.00	463.35	463.05	466.88	100.45	15.84	2885.43	4170.66
	97.600	60.00	.00	.00	446.00	41800.00	463.90	463.71	467.50	98.82	16.16	2906.58	4204.93
	98.400	40.00	.00	.00	447.00	41800.00	464.13	461.64	468.07	140.62	15.92	2625.31	3524.90
	98.780	38.00	.00	.00	447.00	41800.00	465.21	461.64	468.60	113.27	14.78	2827.53	3927.49
*	99.330	55.00	.00	.00	448.00	41800.00	467.60	459.94	469.02	20.42	9.31	4392.68	9249.92
	100.400	107.00	.00	.00	450.00	41800.00	468.28	462.97	469.27	22.31	7.39	5380.23	8850.01
	102.000	160.00	.00	.00	453.00	41800.00	468.67	463.15	469.58	24.71	7.02	5514.93	8408.17
	103.600	160.00	.00	.00	454.00	41800.00	469.00	464.27	470.01	31.76	7.55	5201.52	7417.38
	104.950	135.00	.00	.00	455.00	41800.00	469.41	465.00	470.49	36.48	7.83	5072.19	6920.21
	106.100	115.00	.00	.00	455.00	41800.00	469.36	466.12	471.14	39.74	8.50	3974.33	6630.76
	107.900	180.00	.00	.00	456.00	41800.00	470.10	467.13	472.05	68.29	11.15	3733.45	5058.27
	109.400	150.00	.00	.00	457.00	41800.00	471.17	468.34	473.11	72.04	11.09	3744.05	4924.87
	110.650	125.00	.00	.00	457.00	41800.00	472.25	468.21	473.88	49.69	9.64	4106.66	5929.82
	112.150	150.00	.00	.00	458.00	41800.00	472.92	469.79	474.83	68.08	10.80	3780.84	5066.08
	113.650	150.00	.00	.00	459.00	41800.00	474.09	470.43	475.79	58.41	10.19	3995.24	5469.09
	115.150	150.00	.00	.00	460.00	41800.00	474.89	471.00	476.67	55.29	10.11	3937.91	5621.47
	116.450	130.00	.00	.00	460.00	41800.00	475.45	471.95	477.43	53.19	10.32	3726.55	5731.43
	117.600	115.00	.00	.00	461.00	41800.00	475.77	473.39	478.31	72.48	11.72	3300.38	4909.84
	118.500	90.00	.00	.00	461.00	41800.00	476.41	474.25	478.90	58.58	10.60	3572.17	5461.52

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MALIBU CREEK (e)

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	52250.00	303.02	.00	.00	9.02	176.75	.00
*	1.500	52250.00	309.37	.00	6.35	.00	328.77	150.00
	3.000	52250.00	309.29	.00	-.07	.00	297.88	150.00
*	7.500	52250.00	308.07	.00	-1.22	.00	223.39	450.00
*	14.500	52250.00	315.15	.00	7.07	.00	289.83	700.00
*	20.500	52250.00	313.99	.00	-1.16	.00	174.63	600.00
*	28.000	52250.00	320.37	.00	6.38	.00	164.69	750.00
*	35.000	52250.00	328.08	.00	7.71	.00	164.23	700.00
*	43.000	52250.00	353.43	.00	25.35	.00	191.61	800.00
*	48.500	52250.00	378.78	.00	25.35	.00	97.55	550.00
*	54.250	52250.00	393.74	.00	14.96	.00	148.08	425.00
*	59.500	52250.00	413.73	.00	19.99	.00	163.35	525.00
*	65.200	52250.00	435.32	.00	21.60	.00	130.65	570.00
*	77.000	52250.00	451.98	.00	16.66	.00	191.92	1180.00
*	86.000	41800.00	461.12	.00	9.14	.00	624.57	700.00

*	91.000	41800.00	460.99	.00	-.13	.00	265.79	500.00
	93.500	41800.00	463.11	.00	2.12	.00	545.61	250.00
	96.100	41800.00	464.12	.00	1.02	.00	453.62	260.00
*	97.000	41800.00	463.35	.00	-.77	.00	382.26	90.00
	97.600	41800.00	463.90	.00	.55	.00	394.52	60.00
	98.400	41800.00	464.13	.00	.23	.00	188.27	40.00
	98.780	41800.00	465.21	.00	1.08	.00	188.30	38.00
*	99.330	41800.00	467.60	.00	2.40	.00	305.00	55.00
	100.400	41800.00	468.28	.00	.68	.00	525.44	107.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
102.000	41800.00	468.67	.00	.39	.00	503.34	160.00
103.600	41800.00	469.00	.00	.33	.00	546.64	160.00
104.950	41800.00	469.41	.00	.42	.00	551.71	135.00
106.100	41800.00	469.36	.00	-.05	.00	427.43	115.00
107.900	41800.00	470.10	.00	.74	.00	387.71	180.00
109.400	41800.00	471.17	.00	1.06	.00	385.88	150.00
110.650	41800.00	472.25	.00	1.08	.00	379.21	125.00
112.150	41800.00	472.92	.00	.68	.00	388.71	150.00
113.650	41800.00	474.09	.00	1.16	.00	386.58	150.00
115.150	41800.00	474.89	.00	.80	.00	352.48	150.00
116.450	41800.00	475.45	.00	.56	.00	343.78	130.00
117.600	41800.00	475.77	.00	.32	.00	322.26	115.00
118.500	41800.00	476.41	.00	.64	.00	341.10	90.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      .000  PROFILE=  1  CRITICAL DEPTH ASSUMED
WARNING SECNO=     1.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=     7.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     7.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=    14.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=    20.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    20.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    28.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    28.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    35.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    35.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    43.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    43.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    48.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    48.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    54.250  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    54.250  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    59.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    59.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    65.200  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    65.200  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    77.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    77.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=    86.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    91.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

```
WARNING SECNO=     97.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     99.330  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

APPENDIX 2

MALIBU CREEK HYDRAULIC ANALYSIS FOR ULTIMATE CHANNEL CONDITION

```
1*************************************************************
 *  WATER SURFACE PROFILES                                   *
 *  VERSION OF SEPTEMBER 1988                                *
 *  ERROR: 01,02,03                                          *
 *  UPDATED:  SEPTEMBER 1989                                 *
 *  RUN DATE      6/14/90    TIME     6:16: 2                *
 *************************************************************

 **************************************
 *  U.S. ARMY CORPS OF ENGINEERS
 *  THE HYDROLOGIC ENGINEERING CENTER
 *  609 SECOND STREET, SUITE D
 *  DAVIS, CALIFORNIA 95616-4687
 *          (916) 756-1104
 **************************************


                X     X  XXXXXXX   XXXXX               XXXXX
                X     X  X        X     X             X     X
                X     X  X        X                         X
                XXXXXXX  XXXX     X          XXXXX     XXXXX
                X     X  X        X                   X
                X     X  X        X     X             X
                X     X  XXXXXXX   XXXXX              XXXXXXX

 END OF BANNER
1
     6/14/90        6:16: 2                                                  PAGE     1
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ULTIMATE

```
                                                   THIS RUN EXECUTED  6/14/90     6:16: 2

 *****************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -   01,02,03
   MODIFICATION -
 *****************************************************


 T1   MALIBU CREEK ULTIMATE VEGETATION GROWTH SCENARIO.  RIVERTECH, FEB., 1990
 T2   ALL CROSS SECTIONS LOOKING DOWNSTREAM.   MODIFIED 6-6-90
 T3        MALIBU CREEK (F)

 J1   ICHECK    INQ     NINV     IDIR     STRT    METRIC    HVINS     Q       WSEL     FQ

         0        2       0        0       -1        0        0       0       294       0

 J2   NPROF    IPLOT    PRFVS    XSECV    XSECH     FN      ALLDC    IBW     CHNIM    ITRACE

        1        0       -1        0        0        0       -1       0        0        0


 NC     0.040     0.040     0.055     0.1       0.3
 QT         1     52250
 X1      0.00         4       100      277         0        0        0
 GR       305       100       289      101       289      276      305      277

 X1      1.50         8       260      390       100      200      150
 GR       320       100       300      160       292      260      288      320      286      350
 GR       286       390       298      440       320      480

 X1      3.00         9       230      360       150      160      150
 GR       320       100       300      140       292      230      286      290      286      315
 GR       290       360       298      370       300      410      320      430

 X1      7.50         8       135      240       400      500      450
 GR       320       100       290      135       288      140      288      155      290      170
 GR       292       240       302      285       320      440

 X1     14.50         9       210      360       750      650      700
 GR       320       100       304      120       306      180      306      210      290      250
 GR       290       265       292      305       296      360      320      405

 X1     20.50         9       140      260       550      650      600
 GR       330       100       300      140       296      160      294      180      294      200
 GR       296       210       300      260       310      290      330      320

 X1     28.00         6       135      230       700      800      750
 GR       330       100       300      135       300      175      304      230      310      250
 GR       330       300
1
      6/14/90        6:16: 2                                                  PAGE     2


 X1     35.00         8       150      260       700      750      700
 GR       340       100       310      150       308      160      310      170      312      200
 GR       310       230       310      260       340      300

 X1     43.00         6       150      280       800      800      800
 GR       360       100       340      150       336      180      336      210      338      280
 GR       360       320

 X1     48.50         5       145      170       550      550      550
 GR       380       100       350      135       344      145      344      170      380      200

 X1     54.25         6       130      230       425      425      425
 GR       400       100       380      130       370      160      370      190      380      230
 GR       400       270

 X1     59.50         6       140      245       525      525      525
```

GR GR	420 420	100 290	400	140	392	160	392	205	400	245
X1 GR GR	65.20 460 420	7 100 230	145 420 460	230 130 280	570 414	570 145	570 412	165	414	190
X1 GR GR	77.00 470 470	6 100 370	145 440	285 145	1180 434	1180 220	1180 434	270	440	285
NC QT X1 GR GR GR	.040 1 86.00 470 450 454	.040 41800 12 100 470 840	.080 310 460 460 470	470 250 490 880	900 450 460	600 310 520	700 440 452	360 570	440 452	425 760
X1 GR GR	91.00 480 442	10 100 345	215 460 450	370 140 370	500 450 463	450 215 410	500 444 464	250 730	442 480	315 790
X1 GR GR GR	93.50 480 444 470	12 100 330 745	270 470 444 480	435 130 395 790	290 460 450	160 145 435	250 458 463	210 470	448 463	270 685
X1 GR GR GR	96.10 480 445 480	11 100 430 700	305 460 445	505 140 460	290 460 456	230 235 505	260 454 460	305 540	450 470	360 650

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X1 GR GR GR	97.00 480 454 460	13 100 355 530	325 466 450 470	490 135 435 600	110 462 446 480	85 190 465 720	90 460 446	280 485	456 450	325 490
X1 GR GR GR	97.60 480 454 448	14 100 390 520	355 470 454 462	520 130 415 521	60 462 452 470	60 175 440 680	60 460 446 480	285 485 735	456 446	355 510
NC X1 GR GR GR GR	.040 98.40 468 468 447 450	.040 18 100 155.1 238 275	.060 100 454 468 468 448	302 100.1 163.9 238.1 301.9	40 454 452 468 468	40 125 164 246.9 302	40 452 450 447	130 190 247	452 448 448	155 220 265
X1	98.78	0			38	38	38			
NC X1 GR GR GR GR	.041 99.33 480 450 448 480	.042 16 100 480 645 900	.100 490 472 448 448	645 265 490 660	55 470 448 462	55 415 505 685	55 468 450 466	435 570 700	455 450 470	435.1 635 800
NC X1 GR GR GR GR	0.041 100.40 480 454 450 480	0.042 16 100 500 695 850	0.100 535 470 450 460	680 200 535 710	70 466 450 464	120 255 570 735	107 462 452 470	350 595 755	460 450 472	480 680 810
X1 GR GR GR	102.00 480 456 466	14 100 450 710	480 472 454 470	670 190 480 720	80 462 454 470	160 260 550 760	160 460 453 480	330 650 780	458 454	425 670
X1 GR GR GR	103.60 480 458 456	15 100 455 685	475 472 456 460	685 210 475 705	130 464 456 468	130 260 520 720	160 462 454 468	290 645 775	460 454 480	395 665 780
X1 GR GR GR GR	104.95 480 458 456 480	16 100 515 695 865	515 470 456 456	750 280 600 750	135 464 456 462	135 350 640 780	135 462 455 468	380 675 790	460 455 468	490 685 835

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X1 GR GR GR	106.10 480 458 456	13 100 485 695	640 472 456 472	695 190 550 725	115 470 456 480	115 280 640 726	115 466 455	360 670	460 455	455 685
X1 GR GR	107.90 480 456	10 100 390	340 470 456	510 140 495	160 466 458	190 195 510	180 460 472	320 530	456 480	340 531
X1 GR	109.40 480	14 100	295 468	485 135	150 466	150 180	150 462	270	460	295

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GR     458     300     457     315     457     340     458     400     458     470
GR     460     485     470     500     472     520     480     521

X1  110.65      12     300     480     125     125     125
GR     480     100     470     140     466     195     460     275     458     300
GR     457     315     457     340     458     365     458     445     460     480
GR     470     510     480     511

NC   0.044   0.042   0.100
X1  112.15      12     355     535     150     150     150
GR     480     100     470     215     468     250     462     315     460     355
GR     458     380     458     415     460     470     462     535     476     580
GR     478     660     480     661

X1  113.65      11     295     480     150     150     150
GR     480     100     470     165     468     200     462     275     460     295
GR     459     335     459     359     460     370     462     480     474     525
GR     480     526

X1  115.15      10     280     450     150     150     150
GR     480     100     470     145     468     180     466     195     462     280
GR     460     300     460     350     462     450     470     475     480     476

X1  116.45      10     350     445     130     130     130
GR     480     100     470     170     468     195     464     280     461     350
GR     460     405     460     440     462     445     468     475     480     476

X1  117.60      10     310     395     115     115     115
GR     480     100     472     125     468     160     466     250     462     310
GR     461     340     461     370     462     395     472     435     480     436

X1  118.50      11     275     390      90      90      90
GR     480     100     472     125     468     175     468     250     466     275
GR     462     295     461     360     461     390     462     415     466     430
GR     480     460
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

 *PROF  1

 CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
0

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
      .000     14.02    303.02    303.02    294.00    309.99      6.98       .00       .00    305.00
    52250.        0.    52250.        0.        0.     2465.        0.        0.        0.    305.00
       .00       .00     21.20       .00      .000      .055      .000      .000    289.00    100.12
   .022060        0.        0.        0.         0        16         0       .00    176.75    276.88
0
 *SECNO 1.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.23

     1.500     23.79    309.79    302.19       .00    311.27      1.49       .73       .55    292.00
    52250.    14192.    27255.    10803.     1522.     2822.     1016.       13.        1.    286.00
       .00      9.32      9.66     10.64      .040      .055      .040      .000    286.00    130.64
   .002114      100.      150.      200.         3         8         0       .00    330.78    461.43
0
 *SECNO 3.000
     3.000     23.91    309.91    303.33       .00    311.74      1.83       .37       .10    292.00
    52250.    14661.    31495.     6094.     1351.     2839.      645.       31.        2.    290.00
       .01     10.86     11.09      9.45      .040      .055      .040      .000    286.00    120.17
   .002775      150.      150.      160.         3        19         0       .00    299.74    419.91
0
 *SECNO 7.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .61

     7.500     22.20    310.20    307.75       .00    314.39      4.19      1.94       .71    290.00
    52250.     2994.    36303.    12952.      238.     2101.      884.       73.        5.    292.00
       .02     12.58     17.28     14.65      .040      .055      .040      .000    288.00    111.43
   .007575      400.      450.      500.         3        15         0       .00    244.21    355.64
0
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST
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*SECNO 14.500

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.55

    14.500     25.91    315.91    309.58       .00    317.87      1.95      3.25       .22    306.00
    52250.    10090.    38861.     3300.     1041.     3307.      372.      136.        9.    296.00
       .03      9.69     11.75      8.88      .040      .055      .040      .000    290.00    105.11
   .003149      750.      700.      650.         3        15         0       .00    292.23    397.34
0
*SECNO 20.500

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .62

    20.500     22.78    316.78    313.79       .00    321.60      4.82      2.88       .86    300.00
    52250.     2251.    43816.     6184.      188.     2424.      388.      189.       12.    300.00
       .04     11.98     18.07     15.93      .040      .055      .040      .000    294.00    117.62
   .008206      550.      600.      650.         3        15         0       .00    182.56    300.18
0
*SECNO 28.000
    28.000     22.71    322.71    319.99       .00    327.99      5.28      6.25       .14    300.00
    52250.     4303.    39188.     8759.      301.     2048.      516.      240.       15.    304.00
       .05     14.30     19.14     16.96      .040      .055      .040      .000    300.00    108.50
   .008377      700.      750.      800.         3        11         0       .00    173.29    281.79
0
*SECNO 35.000

3301 HV CHANGED MORE THAN HVINS

    35.000     21.02    329.02    327.90       .00    335.48      6.46      7.13       .35    310.00
    52250.     5057.    43330.     3863.      301.     2052.      241.      284.       18.    310.00
       .06     16.77     21.11     16.02      .040      .055      .040      .000    308.00    118.30
   .012419      700.      700.      750.         2        11         0       .00    167.06    285.36
0
1
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*SECNO 43.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    43.000     17.21    353.21    353.21       .00    360.00      6.78     11.08       .10    340.00
    52250.     3387.    45411.     3451.      218.     2108.      210.      331.       21.    338.00
       .07     15.52     21.54     16.40      .040      .055      .040      .000    336.00    116.96
   .015537      800.      800.      800.         0        15         0       .00    190.70    307.66
0
*SECNO 48.500

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    48.500     33.28    377.28    377.28       .00    388.31     11.03      7.25      1.27    344.00
    52250.    18657.    24757.     8836.      737.      832.      462.      360.       23.    344.00
       .08     25.31     29.75     19.14      .040      .055      .040      .000    344.00    103.17
   .011323      550.      550.      550.         0        17         0       .00     94.57    197.74
0
*SECNO 54.250

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    54.250     23.64    393.64    393.64       .00    401.79      8.16      5.41       .29    380.00
    52250.     1981.    47498.     2771.      139.     2014.      186.      382.       24.    380.00
       .09     14.20     23.59     14.90      .040      .055      .040      .000    370.00    109.55
   .014444      425.      425.      425.         0        19         0       .00    147.73    257.27
0
*SECNO 59.500

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    59.500     21.59    413.59    413.59       .00    421.20      7.62      7.54       .05    400.00
    52250.     2729.    46406.     3115.      185.     2027.      208.      410.       26.    400.00
       .09     14.79     22.90     15.00      .040      .055      .040      .000    392.00    112.83
   .014284      525.      525.      525.         0        11         0       .00    162.74    275.57
0
1
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST
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 *SECNO 65.200

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    65.200     23.21   435.21    435.21      .00    443.95      8.75      8.10       .34    414.00
    52250.     9004.   41152.     2094.     360.     1728.      145.      441.       28.    420.00
       .10     25.02    23.82     14.49     .040      .055      .040      .000    412.00    118.59
   .014148      570.     570.      570.        0         8         0       .00    130.41    249.01
0
 *SECNO 77.000

 3301 HV CHANGED MORE THAN HVINS

    77.000     19.58   453.58    451.89      .00    458.91      5.33     14.62       .34    440.00
    52250.     1705.   47043.     3502.     138.     2471.      261.      510.       33.    440.00
       .12     12.33    19.03     13.40     .040      .055      .040      .000    434.00    124.63
   .010939     1180.    1180.     1180.        2        15         0       .00    198.86    323.48
0
 *SECNO 86.000

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.85

    86.000     21.70   461.70    455.76      .00    462.36       .66      2.97       .47    450.00
    41800.     2415.   17644.    21741.     423.     2997.     3082.      583.       39.    450.00
       .15      5.70     5.89      7.05     .040      .080      .040      .000    440.00    224.54
   .002055      900.     700.      600.        3        14         0       .00    634.70    859.24
0
 *SECNO 91.000

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .51

    91.000     20.47   462.47    457.37      .00    464.52      2.06      1.75       .42    450.00
    41800.     7043.   32172.     2585.     566.     2833.      239.      639.       44.    450.00
       .16     12.43    11.36     10.81     .040      .080      .040      .000    442.00    135.06
   .007883      500.     500.      450.        2        19         0       .00    273.31    408.37
0
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


 *SECNO 93.500

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.42

    93.500     20.79   464.79    457.44      .00    465.96      1.17      1.35       .09    448.00
    41800.    11279.   26542.     3979.    1101.     3190.      689.      663.       46.    450.00
       .17     10.24     8.32      5.78     .040      .080      .040      .000    444.00    137.81
   .003882      290.     250.      160.        3        14         0       .00    562.54    700.35
0
 *SECNO 96.100
    96.100     20.99   465.99    460.84      .00    467.05      1.05      1.07       .01    454.00
    41800.    11258.   26866.     3677.    1235.     3391.      477.      694.       49.    456.00
       .17      9.12     7.92      7.70     .040      .080      .040      .000    445.00    128.01
   .004221      290.     260.      230.        2        19         0       .00    477.92    605.93
0
 *SECNO 97.000

 3301 HV CHANGED MORE THAN HVINS

    97.000     19.98   465.98    463.08      .00    467.80      1.82       .53       .23    456.00
    41800.     9527.   24469.     7803.     917.     2478.      565.      704.       50.    450.00
       .18     10.38     9.88     13.81     .040      .080      .040      .000    446.00    135.19
   .007742      110.      90.       85.        2        15         0       .00    436.72    571.90
0
 *SECNO 97.600
    97.600     20.53   466.53    463.36      .00    468.28      1.74       .47       .01    456.00
    41800.    14724.   25889.     1187.    1264.     2553.      216.      709.       51.    448.00
       .18     11.65    10.14      5.50     .040      .080      .040      .000    446.00    149.49
   .007773       60.      60.       60.        2        15         0       .00    461.62    611.12
0
 *SECNO 98.400

 3265 DIVIDED FLOW

1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST
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 3301 HV CHANGED MORE THAN HVINS

   98.400     18.91    465.91    461.82       .00    469.15      3.24       .42       .45    468.00
   41800.        0.    41800.        0.        0.     2895.        0.      712.       51.    468.00
      .18       .00     14.44       .00      .000      .060      .000      .000    447.00    100.01
  .015101       40.       40.       40.         3        19         0       .00    184.33    301.99
0
 *SECNO 98.780

 3265 DIVIDED FLOW

   98.780     19.82    466.82    461.82       .00    469.71      2.89       .53       .03    468.00
   41800.        0.    41800.        0.        0.     3063.        0.      715.       51.    468.00
      .18       .00     13.65       .00      .000      .060      .000      .000    447.00    100.01
  .012832       38.       38.       38.         2        15         0       .00    184.36    301.99
0
 *SECNO 99.330

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.80

   99.330     20.56    468.56    461.18       .00    470.20      1.64       .36       .13    448.00
   41800.    12035.    20047.     9718.      919.     2981.      797.      720.       52.    448.00
      .18     13.10      6.72     12.19      .041      .100      .042      .000    448.00    429.44
  .003981       55.       55.       55.         3        14         0       .00    334.45    763.89
0
 *SECNO 100.400

 3301 HV CHANGED MORE THAN HVINS

  100.400     19.71    469.71    463.55       .00    470.55       .84       .28       .08    450.00
   41800.    21006.    13771.     7023.     2645.     2749.      764.      732.       53.    450.00
      .19      7.94      5.01      9.20      .041      .100      .042      .000    450.00    203.92
  .002251       70.      107.      120.         2        21         0       .00    550.12    754.05
0
1
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 102.000
  102.000     16.96    469.96    463.33       .00    470.85       .89       .28       .02    454.00
   41800.    23628.    14916.     3257.     2662.     3092.      418.      750.       54.    454.00
      .19      8.88      4.82      7.79      .041      .100      .042      .000    453.00    204.30
  .002556       80.      160.      160.         2        11         0       .00    515.60    719.89
0
 *SECNO 103.600
  103.600     16.31    470.31    464.35       .00    471.28       .97       .41       .02    456.00
   41800.    21454.    16662.     3684.     2267.     3191.      469.      770.       56.    456.00
      .19      9.46      5.22      7.85      .041      .100      .042      .000    454.00    220.54
  .003282      130.      160.      130.         2        14         0       .00    555.43    775.96
0
 *SECNO 104.950
  104.950     15.78    470.78    465.04       .00    471.77       .98       .48       .00    458.00
   41800.    18040.    18845.     4915.     1875.     3422.      546.      788.       58.    456.00
      .20      9.62      5.51      9.00      .041      .100      .042      .000    455.00    265.87
  .003864      135.      135.      135.         2        14         0       .00    576.09    841.96
0
 *SECNO 106.100
  106.100     15.85    470.85    466.52       .00    472.28      1.43       .38       .14    456.00
   41800.    36184.     4235.     1381.     3583.      852.      207.      802.       59.    456.00
      .20     10.10      4.97      6.68      .041      .100      .042      .000    455.00    241.62
  .002903      115.      115.      115.         2        19         0       .00    481.23    722.85
0
 *SECNO 107.900

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .61

  107.900     15.33    471.33    467.16       .00    473.15      1.82       .75       .12    456.00
   41800.    19706.    20866.     1228.     1494.     2591.      127.      819.       61.    458.00
      .21     13.19      8.05      9.68      .041      .100      .042      .000    456.00    134.69
  .007781      160.      180.      190.         2        15         0       .00    394.35    529.04
0
 *SECNO 109.400
  109.400     15.56    472.56    468.26       .00    474.34      1.78      1.19       .00    460.00
   41800.    17959.    22485.     1357.     1339.     2808.      145.      834.       62.    460.00
      .21     13.41      8.01      9.39      .041      .100      .042      .000    457.00    121.71
  .008033      150.      150.      150.         3        19         0       .00    398.36    520.07
0
1
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 110.650
```

```
  110.650      16.54    473.54    468.81       .00    475.18      1.64       .83       .01    458.00
   41800.     19551.    19507.     2742.     1537.     2808.      257.      847.       63.    460.00
      .21      12.72      6.95     10.67      .041      .100      .042      .000    457.00    125.82
  .005609       125.      125.      125.         0        15         0       .00    384.54    510.35
0
 *SECNO 112.150
  112.150      16.45    474.45    470.30       .00    476.15      1.70       .95       .02    460.00
   41800.     18816.    20528.     2456.     1457.     2686.      249.      862.       65.    462.00
      .22      12.91      7.64      9.86      .044      .100      .042      .000    458.00    163.81
  .007205       150.      150.      150.         2        15         0       .00    411.21    575.02
0
 *SECNO 113.650
  113.650      16.61    475.61    470.76       .00    477.17      1.56      1.01       .01    460.00
   41800.     17651.    20515.     3633.     1421.     2827.      343.      877.       66.    462.00
      .22      12.42      7.26     10.60      .044      .100      .042      .000    459.00    128.54
  .006290       150.      150.      150.         2        19         0       .00    396.73    525.27
0
 *SECNO 115.150
  115.150      16.44    476.44    471.28       .00    478.12      1.68       .91       .03    462.00
   41800.     19401.    19123.     3276.     1553.     2675.      263.      893.       67.    462.00
      .23      12.49      7.15     12.45      .044      .100      .042      .000    460.00    116.01
  .005873       150.      150.      150.         2        19         0       .00    359.63    475.64
0
 *SECNO 116.450
  116.450      17.07    477.07    472.41       .00    478.81      1.74       .68       .02    461.00
   41800.     27504.    10483.     3813.     2339.     1590.      366.      906.       68.    462.00
      .23      11.76      6.59     10.43      .044      .100      .042      .000    460.00    120.48
  .004626       130.      130.      130.         2        15         0       .00    355.28    475.76
0
 *SECNO 117.600
  117.600      16.38    477.38    473.72       .00    479.55      2.17       .61       .13    462.00
   41800.     26393.    10063.     5344.     2041.     1365.      417.      917.       69.    462.00
      .23      12.93      7.37     12.82      .044      .100      .042      .000    461.00    108.19
  .006080       115.      115.      115.         2        19         0       .00    327.48    435.67
0
1
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


 *SECNO 118.500
  118.500      17.10    478.10    474.52       .00    480.09      1.99       .52       .02    466.00
   41800.     16831.    13349.    11620.     1499.     1874.      784.      925.       70.    461.00
      .24      11.23      7.12     14.83      .044      .100      .042      .000    461.00    105.93
  .005584        90.       90.       90.         2        15         0       .00    350.00    455.93
0
1
```


THIS RUN EXECUTED 6/14/90 6:16:15

```
*******************************************************
  HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

  ERROR CORR -   01,02,03
  MODIFICATION -
*******************************************************
```

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

MALIBU CREEK (F)

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	289.00	52250.00	303.02	303.02	309.99	220.60	21.20	2465.07	3517.92
*	1.500	150.00	.00	.00	286.00	52250.00	309.79	302.19	311.27	21.14	9.66	5359.83	11364.69
	3.000	150.00	.00	.00	286.00	52250.00	309.91	303.33	311.74	27.75	11.09	4834.21	9917.97
*	7.500	450.00	.00	.00	288.00	52250.00	310.20	307.75	314.39	75.75	17.28	3223.40	6003.20
*	14.500	700.00	.00	.00	290.00	52250.00	315.91	309.58	317.87	31.49	11.75	4719.38	9310.74
*	20.500	600.00	.00	.00	294.00	52250.00	316.78	313.79	321.60	82.06	18.07	3000.50	5767.77
	28.000	750.00	.00	.00	300.00	52250.00	322.71	319.99	327.99	83.77	19.14	2865.16	5708.79
	35.000	700.00	.00	.00	308.00	52250.00	329.02	327.90	335.48	124.19	21.11	2594.85	4688.58
*	43.000	800.00	.00	.00	336.00	52250.00	353.21	353.21	360.00	155.37	21.54	2536.54	4191.79
*	48.500	550.00	.00	.00	344.00	52250.00	377.28	377.28	388.31	113.23	29.75	2030.83	4910.33
*	54.250	425.00	.00	.00	370.00	52250.00	393.64	393.64	401.79	144.44	23.59	2338.98	4347.56
*	59.500	525.00	.00	.00	392.00	52250.00	413.59	413.59	421.20	142.84	22.90	2418.82	4371.75

*	65.200	570.00	.00	.00	412.00	52250.00	435.21	435.21	443.95	141.48	23.82	2231.97	4392.72
	77.000	1180.00	.00	.00	434.00	52250.00	453.58	451.89	458.91	109.39	19.03	2871.15	4995.68
*	86.000	700.00	.00	.00	440.00	41800.00	461.70	455.76	462.36	20.55	5.89	6501.96	9220.62
*	91.000	500.00	.00	.00	442.00	41800.00	462.47	457.37	464.52	78.83	11.36	3638.53	4708.05
*	93.500	250.00	.00	.00	444.00	41800.00	464.79	457.44	465.96	38.82	8.32	4980.46	6708.59

1
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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	96.100	260.00	.00	.00	445.00	41800.00	465.99	460.84	467.05	42.21	7.92	5103.38	6433.84
	97.000	90.00	.00	.00	446.00	41800.00	465.98	463.08	467.80	77.42	9.88	3960.05	4750.72
	97.600	60.00	.00	.00	446.00	41800.00	466.53	463.36	468.28	77.73	10.14	4033.01	4741.27
	98.400	40.00	.00	.00	447.00	41800.00	465.91	461.82	469.15	151.01	14.44	2894.65	3401.51
	98.780	38.00	.00	.00	447.00	41800.00	466.82	461.82	469.71	128.32	13.65	3063.24	3690.03
*	99.330	55.00	.00	.00	448.00	41800.00	468.56	461.18	470.20	39.81	6.72	4697.03	6624.67
	100.400	107.00	.00	.00	450.00	41800.00	469.71	463.55	470.55	22.51	5.01	6157.28	8810.81
	102.000	160.00	.00	.00	453.00	41800.00	469.96	463.33	470.85	25.56	4.82	6172.06	8268.47
	103.600	160.00	.00	.00	454.00	41800.00	470.31	464.35	471.28	32.82	5.22	5927.59	7296.13
	104.950	135.00	.00	.00	455.00	41800.00	470.78	465.04	471.77	38.64	5.51	5843.31	6724.69
	106.100	115.00	.00	.00	455.00	41800.00	470.85	466.52	472.28	29.03	4.97	4642.16	7757.69
*	107.900	180.00	.00	.00	456.00	41800.00	471.33	467.16	473.15	77.81	8.05	4211.98	4738.77
	109.400	150.00	.00	.00	457.00	41800.00	472.56	468.26	474.34	80.33	8.01	4292.19	4663.73
	110.650	125.00	.00	.00	457.00	41800.00	473.54	468.81	475.18	56.09	6.95	4602.75	5581.38
	112.150	150.00	.00	.00	458.00	41800.00	474.45	470.30	476.15	72.05	7.64	4392.53	4924.59
	113.650	150.00	.00	.00	459.00	41800.00	475.61	470.76	477.17	62.90	7.26	4591.28	5270.49
	115.150	150.00	.00	.00	460.00	41800.00	476.44	471.28	478.12	58.73	7.15	4491.17	5454.24
	116.450	130.00	.00	.00	460.00	41800.00	477.07	472.41	478.81	46.26	6.59	4293.96	6145.55
	117.600	115.00	.00	.00	461.00	41800.00	477.38	473.72	479.55	60.80	7.37	3822.30	5360.84
	118.500	90.00	.00	.00	461.00	41800.00	478.10	474.52	480.09	55.84	7.12	4156.35	5593.65

1
6/14/90 6:16: 2 PAGE 16

MALIBU CREEK (F)

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	52250.00	303.02	.00	.00	9.02	176.75	.00
*	1.500	52250.00	309.79	.00	6.77	.00	330.78	150.00
	3.000	52250.00	309.91	.00	.13	.00	299.74	150.00
*	7.500	52250.00	310.20	.00	.29	.00	244.21	450.00
*	14.500	52250.00	315.91	.00	5.71	.00	292.23	700.00
*	20.500	52250.00	316.78	.00	.87	.00	182.56	600.00
	28.000	52250.00	322.71	.00	5.93	.00	173.29	750.00
	35.000	52250.00	329.02	.00	6.30	.00	167.06	700.00
*	43.000	52250.00	353.21	.00	24.20	.00	190.70	800.00
*	48.500	52250.00	377.28	.00	24.07	.00	94.57	550.00
*	54.250	52250.00	393.64	.00	16.35	.00	147.73	425.00
*	59.500	52250.00	413.59	.00	19.95	.00	162.74	525.00
*	65.200	52250.00	435.21	.00	21.62	.00	130.41	570.00
	77.000	52250.00	453.58	.00	18.38	.00	198.86	1180.00
*	86.000	41800.00	461.70	.00	8.11	.00	634.70	700.00
*	91.000	41800.00	462.47	.00	.77	.00	273.31	500.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	93.500	41800.00	464.79	.00	2.32	.00	562.54	250.00
	96.100	41800.00	465.99	.00	1.20	.00	477.92	260.00
	97.000	41800.00	465.98	.00	-.01	.00	436.72	90.00
	97.600	41800.00	466.53	.00	.55	.00	461.62	60.00
	98.400	41800.00	465.91	.00	-.62	.00	184.33	40.00
	98.780	41800.00	466.82	.00	.91	.00	184.36	38.00
*	99.330	41800.00	468.56	.00	1.74	.00	334.45	55.00
	100.400	41800.00	469.71	.00	1.16	.00	550.12	107.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	102.000	41800.00	469.96	.00	.24	.00	515.60	160.00
	103.600	41800.00	470.31	.00	.36	.00	555.43	160.00
	104.950	41800.00	470.78	.00	.47	.00	576.09	135.00
	106.100	41800.00	470.85	.00	.07	.00	481.23	115.00
*	107.900	41800.00	471.33	.00	.48	.00	394.35	180.00
	109.400	41800.00	472.56	.00	1.23	.00	398.36	150.00
	110.650	41800.00	473.54	.00	.99	.00	384.54	125.00
	112.150	41800.00	474.45	.00	.91	.00	411.21	150.00
	113.650	41800.00	475.61	.00	1.16	.00	396.73	150.00
	115.150	41800.00	476.44	.00	.83	.00	359.63	150.00
	116.450	41800.00	477.07	.00	.63	.00	355.28	130.00
	117.600	41800.00	477.38	.00	.30	.00	327.48	115.00
	118.500	41800.00	478.10	.00	.72	.00	350.00	90.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      .000  PROFILE=  1  CRITICAL DEPTH ASSUMED
WARNING SECNO=     1.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     7.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    14.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    20.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=    43.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    43.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    48.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    48.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    54.250  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    54.250  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    59.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    59.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    65.200  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    65.200  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=    86.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    91.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    93.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    99.330  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=   107.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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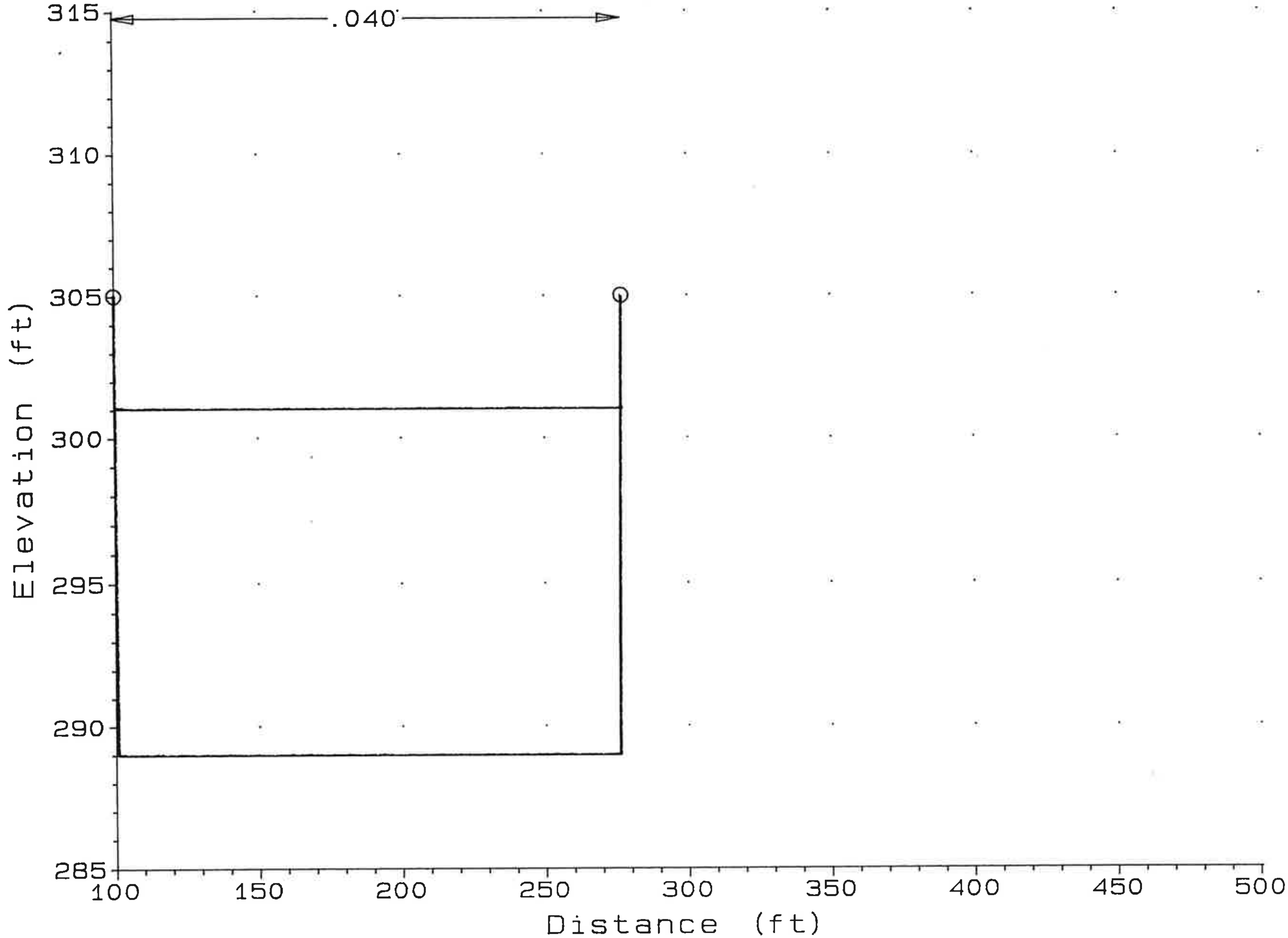
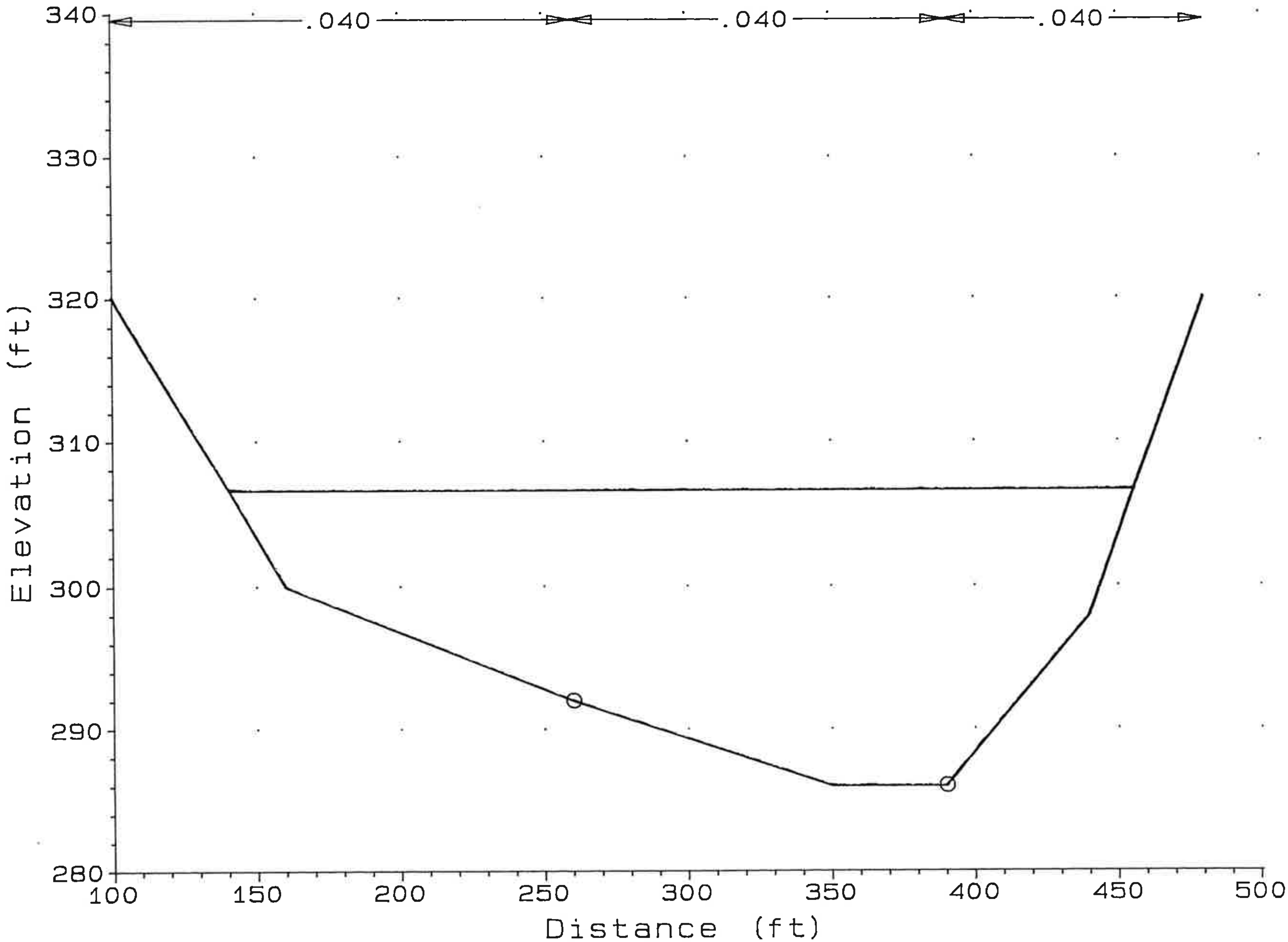
APPENDIX 3

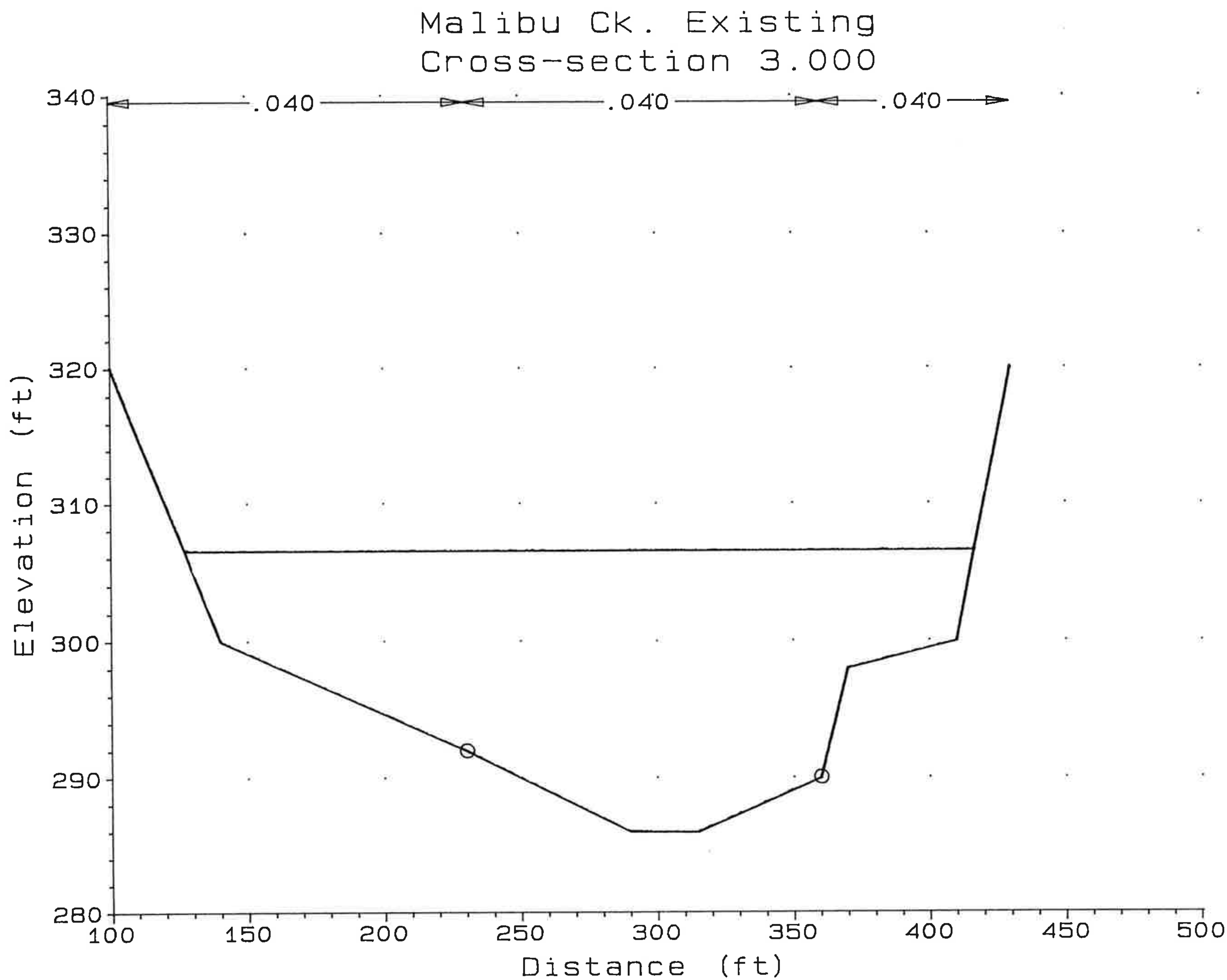
MALIBU CREEK
CROSS SECTION PLOTS FOR EXISTING CHANNEL CONDITION

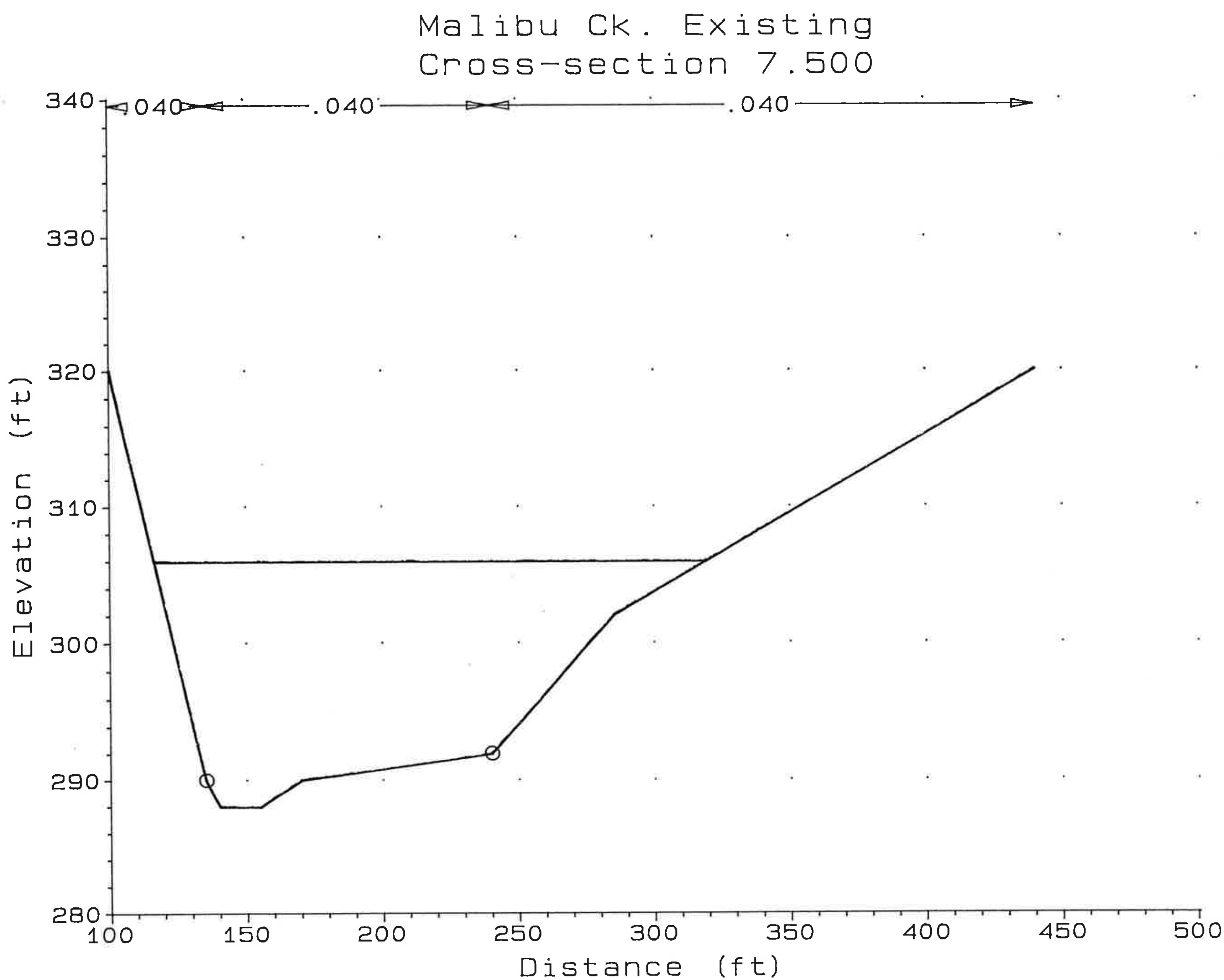
Malibu Ck. Existing
Cross-section .000



Malibu Ck. Existing
Cross-section 1.500

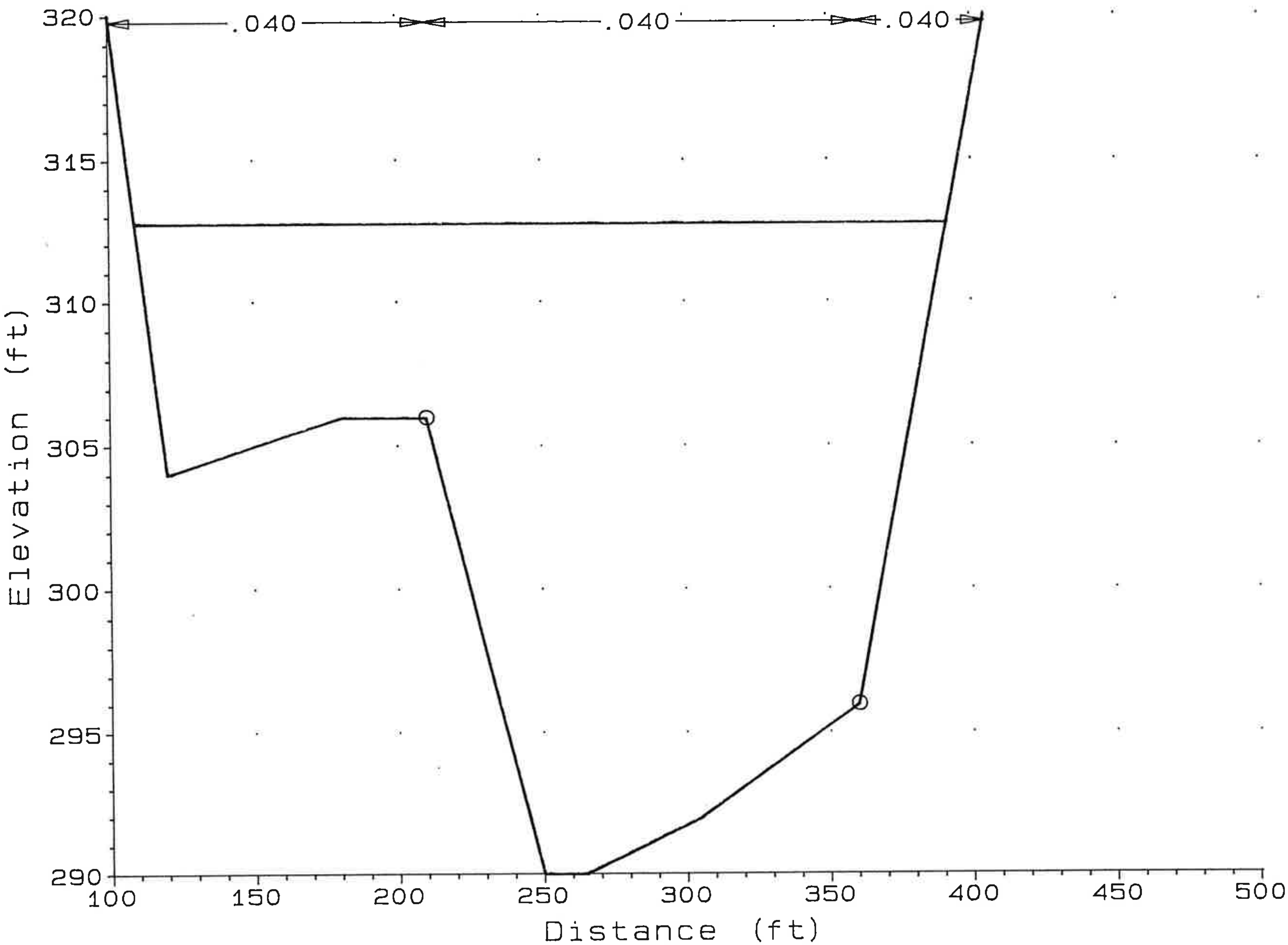


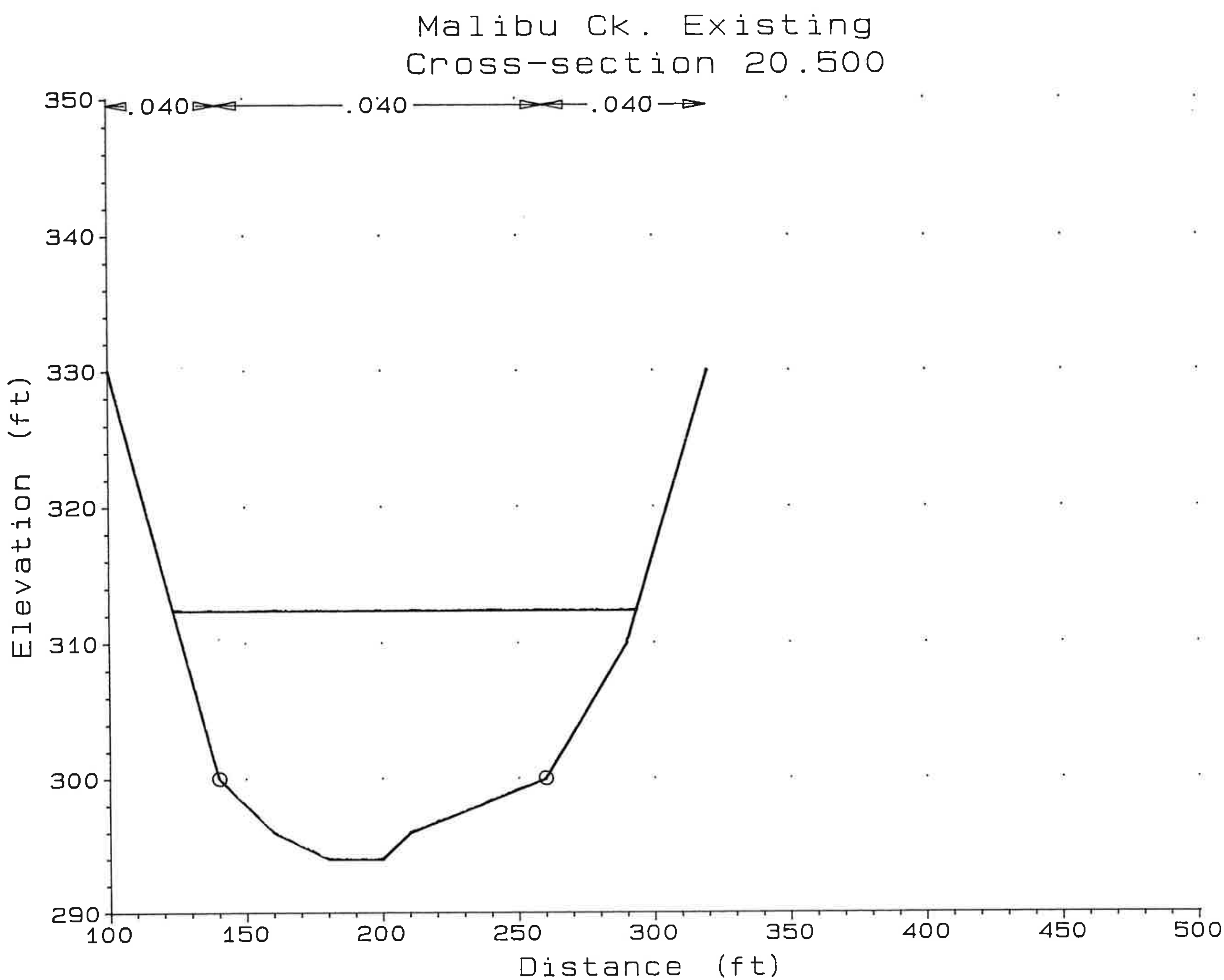

Malibu Ck. Existing
Cross-section 3.000
.040
.040
.040
340
330
320
310
300
290
280
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



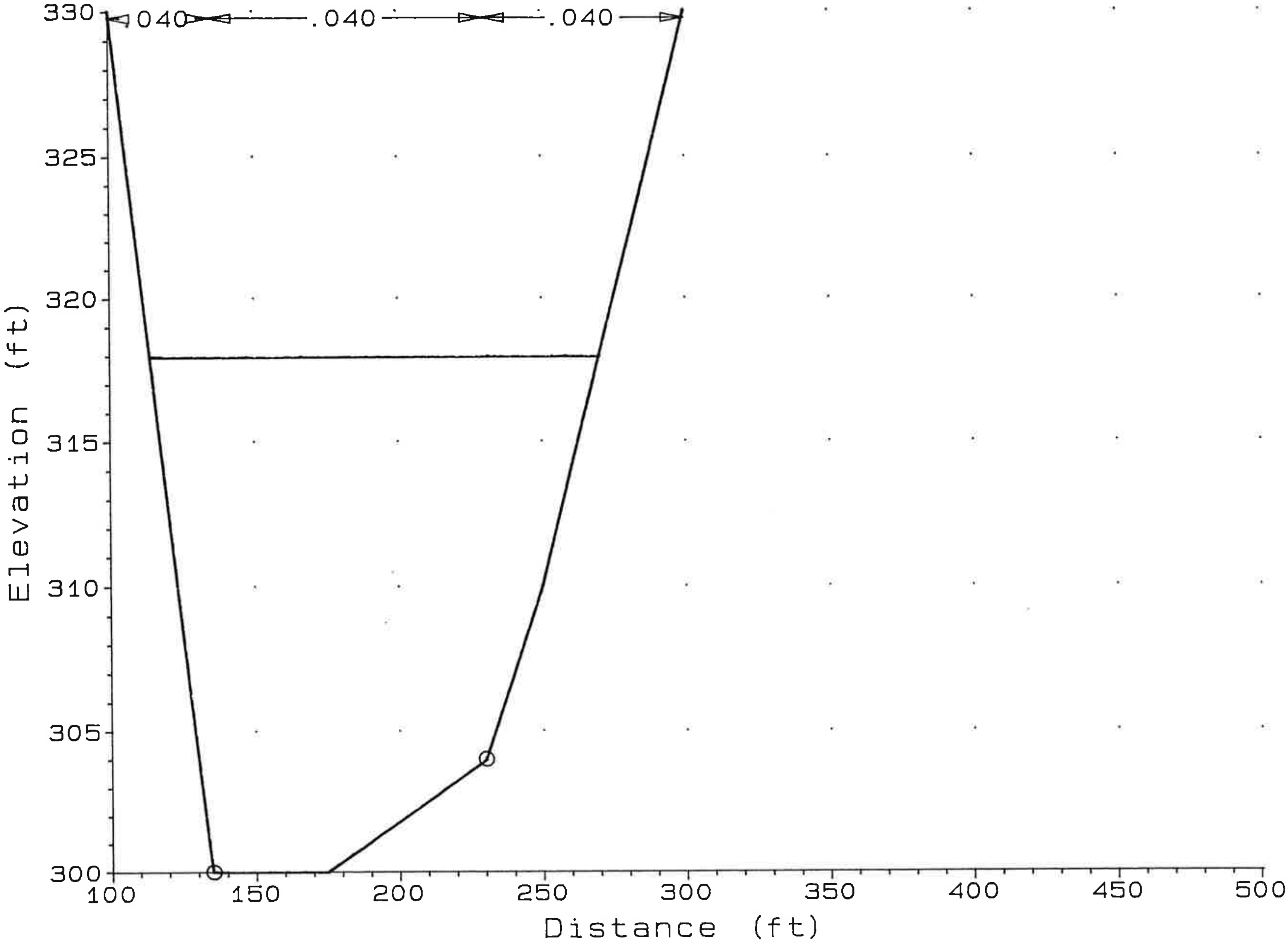
Malibu Ck. Existing
Cross-section 7.500
.040
.040
.040
Elevation (ft)
340
330
320
310
300
290
280
Distance (ft)
100
150
200
250
300
350
400
450
500

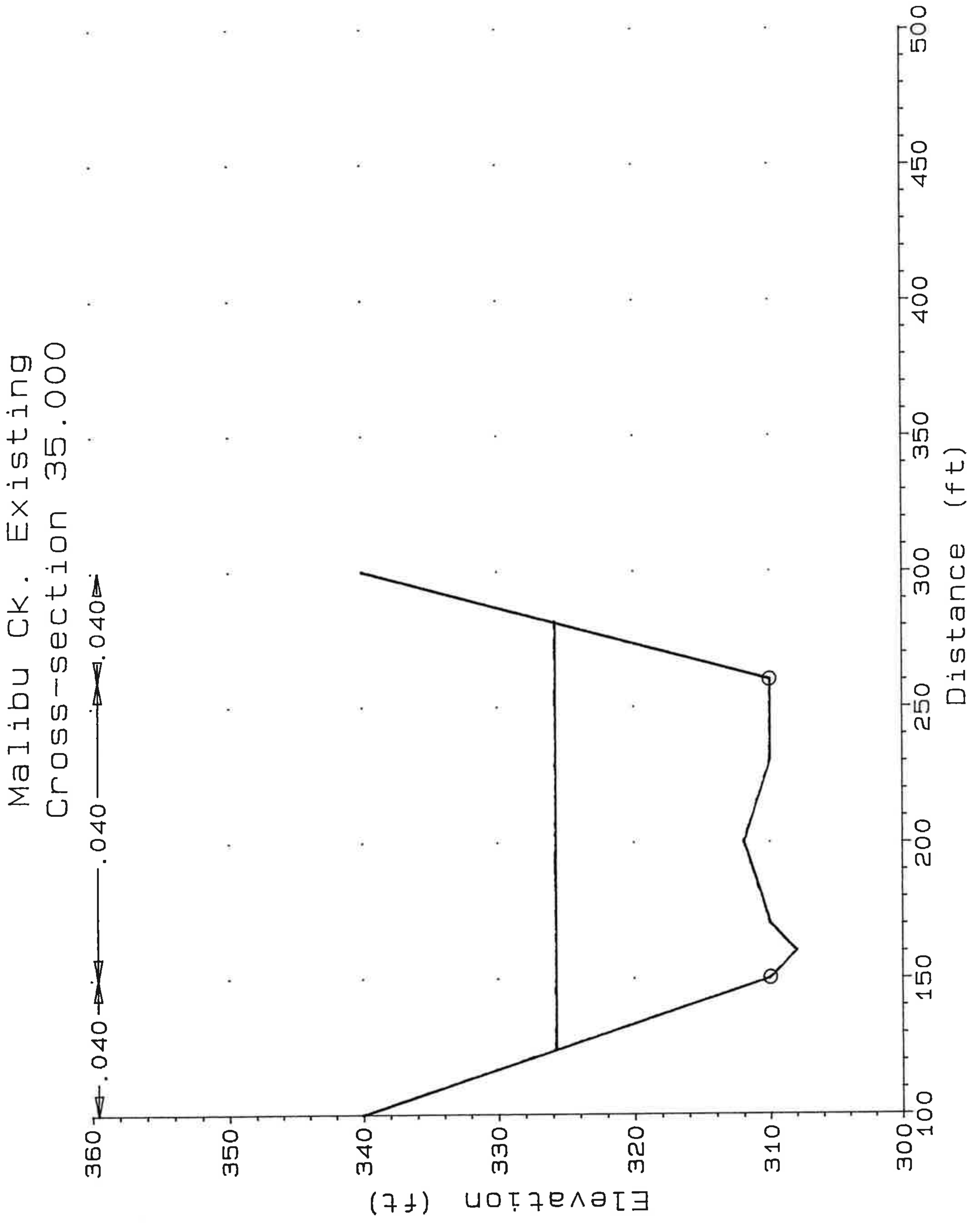
Malibu Ck. Existing
Cross-section 14.500



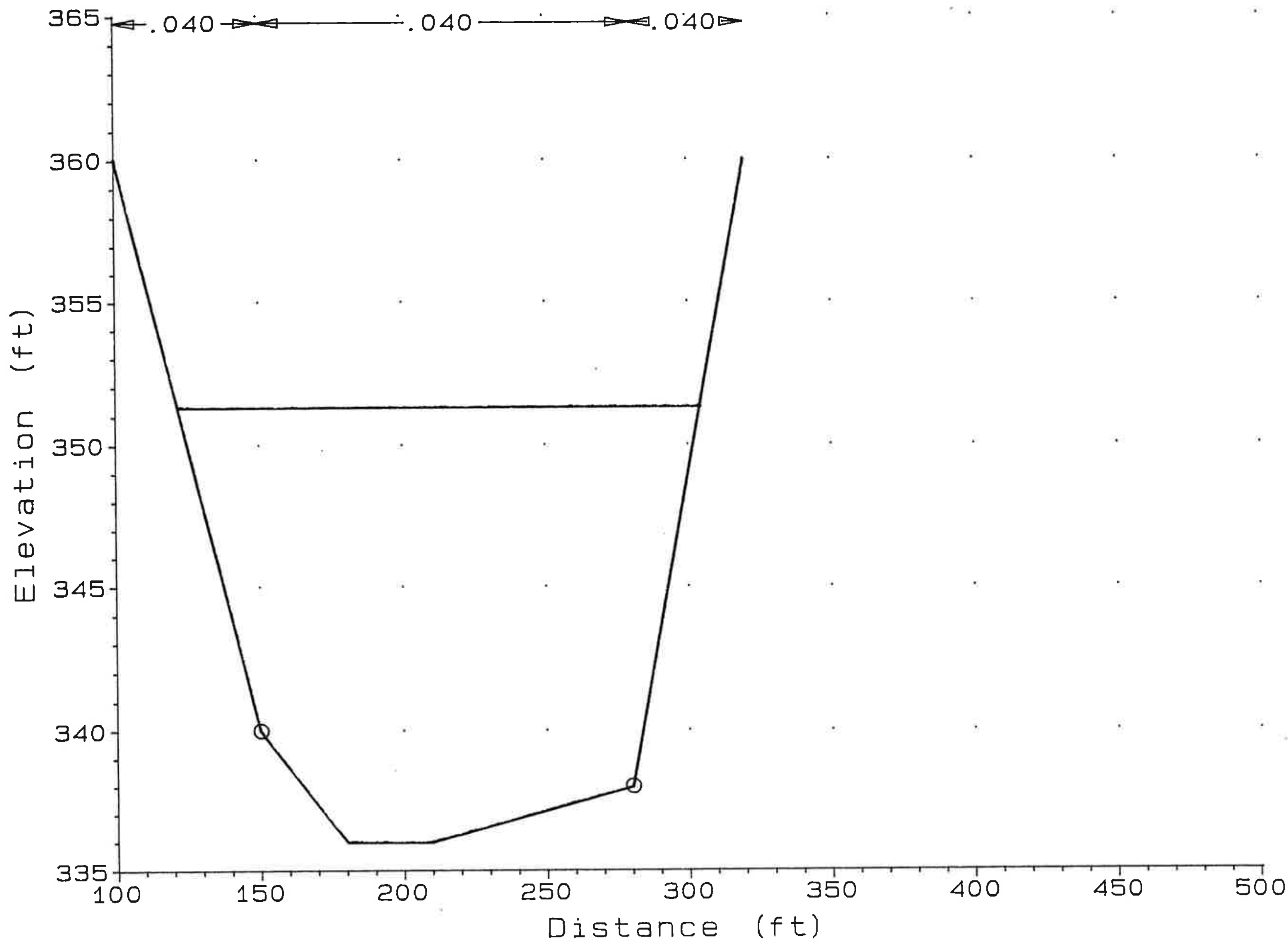

Malibu Ck. Existing
Cross-section 20.500
.040
.040
.040
350
340
330
320
310
300
290
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)

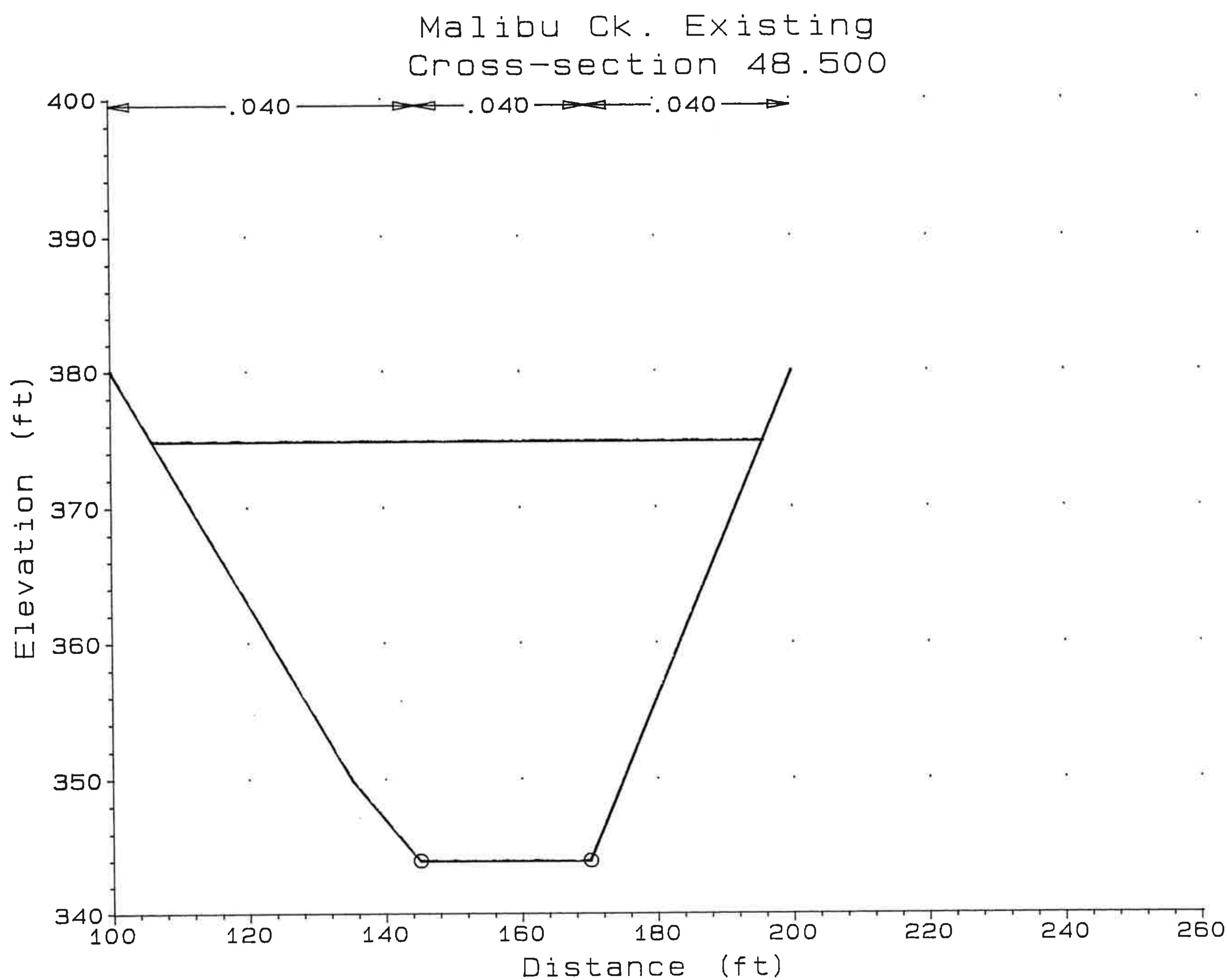
Malibu Ck. Existing
Cross-section 28.000

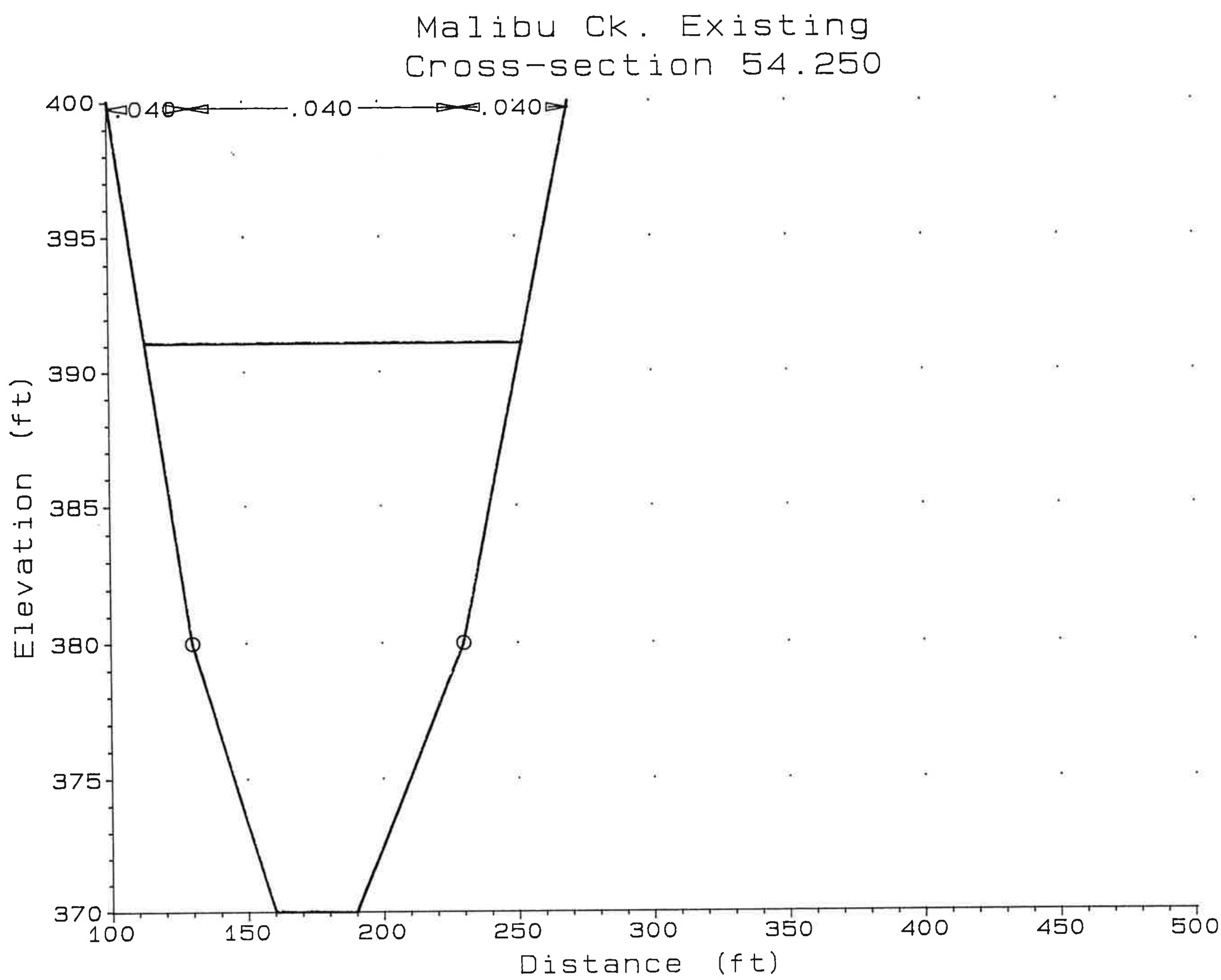


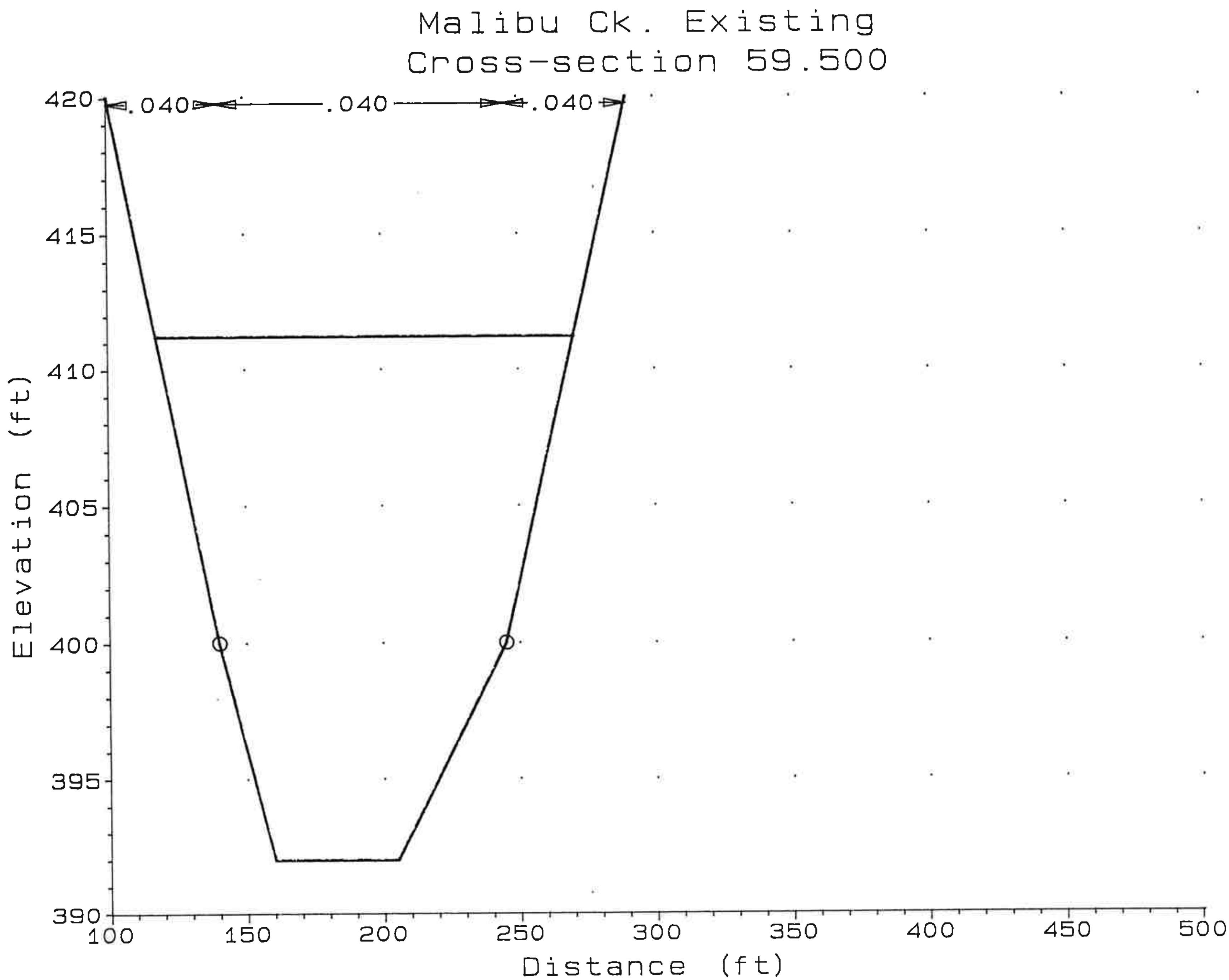

Malibu Ck. Existing
Cross-section 35.000
.040
.040
.040
Elevation (ft)
360
350
340
330
320
310
300
Distance (ft)
100
150
200
250
300
350
400
450
500

Malibu Ck. Existing
Cross-section 43.000

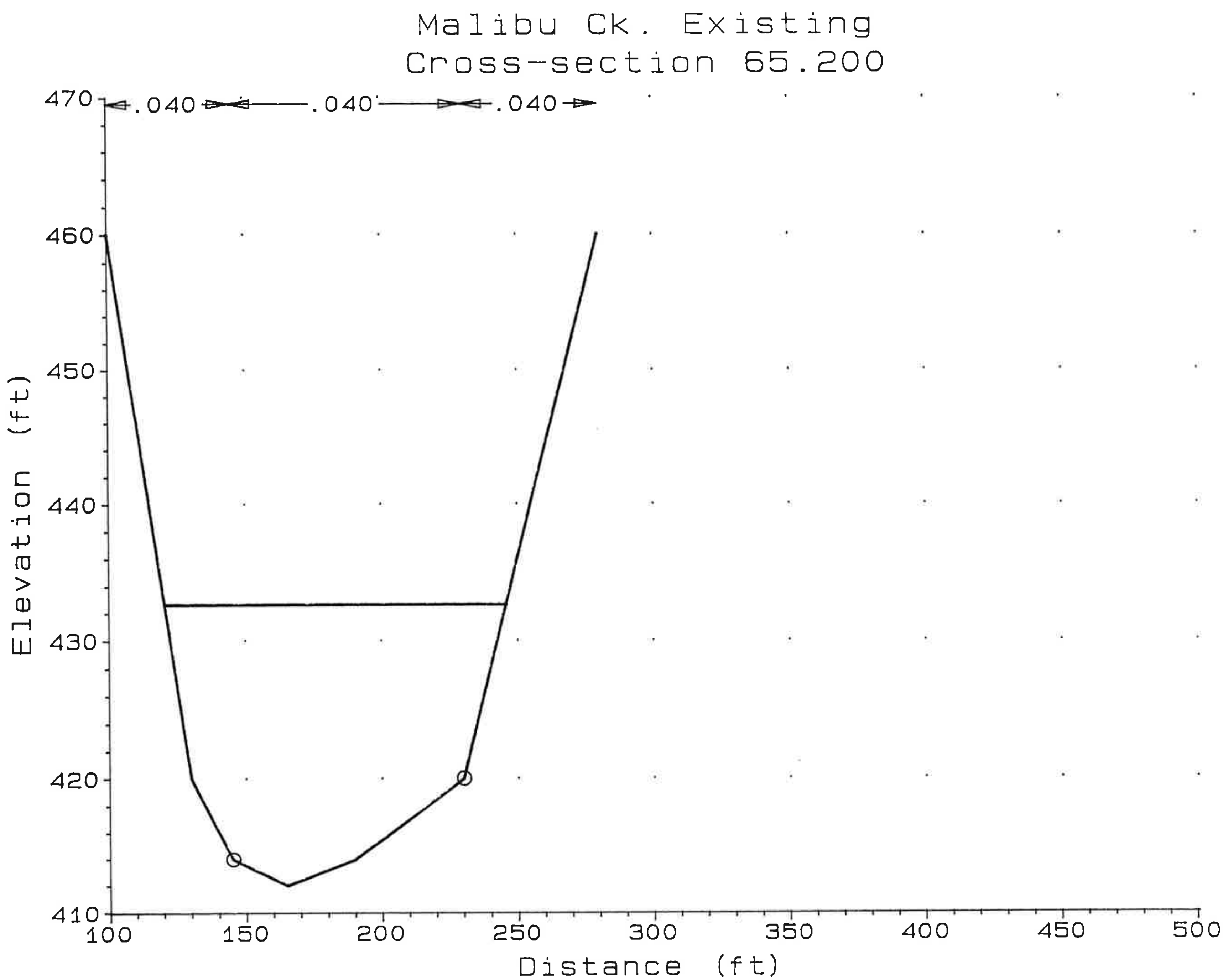



Malibu Ck. Existing
Cross-section 48.500
.040
.040
.040
400
390
380
370
360
350
340
Elevation (ft)
100
120
140
160
180
200
220
240
260
Distance (ft)

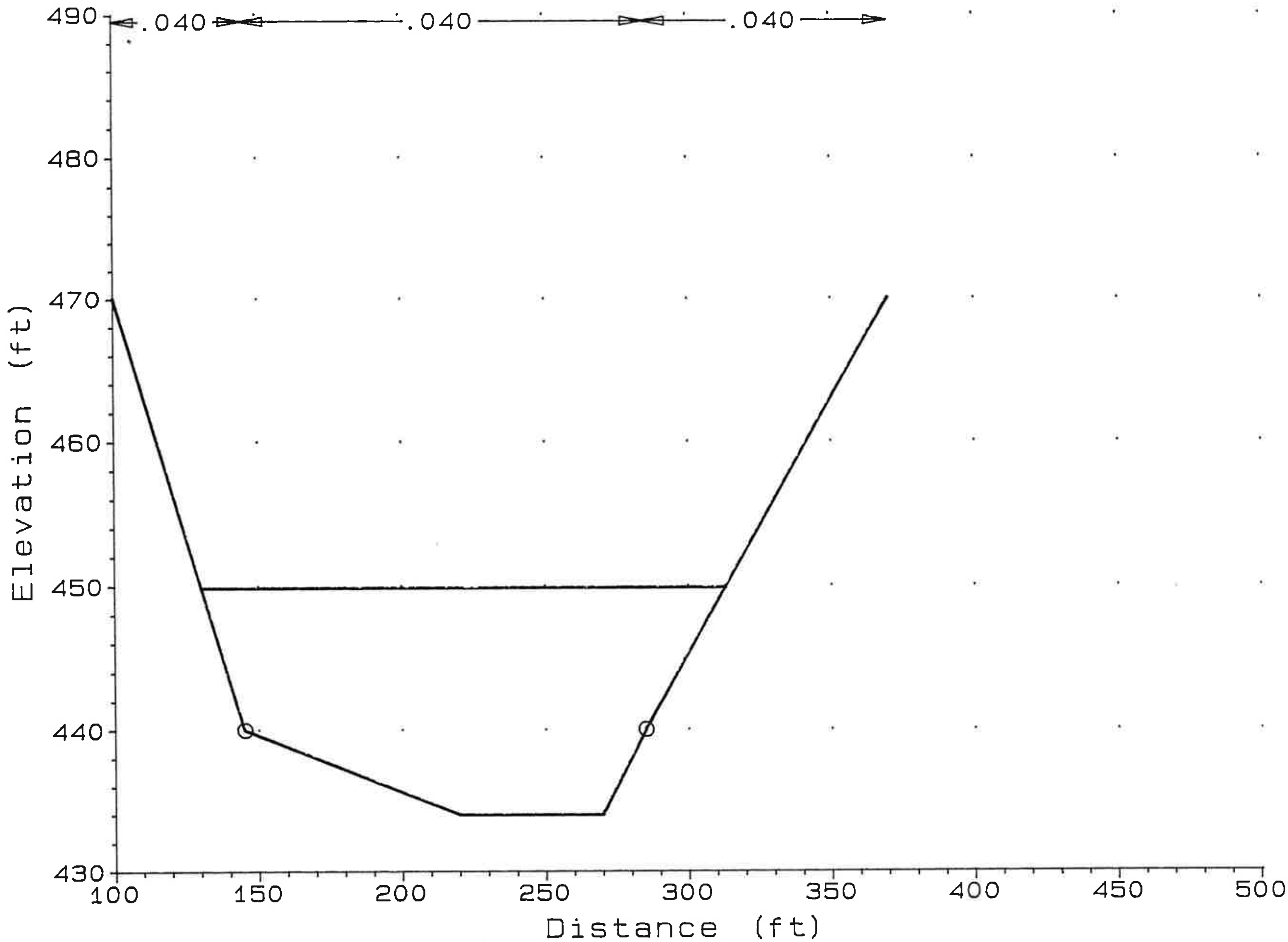

Malibu Ck. Existing
Cross-section 54.250
.040
.040
.040
400
395
390
385
380
375
370
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



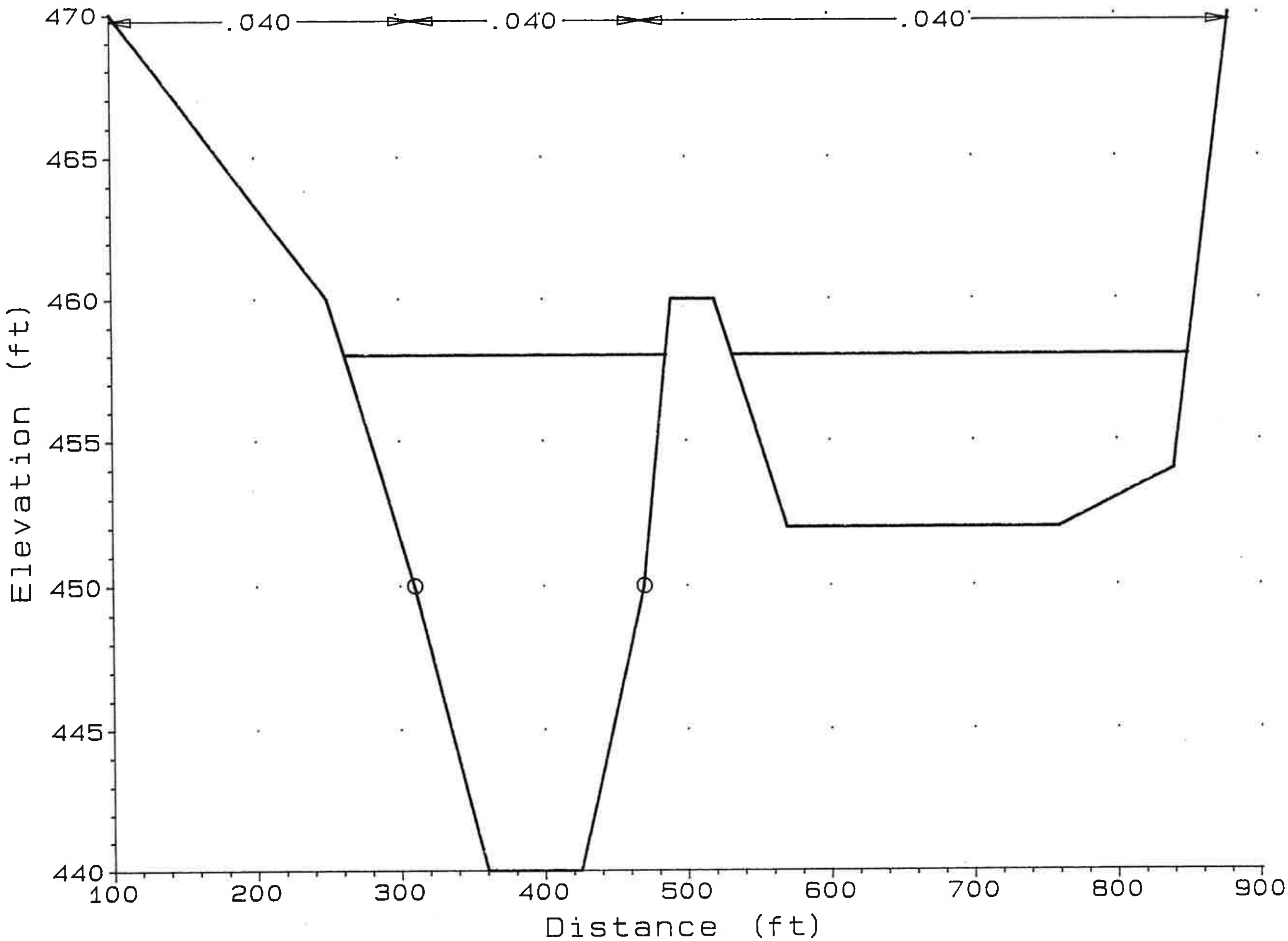
Malibu Ck. Existing
Cross-section 59.500
.040
.040
.040
420
415
410
405
400
395
390
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)

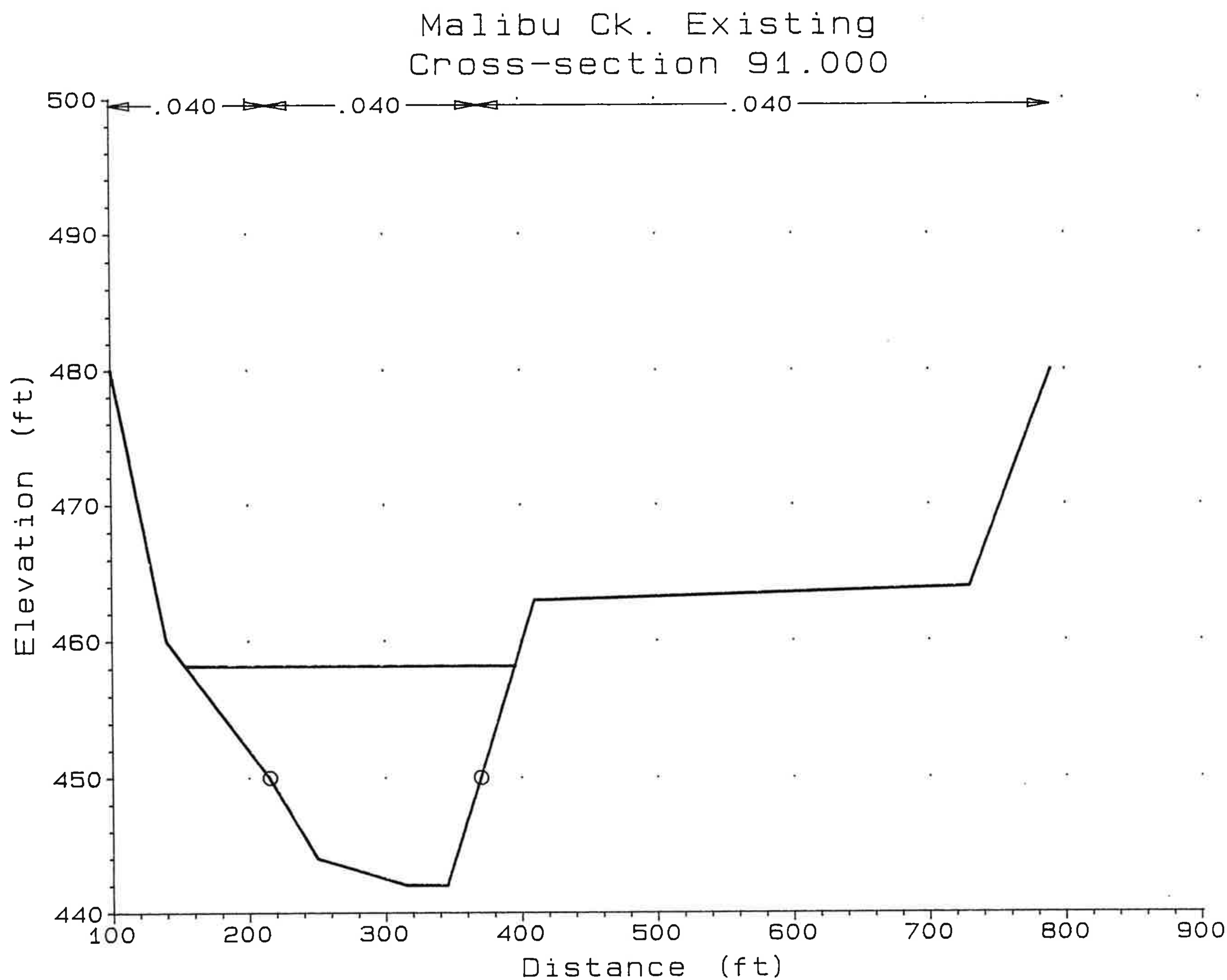

Malibu Ck. Existing
Cross-section 65.200
.040
.040
.040
470
460
450
440
430
420
410
100
150
200
250
300
350
400
450
500
Elevation (ft)
Distance (ft)

Malibu Ck. Existing
Cross-section 77.000



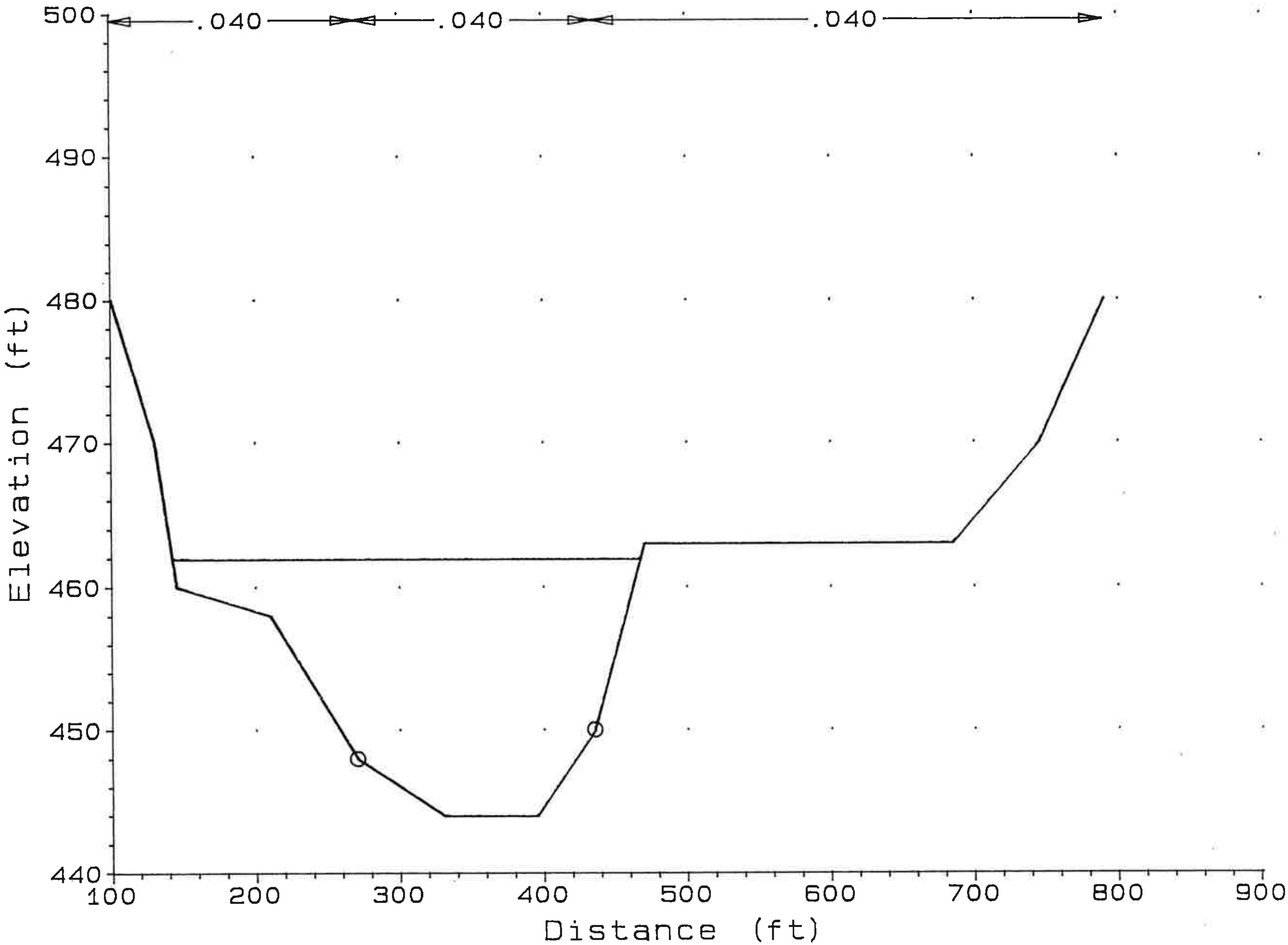
Malibu Ck. Existing
Cross-section 86.000

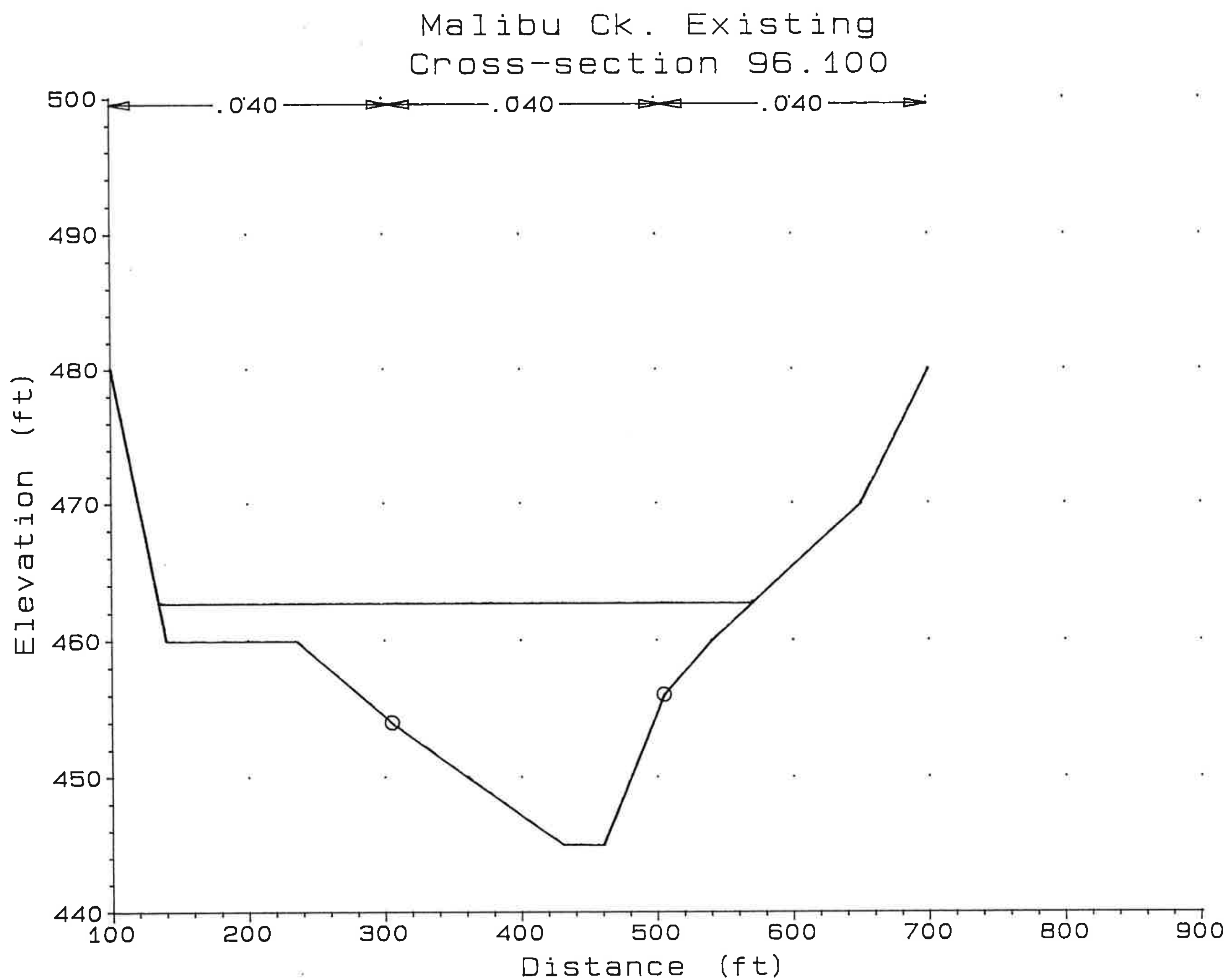




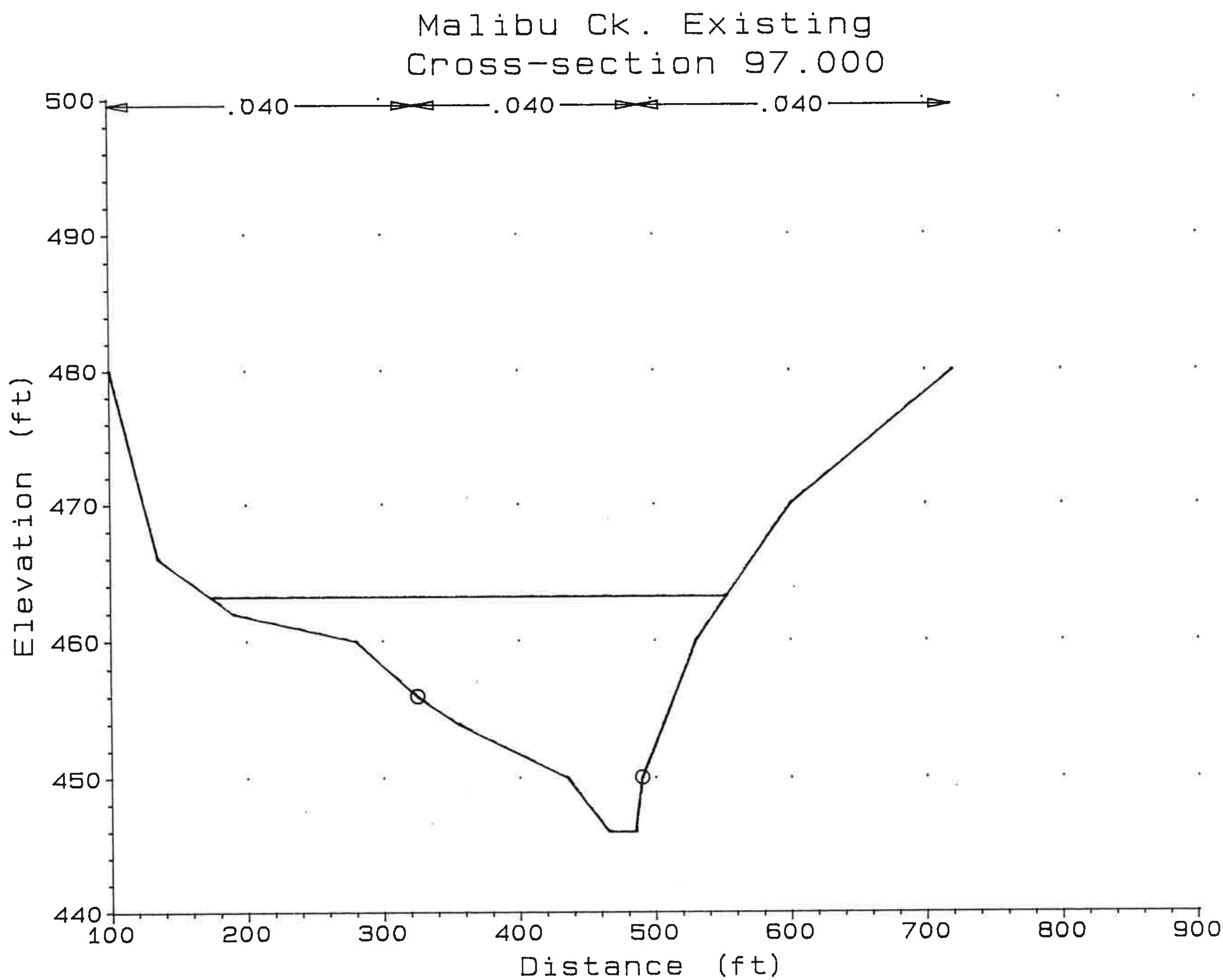
Malibu Ck. Existing
Cross-section 91.000
.040
.040
.040
Elevation (ft)
500
490
480
470
460
450
440
Distance (ft)
100
200
300
400
500
600
700
800
900

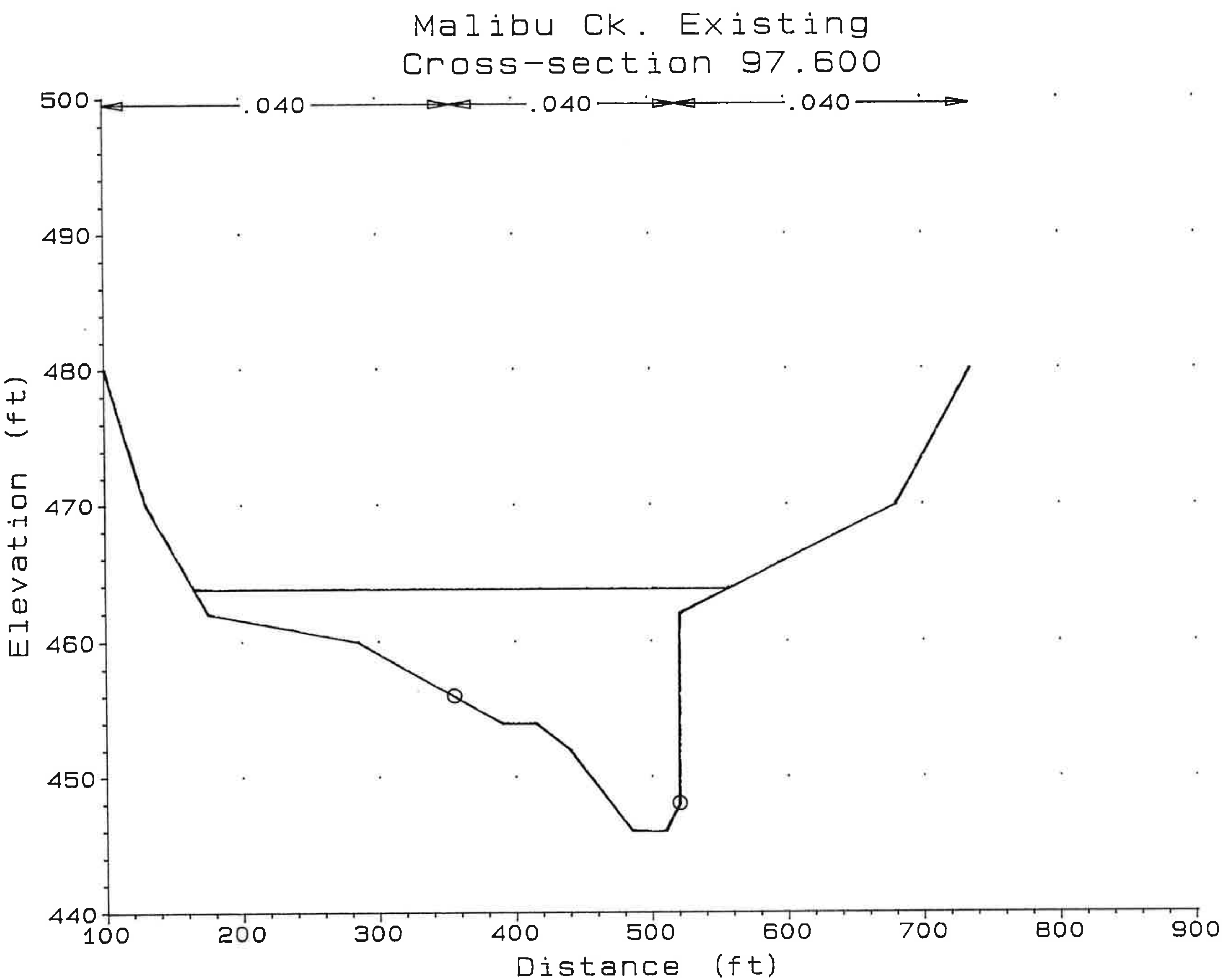
Malibu Ck. Existing
Cross-section 93.500





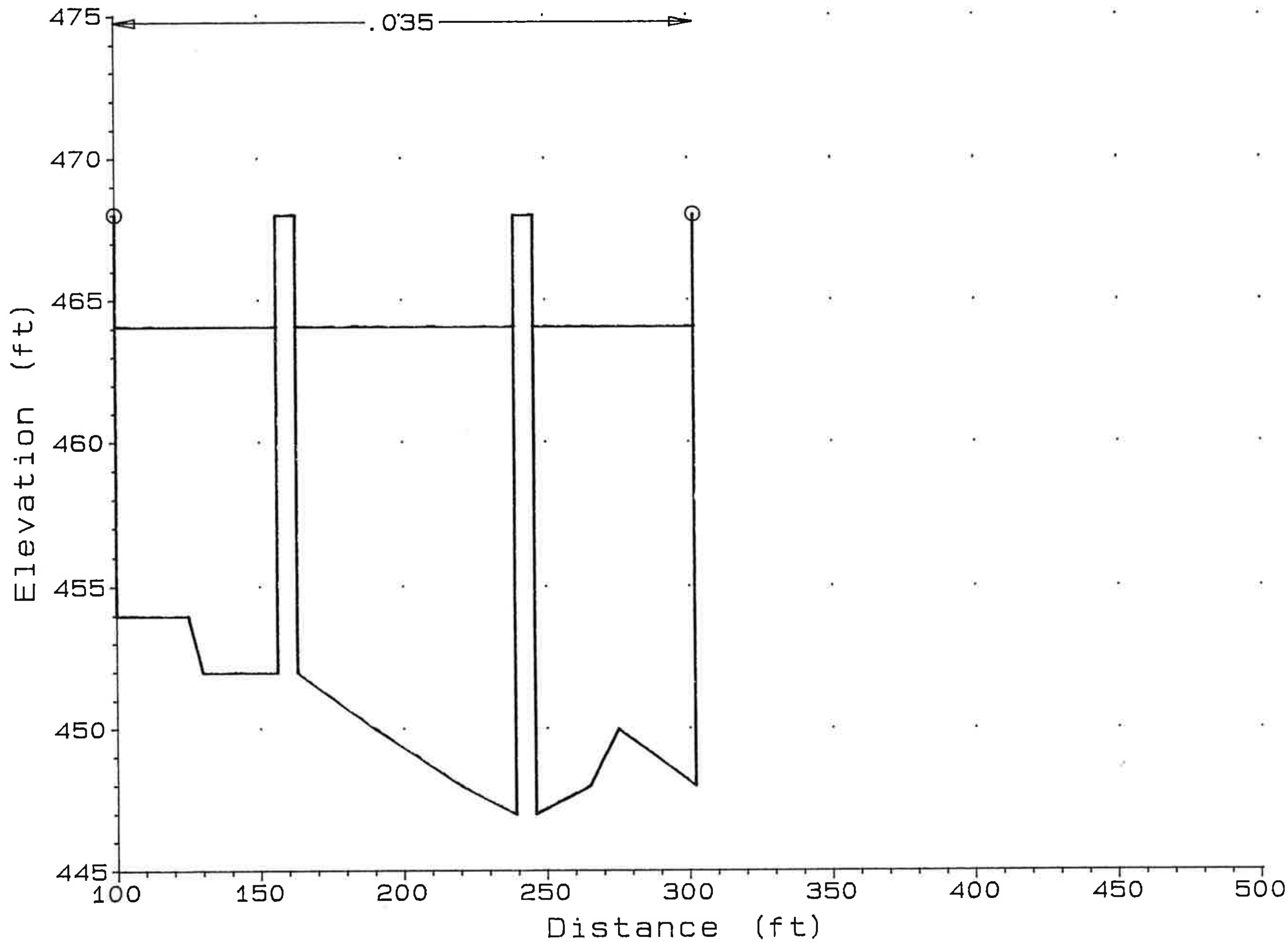
Malibu Ck. Existing
Cross-section 96.100
.040
.040
.040
500
490
480
470
460
450
440
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)


Malibu Ck. Existing
Cross-section 97.000
.040
.040
.040
Elevation (ft)
500
490
480
470
460
450
440
Distance (ft)
100
200
300
400
500
600
700
800
900

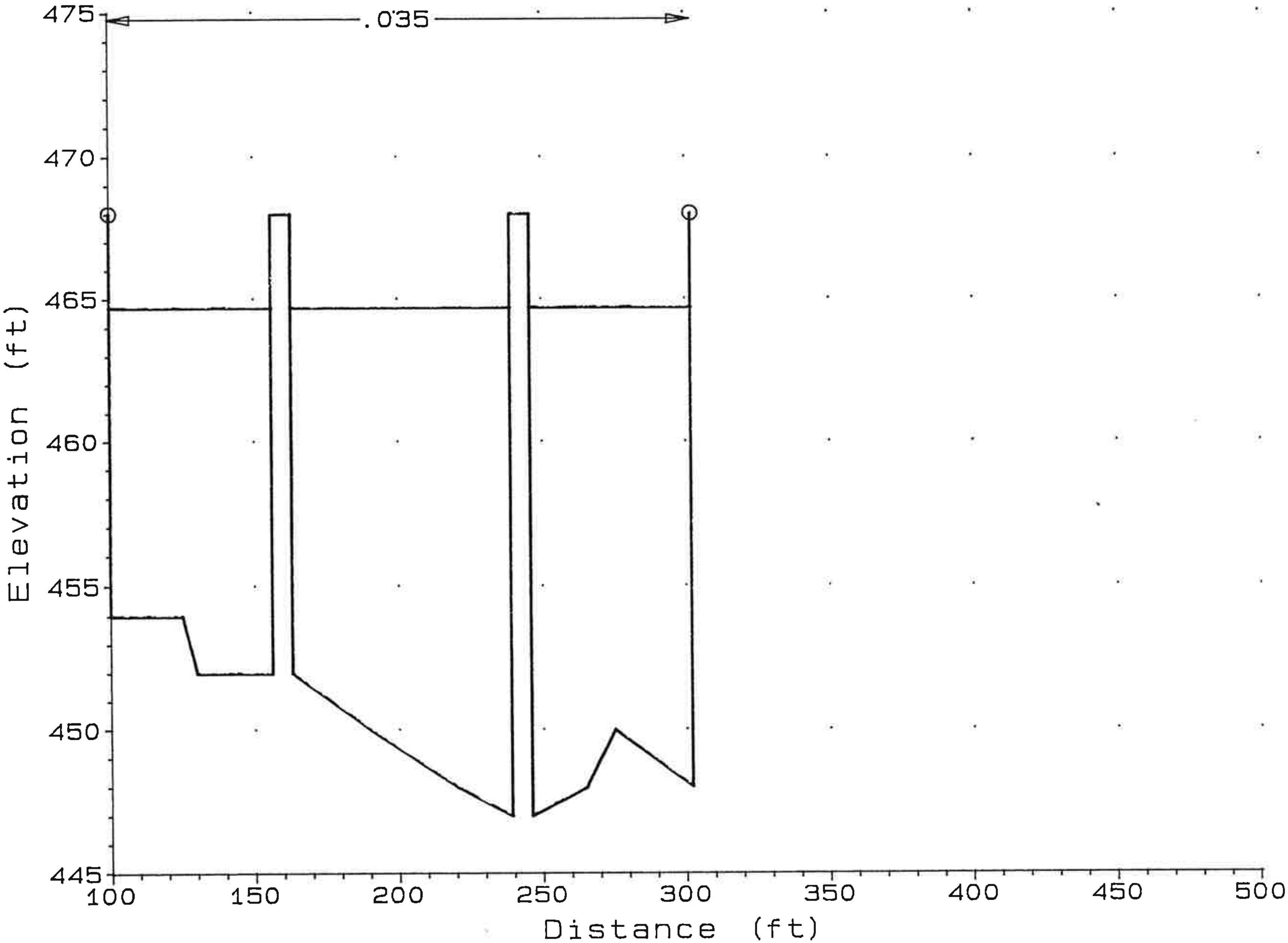


Malibu Ck. Existing
Cross-section 97.600
.040
.040
.040
500
490
480
470
460
450
440
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)

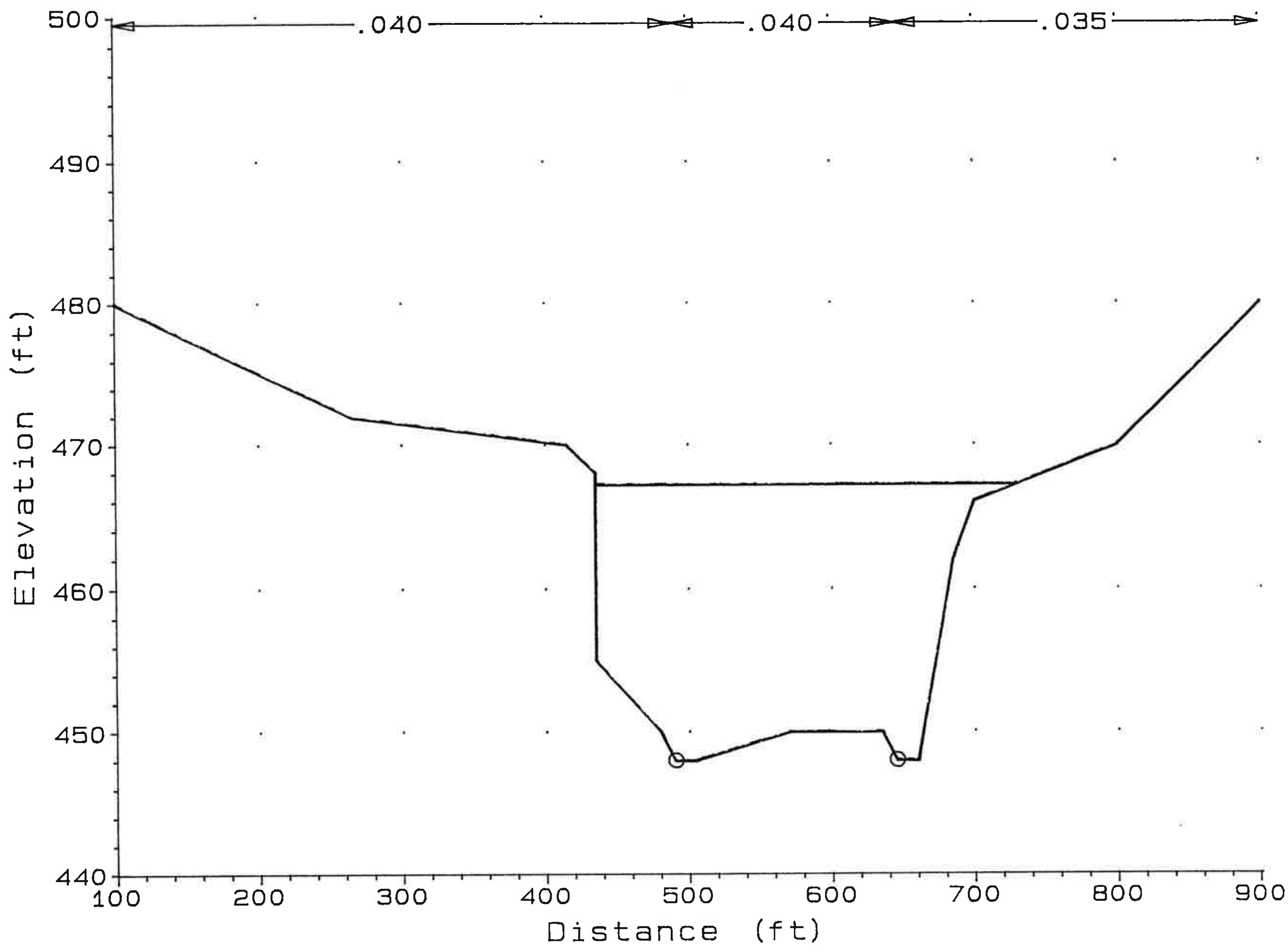
Malibu Ck. Existing
Cross-section 98.400

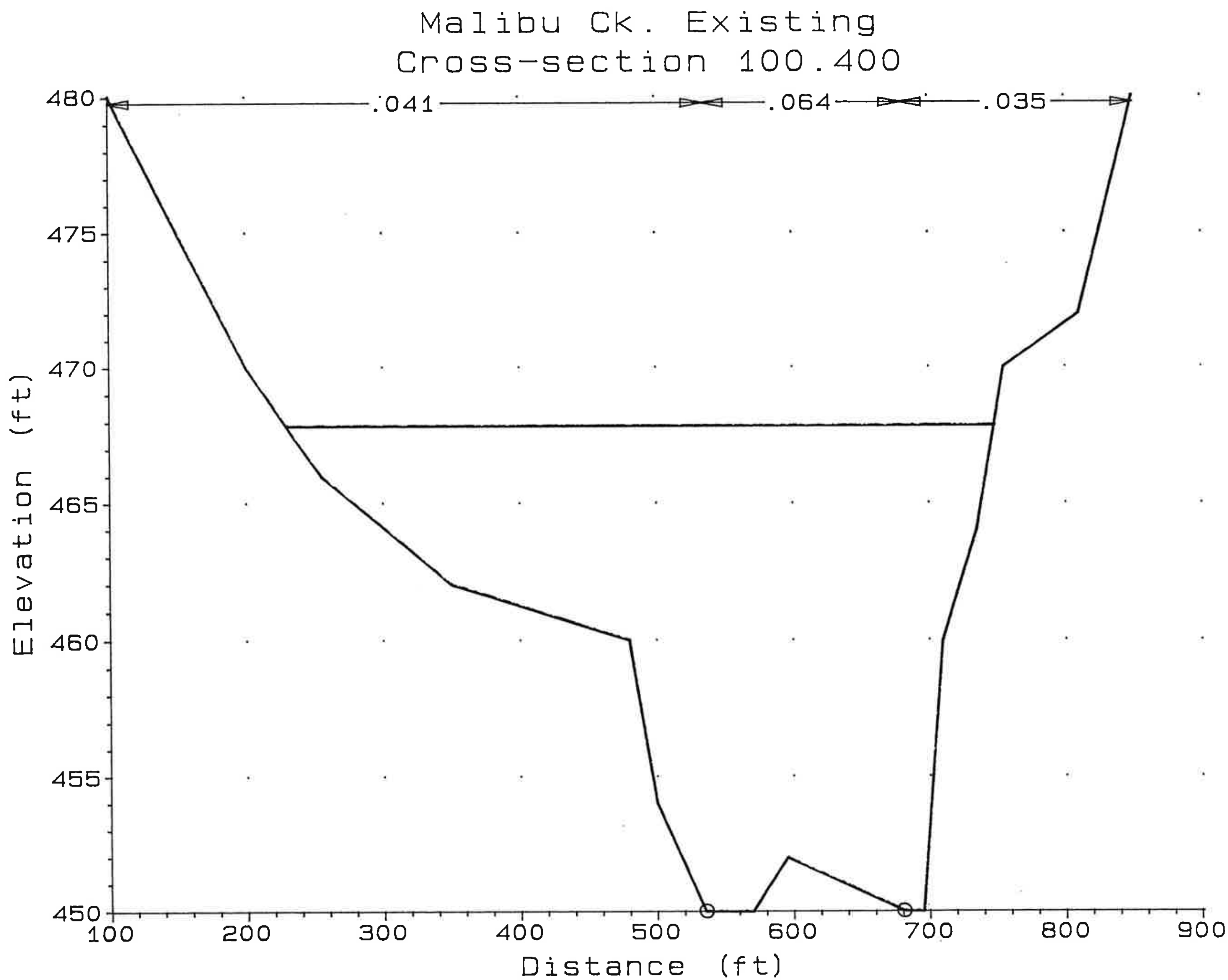


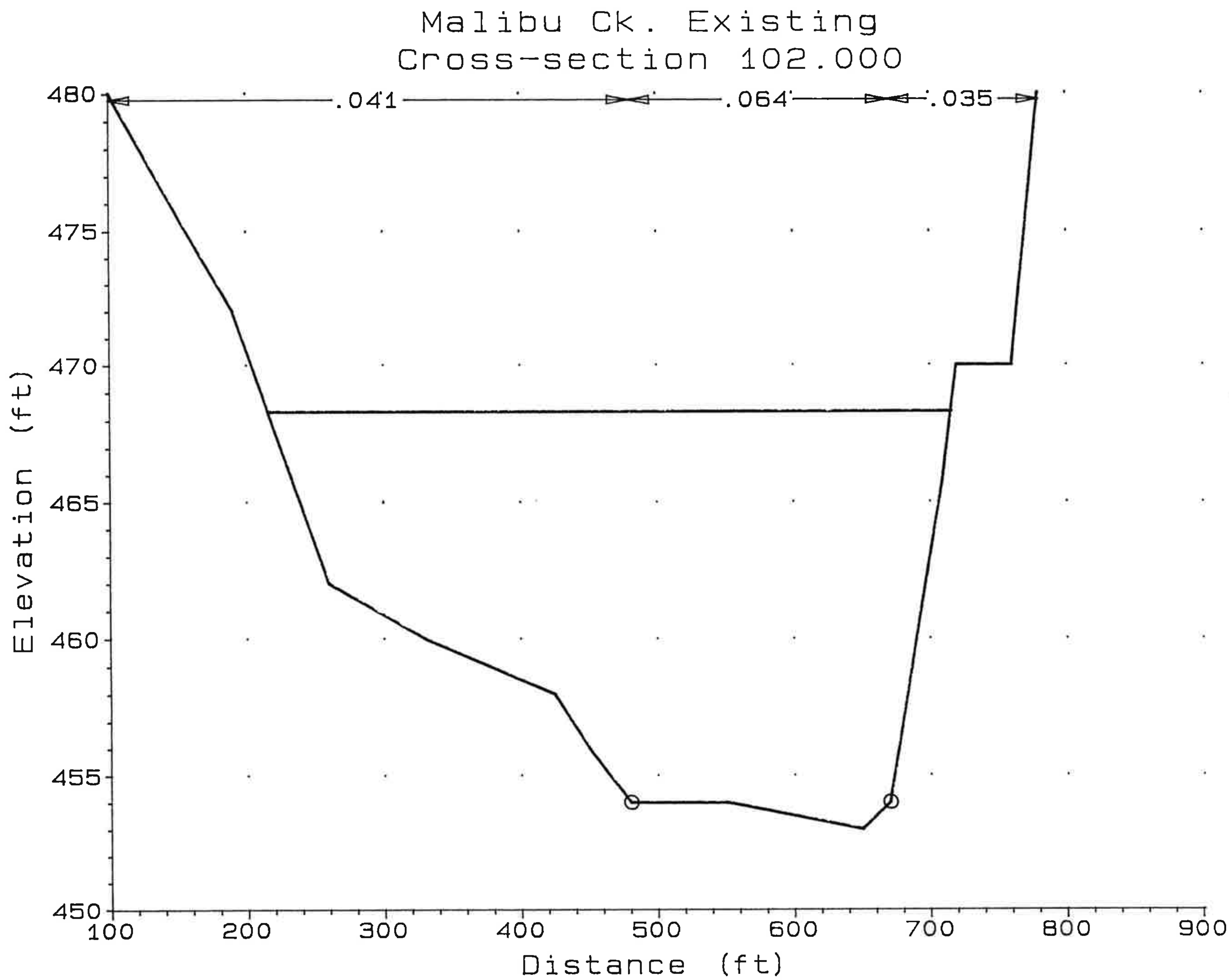
Malibu Ck. Existing
Cross-section 98.780



Malibu Ck. Existing
Cross-section 99.330




Malibu Ck. Existing
Cross-section 100.400
.041
.064
.035
Elevation (ft)
480
475
470
465
460
455
450
Distance (ft)
100
200
300
400
500
600
700
800
900


Malibu Ck. Existing
Cross-section 102.000
.041
.064
.035
Elevation (ft)
Distance (ft)
480
475
470
465
460
455
450
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200
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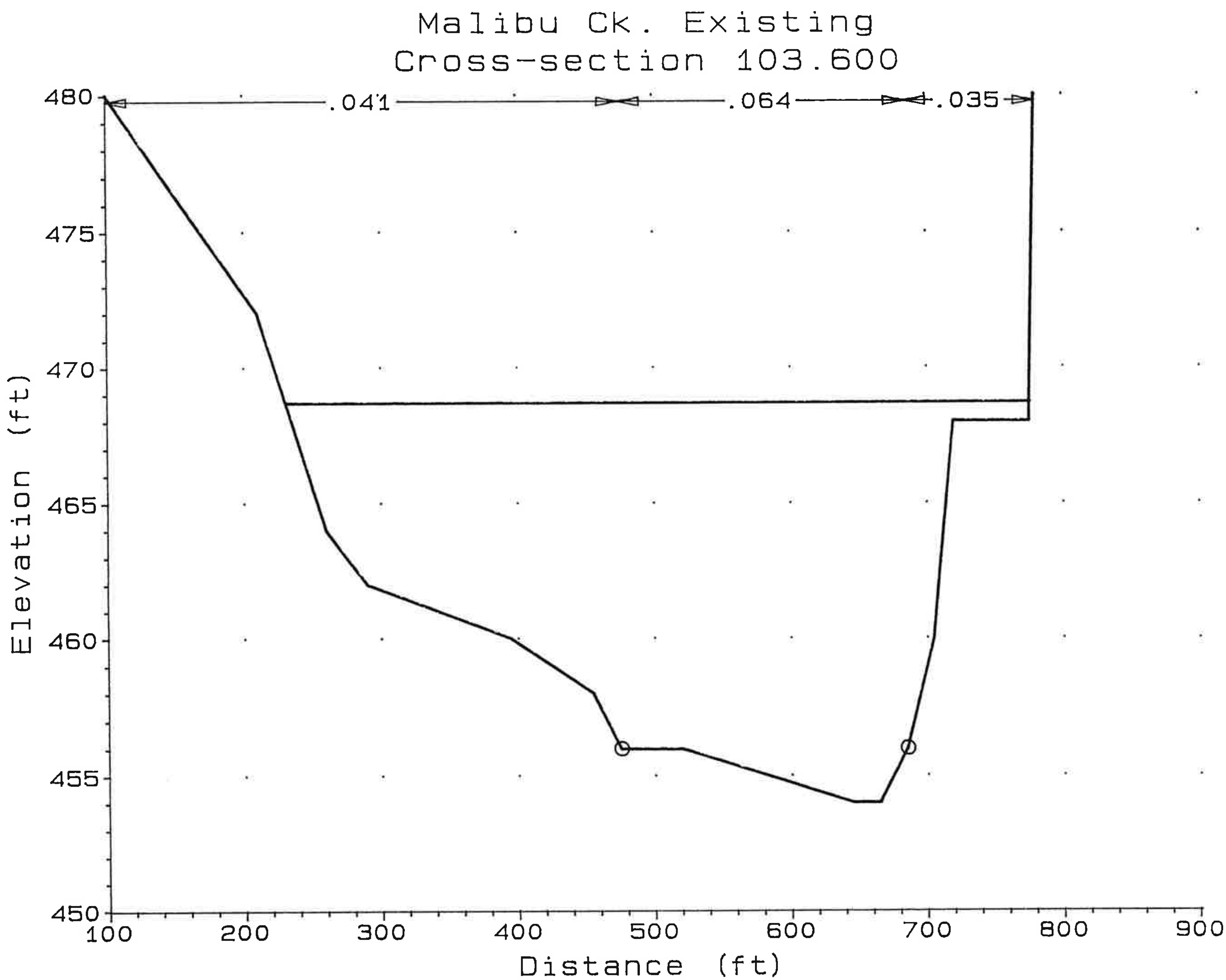
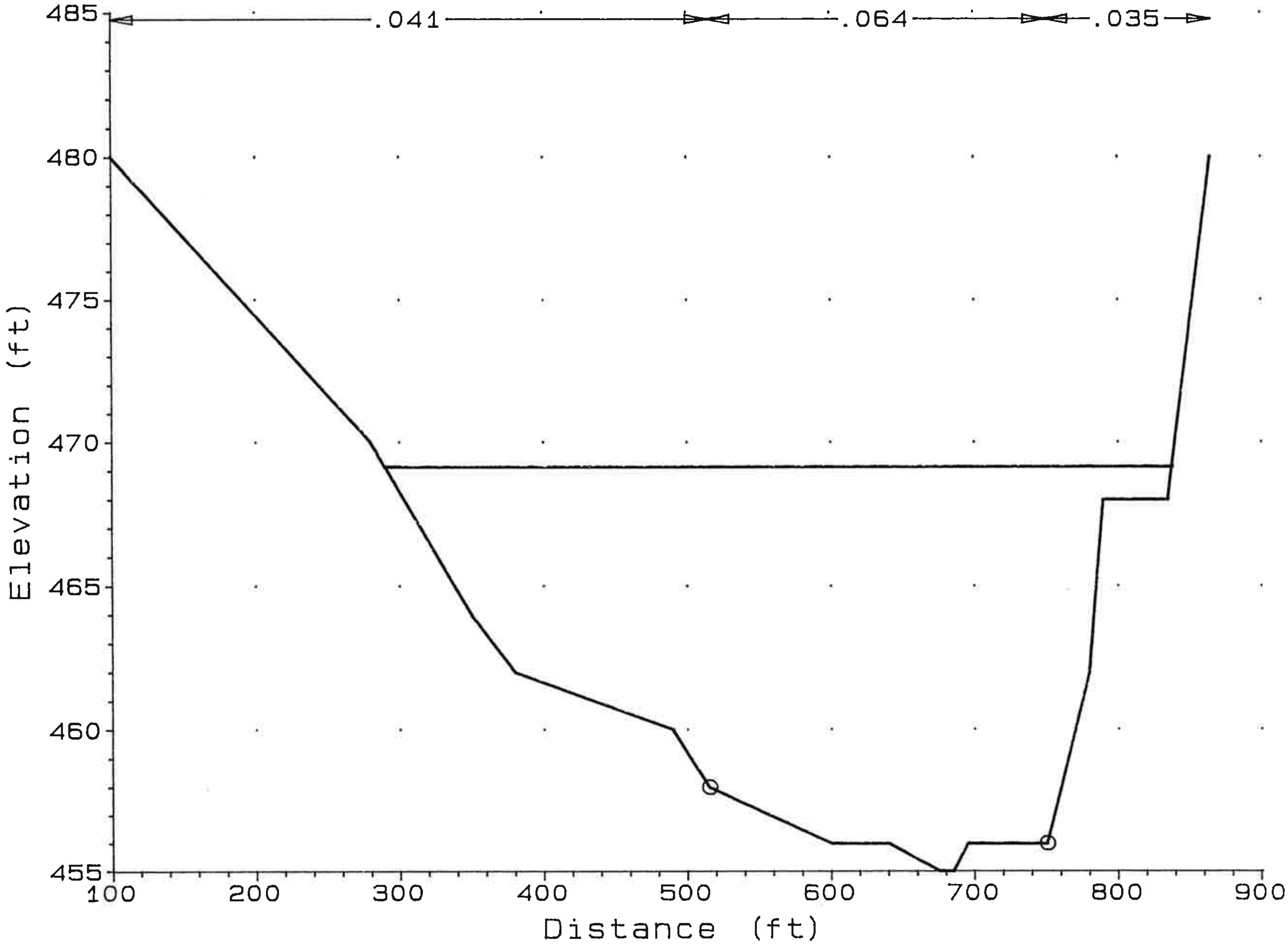
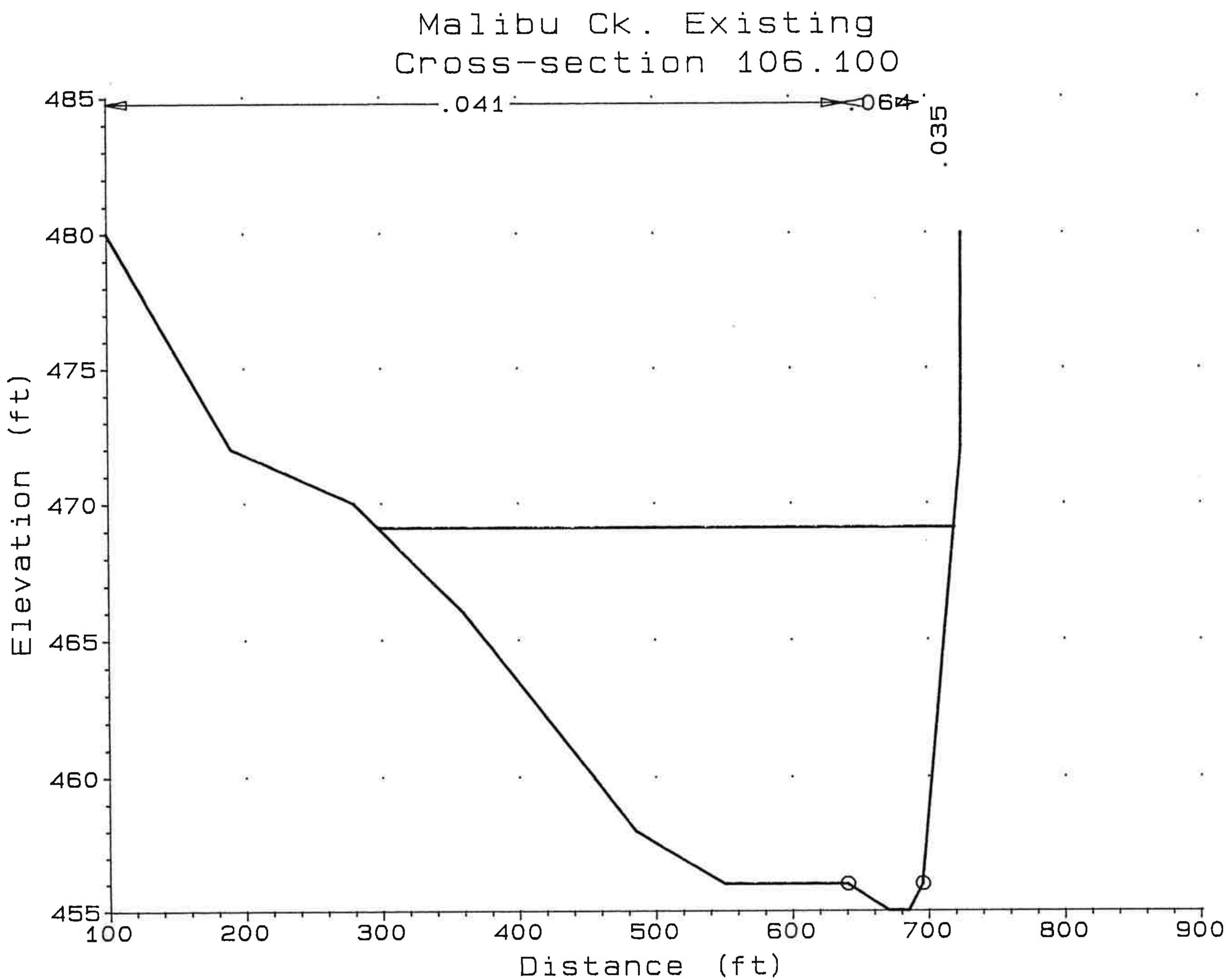
500
600
700
800
900



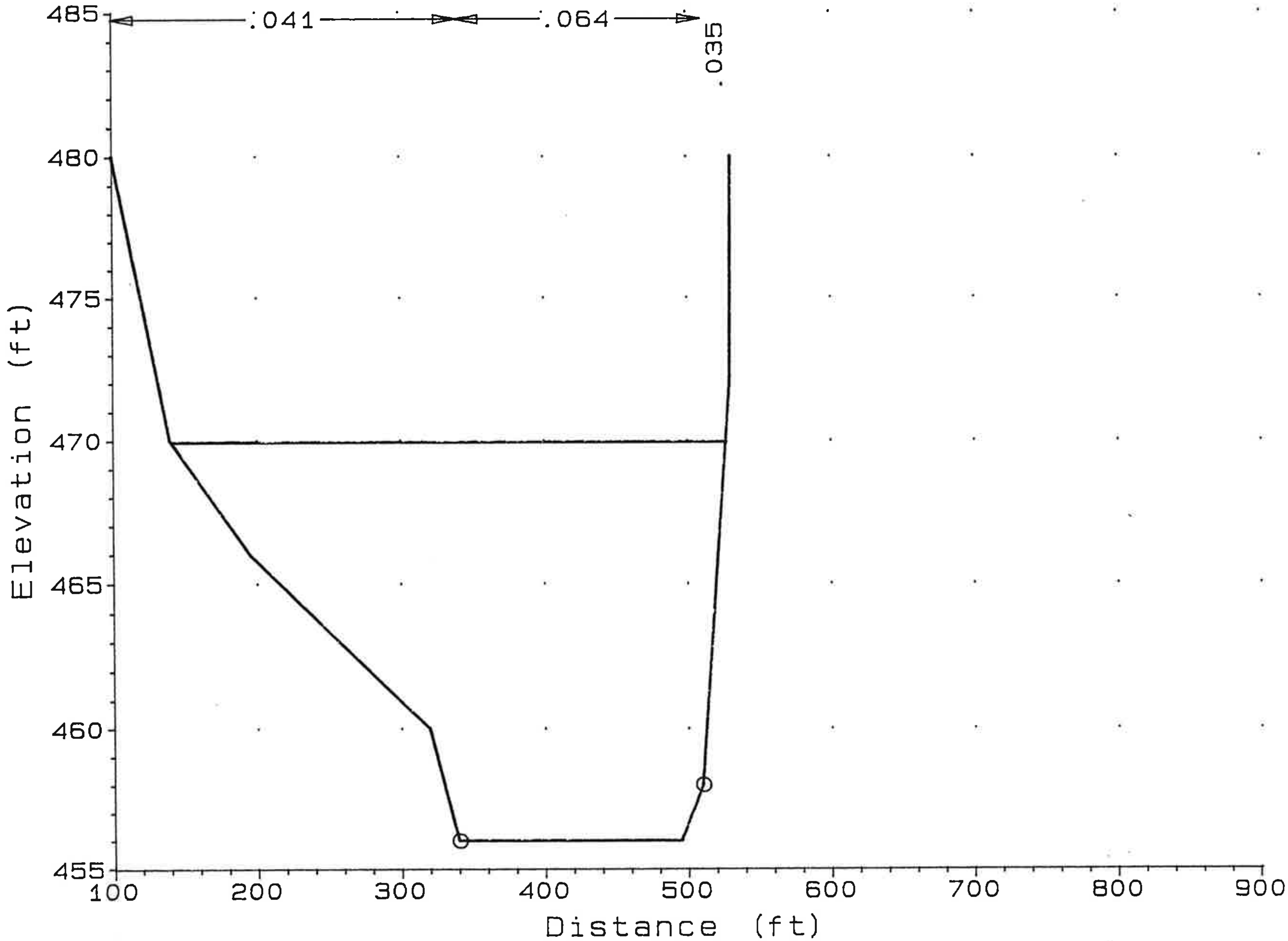
Malibu Ck. Existing
Cross-section 103.600
.041
.064
.035
Elevation (ft)
480
475
470
465
460
455
450
100
200
300
400
500
600
700
800
900
Distance (ft)

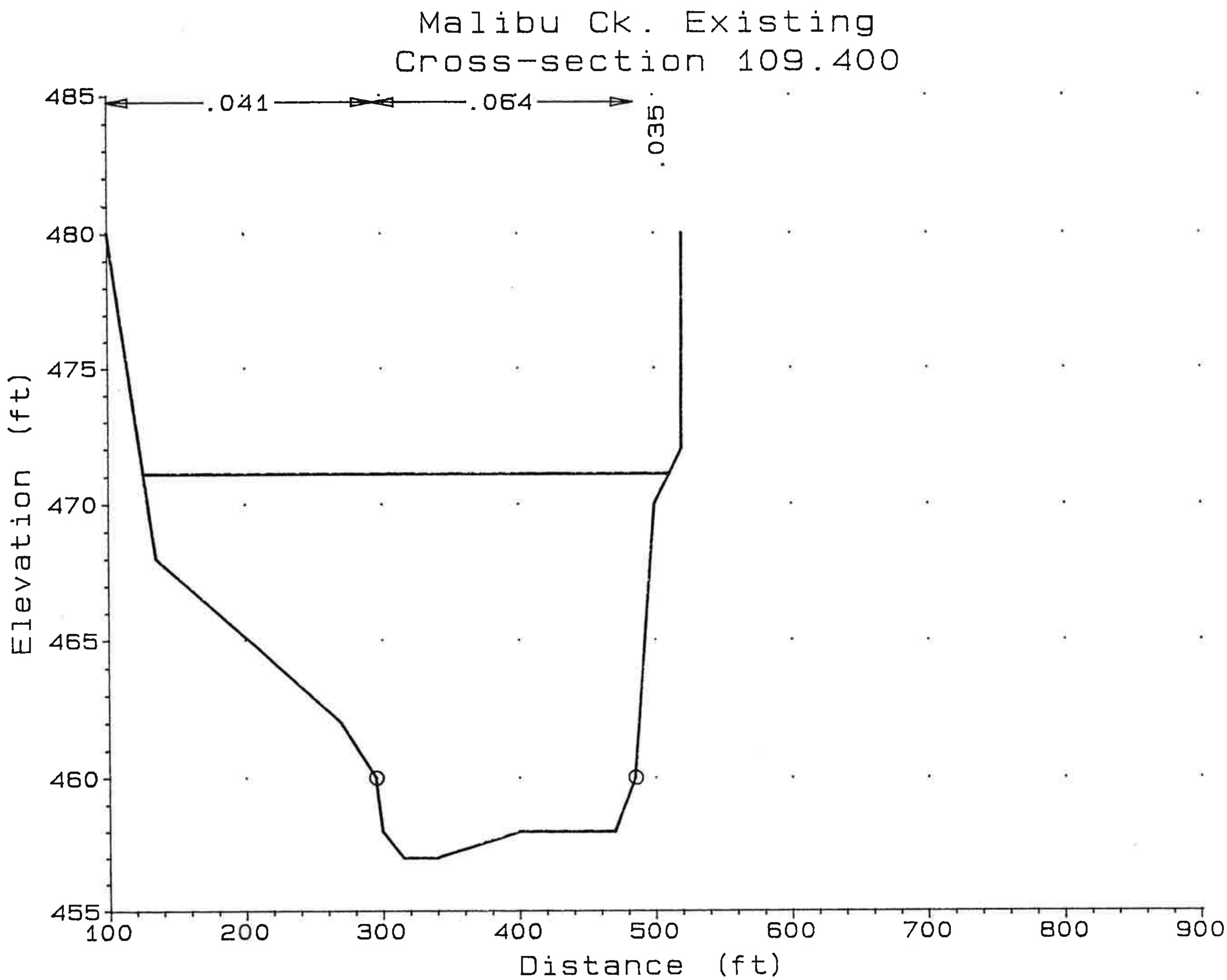
Malibu Ck. Existing
Cross-section 104.950



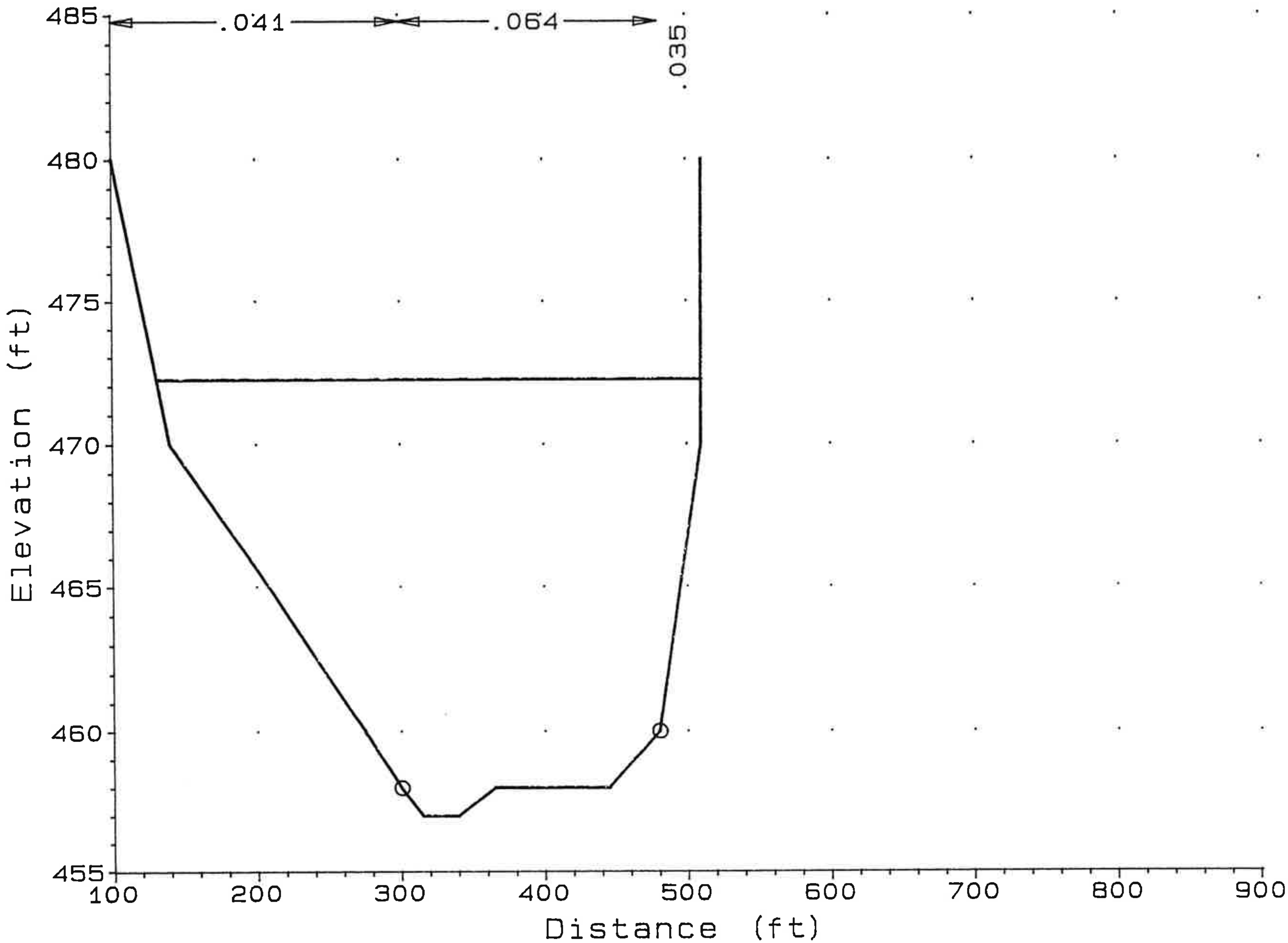

Malibu Ck. Existing
Cross-section 106.100
.041
.064
.035
Elevation (ft)
485
480
475
470
465
460
455
Distance (ft)
100
200
300
400
500
600
700
800
900

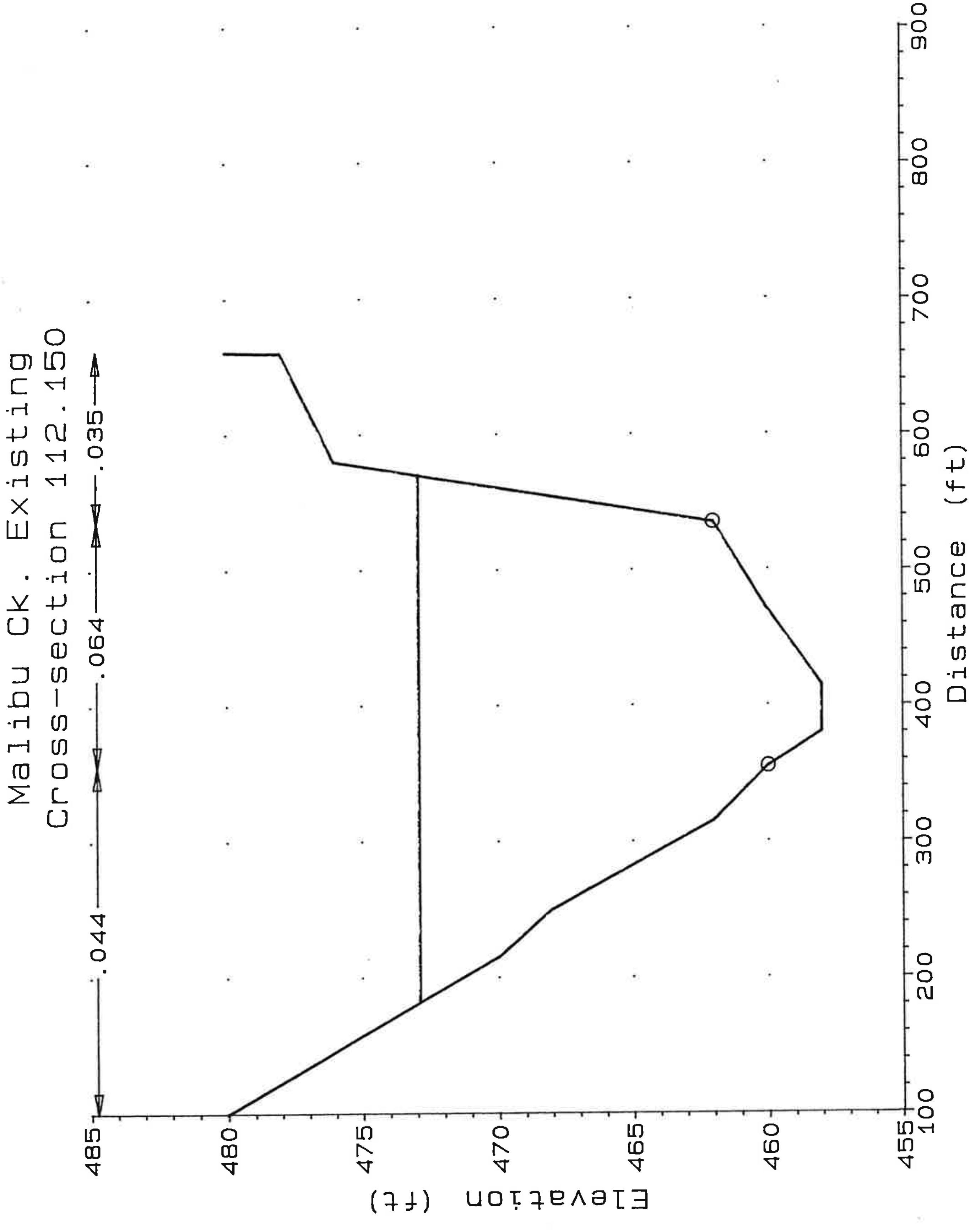
Malibu Ck. Existing
Cross-section 107.900

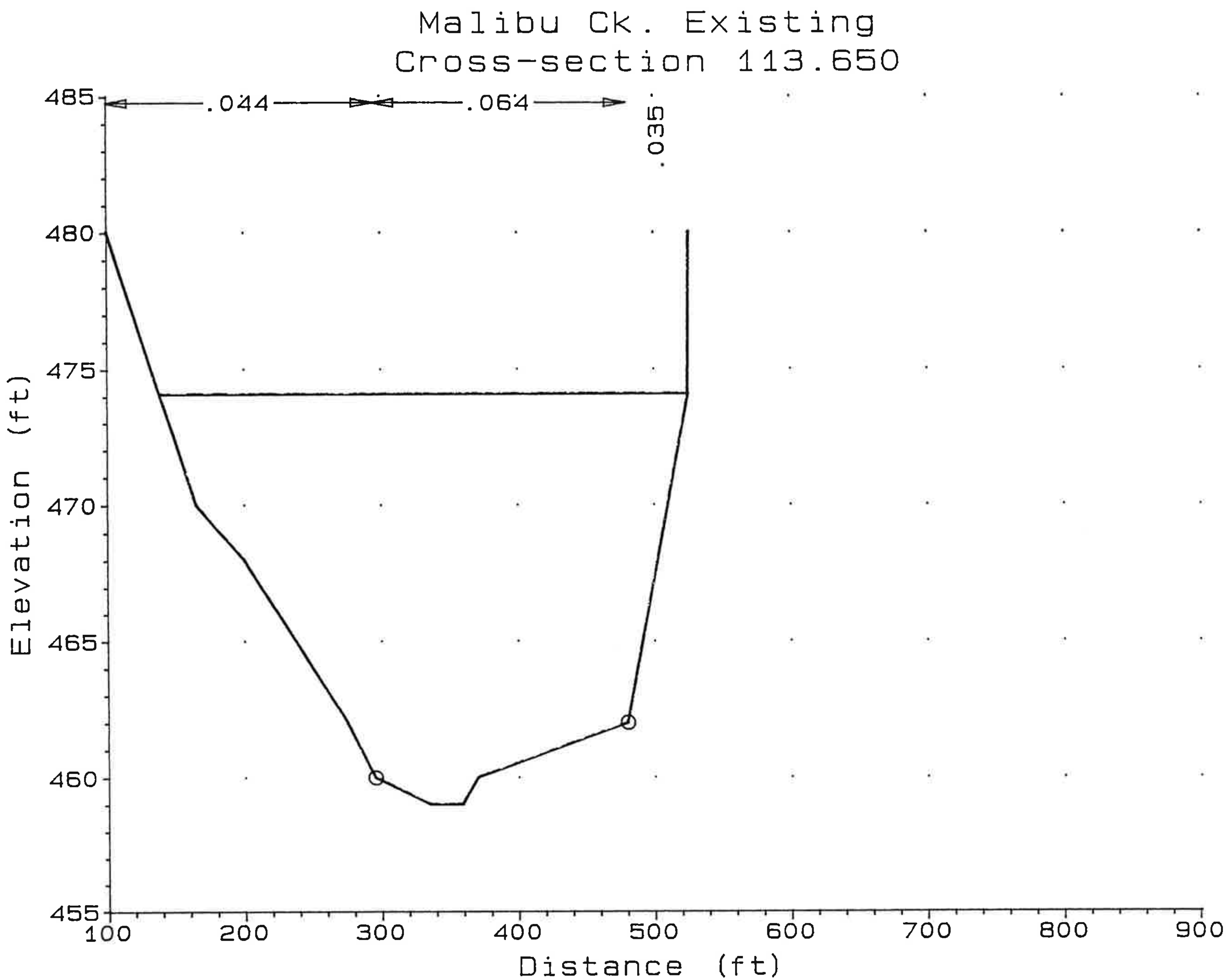


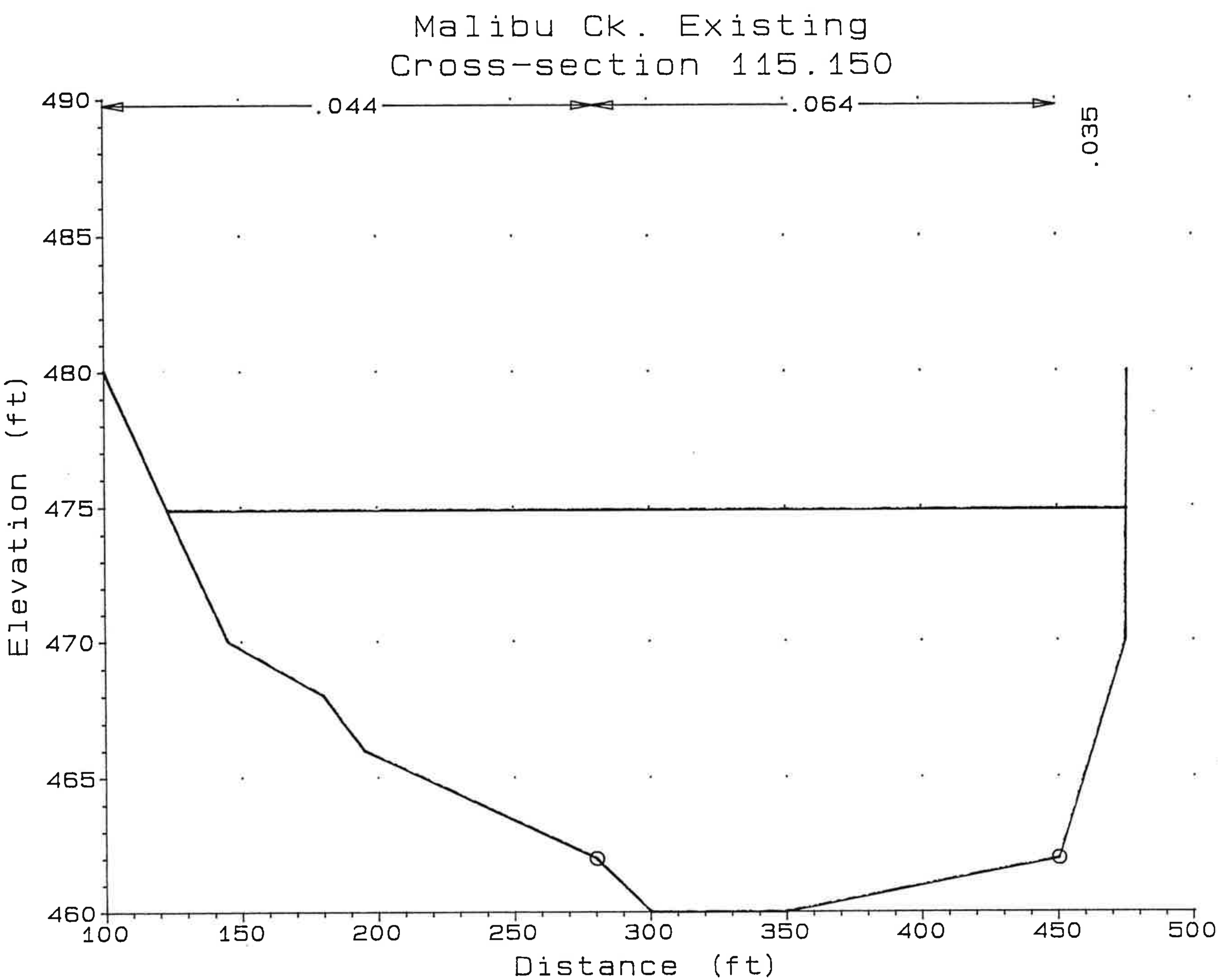

Malibu Ck. Existing
Cross-section 109.400
.041
.064
.035
485
480
475
470
465
460
455
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)

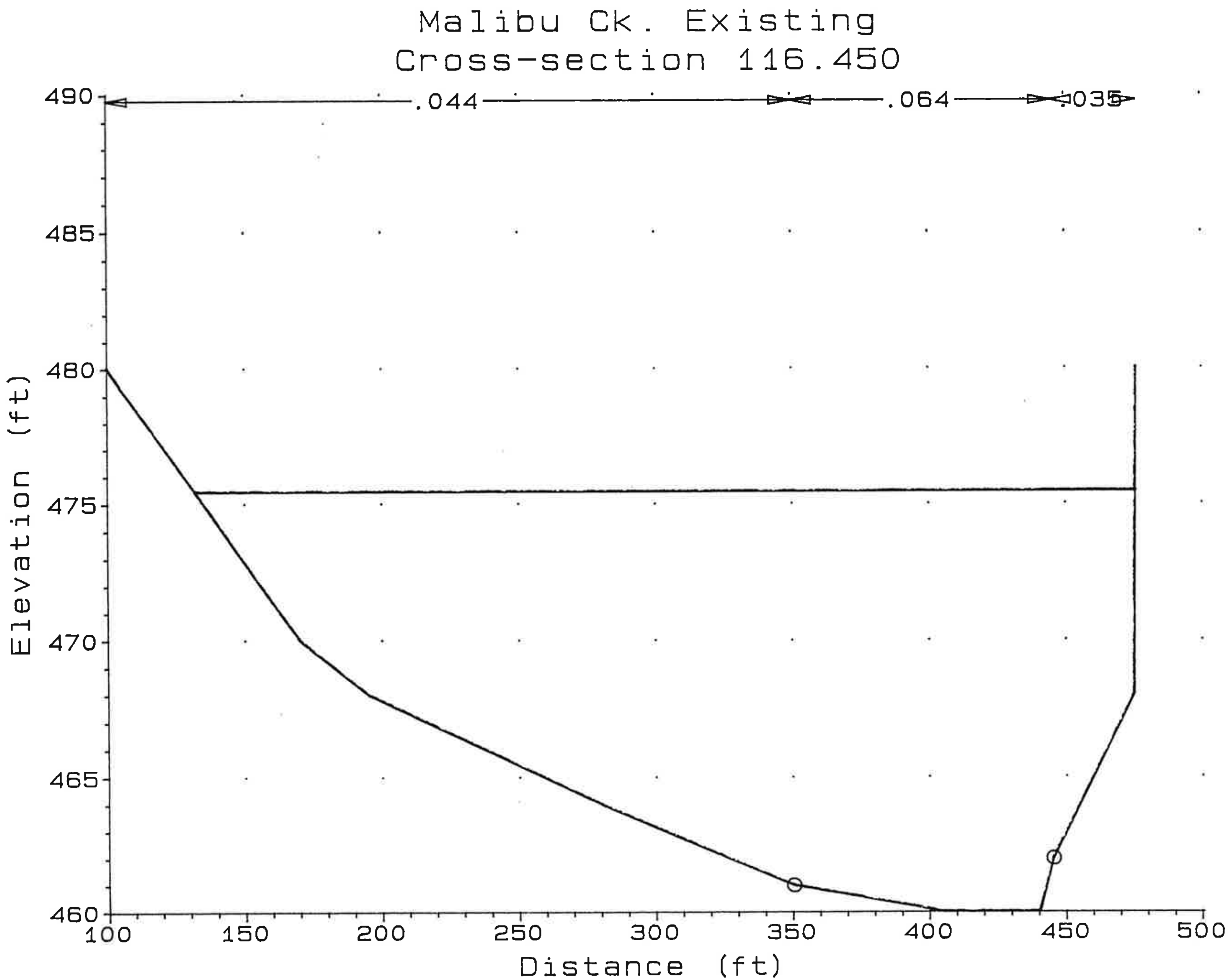
Malibu Ck. Existing
Cross-section 110.650




Malibu Ck. Existing
Cross-section 112.150
.044
.064
.035
Elevation (ft)
Distance (ft)
485
480
475
470
465
460
455
100
200
300
400
500
600
700
800
900

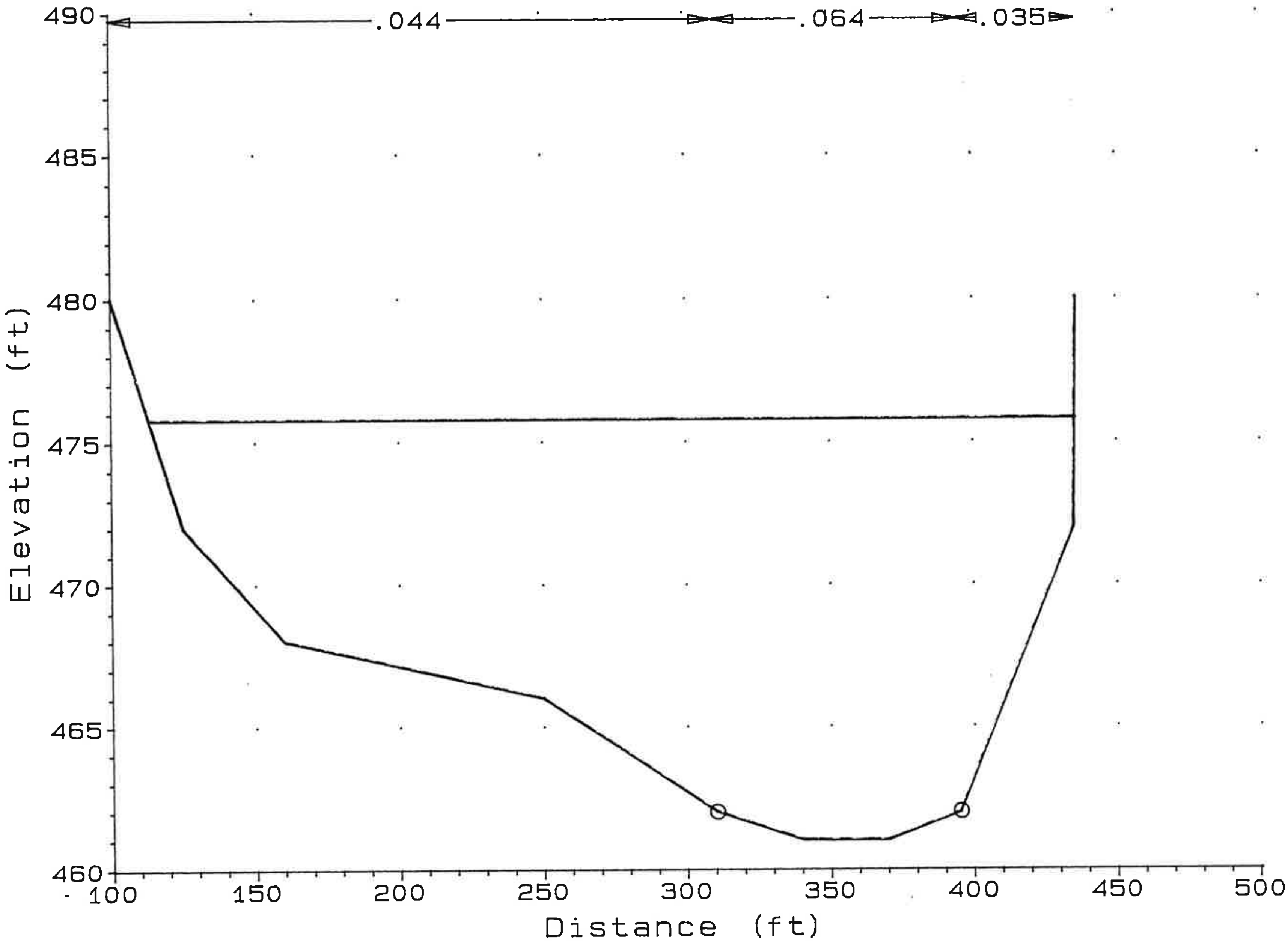

Malibu Ck. Existing
Cross-section 113.650
.044
.064
.035
Elevation (ft)
485
480
475
470
465
460
455
Distance (ft)
100
200
300
400
500
600
700
800
900

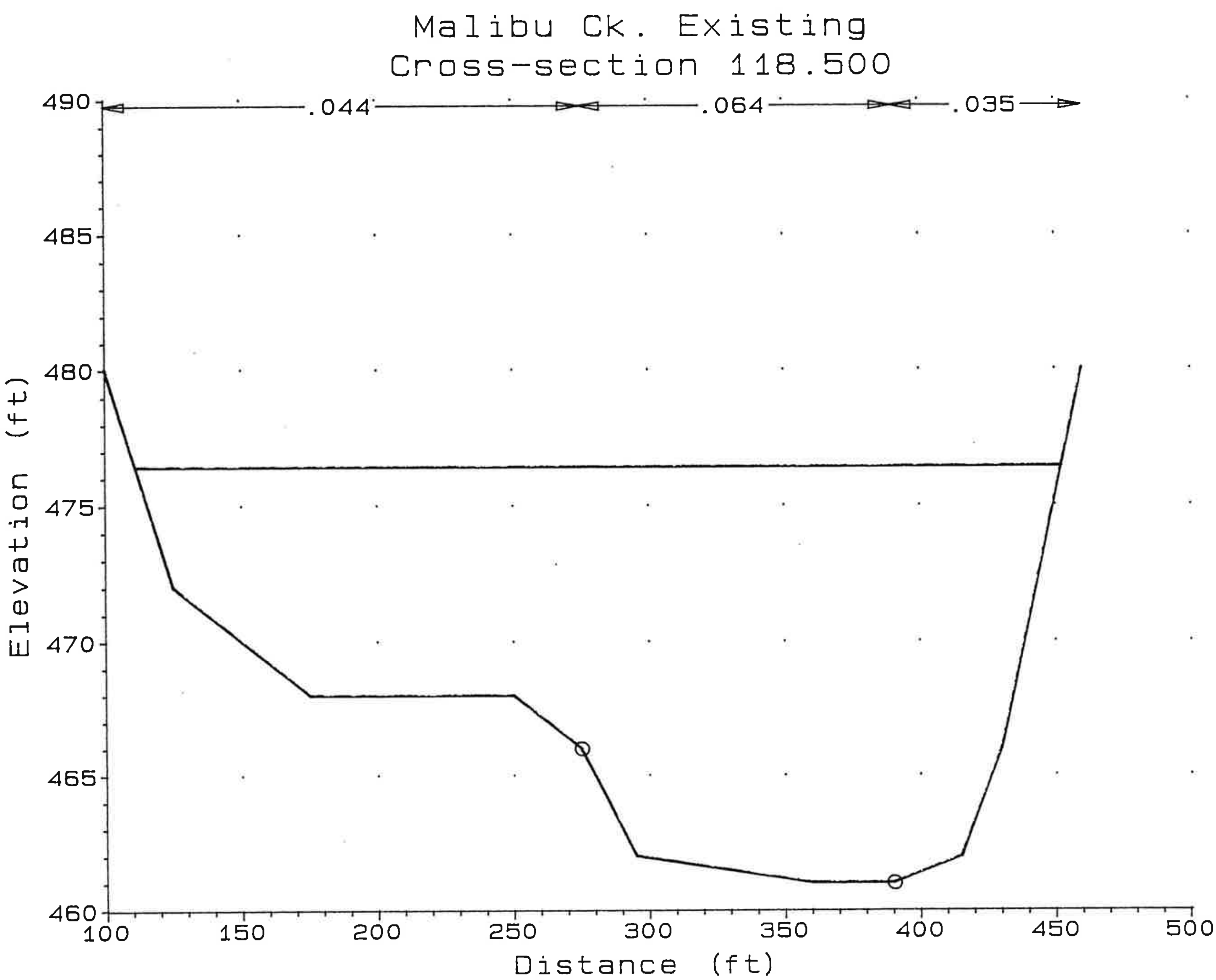

Malibu Ck. Existing
Cross-section 115.150
.044
.064
.035
490
485
480
475
470
465
460
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



Malibu Ck. Existing
Cross-section 116.450
.044
.064
.035
490
485
480
475
470
465
460
100
150
200
250
300
350
400
450
500
Elevation (ft)
Distance (ft)

Malibu Ck. Existing
Cross-section 117.600

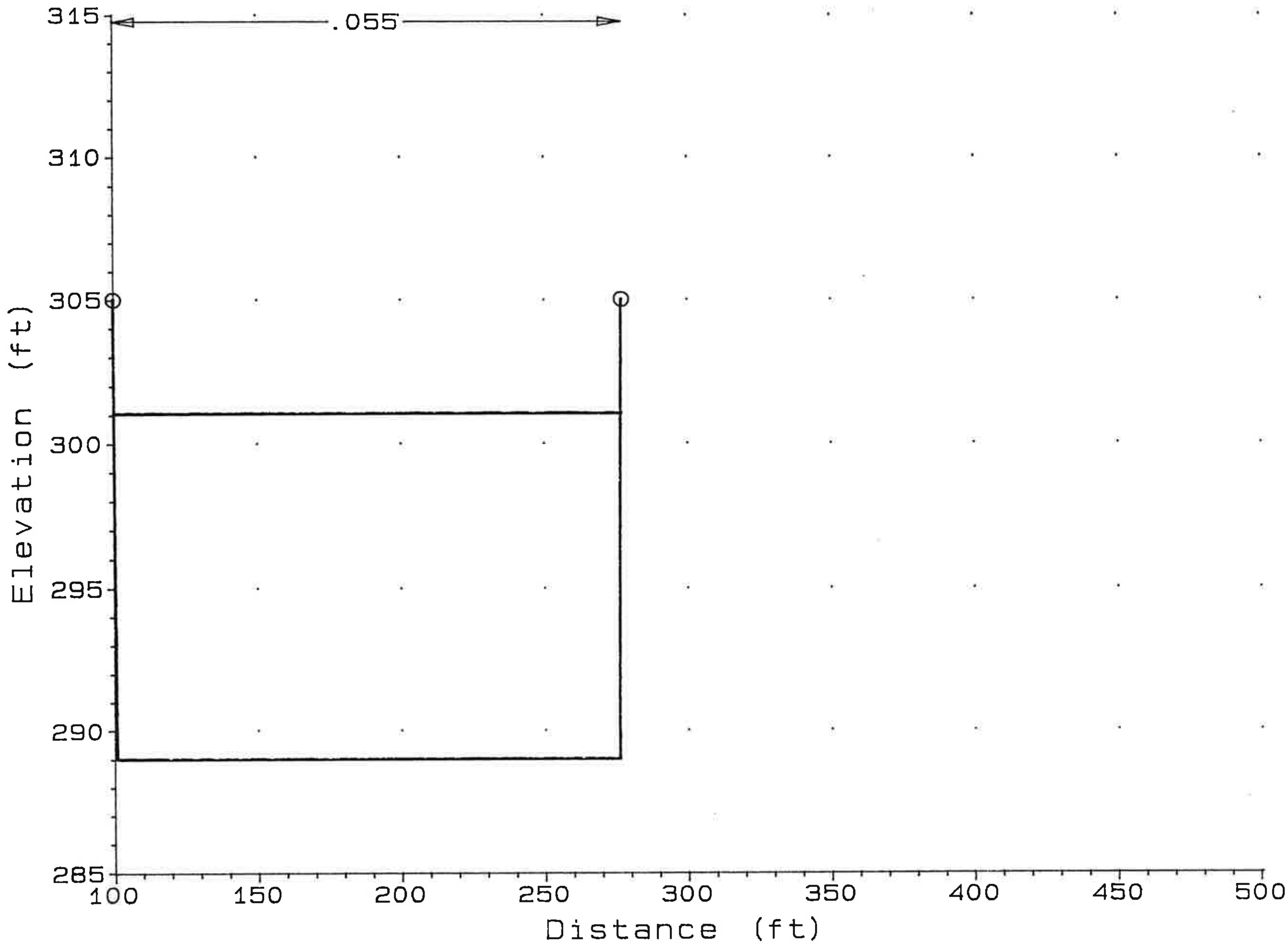



Malibu Ck. Existing
Cross-section 118.500
.044
.064
.035
490
485
480
475
470
465
460
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)

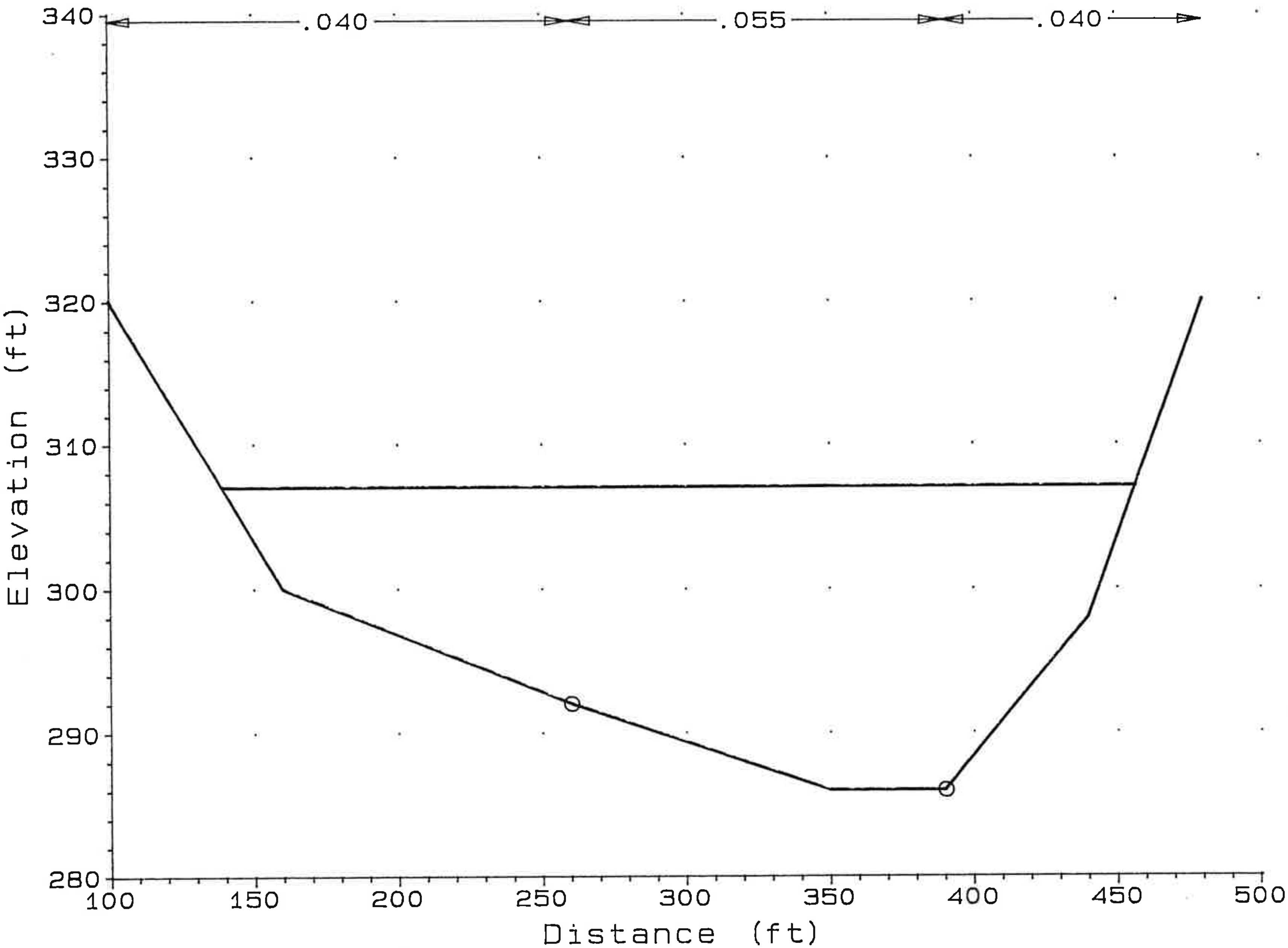
APPENDIX 4

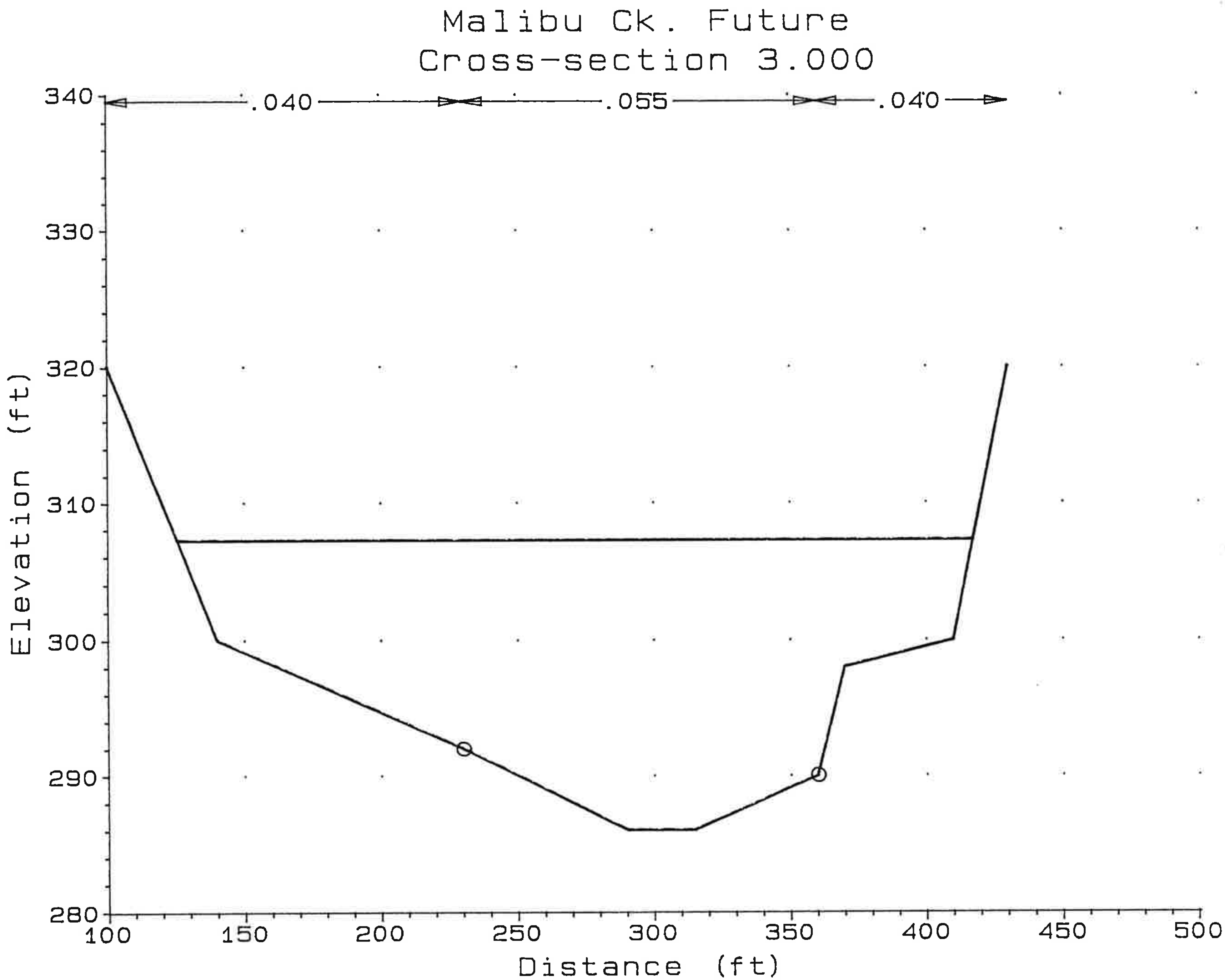
MALIBU CREEK
CROSS SECTION PLOTS FOR
ULTIMATE CHANNEL CONDITION

Malibu Ck. Future
Cross-section .000

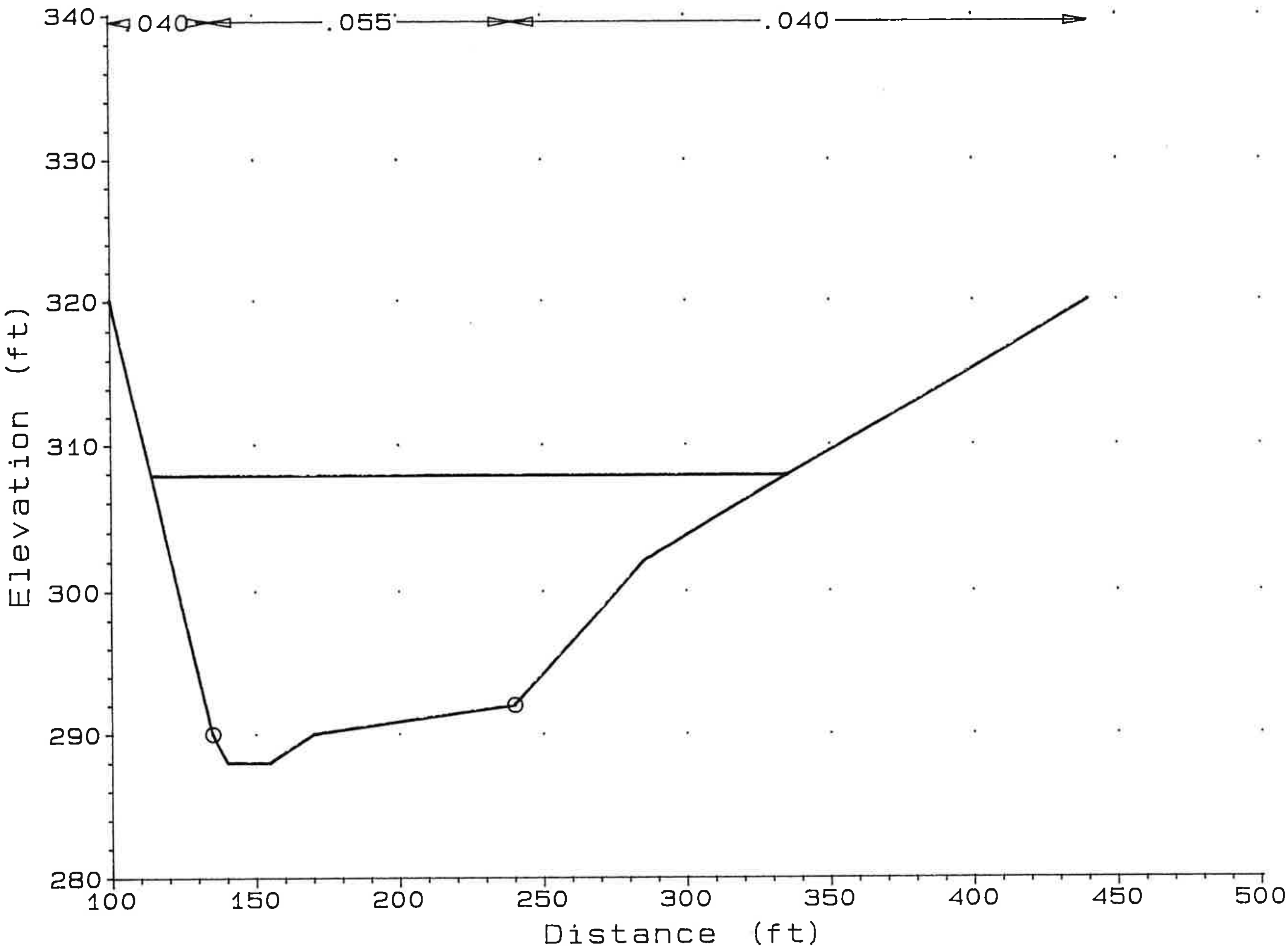


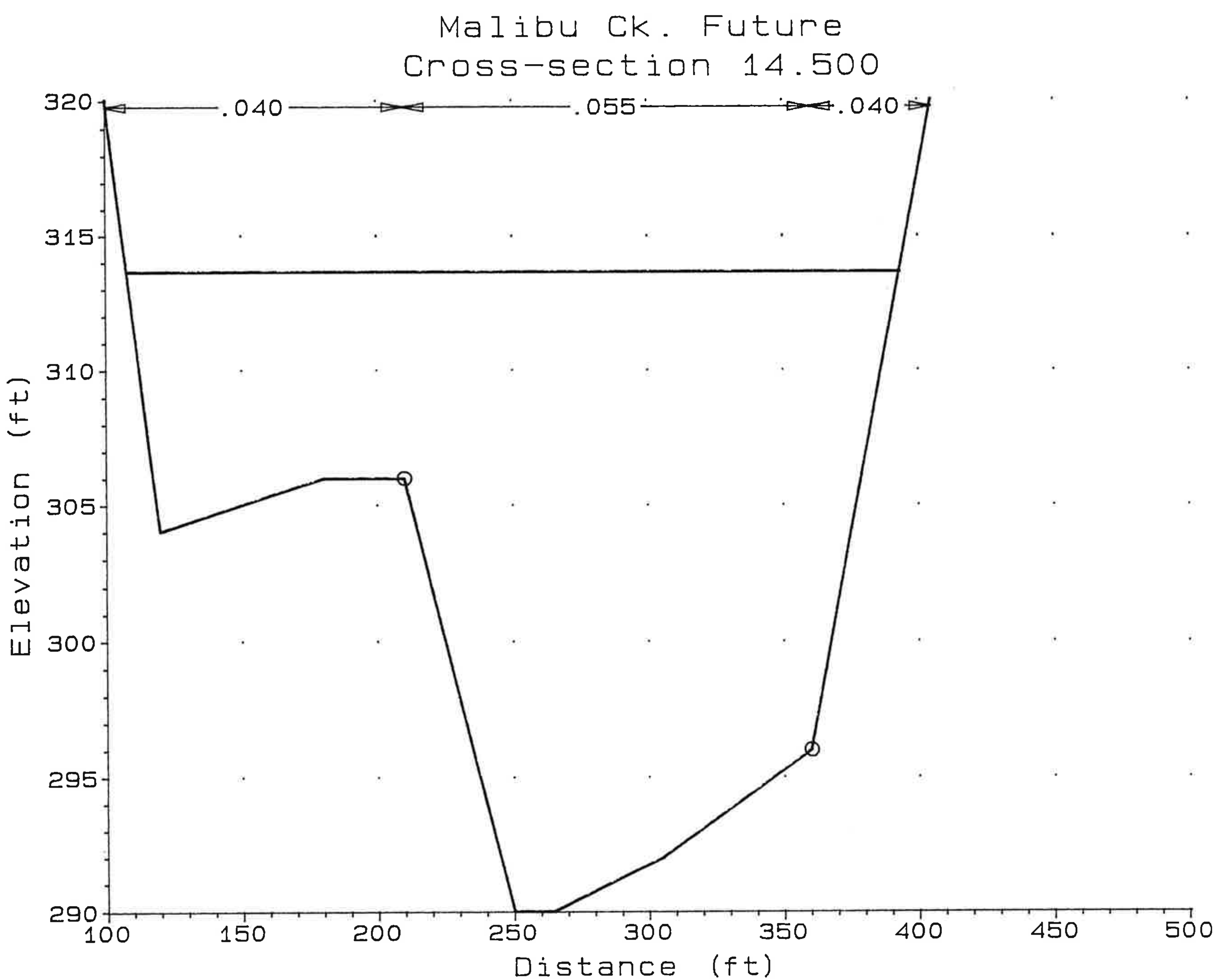
Malibu Ck. Future
Cross-section 1.500

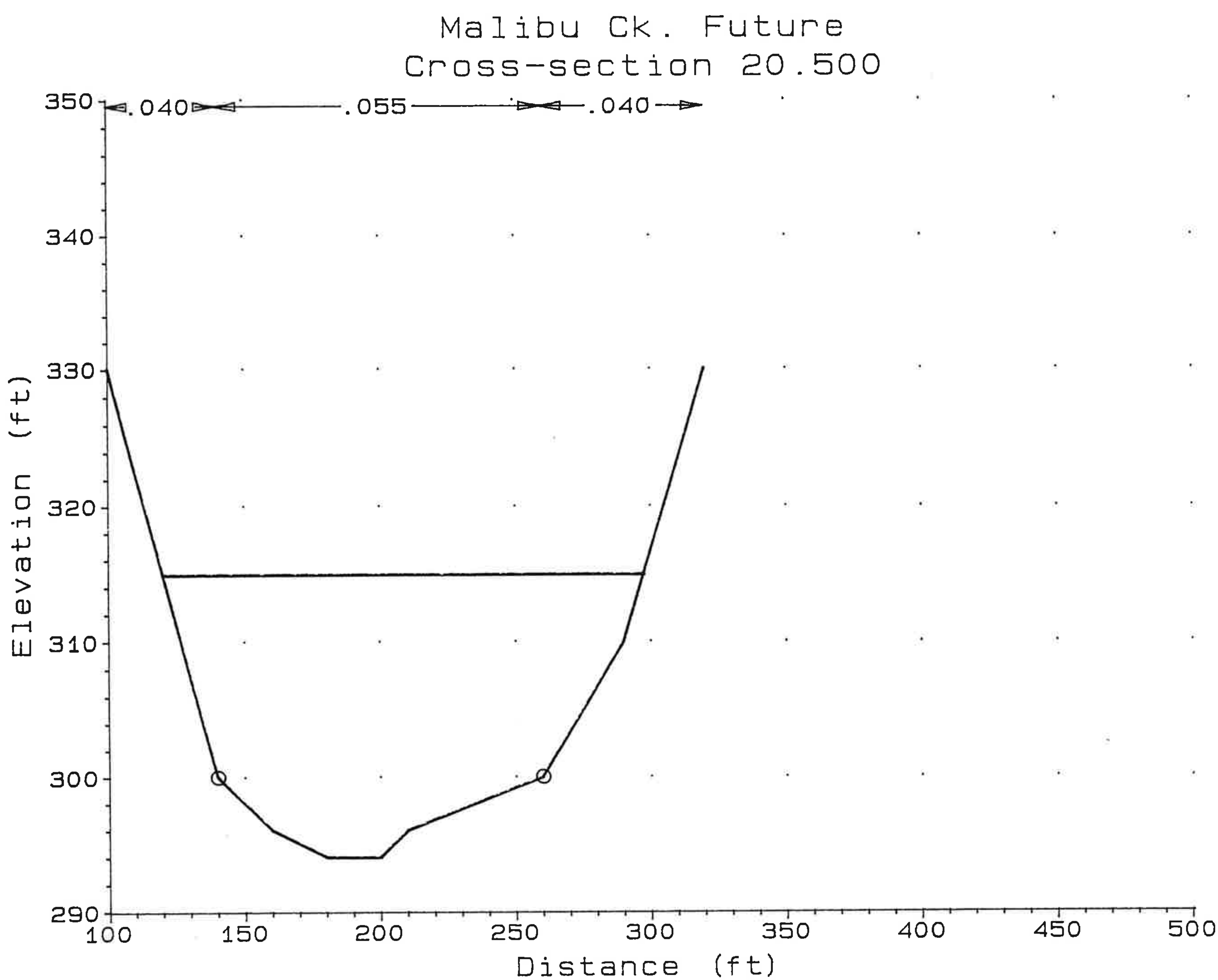



Malibu Ck. Future
Cross-section 3.000
.040
.055
.040
340
330
320
310
300
290
280
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)

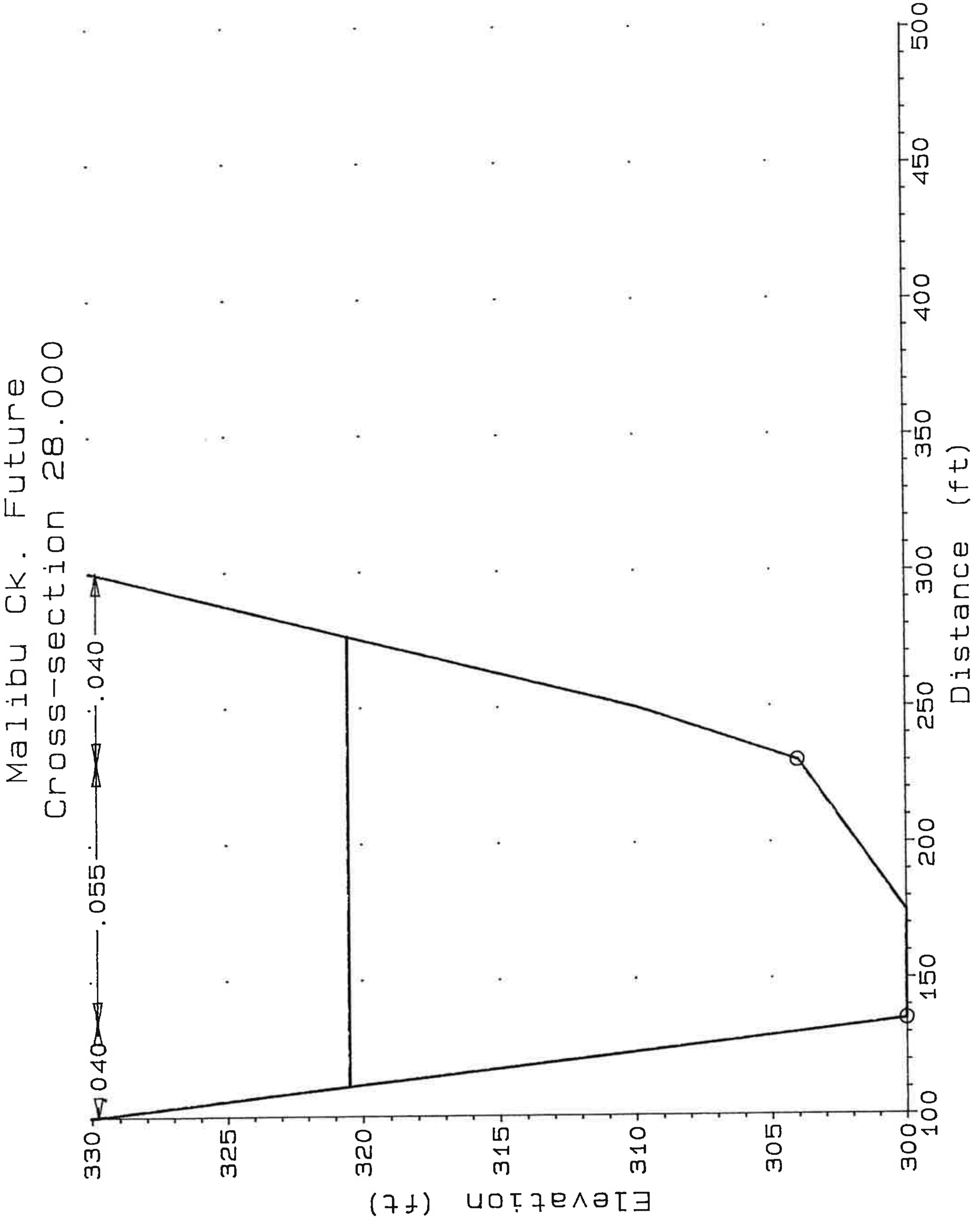
Malibu Ck. Future
Cross-section 7.500



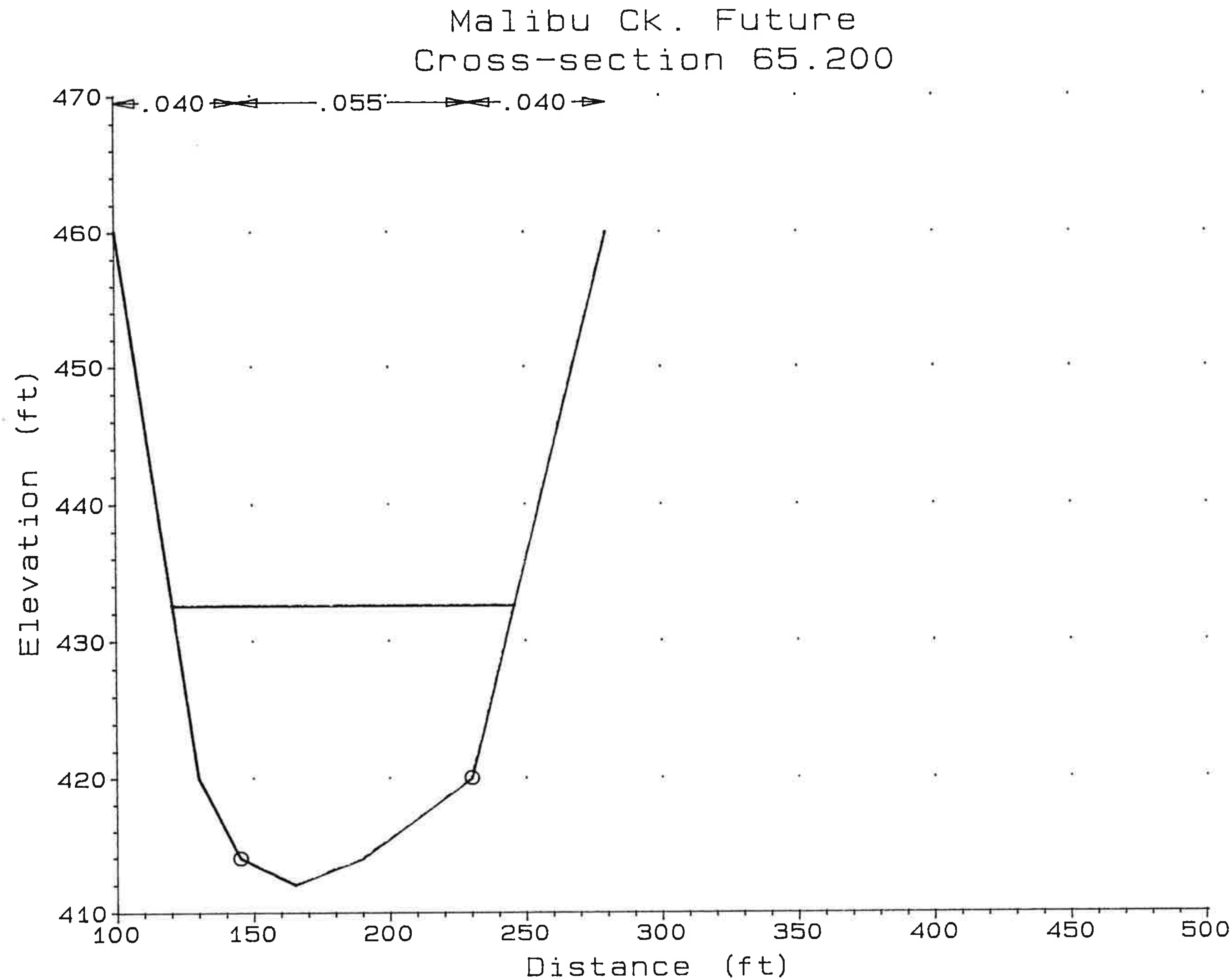

Malibu Ck. Future
Cross-section 14.500
.040
.055
.040
320
315
310
305
300
295
290
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



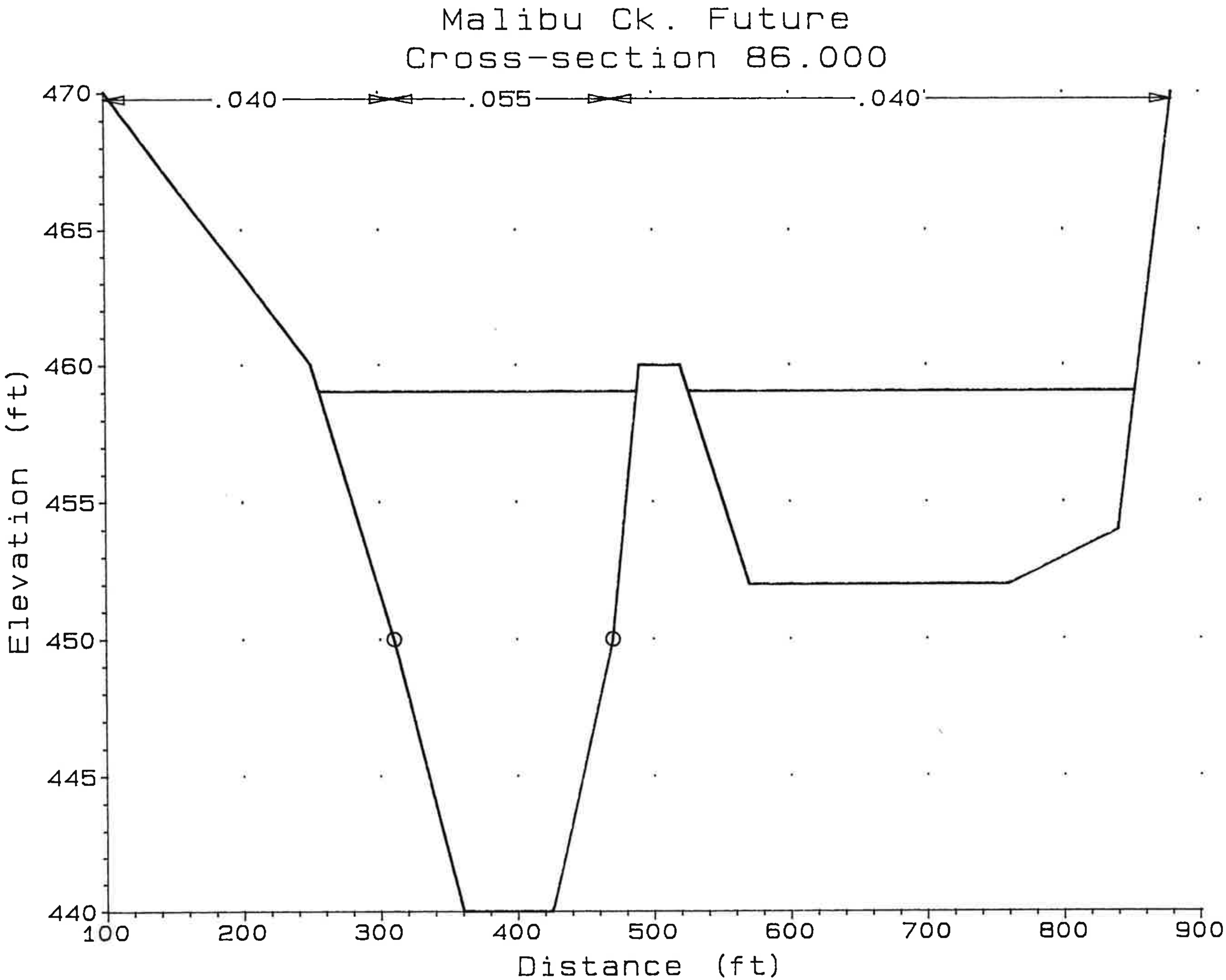
Malibu Ck. Future
Cross-section 20.500
.040
.055
.040
350
340
330
320
310
300
290
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



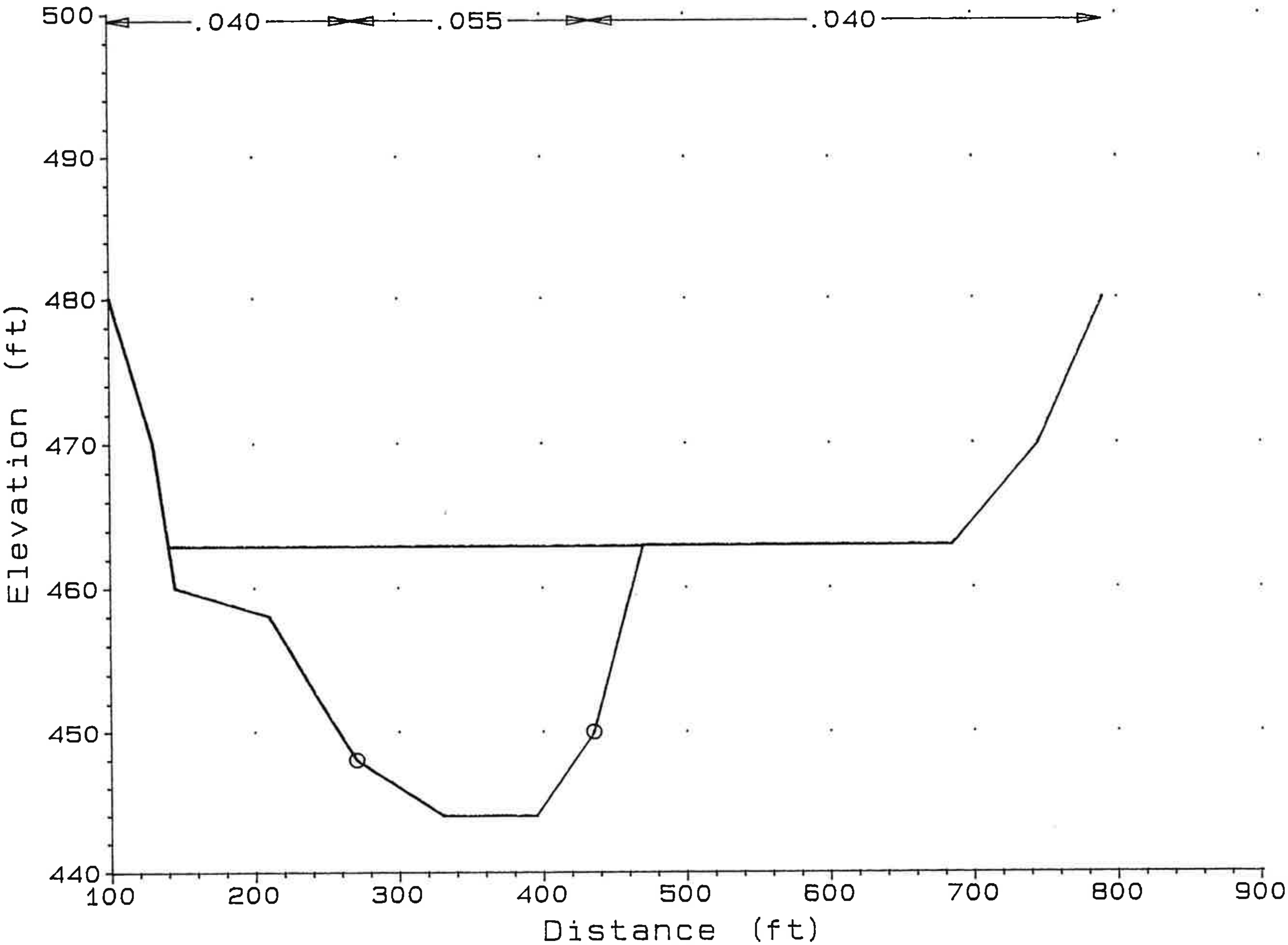
Malibu Ck. Future
Cross-section 28.000
.040
.055
.040
Elevation (ft)
330
325
320
315
310
305
300
Distance (ft)
100
150
200
250
300
350
400
450
500



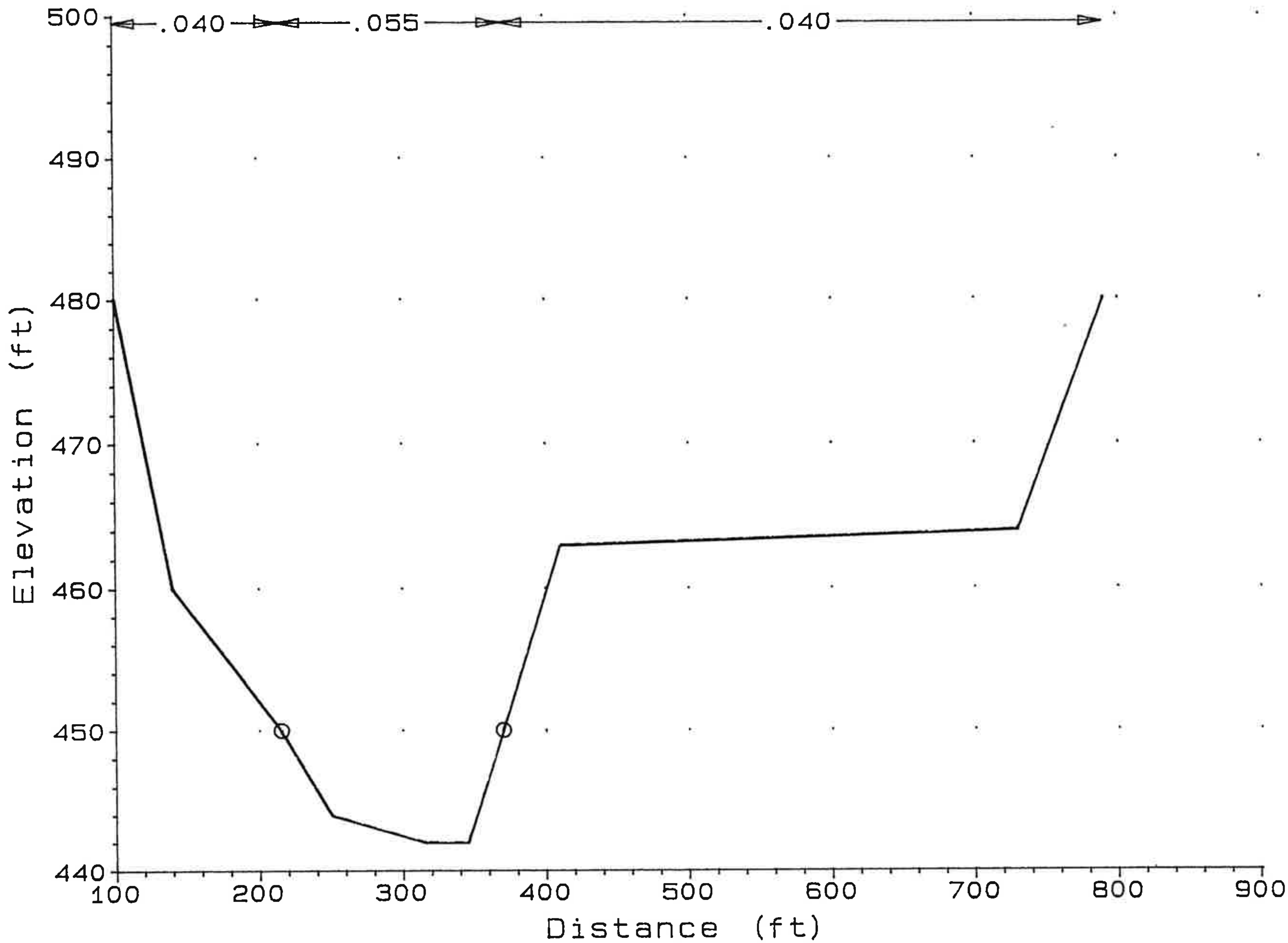
Malibu Ck. Future
Cross-section 65.200
.040
.055
.040
Elevation (ft)
470
460
450
440
430
420
410
100
150
200
250
300
350
400
450
500
Distance (ft)

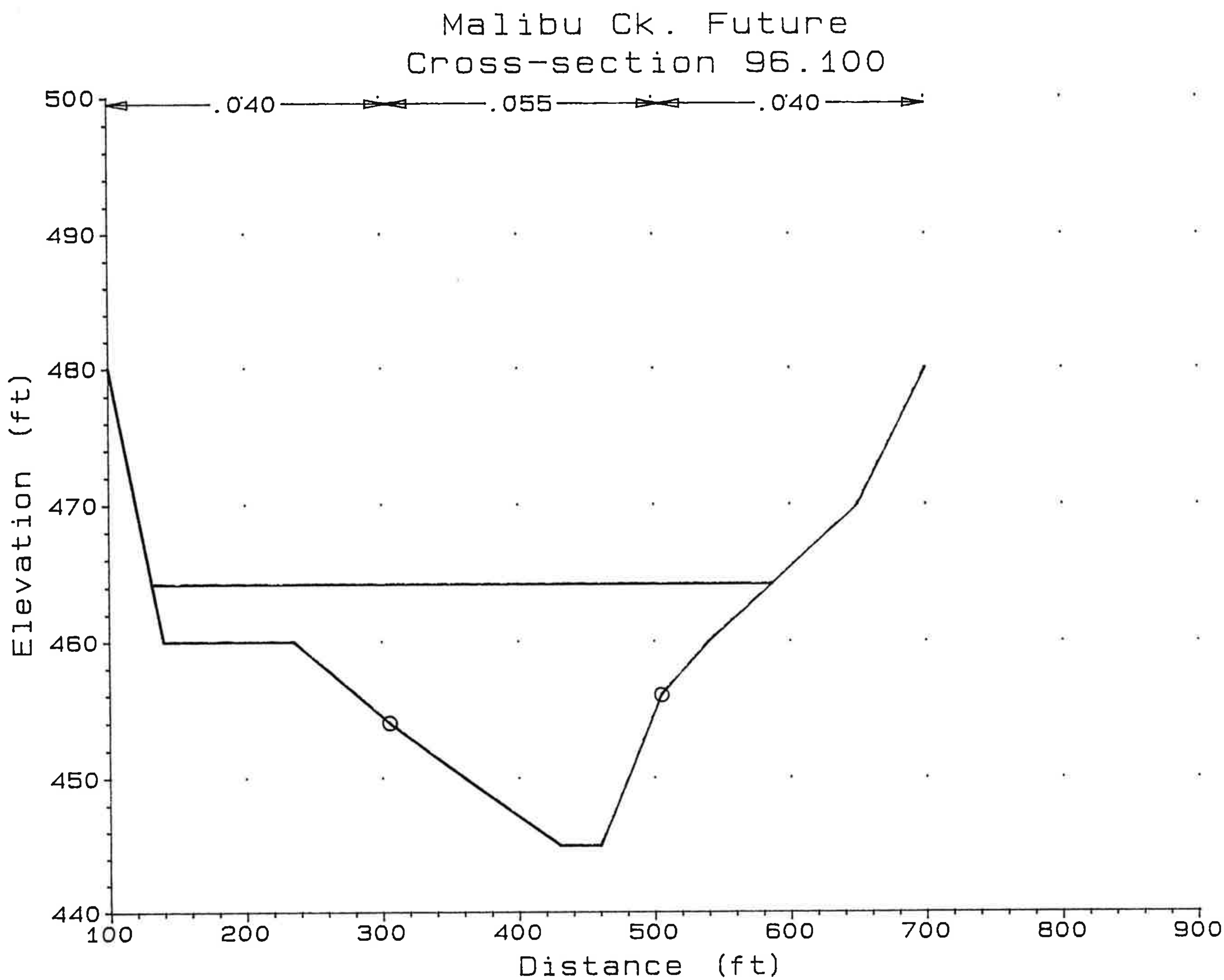

Malibu Ck. Future
Cross-section 86.000
.040
.055
.040
470
465
460
455
450
445
440
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)

Malibu Ck. Future
Cross-section 93.500



Malibu Ck. Future
Cross-section 91.000




Malibu Ck. Future
Cross-section 96.100
.040
.055
.040
Elevation (ft)
500
490
480
470
460
450
440
100
200
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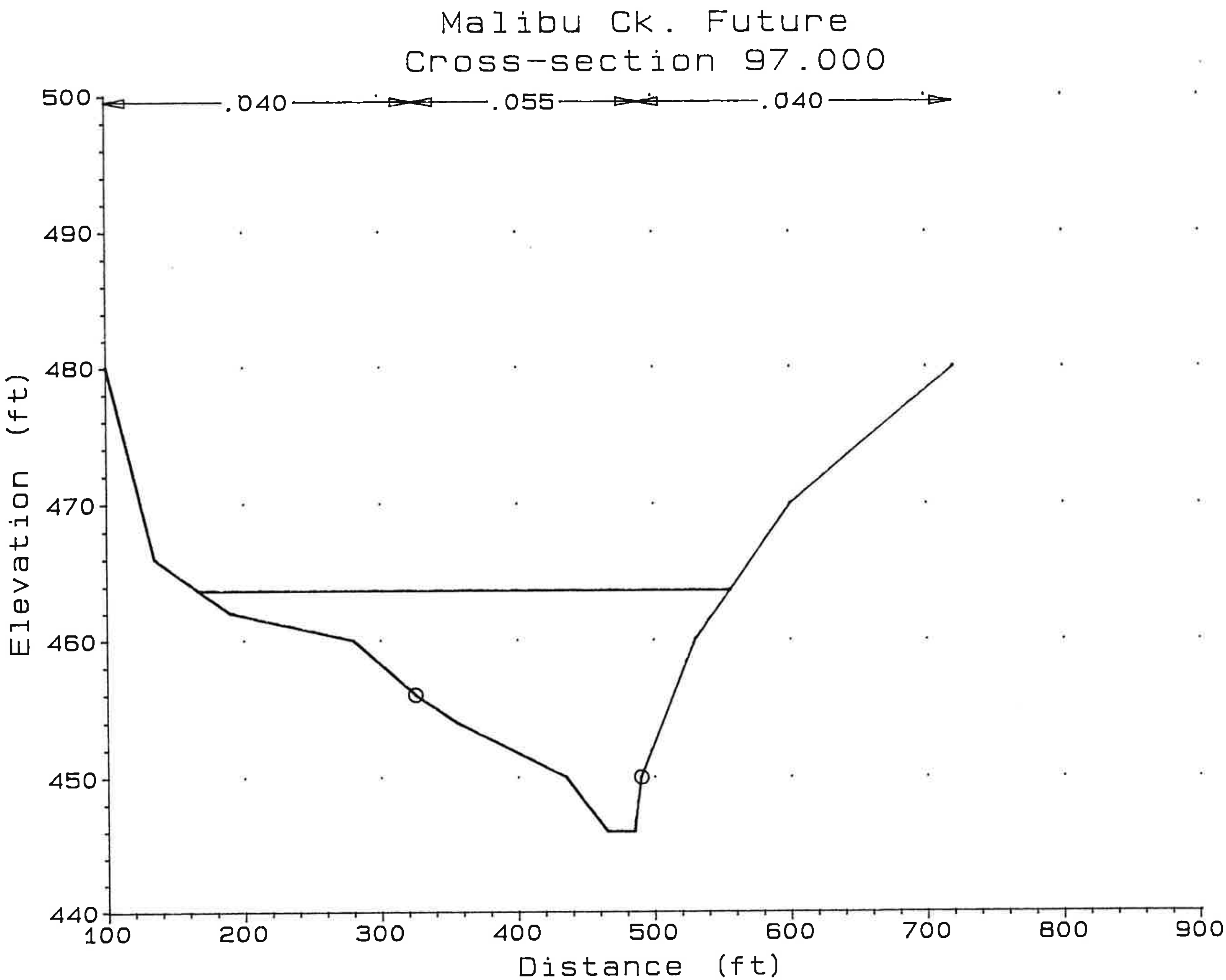
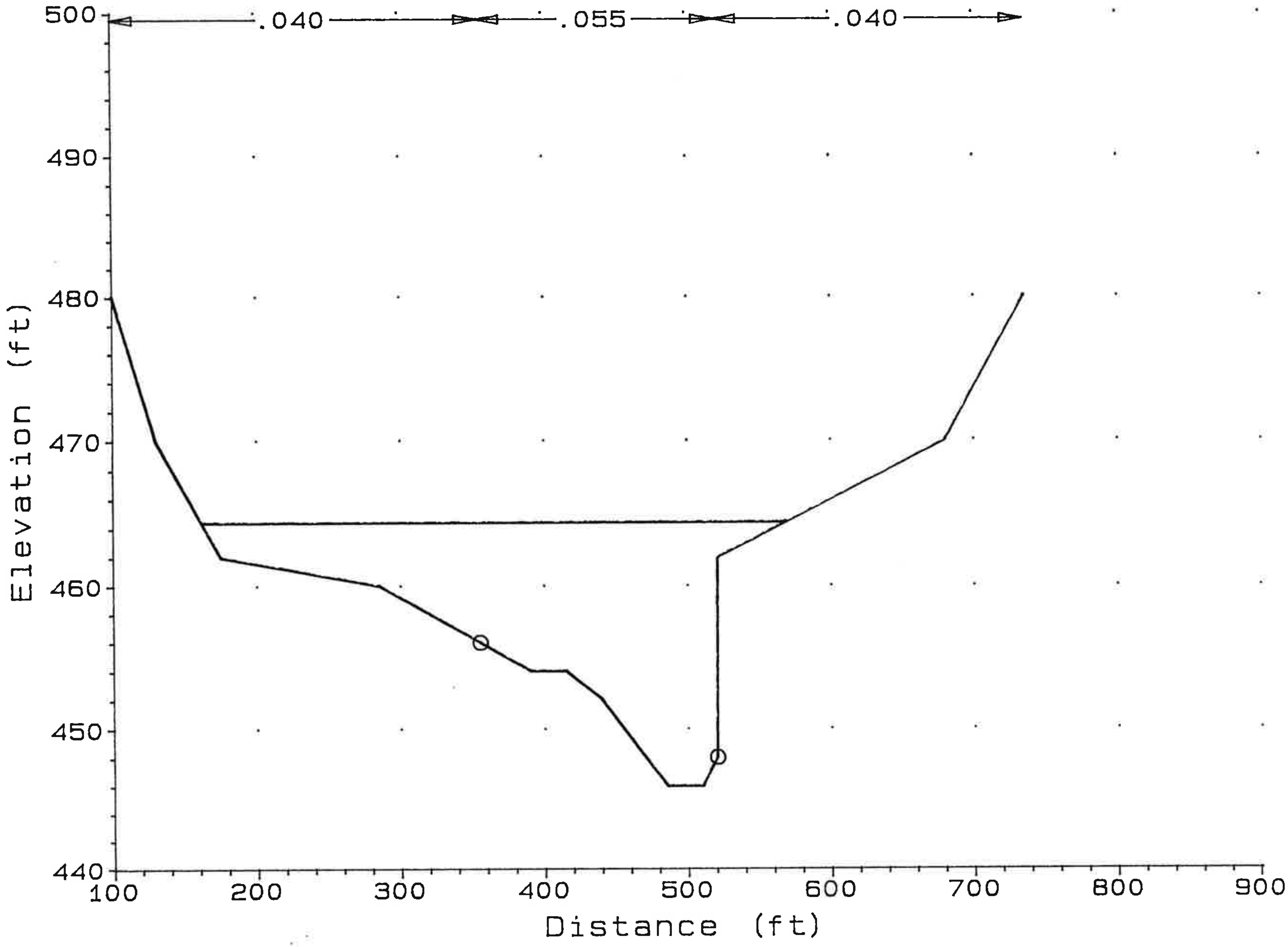
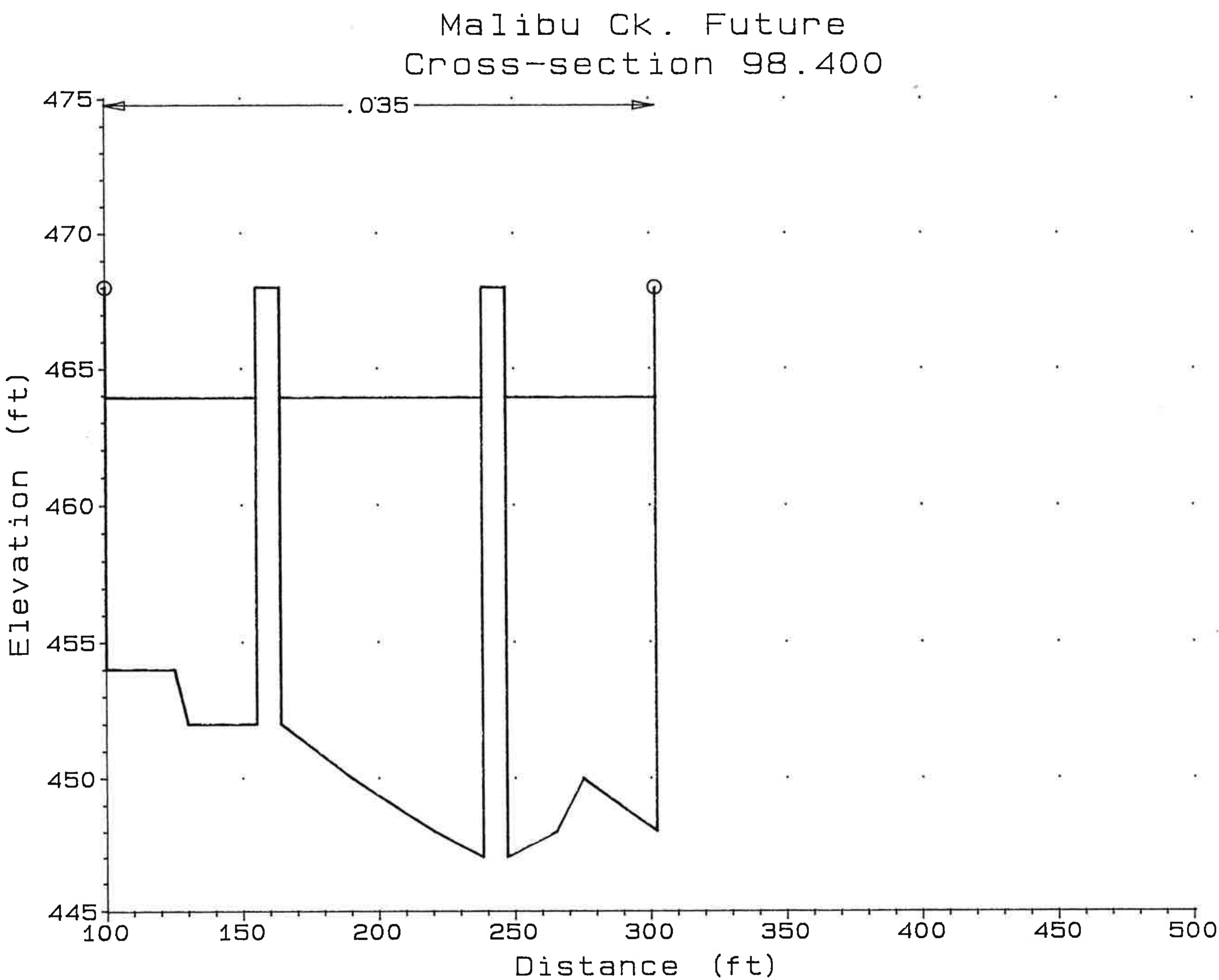
400
500
600
700
800
900
Distance (ft)

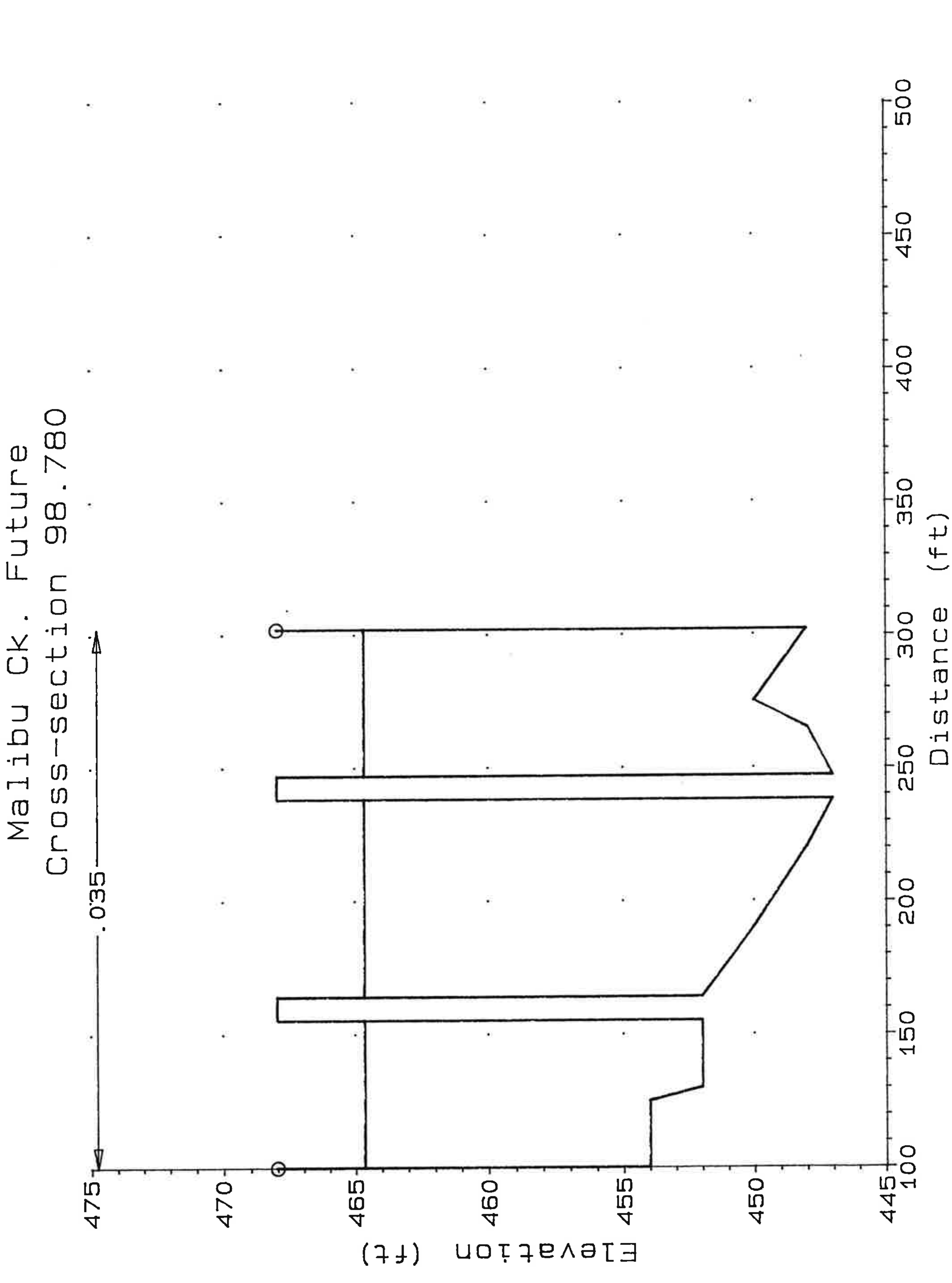

Malibu Ck. Future
Cross-section 97.000
.040
.055
.040
Elevation (ft)
500
490
480
470
460
450
440
100
200
300
400
500
600
700
800
900
Distance (ft)

Malibu Ck. Future
Cross-section 97.600



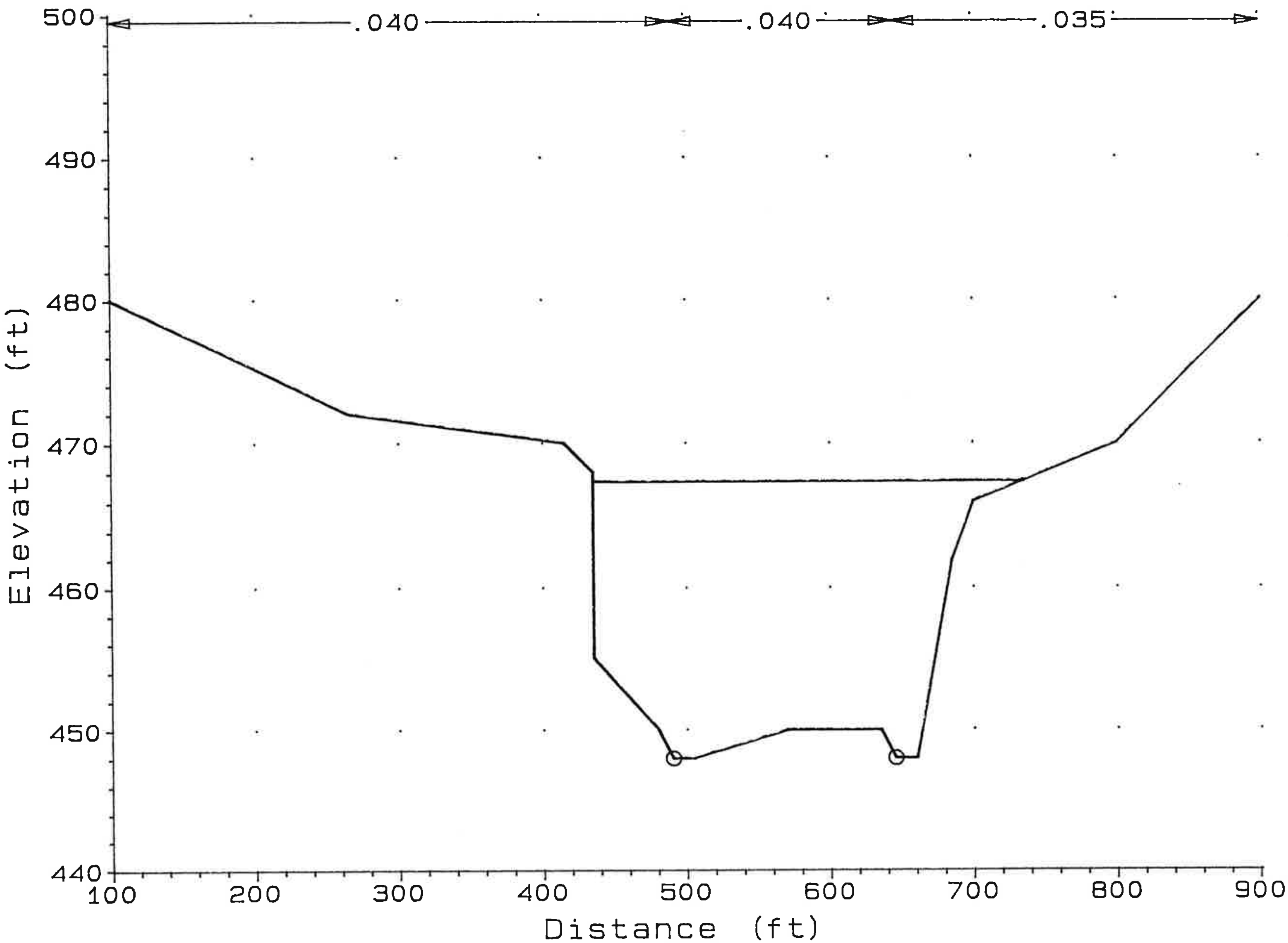


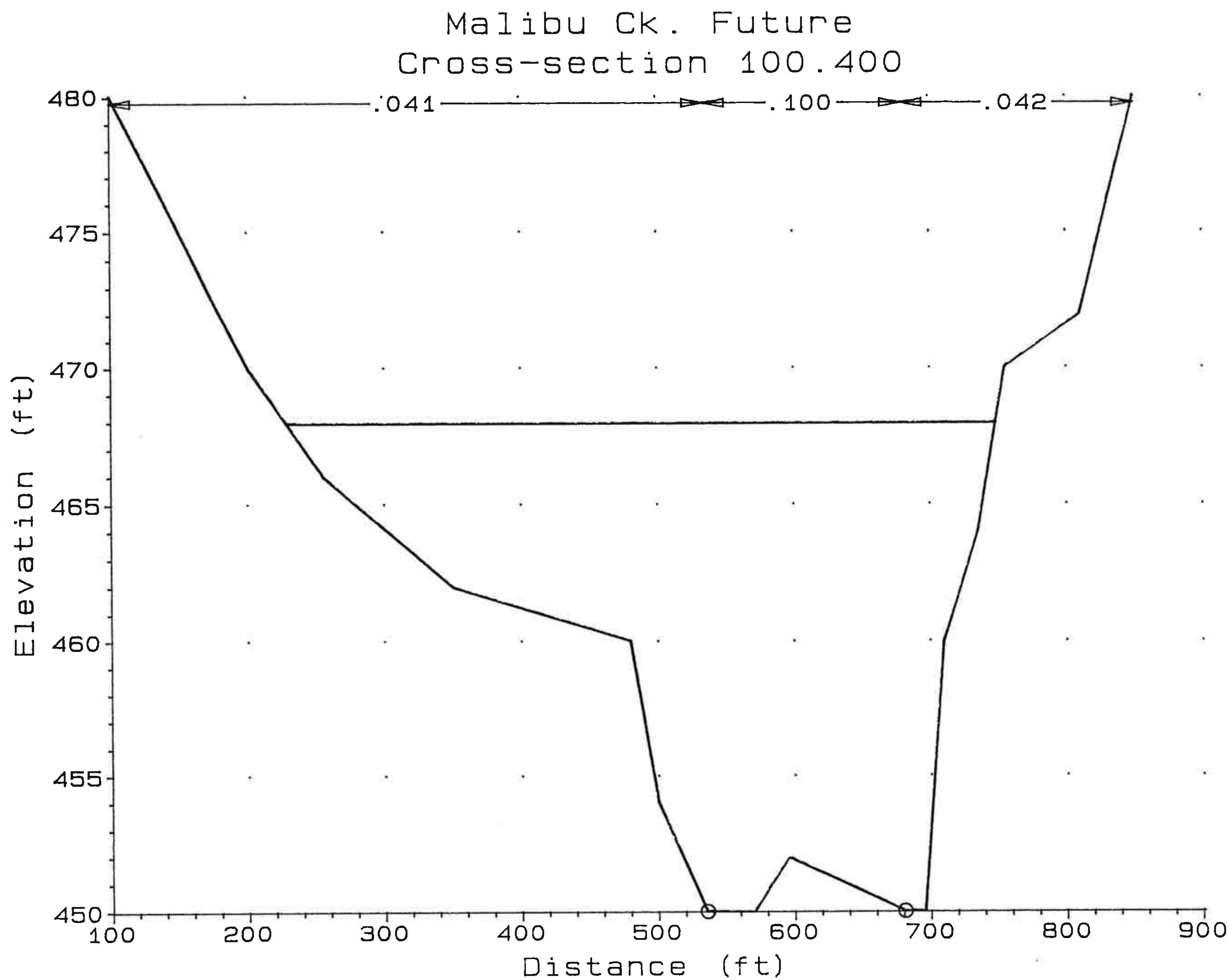
Malibu Ck. Future
Cross-section 98.400
.035
475
470
465
460
455
450
445
Elevation (ft)
100
150
200
250
300
350
400
450
500
Distance (ft)



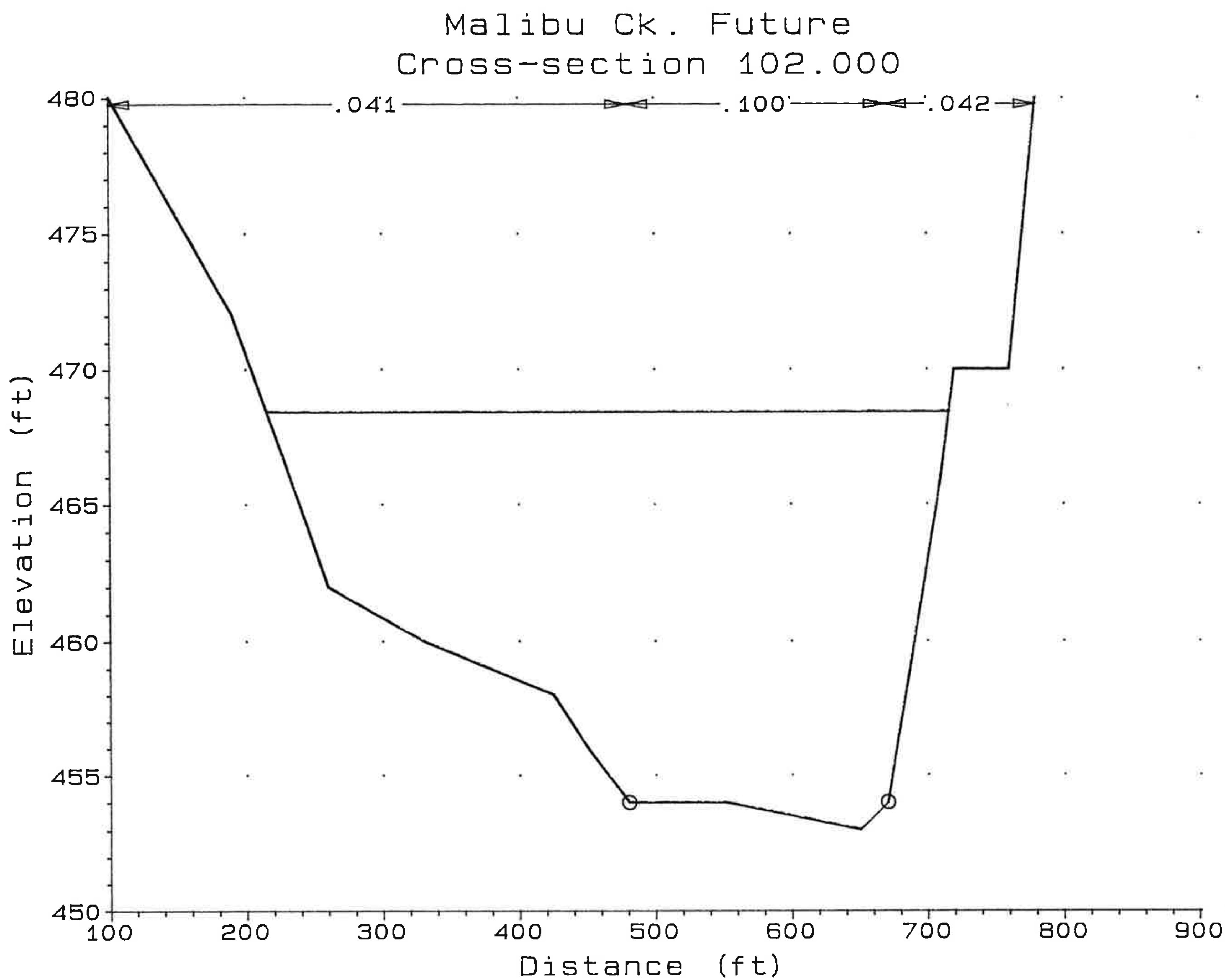
Malibu Ck. Future
Cross-section 98.780
.035
Elevation (ft)
Distance (ft)
475
470
465
460
455
450
445
100
150
200
250
300
350
400
450
500

Malibu Ck. Future
Cross-section 99.330

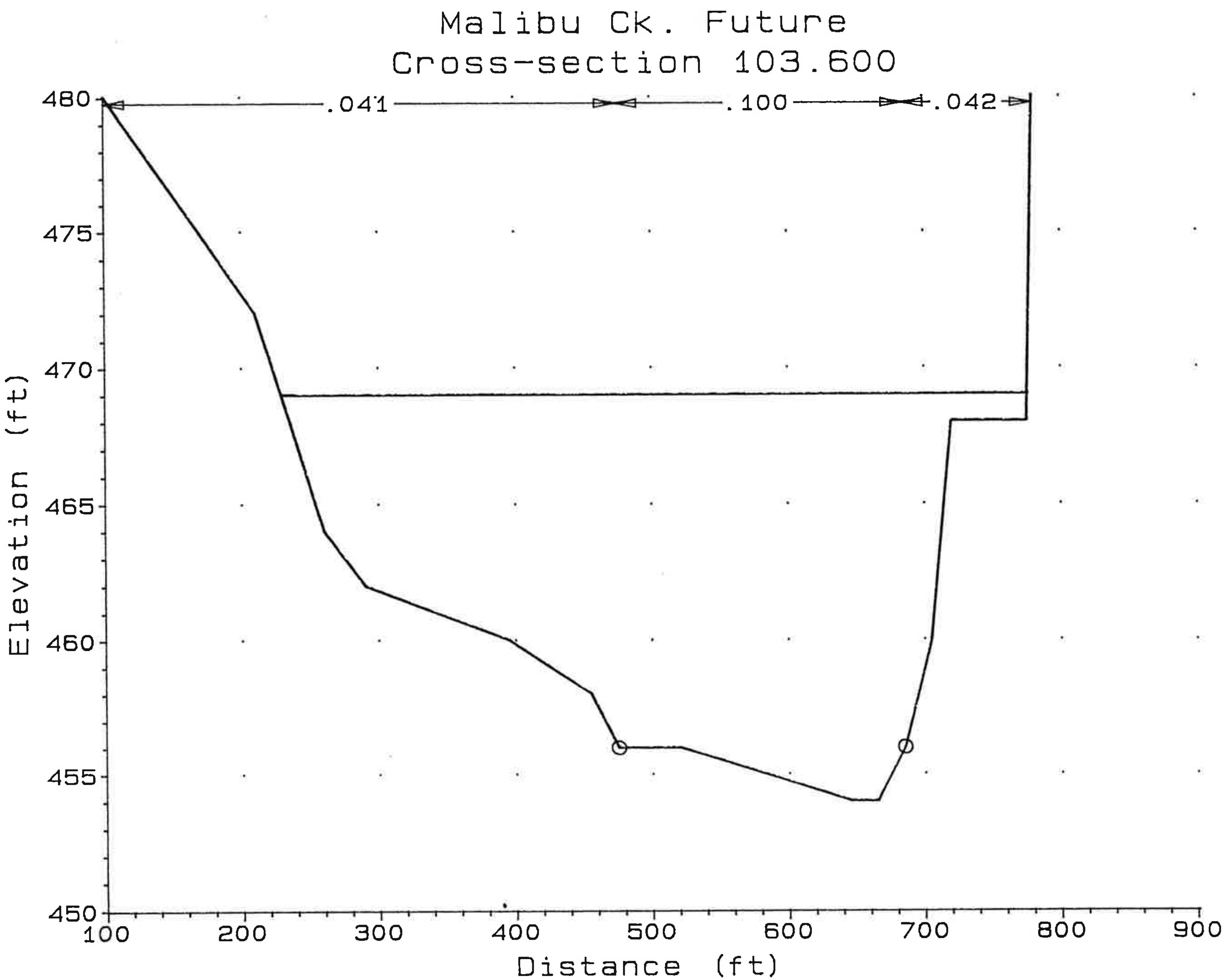




Malibu Ck. Future
Cross-section 100.400
.041
.100
.042
480
475
470
465
460
455
450
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)

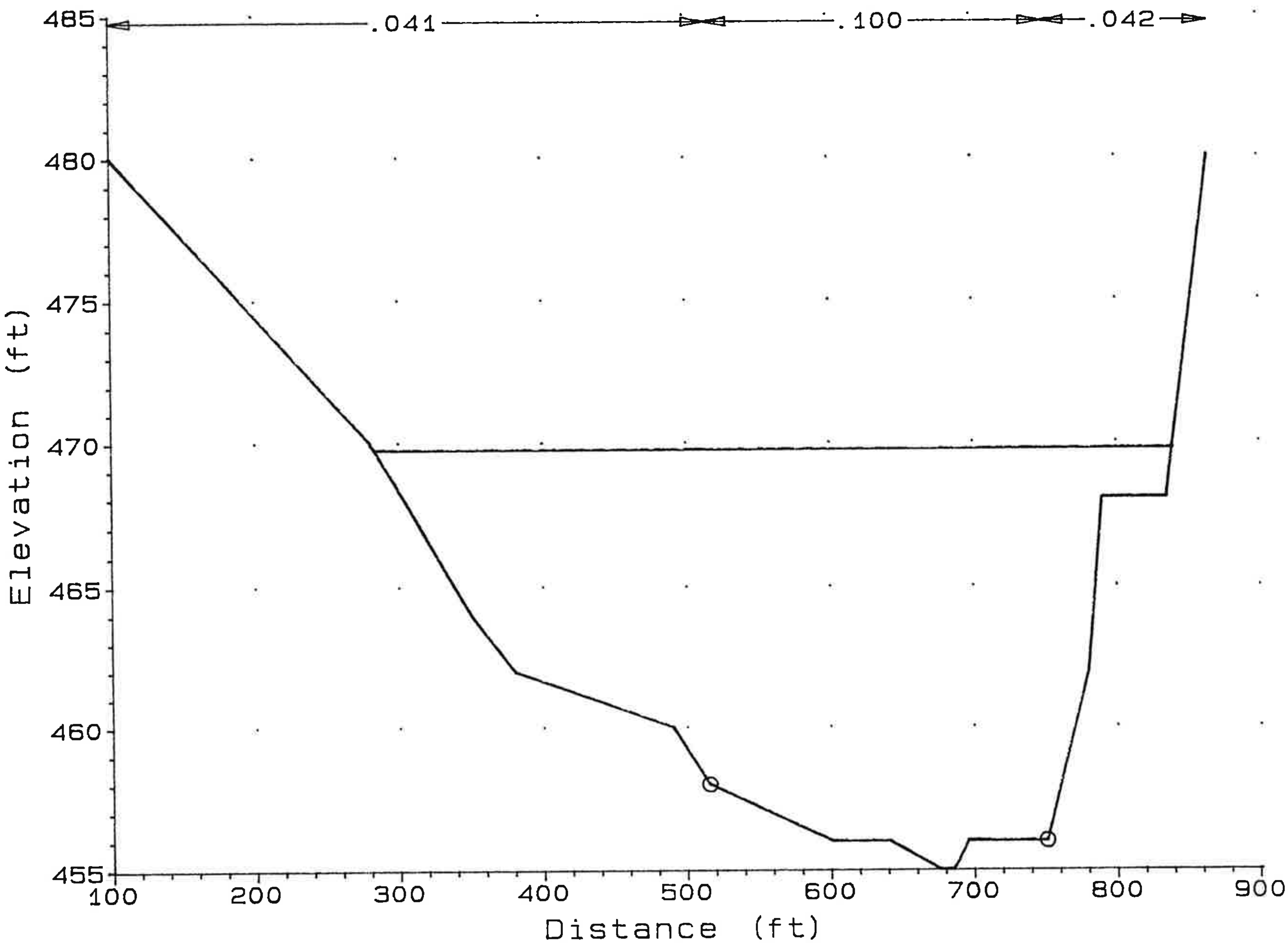


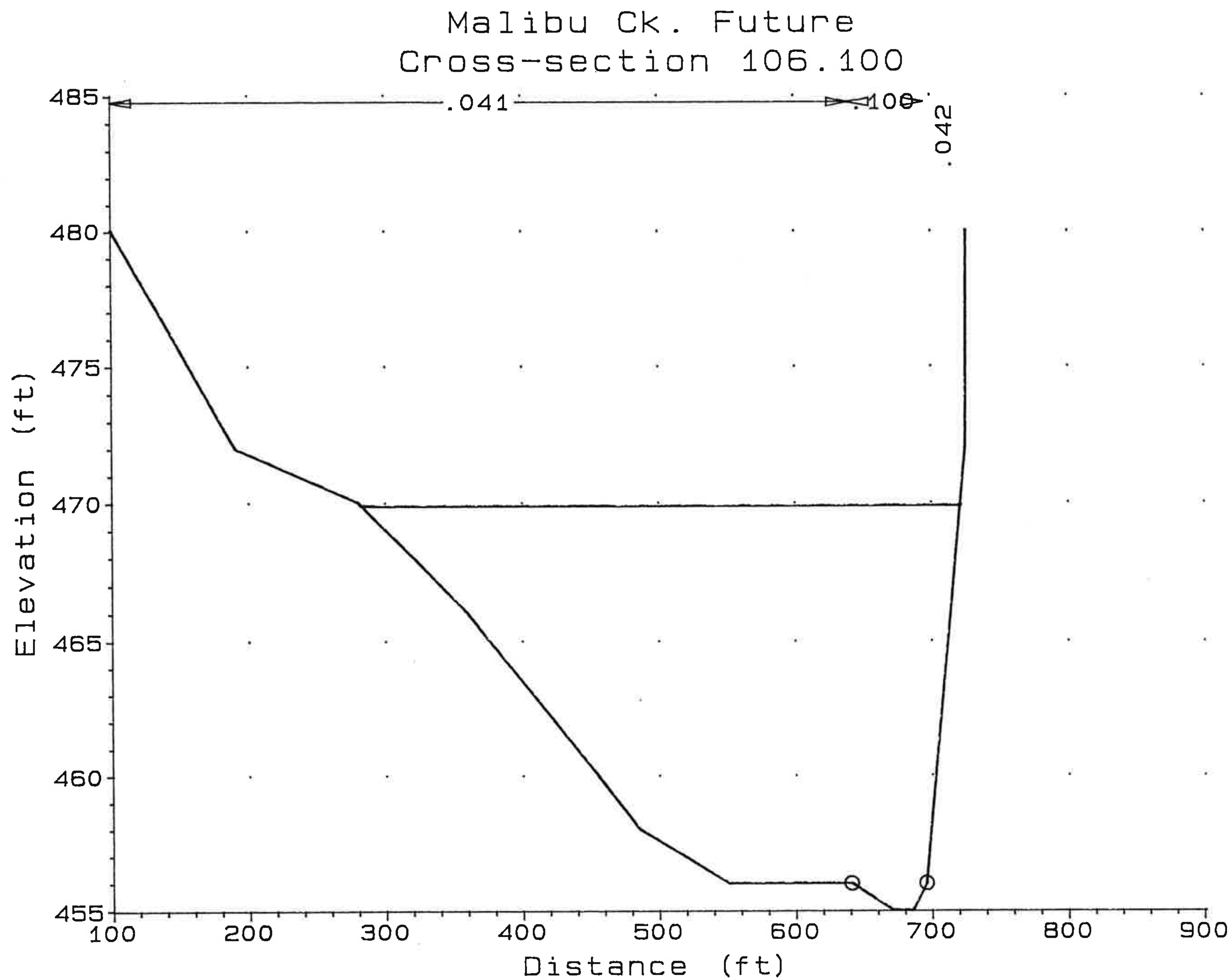
Malibu Ck. Future
Cross-section 102.000
.041
.100
.042
Elevation (ft)
480
475
470
465
460
455
450
Distance (ft)
100
200
300
400
500
600
700
800
900

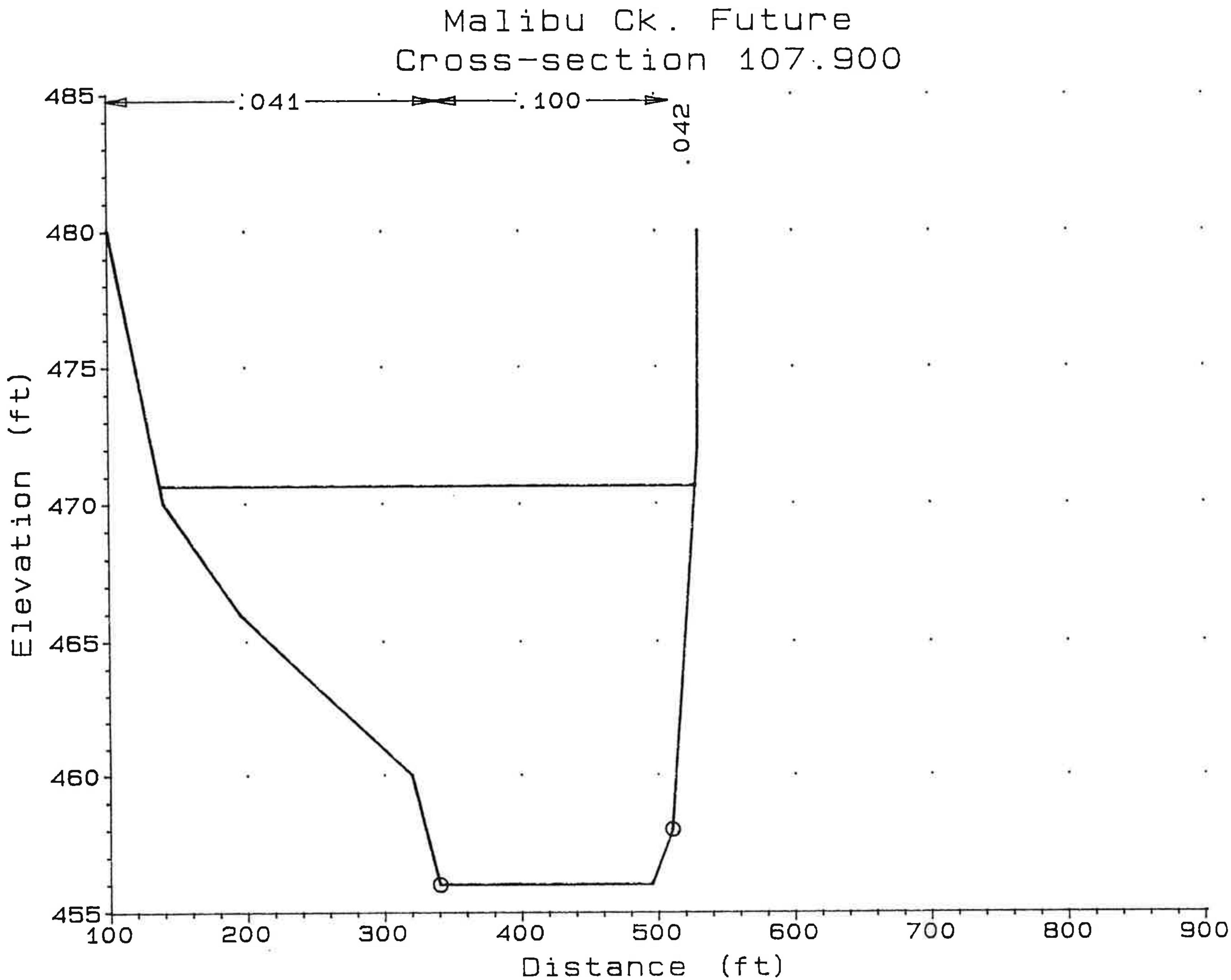


Malibu Ck. Future
Cross-section 103.600
.041
.100
.042
Elevation (ft)
480
475
470
465
460
455
450
100
200
300
400
500
600
700
800
900
Distance (ft)

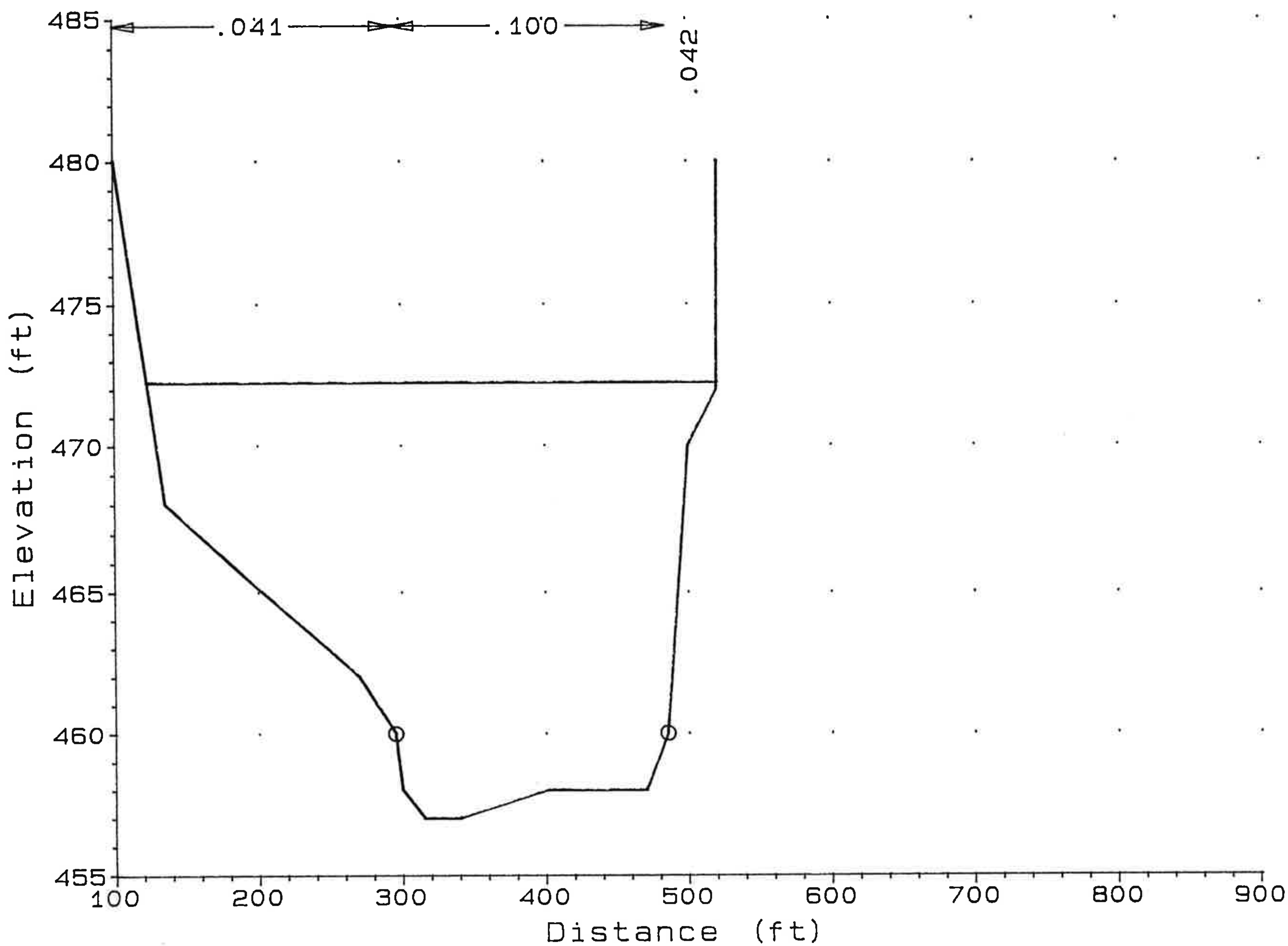
Malibu Ck. Future
Cross-section 104.950



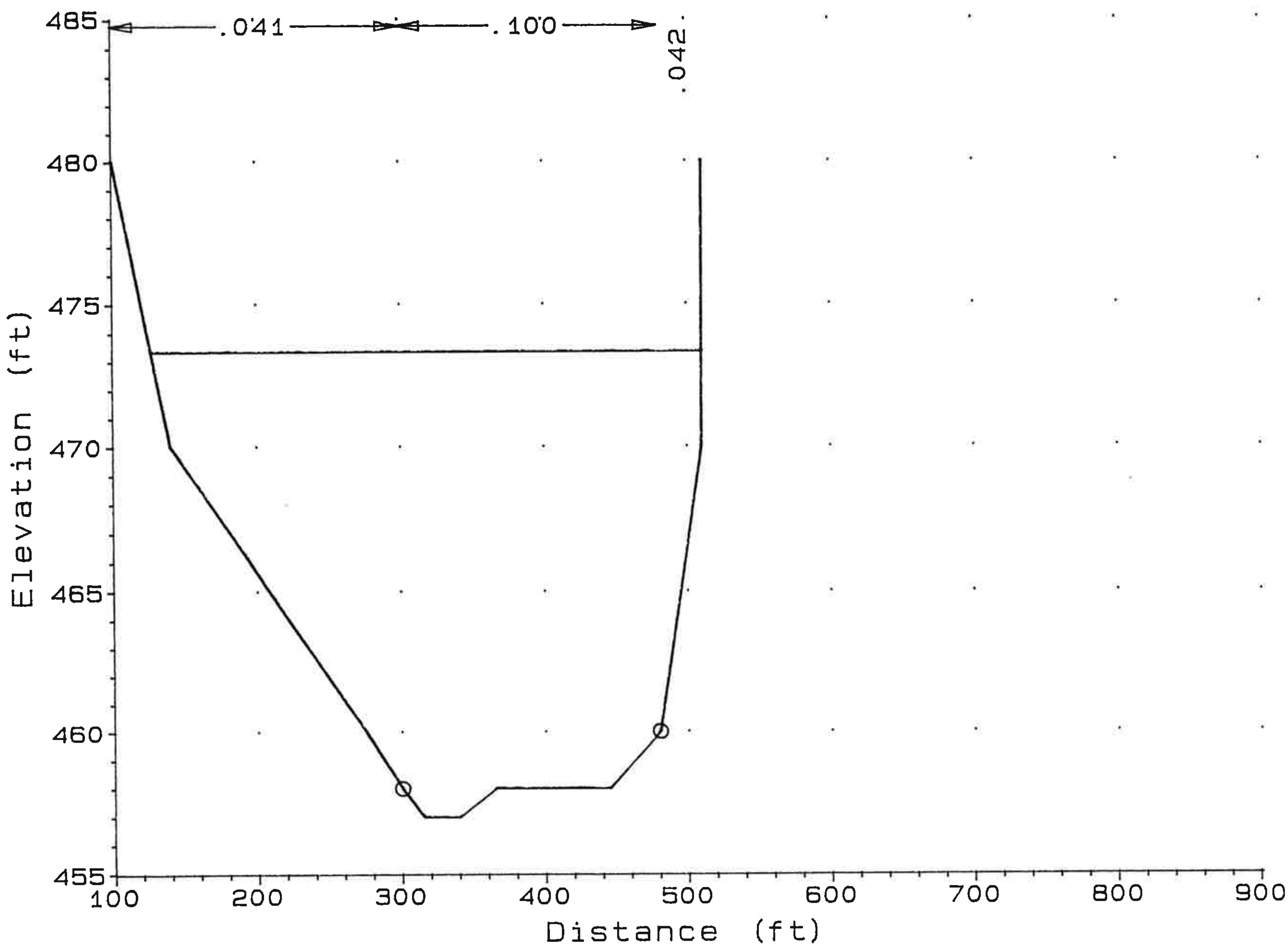

Malibu Ck. Future
Cross-section 106.100
.041
.100
.042
485
480
475
470
465
460
455
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)


Malibu Ck. Future
Cross-section 107.900
.041
.100
.042
485
480
475
470
465
460
455
Elevation (ft)
100
200
300
400
500
600
700
800
900
Distance (ft)

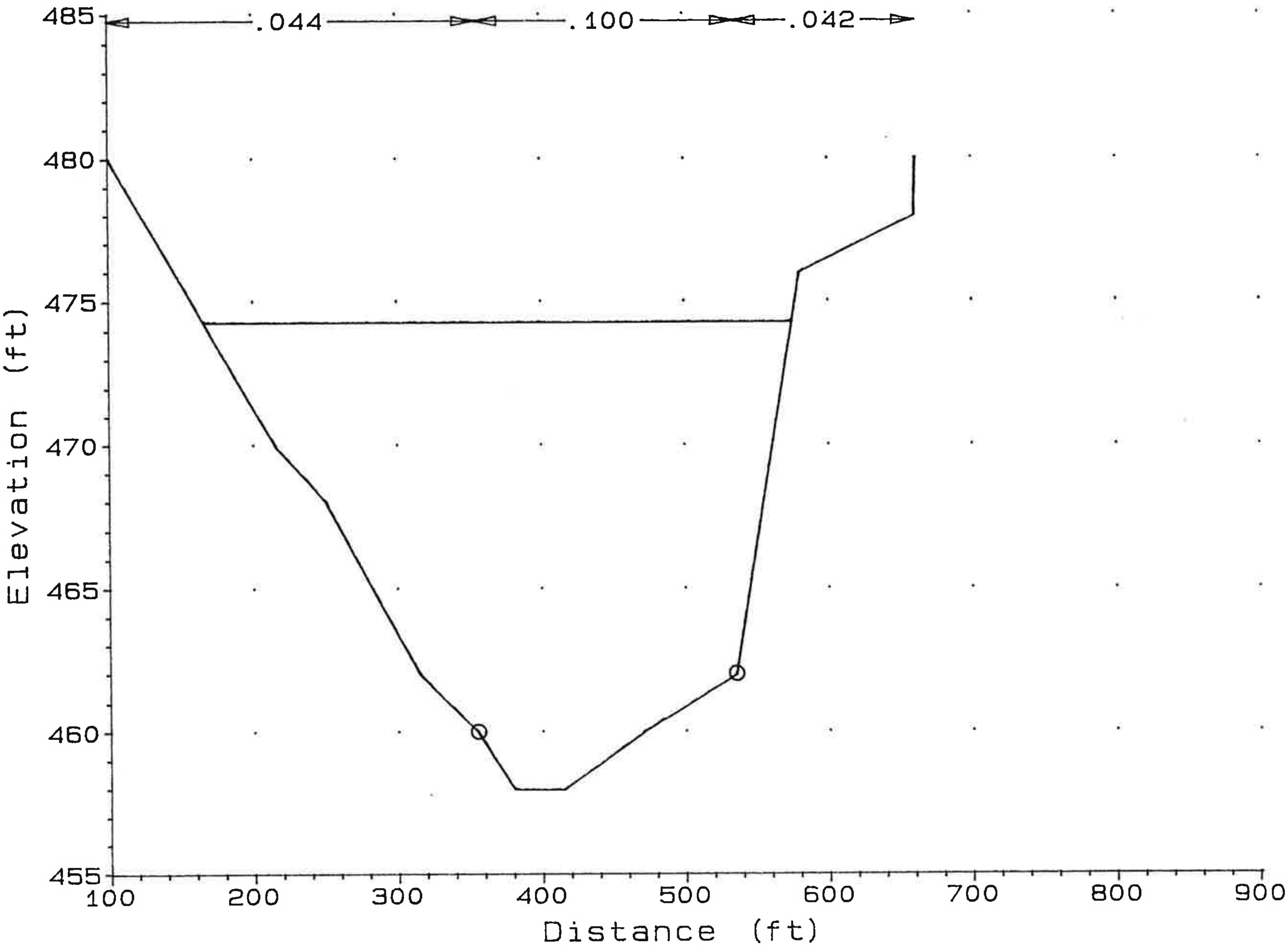
Malibu Ck. Future
Cross-section 109.400



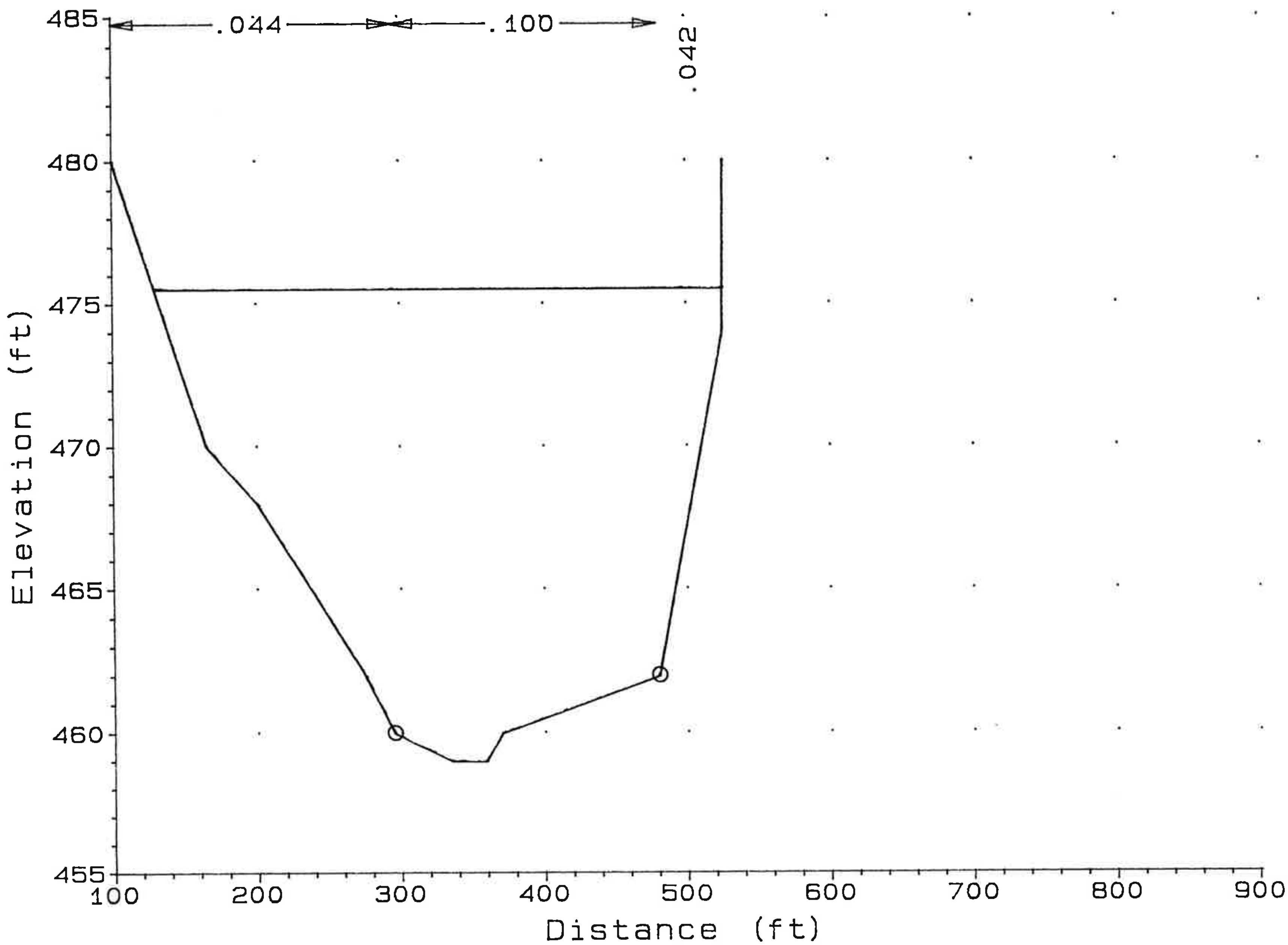
Malibu Ck. Future
Cross-section 110.650



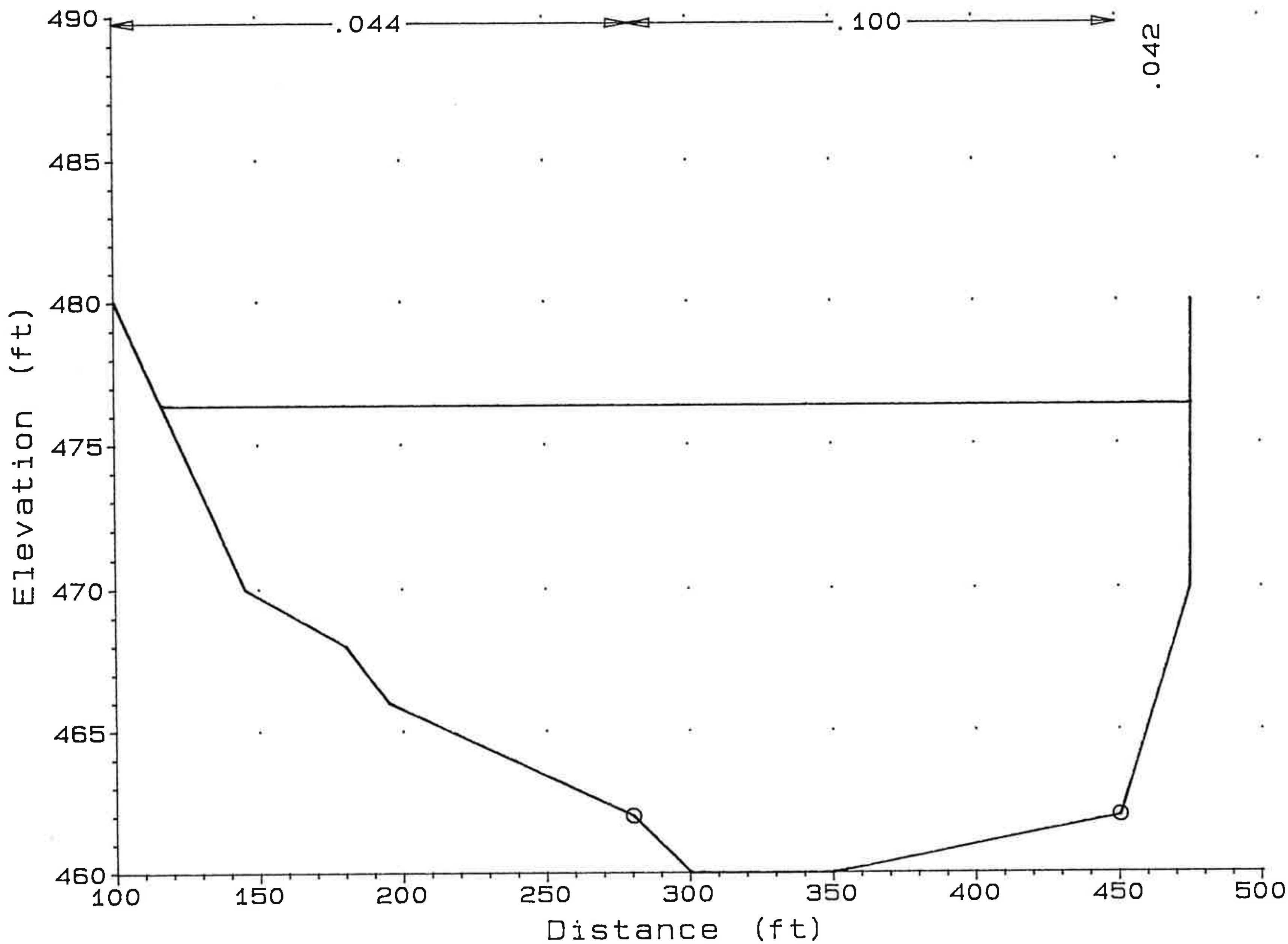
Malibu Ck. Future
Cross-section 112.150

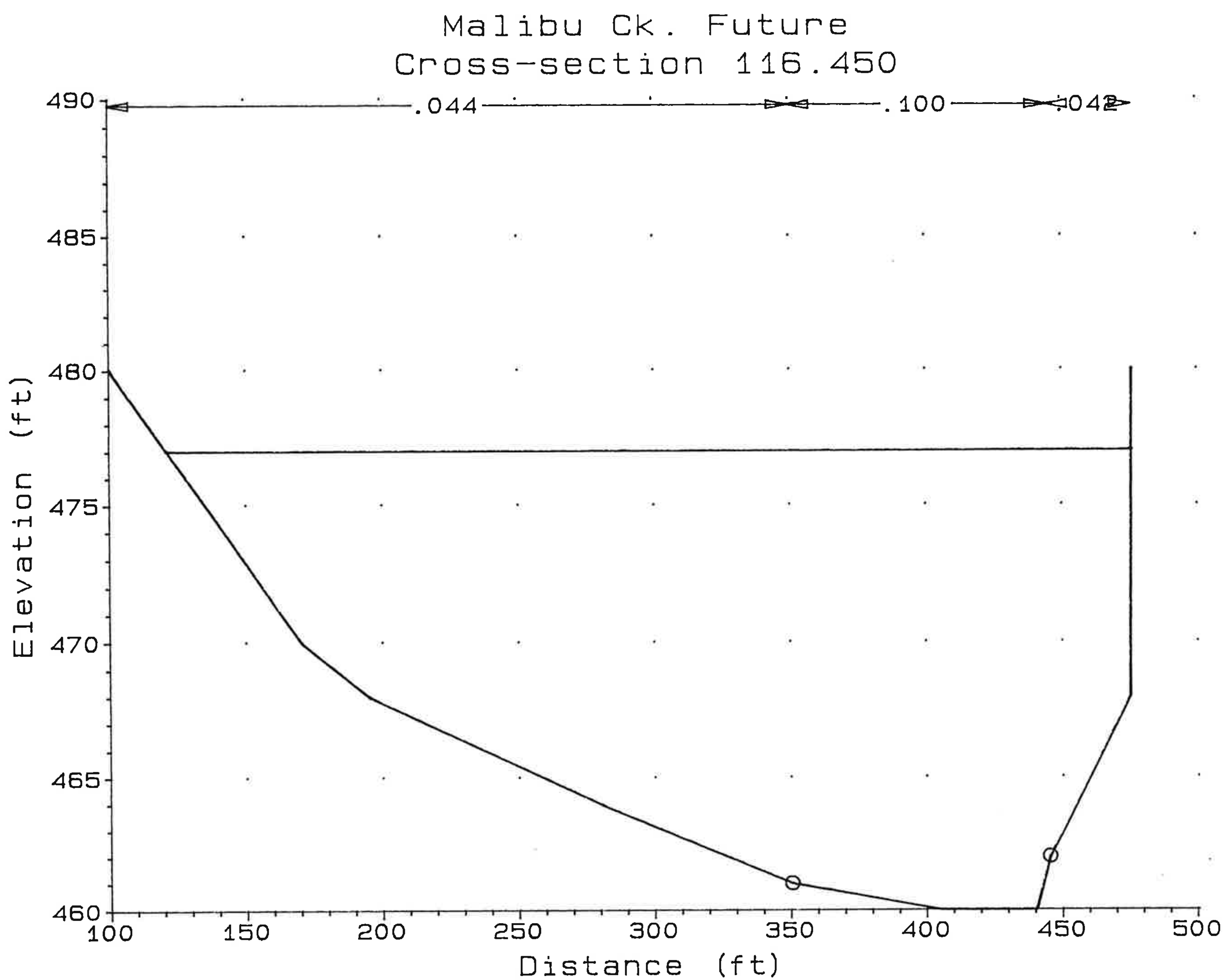


Malibu Ck. Future
Cross-section 113.650



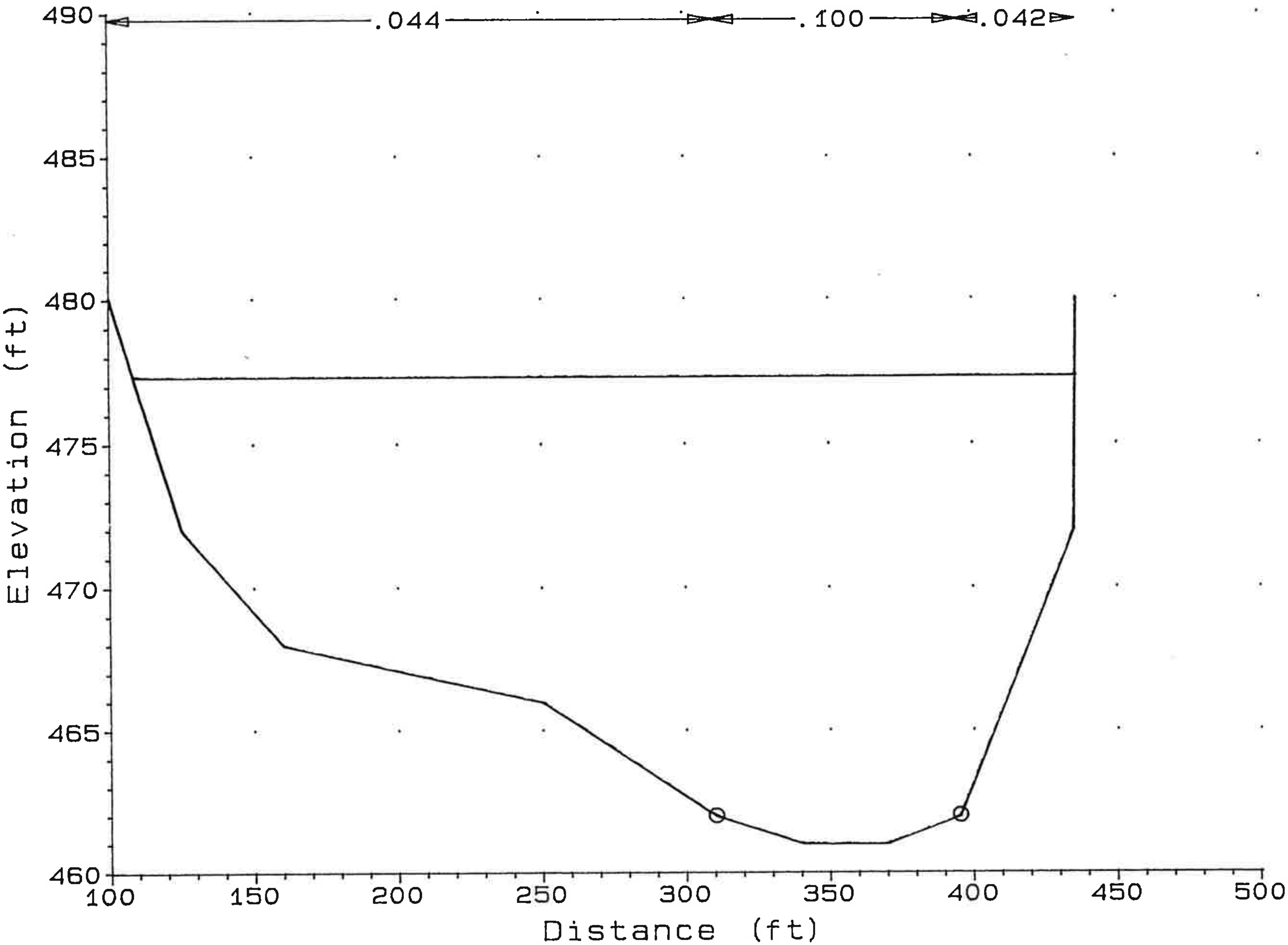
Malibu Ck. Future
Cross-section 115.150

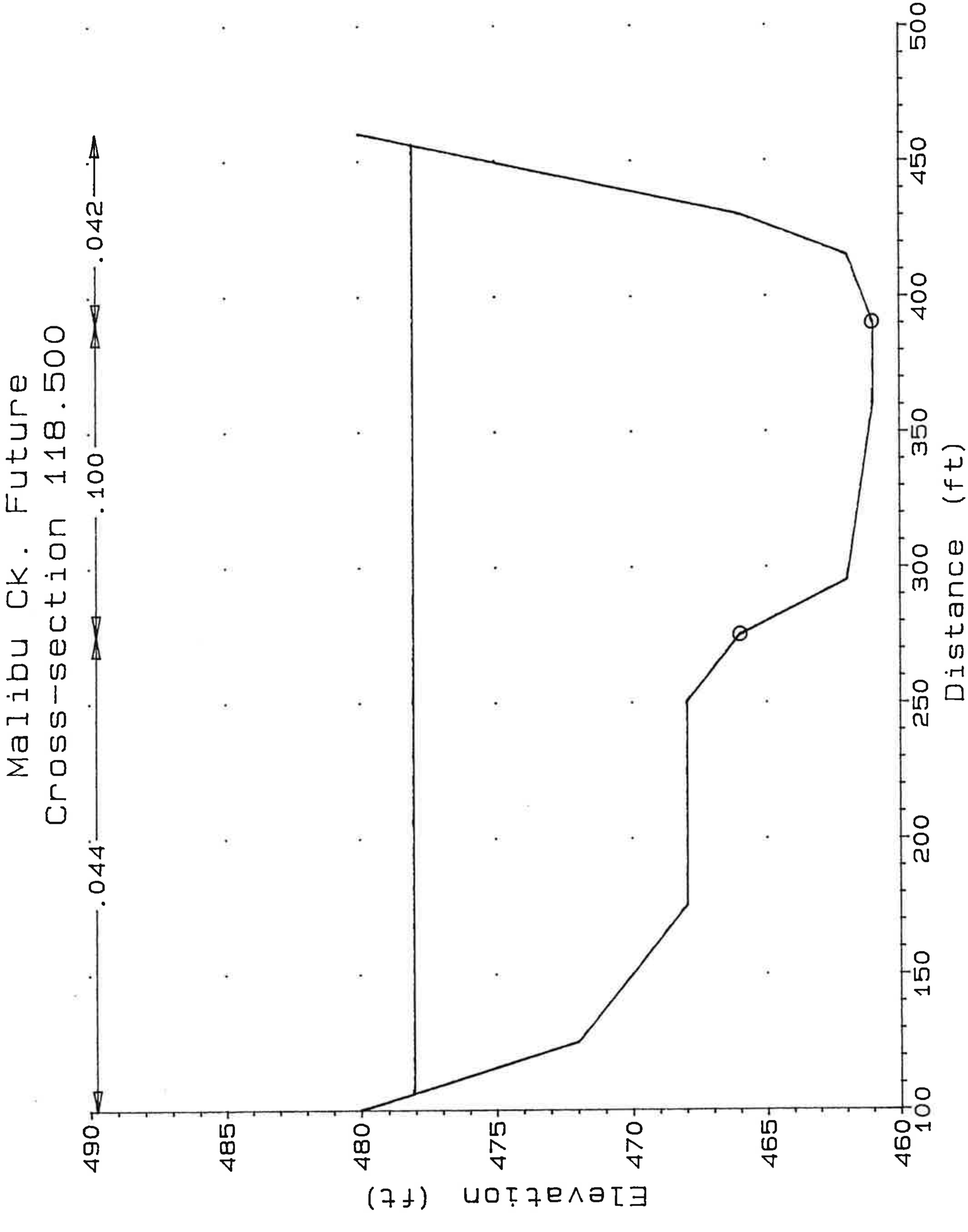




Malibu Ck. Future
Cross-section 116.450
.044
.100
.042
Elevation (ft)
490
485
480
475
470
465
460
Distance (ft)
100
150
200
250
300
350
400
450
500

Malibu Ck. Future
Cross-section 117.600




Malibu Ck. Future
Cross-section 118.500
.044
.100
.042
Elevation (ft)
490
485
480
475
470
465
460
Distance (ft)
100
150
200
250
300
350
400
450
500

APPENDIX 5

MALIBU CREEK HYDRAULIC ANALYSIS FOR COMPLETE BLOCKAGE OF BRIDGE OPENING

```
1*************************************************************
 *  WATER SURFACE PROFILES                                   *
 *  VERSION OF SEPTEMBER 1988                                *
 *  ERROR: 01,02,03                                          *
 *  UPDATED:   SEPTEMBER 1989                                *
 *  RUN DATE     4/30/90    TIME     8:54:53                 *
 *************************************************************
```

```
*****************************************
*  U.S. ARMY CORPS OF ENGINEERS         *
*  THE HYDROLOGIC ENGINEERING CENTER    *
*  609 SECOND STREET, SUITE D           *
*  DAVIS, CALIFORNIA 95616-4687         *
*          (916) 756-1104               *
*****************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X         XXXXX     XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

END OF BANNER

```
1
     4/30/90        8:54:53                                                    PAGE    1

                                                        THIS RUN EXECUTED  4/30/90      8:54:53

 ***************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -  01,02,03
   MODIFICATION -
 ***************************************************

T1   MALIBU CREEK ULTIMATE VEGETATION GROWTH SCENARIO.  RIVERTECH, FEB., 1990
T2   ALL CROSS SECTIONS LOOKING DOWNSTREAM. **complete blockage at bridge**
T3        MALIBU CREEK (u)

J1   ICHECK     INQ      NINV      IDIR      STRT     METRIC     HVINS       Q       WSEL       FQ

        0         2         0         0        -1         0         0         0        294        0

J2   NPROF     IPLOT     PRFVS     XSECV     XSECH       FN      ALLDC      IBW      CHNIM    ITRACE

        1         0        -1         0         0         0        -1         0         0         0

NC    0.040     0.040     0.055      0.1       0.3
QT        1     41800
X1     0.00         4       100       277         0         0         0
GR      305       100       289       101       289       276       305       277

X1     1.50         8       260       390       100       200       150
GR      320       100       300       160       292       260       288       320       286       350
GR      286       390       298       440       320       480

X1     3.00         9       230       360       150       160       150
GR      320       100       300       140       292       230       286       290       286       315
GR      290       360       298       370       300       410       320       430

X1     7.50         8       135       240       400       500       450
GR      320       100       290       135       288       140       288       155       290       170
GR      292       240       302       285       320       440

X1    14.50         9       210       360       750       650       700
GR      320       100       304       120       306       180       306       210       290       250
GR      290       265       292       305       296       360       320       405

X1    20.50         9       140       260       550       650       600
GR      330       100       300       140       296       160       294       180       294       200
GR      296       210       300       260       310       290       330       320

X1    28.00         6       135       230       700       800       750
GR      330       100       300       135       300       175       304       230       310       250
GR      330       300
1
     4/30/90        8:54:53                                                    PAGE    2

X1    35.00         8       150       260       700       750       700
GR      340       100       310       150       308       160       310       170       312       200
GR      310       230       310       260       340       300

X1    43.00         6       150       280       800       800       800
GR      360       100       340       150       336       180       336       210       338       280
GR      360       320

X1    48.50         5       145       170       550       550       550
GR      380       100       350       135       344       145       344       170       380       200

X1    54.25         6       130       230       425       425       425
GR      400       100       380       130       370       160       370       190       380       230
GR      400       270

X1    59.50         6       140       245       525       525       525
```

GR GR	420 420	100 290	400	140	392	160	392	205	400	245
X1 GR GR	65.20 460 420	7 100 230	145 420 460	230 130 280	570 414	570 145	570 412	165	414	190
X1 GR GR	77.00 470 470	6 100 370	145 440	285 145	1180 434	1180 220	1180 434	270	440	285
X1 GR GR GR	86.00 470 450 454	12 100 470 840	310 460 460 470	470 250 490 880	900 450 460	600 310 520	700 440 452	360 570	440 452	425 760
X1 GR GR	91.00 480 442	10 100 345	215 460 450	370 140 370	500 450 463	450 215 410	500 444 464	250 730	442 480	315 790
X1 GR GR GR	93.50 480 444 470	12 100 330 745	270 470 444 480	435 130 395 790	290 460 450	160 145 435	250 458 463	210 470	448 463	270 685
X1 GR GR GR	96.10 480 445 480	11 100 430 700	305 460 445	505 140 460	290 460 456	230 235 505	260 454 460	305 540	450 470	360 650
X1 GR GR GR	97.00 480 454 460	13 100 355 530	325 466 450 470	490 135 435 600	110 462 446 480	85 190 465 720	90 460 446	280 485	456 450	325 490

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X1 GR GR GR	97.60 480 454 448	14 100 390 520	355 470 454 462	520 130 415 521	60 462 452 470	60 175 440 680	60 460 446 480	285 485 735	456 446	355 510
NC X1 GR GR	.020 98.40 480 476	.020 7 100 720	.020 100 472 480	870 185 870	40 471	40 270	40 472	510	474	650
X1	98.78	0			38	38	38			
NC X1 GR GR GR GR	0.040 99.33 480 450 448 480	0.035 16 100 480 645 900	0.040 490 472 448 448	645 265 490 660	55 470 448 462	55 415 505 685	55 468 450 466	435 570 700	455 450 470	435.1 635 800
NC X1 GR GR GR GR	0.041 100.40 480 454 450 480	0.042 16 100 500 695 850	0.100 535 470 450 460	680 200 535 710	70 466 450 464	120 255 570 735	107 462 452 470	350 595 755	460 450 472	480 680 810
X1 GR GR GR	102.00 480 456 466	14 100 450 710	480 472 454 470	670 190 480 720	80 462 454 470	160 260 550 760	160 460 453 480	330 650 780	458 454	425 670
X1 GR GR GR	103.60 480 458 456	15 100 455 685	475 472 456 460	685 210 475 705	130 464 456 468	130 260 520 720	160 462 454 468	290 645 775	460 454 480	395 665 780
X1 GR GR GR GR	104.95 480 458 456 480	16 100 515 695 865	515 470 456 456	750 280 600 750	135 464 456 462	135 350 640 780	135 462 455 468	380 675 790	460 455 468	490 685 835
X1 GR GR GR	106.10 480 458 456	13 100 485 695	640 472 456 472	695 190 550 725	115 470 456 480	115 280 640 726	115 466 455	360 670	460 455	455 685
X1 GR GR	107.90 480 456	10 100 390	340 470 456	510 140 495	160 466 458	190 195 510	180 460 472	320 530	456 480	340 531

1 4/30/90 8:54:53 PAGE 4

X1 GR GR GR	109.40 480 458 460	14 100 300 485	295 468 457 470	485 135 315 500	150 466 457 472	150 180 340 520	150 462 458 480	270 400 521	460 458	295 470
X1	110.65	12	300	480	125	125	125			

```
GR     480     100     470     140     466     195     460     275     458     300
GR     457     315     457     340     458     365     458     445     460     480
GR     470     510     480     511

NC   0.044   0.042   0.100
X1  112.15      12     355     535     150     150     150
GR     480     100     470     215     468     250     462     315     460     355
GR     458     380     458     415     460     470     462     535     476     580
GR     478     660     480     661

X1  113.65      11     295     480     150     150     150
GR     480     100     470     165     468     200     462     275     460     295
GR     459     335     459     359     460     370     462     480     474     525
GR     480     526

X1  115.15      10     280     450     150     150     150
GR     480     100     470     145     468     180     466     195     462     280
GR     460     300     460     350     462     450     470     475     480     476

X1  116.45      10     350     445     130     130     130
GR     480     100     470     170     468     195     464     280     461     350
GR     460     405     460     440     462     445     468     475     480     476

X1  117.60      10     310     395     115     115     115
GR     480     100     472     125     468     160     466     250     462     310
GR     461     340     461     370     462     395     472     435     480     436

X1  118.50      11     275     390      90      90      90
GR     480     100     472     125     468     175     468     250     466     275
GR     462     295     461     360     461     390     462     415     466     430
GR     480     460
```



```
    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

 *PROF 1

 CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
0
 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
     .000     12.04    301.04    301.04    294.00    307.10      6.06       .00       .00    305.00
   41800.        0.    41800.        0.        0.     2117.        0.        0.        0.    305.00
      .00       .00     19.75       .00      .000      .055      .000      .000    289.00    100.25
  .022856        0.        0.        0.         0        16         0       .00    176.51    276.75
0
 *SECNO 1.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.08

    1.500     21.00    307.00    300.67       .00    308.38      1.38       .82       .47    292.00
   41800.    10190.    23118.     8491.     1174.     2461.      824.       11.        1.    286.00
      .00      8.68      9.40     10.31      .040      .055      .040      .000    286.00    138.99
  .002402      100.      150.      200.         3        11         0       .00    317.38    456.37
0
 *SECNO 3.000
    3.000     21.20    307.20    301.89       .00    308.89      1.69       .42       .09    292.00
   41800.    10725.    26894.     4181.     1059.     2485.      486.       26.        2.    290.00
      .01     10.13     10.82      8.61      .040      .055      .040      .000    286.00    125.61
  .003153      150.      150.      160.         2        19         0       .00    291.58    417.19
0
 *SECNO 7.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .62

    7.500     19.83    307.83    305.66       .00    311.72      3.89      2.16       .66    290.00
   41800.     2236.    30649.     8914.      186.     1853.      634.       60.        5.    292.00
      .02     12.05     16.54     14.06      .040      .055      .040      .000    288.00    114.19
  .008219      400.      450.      500.         2        15         0       .00    221.04    335.23
0
```



```
    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

 *SECNO 14.500

 3301 HV CHANGED MORE THAN HVINS
```

```
3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.60

   14.500    23.62   313.62   307.97      .00   315.33     1.71     3.40      .22   306.00
   41800.    6733.   32664.    2404.     804.    2963.     291.     115.       9.    296.00
      .03     8.38    11.02     8.26     .040     .055     .040     .000   290.00   107.97
  .003207     750.     700.     650.        2       11        0      .00   285.07   393.04
0
 *SECNO 20.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

   20.500    20.90   314.90   311.73      .00   318.82     3.92     2.83      .66   300.00
   41800.    1577.   35843.    4380.     148.    2198.     315.     161.      12.    300.00
      .05    10.66    16.31    13.91     .040     .055     .040     .000   294.00   120.13
  .007615     550.     600.     650.        3       15        0      .00   177.22   297.35
0
 *SECNO 28.000

 3301 HV CHANGED MORE THAN HVINS

   28.000    20.46   320.46   317.64      .00   324.95     4.49     5.96      .17   300.00
   41800.    3224.   32273.    6303.     244.    1834.     406.     205.      15.    304.00
      .06    13.20    17.60    15.53     .040     .055     .040     .000   300.00   111.13
  .008212     700.     750.     800.        3       15        0      .00   165.02   276.15
0
 *SECNO 35.000

 3301 HV CHANGED MORE THAN HVINS

   35.000    18.79   326.79   325.59      .00   332.37     5.58     7.10      .33   310.00
   41800.    3659.   35346.    2795.     235.    1808.     188.     243.      17.    310.00
      .07    15.56    19.55    14.86     .040     .055     .040     .000   308.00   122.00
  .012612     700.     700.     750.        2       15        0      .00   160.39   282.40
0
1
     4/30/90       8:54:53                                                                                      PAGE     7

    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 *SECNO 43.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   43.000    15.14   351.14   351.14      .00   357.17     6.03    11.48      .14   340.00
   41800.    2209.   37190.    2401.     155.    1838.     157.     284.      21.    338.00
      .08    14.25    20.24    15.31     .040     .055     .040     .000   336.00   122.16
  .016460     800.     800.     800.        0       15        0      .00   181.72   303.88
0
 *SECNO 48.500

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   48.500    29.69   373.69   373.69      .00   383.69    10.00     7.59     1.19   344.00
   41800.   14350.   20822.    6629.     594.     742.     367.     308.      22.    344.00
      .09    24.15    28.05    18.05     .040     .055     .040     .000   344.00   107.36
  .011725     550.     550.     550.        0       17        0      .00    87.38   194.74
0
 *SECNO 54.250

 3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   54.250    21.05   391.05   391.05      .00   398.38     7.34     5.69      .27   380.00
   41800.    1167.   39001.    1632.      92.    1755.     122.     326.      23.    380.00
      .09    12.75    22.23    13.38     .040     .055     .040     .000   370.00   113.43
  .015409     425.     425.     425.        0       19        0      .00   138.66   252.09
0
 *SECNO 59.500
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   59.500    19.15   411.15   411.15      .00   418.02     6.86     8.03      .05   400.00
   41800.    1663.   38239.    1898.     124.    1771.     140.     350.      25.    400.00
      .10    13.37    21.59    13.56     .040     .055     .040     .000   392.00   117.69
  .015200     525.     525.     525.        0       11        0      .00   152.40   270.09
0
1
     4/30/90       8:54:53                                                                                      PAGE     8

    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 *SECNO 65.200

 3301 HV CHANGED MORE THAN HVINS
```

```
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   65.200     20.57    432.57    432.57       .00    440.32      7.75      8.59       .27    414.00
   41800.     6948.    33556.     1296.      293.     1503.       99.      376.       27.    420.00
      .11     23.73     22.32     13.12      .040      .055      .040      .000    412.00    120.57
  .014950      570.      570.      570.         0         8         0       .00    125.14    245.71
0
 *SECNO 77.000

 3301 HV CHANGED MORE THAN HVINS

   77.000     17.32    451.32    449.82       .00    456.06      4.73     15.44       .30    440.00
   41800.     1080.    38501.     2218.       96.     2156.      182.      434.       31.    440.00
      .12     11.22     17.86     12.20      .040      .055      .040      .000    434.00    128.01
  .011550     1180.     1180.     1180.         2        15         0       .00    189.09    317.10
0
 *SECNO 86.000

 3265 DIVIDED FLOW


 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.87

   86.000     19.03    459.03    456.17       .00    460.25      1.21      3.84       .35    450.00
   41800.     1415.    25180.    15204.      245.     2571.     2088.      491.       37.    450.00
      .15      5.78      9.80      7.28      .040      .055      .040      .000    440.00    255.79
  .003298      900.      700.      600.         3        10         0       .00    558.85    852.59
0
 *SECNO 91.000

 3301 HV CHANGED MORE THAN HVINS

1
    4/30/90        8:54:53                                                                              PAGE    9

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

   91.000     18.00    460.00    457.52       .00    463.24      3.24      2.38       .61    450.00
   41800.     3602.    36762.     1437.      375.     2451.      154.      535.       41.    450.00
      .16      9.60     15.00      9.33      .040      .055      .040      .000    442.00    139.99
  .007887      500.      500.      450.         3        16         0       .00    260.79    400.78
0
 *SECNO 93.500

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.44

   93.500     18.95    462.95    457.72       .00    464.72      1.78      1.34       .15    448.00
   41800.     7749.    32331.     1720.      860.     2886.      226.      555.       43.    450.00
      .16      9.01     11.20      7.62      .040      .055      .040      .000    444.00    140.58
  .003804      290.      250.      160.         3        15         0       .00    329.27    469.85
0
 *SECNO 96.100
   96.100     19.22    464.22    460.91       .00    465.80      1.58      1.06       .02    454.00
   41800.     7142.    32499.     2159.      925.     3037.      316.      581.       46.    456.00
      .17      7.72     10.70      6.83      .040      .055      .040      .000    445.00    131.55
  .004215      290.      260.      230.         2        15         0       .00    454.91    586.47
0
 *SECNO 97.000

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .64

   97.000     17.70    463.70    463.02       .00    466.85      3.15       .58       .47    456.00
   41800.     4925.    31165.     5710.      520.     2101.      396.      588.       46.    450.00
      .17      9.47     14.83     14.41      .040      .055      .040      .000    446.00    166.58
  .010286      110.       90.       85.         3        15         0       .00    389.34    555.92
0
1
    4/30/90        8:54:53                                                                              PAGE   10

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST


 *SECNO 97.600
   97.600     18.39    464.39    463.69       .00    467.46      3.07       .60       .01    456.00
   41800.     8756.    32785.      258.      835.     2198.       66.      593.       47.    448.00
      .17     10.49     14.91      3.92      .040      .055      .040      .000    446.00    161.59
  .009702       60.       60.       60.         3         5         0       .00    406.79    568.38
0
```

*SECNO 98.400

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

98.400	7.02	478.02	478.02	.00	480.51	2.49	.22	.06	480.00
41800.	0.	41800.	0.	0.	3303.	0.	596.	47.	480.00
.17	.00	12.65	.00	.000	.020	.000	.000	471.00	121.02
.003492	40.	40.	40.	0	18	0	.00	674.78	795.81

0
*SECNO 98.780

3301 HV CHANGED MORE THAN HVINS

98.780	7.92	478.92	478.03	.00	480.68	1.76	.10	.07	480.00
41800.	0.	41800.	0.	0.	3928.	0.	599.	48.	480.00
.17	.00	10.64	.00	.000	.020	.000	.000	471.00	111.49
.002129	38.	38.	38.	6	5	0	.00	717.95	829.44

0
*SECNO 99.330
3280 CROSS SECTION 99.33 EXTENDED .64 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.87

99.330	32.64	480.64	459.87	.00	480.86	.22	.02	.15	448.00
41800.	10127.	21375.	10298.	4027.	4855.	3209.	609.	49.	448.00
.18	2.51	4.40	3.21	.040	.040	.035	.000	448.00	100.00
.000143	55.	55.	55.	2	14	0	.00	800.00	900.00

0
1

SECNO Q TIME SLOPE	DEPTH QLOB VLOB XLOBL	CWSEL QCH VCH XLCH	CRIWS QROB VROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	OLOSS TWA ELMIN TOPWID	BANK ELEV LEFT/RIGHT SSTA ENDST

*SECNO 100.400
3280 CROSS SECTION 100.40 EXTENDED .71 FEET

100.400	30.71	480.71	463.55	.00	480.88	.17	.02	.00	450.00
41800.	25040.	8982.	7779.	6898.	4343.	2310.	636.	51.	450.00
.19	3.63	2.07	3.37	.041	.100	.042	.000	450.00	100.00
.000208	70.	107.	120.	2	18	0	.00	750.00	850.00

0
*SECNO 102.000
3280 CROSS SECTION 102.00 EXTENDED .71 FEET

102.000	27.71	480.71	463.33	.00	480.91	.21	.03	.01	454.00
41800.	25664.	10972.	5165.	6189.	5135.	1498.	673.	53.	454.00
.20	4.15	2.14	3.45	.041	.100	.042	.000	453.00	100.00
.000255	80.	160.	160.	2	22	0	.00	680.00	780.00

0
*SECNO 103.600
3280 CROSS SECTION 103.60 EXTENDED .74 FEET

103.600	26.74	480.74	464.35	.00	480.96	.22	.04	.00	456.00
41800.	24011.	12198.	5591.	5543.	5381.	1440.	714.	55.	456.00
.21	4.33	2.27	3.88	.041	.100	.042	.000	454.00	100.00
.000308	130.	160.	130.	0	22	0	.00	680.00	780.00

0
*SECNO 104.950
3280 CROSS SECTION 104.95 EXTENDED .80 FEET

104.950	25.80	480.80	465.04	.00	481.00	.21	.04	.00	458.00
41800.	21961.	13435.	6404.	5265.	5774.	1591.	753.	57.	456.00
.22	4.17	2.33	4.02	.041	.100	.042	.000	455.00	100.00
.000343	135.	135.	135.	2	22	0	.00	765.00	865.00

0
*SECNO 106.100
3280 CROSS SECTION 106.10 EXTENDED .78 FEET

106.100	25.78	480.78	466.53	.00	481.06	.28	.04	.02	456.00
41800.	36865.	3086.	1849.	8454.	1398.	508.	783.	59.	456.00
.22	4.36	2.21	3.64	.041	.100	.042	.000	455.00	100.00
.000296	115.	115.	115.	2	14	0	.00	626.00	726.00

0
1

SECNO Q TIME SLOPE	DEPTH QLOB VLOB XLOBL	CWSEL QCH VCH XLCH	CRIWS QROB VROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	OLOSS TWA ELMIN TOPWID	BANK ELEV LEFT/RIGHT SSTA ENDST

*SECNO 107.900
3280 CROSS SECTION 107.90 EXTENDED .69 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .59

```
  107.900    24.69   480.69   467.14      .00   481.21      .53      .08      .08   456.00
   41800.   24573.   15434.    1792.    3590.    4182.     318.     819.      61.   458.00
      .23     6.85     3.69     5.63     .041     .100     .042     .000   456.00   100.00
  .000863     160.     180.     190.        2       14        0      .00   431.00   531.00
0
 *SECNO 109.400
 3280 CROSS SECTION      109.40 EXTENDED        .77 FEET

  109.400    23.78   480.78   468.26      .00   481.38      .60      .15      .02   460.00
   41800.   21652.   17532.    2616.    2861.    4369.     437.     846.      62.   460.00
      .24     7.57     4.01     5.99     .041     .100     .042     .000   457.00   100.00
  .001119     150.     150.     150.        0       18        0      .00   421.00   521.00
0
 *SECNO 110.650
 3280 CROSS SECTION      110.65 EXTENDED        .91 FEET

  110.650    23.90   480.90   468.80      .00   481.53      .63      .14      .01   458.00
   41800.   22191.   16231.    3378.    2926.    4133.     483.     868.      63.   460.00
      .24     7.58     3.93     6.99     .041     .100     .042     .000   457.00   100.00
  .001071     125.     125.     125.        0        8        0      .00   411.00   511.00
0
 *SECNO 112.150
 3280 CROSS SECTION      112.15 EXTENDED       1.18 FEET

  112.150    23.18   481.18   470.28      .00   481.71      .53      .18      .01   460.00
   41800.   20985.   16140.    4676.    2996.    3897.     885.     894.      65.   462.00
      .25     7.01     4.14     5.29     .044     .100     .042     .000   458.00   100.00
  .001288     150.     150.     150.        2       11        0      .00   561.00   661.00
0
 *SECNO 113.650
 3280 CROSS SECTION      113.65 EXTENDED       1.28 FEET

  113.650    22.28   481.28   470.82      .00   481.98      .70      .22      .05   460.00
   41800.   19603.   17547.    4650.    2464.    3876.     602.     919.      67.   462.00
      .26     7.95     4.53     7.73     .044     .100     .042     .000   459.00   100.00
  .001607     150.     150.     150.        2        8        0      .00   426.00   526.00
0
1                                                                                              PAGE  13
     4/30/90       8:54:53

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


 *SECNO 115.150
 3280 CROSS SECTION      115.15 EXTENDED       1.43 FEET

  115.150    21.43   481.43   471.34      .00   482.28      .86      .26      .05   462.00
   41800.   21194.   17061.    3545.    2422.    3522.     392.     942.      68.   462.00
      .26     8.75     4.84     9.04     .044     .100     .042     .000   460.00   100.00
  .001868     150.     150.     150.        2        8        0      .00   376.00   476.00
0
 *SECNO 116.450
 3280 CROSS SECTION      116.45 EXTENDED       1.63 FEET

  116.450    21.63   481.63   472.45      .00   482.52      .89      .23      .01   461.00
   41800.   28841.    9281.    3678.    3447.    2022.     506.     961.      69.   462.00
      .27     8.37     4.59     7.26     .044     .100     .042     .000   460.00   100.00
  .001626     130.     130.     130.        2       11        0      .00   376.00   476.00
0
 *SECNO 117.600
 3280 CROSS SECTION      117.60 EXTENDED       1.65 FEET

  117.600    20.65   481.65   473.72      .00   482.81     1.16      .21      .08   462.00
   41800.   27364.    8818.    5618.    2927.    1728.     592.     975.      70.   462.00
      .27     9.35     5.10     9.49     .044     .100     .042     .000   461.00   100.00
  .002126     115.     115.     115.        2       14        0      .00   336.00   436.00
0
 *SECNO 118.500
 3280 CROSS SECTION      118.50 EXTENDED       1.91 FEET

  118.500    20.91   481.91   474.55      .00   483.02     1.11      .20      .01   466.00
   41800.   18808.   11930.   11062.    2159.    2312.    1046.     986.      71.   461.00
      .28     8.71     5.16    10.57     .044     .100     .042     .000   461.00   100.00
  .002216      90.      90.      90.        2       14        0      .00   360.00   460.00
0
1                                                                                              PAGE  14
     4/30/90       8:54:53


                                                                 THIS RUN EXECUTED  4/30/90     8:55: 6

 **********************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -  01,02,03
   MODIFICATION -
 **********************************************************

 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

   MALIBU CREEK (u)
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SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	289.00	41800.00	301.04	301.04	307.10	228.56	19.75	2116.66	2764.90
*	1.500	150.00	.00	.00	286.00	41800.00	307.00	300.67	308.38	24.02	9.40	4458.41	8528.78
	3.000	150.00	.00	.00	286.00	41800.00	307.20	301.89	308.89	31.53	10.82	4030.00	7443.97
*	7.500	450.00	.00	.00	288.00	41800.00	307.83	305.66	311.72	82.19	16.54	2672.03	4610.57
*	14.500	700.00	.00	.00	290.00	41800.00	313.62	307.97	315.33	32.07	11.02	4058.32	7381.19
*	20.500	600.00	.00	.00	294.00	41800.00	314.90	311.73	318.82	76.15	16.31	2660.95	4789.98
	28.000	750.00	.00	.00	300.00	41800.00	320.46	317.64	324.95	82.12	17.60	2483.71	4612.70
	35.000	700.00	.00	.00	308.00	41800.00	326.79	325.59	332.37	126.12	19.55	2231.04	3722.09
*	43.000	800.00	.00	.00	336.00	41800.00	351.14	351.14	357.17	164.60	20.24	2149.60	3258.07
*	48.500	550.00	.00	.00	344.00	41800.00	373.69	373.69	383.69	117.25	28.05	1703.69	3860.26
*	54.250	425.00	.00	.00	370.00	41800.00	391.05	391.05	398.38	154.09	22.23	1968.17	3367.38
*	59.500	525.00	.00	.00	392.00	41800.00	411.15	411.15	418.02	152.00	21.59	2035.35	3390.46
*	65.200	570.00	.00	.00	412.00	41800.00	432.57	432.57	440.32	149.50	22.32	1895.03	3418.64
	77.000	1180.00	.00	.00	434.00	41800.00	451.32	449.82	456.06	115.50	17.86	2434.19	3889.46
*	86.000	700.00	.00	.00	440.00	41800.00	459.03	456.17	460.25	32.98	9.80	4903.32	7278.88
*	91.000	500.00	.00	.00	442.00	41800.00	460.00	457.52	463.24	78.87	15.00	2979.93	4706.88
*	93.500	250.00	.00	.00	444.00	41800.00	462.95	457.72	464.72	38.04	11.20	3971.11	6777.20

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	96.100	260.00	.00	.00	445.00	41800.00	464.22	460.91	465.80	42.15	10.70	4278.14	6438.18
*	97.000	90.00	.00	.00	446.00	41800.00	463.70	463.02	466.85	102.86	14.83	3017.01	4121.49
	97.600	60.00	.00	.00	446.00	41800.00	464.39	463.69	467.46	97.02	14.91	3099.29	4243.71
*	98.400	40.00	.00	.00	471.00	41800.00	478.02	478.02	480.51	34.92	12.65	3303.24	7073.70
	98.780	38.00	.00	.00	471.00	41800.00	478.92	478.03	480.68	21.29	10.64	3927.88	9058.29
*	99.330	55.00	.00	.00	448.00	41800.00	480.64	459.87	480.86	1.43	4.40	12090.66	35011.86
	100.400	107.00	.00	.00	450.00	41800.00	480.71	463.55	480.88	2.08	2.07	13550.96	28953.42
	102.000	160.00	.00	.00	453.00	41800.00	480.71	463.33	480.91	2.55	2.14	12821.84	26177.83
	103.600	160.00	.00	.00	454.00	41800.00	480.74	464.35	480.96	3.08	2.27	12363.90	23807.36
	104.950	135.00	.00	.00	455.00	41800.00	480.80	465.04	481.00	3.43	2.33	12630.97	22561.34
	106.100	115.00	.00	.00	455.00	41800.00	480.78	466.53	481.06	2.96	2.21	10360.18	24313.98
*	107.900	180.00	.00	.00	456.00	41800.00	480.69	467.14	481.21	8.63	3.69	8089.83	14228.17
	109.400	150.00	.00	.00	457.00	41800.00	480.78	468.26	481.38	11.19	4.01	7667.01	12495.92
	110.650	125.00	.00	.00	457.00	41800.00	480.90	468.80	481.53	10.71	3.93	7542.18	12773.48
	112.150	150.00	.00	.00	458.00	41800.00	481.18	470.28	481.71	12.88	4.14	7777.27	11645.99
	113.650	150.00	.00	.00	459.00	41800.00	481.28	470.82	481.98	16.07	4.53	6942.53	10426.94
	115.150	150.00	.00	.00	460.00	41800.00	481.43	471.34	482.28	18.68	4.84	6336.01	9670.48
	116.450	130.00	.00	.00	460.00	41800.00	481.63	472.45	482.52	16.26	4.59	5975.29	10366.06
	117.600	115.00	.00	.00	461.00	41800.00	481.65	473.72	482.81	21.26	5.10	5247.00	9065.43
	118.500	90.00	.00	.00	461.00	41800.00	481.91	474.55	483.02	22.16	5.16	5516.79	8879.51

MALIBU CREEK (u)

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	41800.00	301.04	.00	.00	7.04	176.51	.00
*	1.500	41800.00	307.00	.00	5.96	.00	317.38	150.00

	3.000	41800.00	307.20	.00	.19	.00	291.58	150.00
*	7.500	41800.00	307.83	.00	.63	.00	221.04	450.00
*	14.500	41800.00	313.62	.00	5.79	.00	285.07	700.00
*	20.500	41800.00	314.90	.00	1.28	.00	177.22	600.00
	28.000	41800.00	320.46	.00	5.56	.00	165.02	750.00
	35.000	41800.00	326.79	.00	6.33	.00	160.39	700.00
*	43.000	41800.00	351.14	.00	24.34	.00	181.72	800.00
*	48.500	41800.00	373.69	.00	22.55	.00	87.38	550.00
*	54.250	41800.00	391.05	.00	17.36	.00	138.66	425.00
*	59.500	41800.00	411.15	.00	20.11	.00	152.40	525.00
*	65.200	41800.00	432.57	.00	21.42	.00	125.14	570.00
	77.000	41800.00	451.32	.00	18.75	.00	189.09	1180.00
*	86.000	41800.00	459.03	.00	7.71	.00	558.85	700.00
*	91.000	41800.00	460.00	.00	.96	.00	260.79	500.00
*	93.500	41800.00	462.95	.00	2.95	.00	329.27	250.00
	96.100	41800.00	464.22	.00	1.28	.00	454.91	260.00
*	97.000	41800.00	463.70	.00	-.52	.00	389.34	90.00
	97.600	41800.00	464.39	.00	.69	.00	406.79	60.00
*	98.400	41800.00	478.02	.00	13.63	.00	674.78	40.00
	98.780	41800.00	478.92	.00	.90	.00	717.95	38.00
*	99.330	41800.00	480.64	.00	1.72	.00	800.00	55.00
	100.400	41800.00	480.71	.00	.07	.00	750.00	107.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	102.000	41800.00	480.71	.00	.00	.00	680.00	160.00
	103.600	41800.00	480.74	.00	.03	.00	680.00	160.00
	104.950	41800.00	480.80	.00	.06	.00	765.00	135.00
	106.100	41800.00	480.78	.00	-.01	.00	626.00	115.00
*	107.900	41800.00	480.69	.00	-.10	.00	431.00	180.00
	109.400	41800.00	480.78	.00	.10	.00	421.00	150.00
	110.650	41800.00	480.90	.00	.12	.00	411.00	125.00
	112.150	41800.00	481.18	.00	.28	.00	561.00	150.00
	113.650	41800.00	481.28	.00	.10	.00	426.00	150.00
	115.150	41800.00	481.43	.00	.15	.00	376.00	150.00
	116.450	41800.00	481.63	.00	.20	.00	376.00	130.00
	117.600	41800.00	481.65	.00	.03	.00	336.00	115.00
	118.500	41800.00	481.91	.00	.25	.00	360.00	90.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= .000 PROFILE= 1 CRITICAL DEPTH ASSUMED

WARNING SECNO= 1.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 7.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 14.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 20.500 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO= 43.000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 43.000 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 48.500 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 48.500 PROFILE= 1 MINIMUM SPECIFIC ENERGY

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CAUTION SECNO=     54.250  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     54.250  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     59.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     59.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     65.200  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     65.200  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     86.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     91.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     93.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     97.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     98.400  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     98.400  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     99.330  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    107.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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RIVERTECH, INC.

APPENDIX 5

MALIBU CREEK HYDRAULIC ANALYSIS FOR COMPLETE BLOCKAGE OF BRIDGE OPENING

```
1**********************************************************
 *  WATER SURFACE PROFILES                                *
 *  VERSION OF SEPTEMBER 1988                             *
 *  ERROR: 01,02,03                                       *
 *  UPDATED:   SEPTEMBER 1989                             *
 *  RUN DATE     4/30/90    TIME     8:54:53              *
 **********************************************************

                                        ****************************************
                                        *  U.S. ARMY CORPS OF ENGINEERS        *
                                        *  THE HYDROLOGIC ENGINEERING CENTER   *
                                        *  609 SECOND STREET, SUITE D          *
                                        *  DAVIS, CALIFORNIA 95616-4687        *
                                        *          (916) 756-1104              *
                                        ****************************************

          X     X  XXXXXXX   XXXXX              XXXXX
          X     X  X        X     X            X     X
          X     X  X        X                        X
          XXXXXXX  XXXX     X         XXXXX     XXXXX
          X     X  X        X                  X
          X     X  X        X     X            X
          X     X  XXXXXXX   XXXXX             XXXXXXX
 END OF BANNER
1                                                              PAGE    1
   4/30/90       8:54:53

                                          THIS RUN EXECUTED  4/30/90     8:54:53

 ****************************************************
  HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

  ERROR CORR -  01,02,03
  MODIFICATION -
 ****************************************************

 T1   MALIBU CREEK ULTIMATE VEGETATION GROWTH SCENARIO.  RIVERTECH, FEB., 1990
 T2   ALL CROSS SECTIONS LOOKING DOWNSTREAM. **complete blockage at bridge**
 T3        MALIBU CREEK (u)

 J1   ICHECK    INQ     NINV     IDIR     STRT    METRIC    HVINS     Q       WSEL      FQ
         0        2       0        0       -1        0        0       0       294       0

 J2   NPROF    IPLOT   PRFVS    XSECV    XSECH      FN     ALLDC     IBW     CHNIM    ITRACE
         1        0      -1        0        0        0       -1       0        0        0

 NC    0.040    0.040    0.055     0.1      0.3
 QT        1    41800
 X1     0.00        4      100     277        0        0        0
 GR      305      100      289     101      289      276      305      277

 X1     1.50        8      260     390      100      200      150
 GR      320      100      300     160      292      260      288      320      286      350
 GR      286      390      298     440      320      480

 X1     3.00        9      230     360      150      160      150
 GR      320      100      300     140      292      230      286      290      286      315
 GR      290      360      298     370      300      410      320      430

 X1     7.50        8      135     240      400      500      450
 GR      320      100      290     135      288      140      288      155      290      170
 GR      292      240      302     285      320      440

 X1    14.50        9      210     360      750      650      700
 GR      320      100      304     120      306      180      306      210      290      250
 GR      290      265      292     305      296      360      320      405

 X1    20.50        9      140     260      550      650      600
 GR      330      100      300     140      296      160      294      180      294      200
 GR      296      210      300     260      310      290      330      320

 X1    28.00        6      135     230      700      800      750
 GR      330      100      300     135      300      175      304      230      310      250
 GR      330      300
1                                                              PAGE    2
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 X1    35.00        8      150     260      700      750      700
 GR      340      100      310     150      308      160      310      170      312      200
 GR      310      230      310     260      340      300

 X1    43.00        6      150     280      800      800      800
 GR      360      100      340     150      336      180      336      210      338      280
 GR      360      320

 X1    48.50        5      145     170      550      550      550
 GR      380      100      350     135      344      145      344      170      380      200

 X1    54.25        6      130     230      425      425      425
 GR      400      100      380     130      370      160      370      190      380      230
 GR      400      270

 X1    59.50        6      140     245      525      525      525
```

GR GR	420 420	100 290	400	140	392	160	392	205	400	245
X1 GR GR	65.20 460 420	7 100 230	145 420 460	230 130 280	570 414	570 145	570 412	165	414	190
X1 GR GR	77.00 470 470	6 100 370	145 440	285 145	1180 434	1180 220	1180 434	270	440	285
X1 GR GR GR	86.00 470 450 454	12 100 470 840	310 460 460 470	470 250 490 880	900 450 460	600 310 520	700 440 452	360 570	440 452	425 760
X1 GR GR	91.00 480 442	10 100 345	215 460 450	370 140 370	500 450 463	450 215 410	500 444 464	250 730	442 480	315 790
X1 GR GR GR	93.50 480 444 470	12 100 330 745	270 470 444 480	435 130 395 790	290 460 450	160 145 435	250 458 463	210 470	448 463	270 685
X1 GR GR GR	96.10 480 445 480	11 100 430 700	305 460 445	505 140 460	290 460 456	230 235 505	260 454 460	305 540	450 470	360 650
X1 GR GR GR	97.00 480 454 460	13 100 355 530	325 466 450 470	490 135 435 600	110 462 446 480	85 190 465 720	90 460 446	280 485	456 450	325 490

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X1 GR GR GR	97.60 480 454 448	14 100 390 520	355 470 454 462	520 130 415 521	60 462 452 470	60 175 440 680	60 460 446 480	285 485 735	456 446	355 510
NC X1 GR GR	.020 98.40 480 476	.020 7 100 720	.020 100 472 480	870 185 870	40 471	40 270	40 472	510	474	650
X1	98.78	0			38	38	38			
NC X1 GR GR GR GR	0.040 99.33 480 450 448 480	0.035 16 100 480 645 900	0.040 490 472 448 448	645 265 490 660	55 470 448 462	55 415 505 685	55 468 450 466	435 570 700	455 450 470	435.1 635 800
NC X1 GR GR GR GR	0.041 100.40 480 454 450 480	0.042 16 100 500 695 850	0.100 535 470 450 460	680 200 535 710	70 466 450 464	120 255 570 735	107 462 452 470	350 595 755	460 450 472	480 680 810
X1 GR GR GR	102.00 480 456 466	14 100 450 710	480 472 454 470	670 190 480 720	80 462 454 470	160 260 550 760	160 460 453 480	330 650 780	458 454	425 670
X1 GR GR GR	103.60 480 458 456	15 100 455 685	475 472 456 460	685 210 475 705	130 464 456 468	130 260 520 720	160 462 454 468	290 645 775	460 454 480	395 665 780
X1 GR GR GR GR	104.95 480 458 456 480	16 100 515 695 865	515 470 456 456	750 280 600 750	135 464 456 462	135 350 640 780	135 462 455 468	380 675 790	460 455 468	490 685 835
X1 GR GR GR	106.10 480 458 456	13 100 485 695	640 472 456 472	695 190 550 725	115 470 456 480	115 280 640 726	115 466 455	360 670	460 455	455 685
X1 GR GR	107.90 480 456	10 100 390	340 470 456	510 140 495	160 466 458	190 195 510	180 460 472	320 530	456 480	340 531

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X1 GR GR GR	109.40 480 458 460	14 100 300 485	295 468 457 470	485 135 315 500	150 466 457 472	150 180 340 520	150 462 458 480	270 400 521	460 458	295 470
X1	110.65	12	300	480	125	125	125			

```
GR     480      100      470      140      466      195      460      275      458      300
GR     457      315      457      340      458      365      458      445      460      480
GR     470      510      480      511

NC   0.044    0.042    0.100
X1  112.15       12      355      535      150      150      150
GR     480      100      470      215      468      250      462      315      460      355
GR     458      380      458      415      460      470      462      535      476      580
GR     478      660      480      661

X1  113.65       11      295      480      150      150      150
GR     480      100      470      165      468      200      462      275      460      295
GR     459      335      459      359      460      370      462      480      474      525
GR     480      526

X1  115.15       10      280      450      150      150      150
GR     480      100      470      145      468      180      466      195      462      280
GR     460      300      460      350      462      450      470      475      480      476

X1  116.45       10      350      445      130      130      130
GR     480      100      470      170      468      195      464      280      461      350
GR     460      405      460      440      462      445      468      475      480      476

X1  117.60       10      310      395      115      115      115
GR     480      100      472      125      468      160      466      250      462      310
GR     461      340      461      370      462      395      472      435      480      436

X1  118.50       11      275      390       90       90       90
GR     480      100      472      125      468      175      468      250      466      275
GR     462      295      461      360      461      390      462      415      466      430
GR     480      460

1
     4/30/90        8:54:53                                                          PAGE    5

     SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
     Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
     TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
     SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

 *PROF 1

 CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
0

 CCHV=      .100 CEHV=      .300
 *SECNO  .000
 3720 CRITICAL DEPTH ASSUMED
      .000    12.04   301.04   301.04   294.00   307.10     6.06      .00      .00   305.00
    41800.       0.   41800.       0.       0.    2117.       0.       0.       0.    305.00
       .00      .00    19.75      .00     .000     .055     .000     .000   289.00   100.25
   .022856       0.       0.       0.        0       16        0      .00   176.51   276.75
0
 *SECNO 1.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.08

     1.500    21.00   307.00   300.67      .00   308.38     1.38      .82      .47   292.00
    41800.   10190.   23118.    8491.    1174.    2461.     824.      11.       1.    286.00
       .00     8.68     9.40    10.31     .040     .055     .040     .000   286.00   138.99
   .002402     100.     150.     200.        3       11        0      .00   317.38   456.37
0
 *SECNO 3.000
     3.000    21.20   307.20   301.89      .00   308.89     1.69      .42      .09   292.00
    41800.   10725.   26894.    4181.    1059.    2485.     486.      26.       2.    290.00
       .01    10.13    10.82     8.61     .040     .055     .040     .000   286.00   125.61
   .003153     150.     150.     160.        2       19        0      .00   291.58   417.19
0
 *SECNO 7.500

 3301 HV CHANGED MORE THAN HVINS

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .62

     7.500    19.83   307.83   305.66      .00   311.72     3.89     2.16      .66   290.00
    41800.    2236.   30649.    8914.     186.    1853.     634.      60.       5.    292.00
       .02    12.05    16.54    14.06     .040     .055     .040     .000   288.00   114.19
   .008219     400.     450.     500.        2       15        0      .00   221.04   335.23
0
1
     4/30/90        8:54:53                                                          PAGE    6

     SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
     Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
     TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
     SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

 *SECNO 14.500

 3301 HV CHANGED MORE THAN HVINS
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3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.60

   14.500    23.62   313.62   307.97      .00   315.33     1.71     3.40      .22   306.00
   41800.    6733.   32664.    2404.     804.    2963.     291.     115.       9.    296.00
      .03     8.38    11.02     8.26     .040     .055     .040     .000   290.00   107.97
  .003207     750.     700.     650.        2       11        0      .00   285.07   393.04
0
 *SECNO 20.500

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

   20.500    20.90   314.90   311.73      .00   318.82     3.92     2.83      .66   300.00
   41800.    1577.   35843.    4380.     148.    2198.     315.     161.      12.    300.00
      .05    10.66    16.31    13.91     .040     .055     .040     .000   294.00   120.13
  .007615     550.     600.     650.        3       15        0      .00   177.22   297.35
0
 *SECNO 28.000

3301 HV CHANGED MORE THAN HVINS

   28.000    20.46   320.46   317.64      .00   324.95     4.49     5.96      .17   300.00
   41800.    3224.   32273.    6303.     244.    1834.     406.     205.      15.    304.00
      .06    13.20    17.60    15.53     .040     .055     .040     .000   300.00   111.13
  .008212     700.     750.     800.        3       15        0      .00   165.02   276.15
0
 *SECNO 35.000

3301 HV CHANGED MORE THAN HVINS

   35.000    18.79   326.79   325.59      .00   332.37     5.58     7.10      .33   310.00
   41800.    3659.   35346.    2795.     235.    1808.     188.     243.      17.    310.00
      .07    15.56    19.55    14.86     .040     .055     .040     .000   308.00   122.00
  .012612     700.     700.     750.        2       15        0      .00   160.39   282.40
0
1
    4/30/90      8:54:53                                                                              PAGE    7


   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 *SECNO 43.000
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   43.000    15.14   351.14   351.14      .00   357.17     6.03    11.48      .14   340.00
   41800.    2209.   37190.    2401.     155.    1838.     157.     284.      21.    338.00
      .08    14.25    20.24    15.31     .040     .055     .040     .000   336.00   122.16
  .016460     800.     800.     800.        0       15        0      .00   181.72   303.88
0
 *SECNO 48.500

3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   48.500    29.69   373.69   373.69      .00   383.69    10.00     7.59     1.19   344.00
   41800.   14350.   20822.    6629.     594.     742.     367.     308.      22.    344.00
      .09    24.15    28.05    18.05     .040     .055     .040     .000   344.00   107.36
  .011725     550.     550.     550.        0       17        0      .00    87.38   194.74
0
 *SECNO 54.250

3301 HV CHANGED MORE THAN HVINS

 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   54.250    21.05   391.05   391.05      .00   398.38     7.34     5.69      .27   380.00
   41800.    1167.   39001.    1632.      92.    1755.     122.     326.      23.    380.00
      .09    12.75    22.23    13.38     .040     .055     .040     .000   370.00   113.43
  .015409     425.     425.     425.        0       19        0      .00   138.66   252.09
0
 *SECNO 59.500
 7185 MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   59.500    19.15   411.15   411.15      .00   418.02     6.86     8.03      .05   400.00
   41800.    1663.   38239.    1898.     124.    1771.     140.     350.      25.    400.00
      .10    13.37    21.59    13.56     .040     .055     .040     .000   392.00   117.69
  .015200     525.     525.     525.        0       11        0      .00   152.40   270.09
0
1
    4/30/90      8:54:53                                                                              PAGE    8


   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


 *SECNO 65.200

3301 HV CHANGED MORE THAN HVINS
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7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  65.200     20.57    432.57    432.57       .00    440.32      7.75      8.59       .27    414.00
  41800.     6948.    33556.     1296.      293.     1503.       99.      376.       27.    420.00
     .11     23.73     22.32     13.12      .040      .055      .040      .000    412.00    120.57
 .014950      570.      570.      570.         0         8         0       .00    125.14    245.71
0
 *SECNO 77.000

 3301 HV CHANGED MORE THAN HVINS

  77.000     17.32    451.32    449.82       .00    456.06      4.73     15.44       .30    440.00
  41800.     1080.    38501.     2218.       96.     2156.      182.      434.       31.    440.00
     .12     11.22     17.86     12.20      .040      .055      .040      .000    434.00    128.01
 .011550     1180.     1180.     1180.         2        15         0       .00    189.09    317.10
0
 *SECNO 86.000

 3265 DIVIDED FLOW


 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.87

  86.000     19.03    459.03    456.17       .00    460.25      1.21      3.84       .35    450.00
  41800.     1415.    25180.    15204.      245.     2571.     2088.      491.       37.    450.00
     .15      5.78      9.80      7.28      .040      .055      .040      .000    440.00    255.79
 .003298      900.      700.      600.         3        10         0       .00    558.85    852.59
0
 *SECNO 91.000

 3301 HV CHANGED MORE THAN HVINS

1                                                                                                  PAGE    9
    4/30/90        8:54:53

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS  BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .65

  91.000     18.00    460.00    457.52       .00    463.24      3.24      2.38       .61    450.00
  41800.     3602.    36762.     1437.      375.     2451.      154.      535.       41.    450.00
     .16      9.60     15.00      9.33      .040      .055      .040      .000    442.00    139.99
 .007887      500.      500.      450.         3        16         0       .00    260.79    400.78
0
 *SECNO 93.500

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.44

  93.500     18.95    462.95    457.72       .00    464.72      1.78      1.34       .15    448.00
  41800.     7749.    32331.     1720.      860.     2886.      226.      555.       43.    450.00
     .16      9.01     11.20      7.62      .040      .055      .040      .000    444.00    140.58
 .003804      290.      250.      160.         3        15         0       .00    329.27    469.85
0
 *SECNO 96.100
  96.100     19.22    464.22    460.91       .00    465.80      1.58      1.06       .02    454.00
  41800.     7142.    32499.     2159.      925.     3037.      316.      581.       46.    456.00
     .17      7.72     10.70      6.83      .040      .055      .040      .000    445.00    131.55
 .004215      290.      260.      230.         2        15         0       .00    454.91    586.47
0
 *SECNO 97.000

 3301 HV CHANGED MORE THAN HVINS


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .64

  97.000     17.70    463.70    463.02       .00    466.85      3.15       .58       .47    456.00
  41800.     4925.    31165.     5710.      520.     2101.      396.      588.       46.    450.00
     .17      9.47     14.83     14.41      .040      .055      .040      .000    446.00    166.58
 .010286      110.       90.       85.         3        15         0       .00    389.34    555.92
0
1                                                                                                  PAGE   10
    4/30/90        8:54:53

   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS  BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 97.600
  97.600     18.39    464.39    463.69       .00    467.46      3.07       .60       .01    456.00
  41800.     8756.    32785.      258.      835.     2198.       66.      593.       47.    448.00
     .17     10.49     14.91      3.92      .040      .055      .040      .000    446.00    161.59
 .009702       60.       60.       60.         3         5         0       .00    406.79    568.38
0
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*SECNO 98.400

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   98.400     7.02   478.02   478.02      .00   480.51     2.49      .22      .06   480.00
   41800.       0.   41800.       0.       0.    3303.       0.     596.      47.   480.00
      .17      .00    12.65      .00     .000     .020     .000     .000   471.00   121.02
  .003492      40.      40.      40.        0       18        0      .00   674.78   795.81
0
*SECNO 98.780

3301 HV CHANGED MORE THAN HVINS

   98.780     7.92   478.92   478.03      .00   480.68     1.76      .10      .07   480.00
   41800.       0.   41800.       0.       0.    3928.       0.     599.      48.   480.00
      .17      .00    10.64      .00     .000     .020     .000     .000   471.00   111.49
  .002129      38.      38.      38.        6        5        0      .00   717.95   829.44
0
*SECNO 99.330
3280 CROSS SECTION      99.33 EXTENDED        .64 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.87
   99.330    32.64   480.64   459.87      .00   480.86      .22      .02      .15   448.00
   41800.   10127.   21375.   10298.    4027.    4855.    3209.     609.      49.   448.00
      .18     2.51     4.40     3.21     .040     .040     .035     .000   448.00   100.00
  .000143      55.      55.      55.        2       14        0      .00   800.00   900.00
0
1
     4/30/90        8:54:53                                                                    PAGE    11

   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN       SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID      ENDST


*SECNO 100.400
3280 CROSS SECTION     100.40 EXTENDED        .71 FEET

  100.400    30.71   480.71   463.55      .00   480.88      .17      .02      .00   450.00
   41800.   25040.    8982.    7779.    6898.    4343.    2310.     636.      51.   450.00
      .19     3.63     2.07     3.37     .041     .100     .042     .000   450.00   100.00
  .000208      70.     107.     120.        2       18        0      .00   750.00   850.00
0
*SECNO 102.000
3280 CROSS SECTION     102.00 EXTENDED        .71 FEET

  102.000    27.71   480.71   463.33      .00   480.91      .21      .03      .01   454.00
   41800.   25664.   10972.    5165.    6189.    5135.    1498.     673.      53.   454.00
      .20     4.15     2.14     3.45     .041     .100     .042     .000   453.00   100.00
  .000255      80.     160.     160.        2       22        0      .00   680.00   780.00
0
*SECNO 103.600
3280 CROSS SECTION     103.60 EXTENDED        .74 FEET

  103.600    26.74   480.74   464.35      .00   480.96      .22      .04      .00   456.00
   41800.   24011.   12198.    5591.    5543.    5381.    1440.     714.      55.   456.00
      .21     4.33     2.27     3.88     .041     .100     .042     .000   454.00   100.00
  .000308     130.     160.     130.        0       22        0      .00   680.00   780.00
0
*SECNO 104.950
3280 CROSS SECTION     104.95 EXTENDED        .80 FEET

  104.950    25.80   480.80   465.04      .00   481.00      .21      .04      .00   458.00
   41800.   21961.   13435.    6404.    5265.    5774.    1591.     753.      57.   456.00
      .22     4.17     2.33     4.02     .041     .100     .042     .000   455.00   100.00
  .000343     135.     135.     135.        2       22        0      .00   765.00   865.00
0
*SECNO 106.100
3280 CROSS SECTION     106.10 EXTENDED        .78 FEET

  106.100    25.78   480.78   466.53      .00   481.06      .28      .04      .02   456.00
   41800.   36865.    3086.    1849.    8454.    1398.     508.     783.      59.   456.00
      .22     4.36     2.21     3.64     .041     .100     .042     .000   455.00   100.00
  .000296     115.     115.     115.        2       14        0      .00   626.00   726.00
0
1
     4/30/90        8:54:53                                                                    PAGE    12

   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
   Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN       SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID      ENDST


*SECNO 107.900
3280 CROSS SECTION     107.90 EXTENDED        .69 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .59
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   107.900     24.69   480.69   467.14       .00   481.21       .53      .08      .08    456.00
    41800.    24573.   15434.    1792.     3590.    4182.      318.     819.      61.    458.00
       .23      6.85     3.69     5.63      .041     .100      .042     .000   456.00    100.00
   .000863      160.     180.     190.         2       14         0      .00   431.00    531.00
0
 *SECNO 109.400
 3280 CROSS SECTION      109.40 EXTENDED        .77 FEET

   109.400     23.78   480.78   468.26       .00   481.38       .60      .15      .02    460.00
    41800.    21652.   17532.    2616.     2861.    4369.      437.     846.      62.    460.00
       .24      7.57     4.01     5.99      .041     .100      .042     .000   457.00    100.00
   .001119      150.     150.     150.         0       18         0      .00   421.00    521.00
0
 *SECNO 110.650
 3280 CROSS SECTION      110.65 EXTENDED        .91 FEET

   110.650     23.90   480.90   468.80       .00   481.53       .63      .14      .01    458.00
    41800.    22191.   16231.    3378.     2926.    4133.      483.     868.      63.    460.00
       .24      7.58     3.93     6.99      .041     .100      .042     .000   457.00    100.00
   .001071      125.     125.     125.         0        8         0      .00   411.00    511.00
0
 *SECNO 112.150
 3280 CROSS SECTION      112.15 EXTENDED       1.18 FEET

   112.150     23.18   481.18   470.28       .00   481.71       .53      .18      .01    460.00
    41800.    20985.   16140.    4676.     2996.    3897.      885.     894.      65.    462.00
       .25      7.01     4.14     5.29      .044     .100      .042     .000   458.00    100.00
   .001288      150.     150.     150.         2       11         0      .00   561.00    661.00
0
 *SECNO 113.650
 3280 CROSS SECTION      113.65 EXTENDED       1.28 FEET

   113.650     22.28   481.28   470.82       .00   481.98       .70      .22      .05    460.00
    41800.    19603.   17547.    4650.     2464.    3876.      602.     919.      67.    462.00
       .26      7.95     4.53     7.73      .044     .100      .042     .000   459.00    100.00
   .001607      150.     150.     150.         2        8         0      .00   426.00    526.00
0
1                                                                                       PAGE  13
    4/30/90        8:54:53

    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 115.150
 3280 CROSS SECTION      115.15 EXTENDED       1.43 FEET

   115.150     21.43   481.43   471.34       .00   482.28       .86      .26      .05    462.00
    41800.    21194.   17061.    3545.     2422.    3522.      392.     942.      68.    462.00
       .26      8.75     4.84     9.04      .044     .100      .042     .000   460.00    100.00
   .001868      150.     150.     150.         2        8         0      .00   376.00    476.00
0
 *SECNO 116.450
 3280 CROSS SECTION      116.45 EXTENDED       1.63 FEET

   116.450     21.63   481.63   472.45       .00   482.52       .89      .23      .01    461.00
    41800.    28841.    9281.    3678.     3447.    2022.      506.     961.      69.    462.00
       .27      8.37     4.59     7.26      .044     .100      .042     .000   460.00    100.00
   .001626      130.     130.     130.         2       11         0      .00   376.00    476.00
0
 *SECNO 117.600
 3280 CROSS SECTION      117.60 EXTENDED       1.65 FEET

   117.600     20.65   481.65   473.72       .00   482.81      1.16      .21      .08    462.00
    41800.    27364.    8818.    5618.     2927.    1728.      592.     975.      70.    462.00
       .27      9.35     5.10     9.49      .044     .100      .042     .000   461.00    100.00
   .002126      115.     115.     115.         2       14         0      .00   336.00    436.00
0
 *SECNO 118.500
 3280 CROSS SECTION      118.50 EXTENDED       1.91 FEET

   118.500     20.91   481.91   474.55       .00   483.02      1.11      .20      .01    466.00
    41800.    18808.   11930.   11062.     2159.    2312.     1046.     986.      71.    461.00
       .28      8.71     5.16    10.57      .044     .100      .042     .000   461.00    100.00
   .002216       90.      90.      90.         2       14         0      .00   360.00    460.00
0
1                                                                                       PAGE  14
    4/30/90        8:54:53


                                                           THIS RUN EXECUTED  4/30/90     8:55: 6

 *******************************************************
   HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

   ERROR CORR -  01,02,03
   MODIFICATION -
 *******************************************************

 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

   MALIBU CREEK (u)
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SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	289.00	41800.00	301.04	301.04	307.10	228.56	19.75	2116.66	2764.90
*	1.500	150.00	.00	.00	286.00	41800.00	307.00	300.67	308.38	24.02	9.40	4458.41	8528.78
	3.000	150.00	.00	.00	286.00	41800.00	307.20	301.89	308.89	31.53	10.82	4030.00	7443.97
*	7.500	450.00	.00	.00	288.00	41800.00	307.83	305.66	311.72	82.19	16.54	2672.03	4610.57
*	14.500	700.00	.00	.00	290.00	41800.00	313.62	307.97	315.33	32.07	11.02	4058.32	7381.19
*	20.500	600.00	.00	.00	294.00	41800.00	314.90	311.73	318.82	76.15	16.31	2660.95	4789.98
	28.000	750.00	.00	.00	300.00	41800.00	320.46	317.64	324.95	82.12	17.60	2483.71	4612.70
	35.000	700.00	.00	.00	308.00	41800.00	326.79	325.59	332.37	126.12	19.55	2231.04	3722.09
*	43.000	800.00	.00	.00	336.00	41800.00	351.14	351.14	357.17	164.60	20.24	2149.60	3258.07
*	48.500	550.00	.00	.00	344.00	41800.00	373.69	373.69	383.69	117.25	28.05	1703.69	3860.26
*	54.250	425.00	.00	.00	370.00	41800.00	391.05	391.05	398.38	154.09	22.23	1968.17	3367.38
*	59.500	525.00	.00	.00	392.00	41800.00	411.15	411.15	418.02	152.00	21.59	2035.35	3390.46
*	65.200	570.00	.00	.00	412.00	41800.00	432.57	432.57	440.32	149.50	22.32	1895.03	3418.64
	77.000	1180.00	.00	.00	434.00	41800.00	451.32	449.82	456.06	115.50	17.86	2434.19	3889.46
*	86.000	700.00	.00	.00	440.00	41800.00	459.03	456.17	460.25	32.98	9.80	4903.32	7278.88
*	91.000	500.00	.00	.00	442.00	41800.00	460.00	457.52	463.24	78.87	15.00	2979.93	4706.88
*	93.500	250.00	.00	.00	444.00	41800.00	462.95	457.72	464.72	38.04	11.20	3971.11	6777.20

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	96.100	260.00	.00	.00	445.00	41800.00	464.22	460.91	465.80	42.15	10.70	4278.14	6438.18
*	97.000	90.00	.00	.00	446.00	41800.00	463.70	463.02	466.85	102.86	14.83	3017.01	4121.49
	97.600	60.00	.00	.00	446.00	41800.00	464.39	463.69	467.46	97.02	14.91	3099.29	4243.71
*	98.400	40.00	.00	.00	471.00	41800.00	478.02	478.02	480.51	34.92	12.65	3303.24	7073.70
	98.780	38.00	.00	.00	471.00	41800.00	478.92	478.03	480.68	21.29	10.64	3927.88	9058.29
*	99.330	55.00	.00	.00	448.00	41800.00	480.64	459.87	480.86	1.43	4.40	12090.66	35011.86
	100.400	107.00	.00	.00	450.00	41800.00	480.71	463.55	480.88	2.08	2.07	13550.96	28953.42
	102.000	160.00	.00	.00	453.00	41800.00	480.71	463.33	480.91	2.55	2.14	12821.84	26177.83
	103.600	160.00	.00	.00	454.00	41800.00	480.74	464.35	480.96	3.08	2.27	12363.90	23807.36
	104.950	135.00	.00	.00	455.00	41800.00	480.80	465.04	481.00	3.43	2.33	12630.97	22561.34
	106.100	115.00	.00	.00	455.00	41800.00	480.78	466.53	481.06	2.96	2.21	10360.18	24313.98
*	107.900	180.00	.00	.00	456.00	41800.00	480.69	467.14	481.21	8.63	3.69	8089.83	14228.17
	109.400	150.00	.00	.00	457.00	41800.00	480.78	468.26	481.38	11.19	4.01	7667.01	12495.92
	110.650	125.00	.00	.00	457.00	41800.00	480.90	468.80	481.53	10.71	3.93	7542.18	12773.48
	112.150	150.00	.00	.00	458.00	41800.00	481.18	470.28	481.71	12.88	4.14	7777.27	11645.99
	113.650	150.00	.00	.00	459.00	41800.00	481.28	470.82	481.98	16.07	4.53	6942.53	10426.94
	115.150	150.00	.00	.00	460.00	41800.00	481.43	471.34	482.28	18.68	4.84	6336.01	9670.48
	116.450	130.00	.00	.00	460.00	41800.00	481.63	472.45	482.52	16.26	4.59	5975.29	10366.06
	117.600	115.00	.00	.00	461.00	41800.00	481.65	473.72	482.81	21.26	5.10	5247.00	9065.43
	118.500	90.00	.00	.00	461.00	41800.00	481.91	474.55	483.02	22.16	5.16	5516.79	8879.51

MALIBU CREEK (U)

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	41800.00	301.04	.00	.00	7.04	176.51	.00
*	1.500	41800.00	307.00	.00	5.96	.00	317.38	150.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3.000	41800.00	307.20	.00	.19	.00	291.58	150.00
*	7.500	41800.00	307.83	.00	.63	.00	221.04	450.00
*	14.500	41800.00	313.62	.00	5.79	.00	285.07	700.00
*	20.500	41800.00	314.90	.00	1.28	.00	177.22	600.00
	28.000	41800.00	320.46	.00	5.56	.00	165.02	750.00
	35.000	41800.00	326.79	.00	6.33	.00	160.39	700.00
*	43.000	41800.00	351.14	.00	24.34	.00	181.72	800.00
*	48.500	41800.00	373.69	.00	22.55	.00	87.38	550.00
*	54.250	41800.00	391.05	.00	17.36	.00	138.66	425.00
*	59.500	41800.00	411.15	.00	20.11	.00	152.40	525.00
*	65.200	41800.00	432.57	.00	21.42	.00	125.14	570.00
	77.000	41800.00	451.32	.00	18.75	.00	189.09	1180.00
*	86.000	41800.00	459.03	.00	7.71	.00	558.85	700.00
*	91.000	41800.00	460.00	.00	.96	.00	260.79	500.00
*	93.500	41800.00	462.95	.00	2.95	.00	329.27	250.00
	96.100	41800.00	464.22	.00	1.28	.00	454.91	260.00
*	97.000	41800.00	463.70	.00	-.52	.00	389.34	90.00
	97.600	41800.00	464.39	.00	.69	.00	406.79	60.00
*	98.400	41800.00	478.02	.00	13.63	.00	674.78	40.00
	98.780	41800.00	478.92	.00	.90	.00	717.95	38.00
*	99.330	41800.00	480.64	.00	1.72	.00	800.00	55.00
	100.400	41800.00	480.71	.00	.07	.00	750.00	107.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	102.000	41800.00	480.71	.00	.00	.00	680.00	160.00
	103.600	41800.00	480.74	.00	.03	.00	680.00	160.00
	104.950	41800.00	480.80	.00	.06	.00	765.00	135.00
	106.100	41800.00	480.78	.00	-.01	.00	626.00	115.00
*	107.900	41800.00	480.69	.00	-.10	.00	431.00	180.00
	109.400	41800.00	480.78	.00	.10	.00	421.00	150.00
	110.650	41800.00	480.90	.00	.12	.00	411.00	125.00
	112.150	41800.00	481.18	.00	.28	.00	561.00	150.00
	113.650	41800.00	481.28	.00	.10	.00	426.00	150.00
	115.150	41800.00	481.43	.00	.15	.00	376.00	150.00
	116.450	41800.00	481.63	.00	.20	.00	376.00	130.00
	117.600	41800.00	481.65	.00	.03	.00	336.00	115.00
	118.500	41800.00	481.91	.00	.25	.00	360.00	90.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=      .000  PROFILE=  1  CRITICAL DEPTH ASSUMED
WARNING SECNO=     1.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     7.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    14.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=    20.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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CAUTION SECNO=    48.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    48.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY
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CAUTION SECNO=     54.250  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     54.250  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     59.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     59.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     65.200  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     65.200  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     86.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     91.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     93.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     97.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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CAUTION SECNO=     98.400  PROFILE=  1  MINIMUM SPECIFIC ENERGY

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WARNING SECNO=    107.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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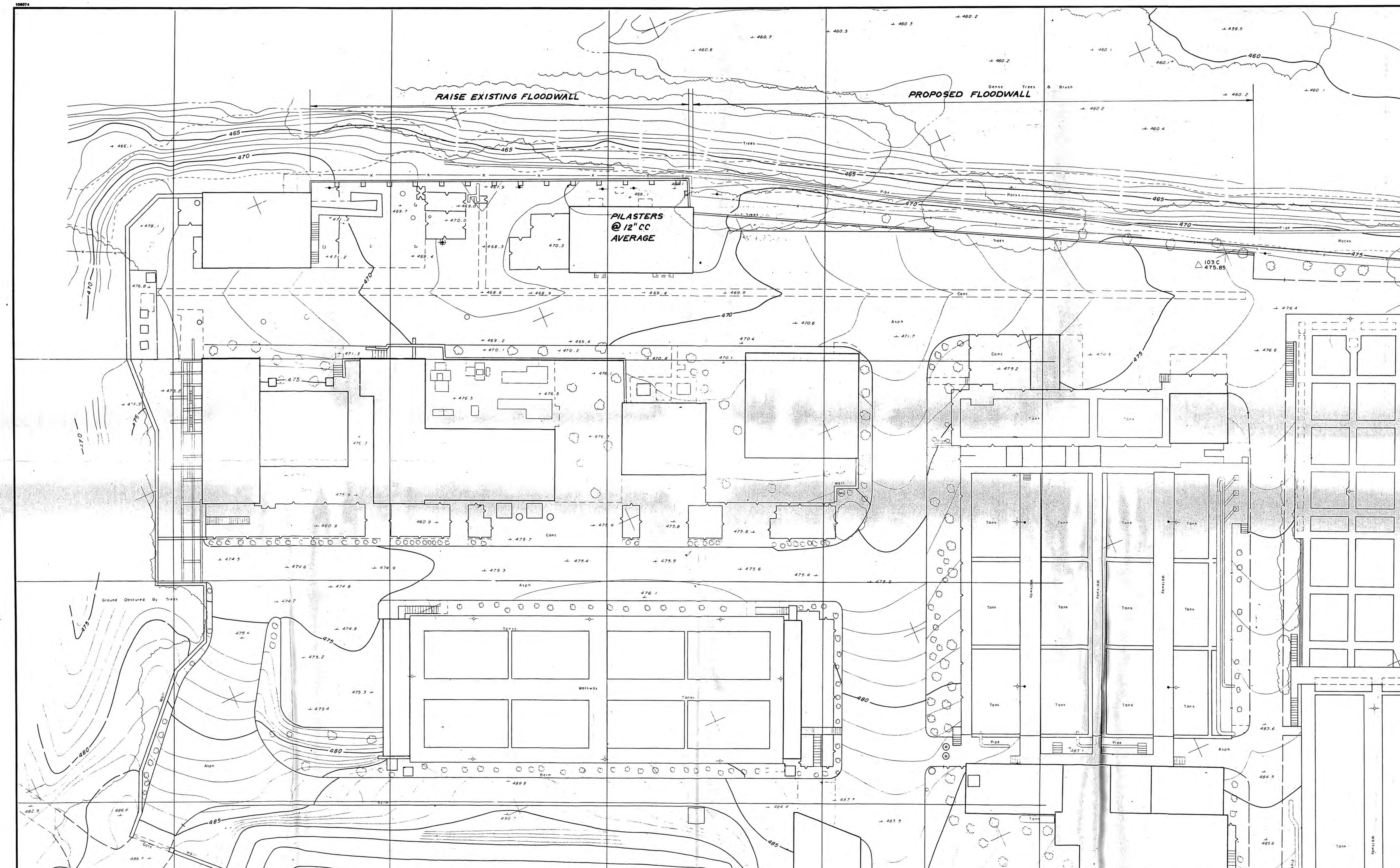
RIVERTECH INC

PLATE 2

TITLE:
FLOODPLAIN BASE MAP FOR MALIBU CREEK NEAR THE TAPIA WATER RECLAMATION FACILITY

SHEET 1 OF 2

106074



REV	DATE	BY	DESCRIPTION	REV	DATE	BY	DESCRIPTION

SCALE:

DESIGNED

DRAWN

CHECKED

SUBMITTED

14038

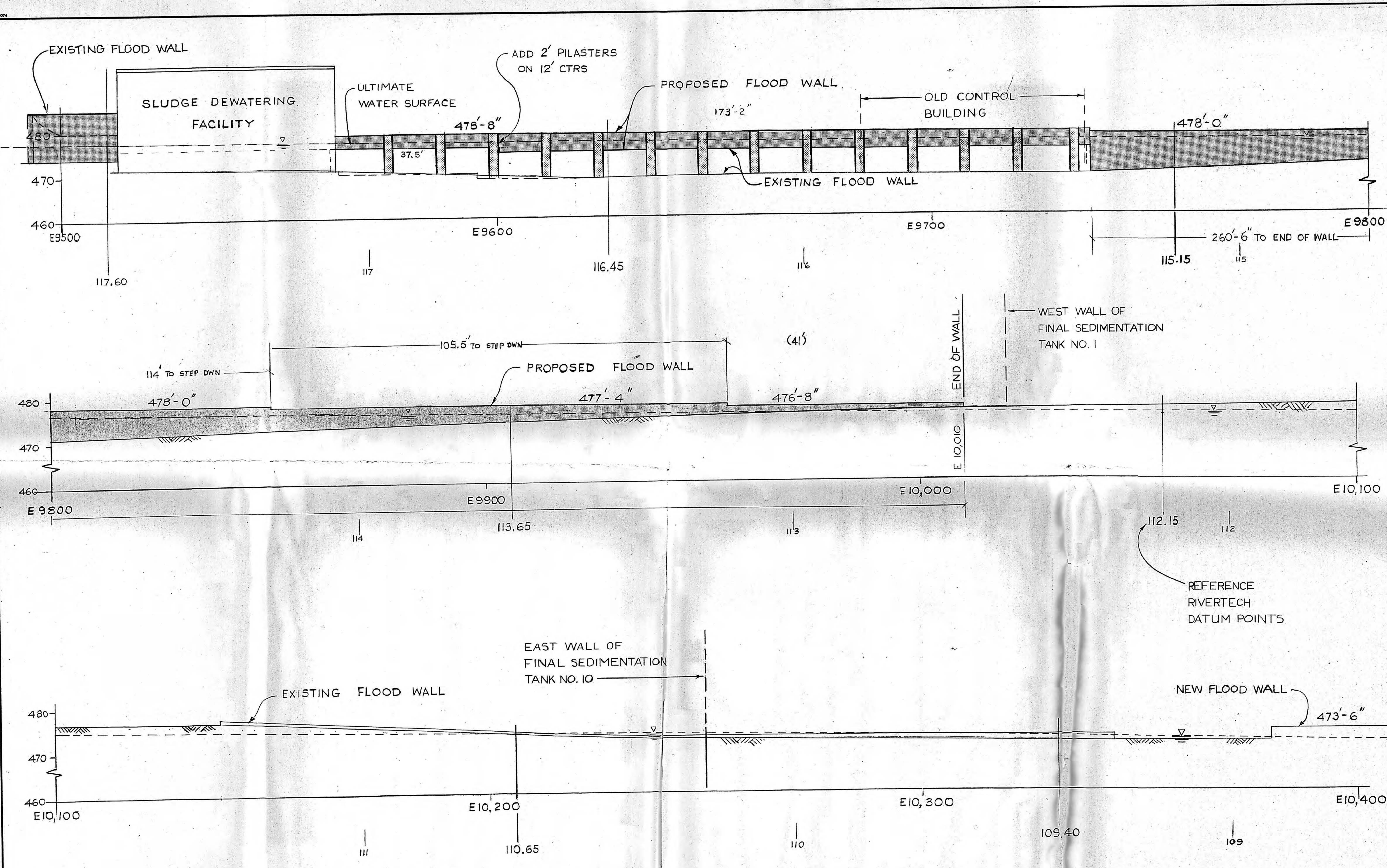
KATSURA CONSULTING ENGINEERS R.C.E. NO. DATE

KATSURA CONSULTING ENGINEERS
Ventura, California

LAS VIRGENES MWD / TRIUNFO CSD
TAPIA WRF - REGIONAL FACILITIES EXPANSION IV
SOLIDS SEPARATION & SECONDARY TREATMENT

SHEET

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A50516



REV	DATE	BY	DESCRIPTION	REV	DATE	BY	DESCRIPTION

SCALE:

DESIGNED

DRAWN

CHECKED

SUBMITTED

KATSURA CONSULTING ENGINEERS | 14038 R.C.E. NO. | DATE

KATSURA CONSULTING ENGINEERS
Ventura, California

LAS VIRGENES MWD / TRIUNFO CSD
TAPIA WRF - REGIONAL FACILITIES EXPANSION IV
SOLIDS SEPARATION & SECONDARY TREATMENT

EXISTING AND PROPOSED FLOODWALL PROFILE

SHEET

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A50516

Appendix G

LACDPW 2022 Hydraulic Study

for the Malibu Canyon Road Bridge Replacement

Malibu Canyon Road Bridge
Location Hydraulic Study Report

Prepared by:

Los Angeles County Public Works
Stormwater Engineering Division
Hydrology & Hydraulics Section

April 2022

REGISTERED CIVIL ENGINEER CERTIFICATION

This Location Hydraulic Study has been prepared by or under the direction of the following Registered Civil Engineer. The undersigned attests to the technical information contained herein and the qualifications of any technical specialist providing engineering data upon which recommendations, conclusions, and decisions are based.

____

Martin Araiza, P.E.
Registered Civil Engineer C61849
Registration Expires 06/30/2023

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Table of Figures

List of Tables

1 INTRODUCTION

The Los Angeles County Public Works (LACPW) has secured engineering funds through the Federal Highway Administration for the retrofit of the Malibu Canyon Road. Preparation of this Location Hydraulic Study is required to demonstrate that the proposed bridge does not pose any adverse risk and does not increase the impacts of flooding.

1.1 PURPOSE

The purpose of this report is to

1) present methodology and results of a hydraulic analysis comparing the impacts of the existing bridge Malibu Canyon Road Bridge and proposed retrofit bridge over Malibu Creek.

2) examine the existing floodplain and ascertain the impacts of the proposed retrofit Malibu Canyon Road Bridge with the base 100-year flood.

1.2 BACKGROUND

The LACPW is proposing to retrofit the existing Malibu Canyon Road Bridge with the same roadway alignment and roadway profile across Malibu Creek. The location of Malibu Canyon Road Bridge is approximately 130 feet south of the intersection of Piuma Road and Malibu Canyon Road and is positioned at the Latitude and Longitude coordinates of 34°04'53.8"N, 118°42'15.5"W respectively, as seen at the pin marker in *Figure 1.1*.

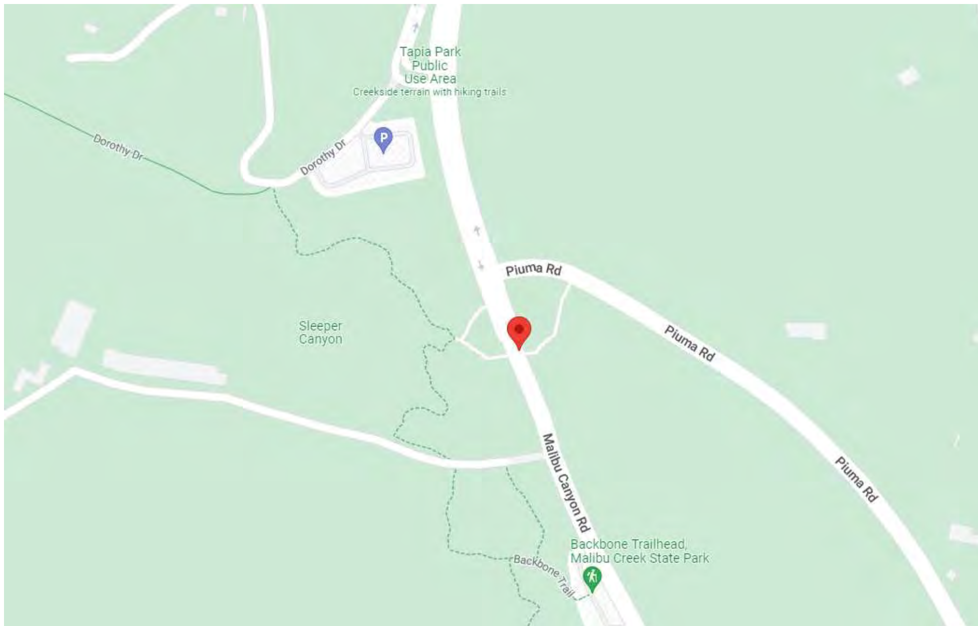

Figure 1.1 – Aerial Overview of the Project Site

All elevations in this report are in U.S. Customary units and are based on the NAD 1983 State Plane California V FIPS 0405 horizontal datum and North American Vertical Datum of 1988 (NAVD 88). The existing bridge was constructed using the National Geodetic Vertical Datum of 1929 and needed to be translated to NAVD 88 to be compatible. The web-based VERTCON program, developed by the National Geodetic Survey, was used to convert between the different vertical datums used.

1.3 EXISTING BRIDGE

The existing bridge's (*Figure 1.2*) length is 212' long, with a width of 32' 2" wide, and has a 3-span bridge design with a pier thickness of 1.5'. The abutments and wing walls of the bridge were constructed with reinforced concrete. *Figure 1.3* shows a typical section view as described in the provided 1952 bridge plans.

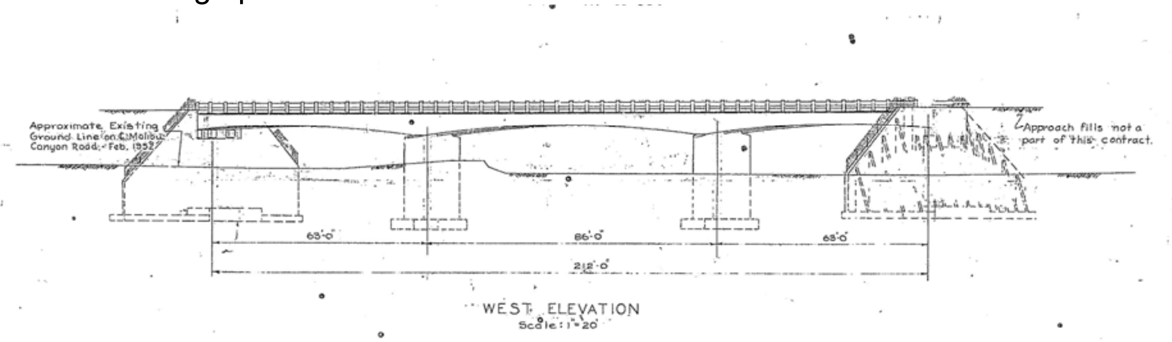

Figure 1.2 – Side View of the Existing Bridge

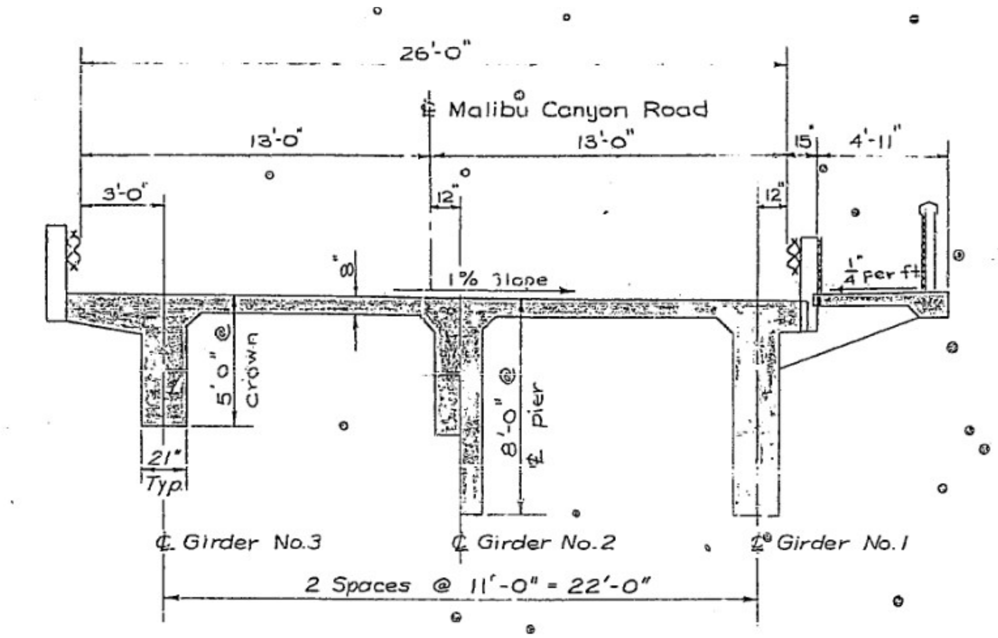

Figure 1.3 – Typical Cross Section of the Existing Bridge

1.4 PROPOSED BRIDGE

The proposed bridge (*Figure 1.4*) is to be 270' long, 57' wide, and will have a 2-span design with a proposed pier thickness of 2'. The reinforced concrete abutments and wing walls of the existing bridge are to remain and not be removed. *Figure 1.5* shows a typical section view as described in the provided 2019 bridge plans.

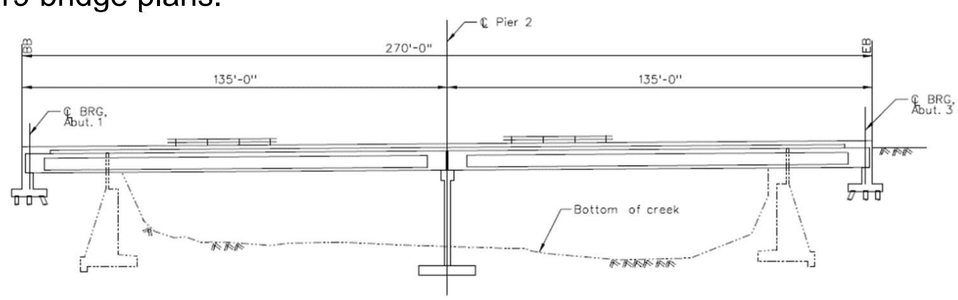

Figure 1.4 – Side View of the Proposed Bridge

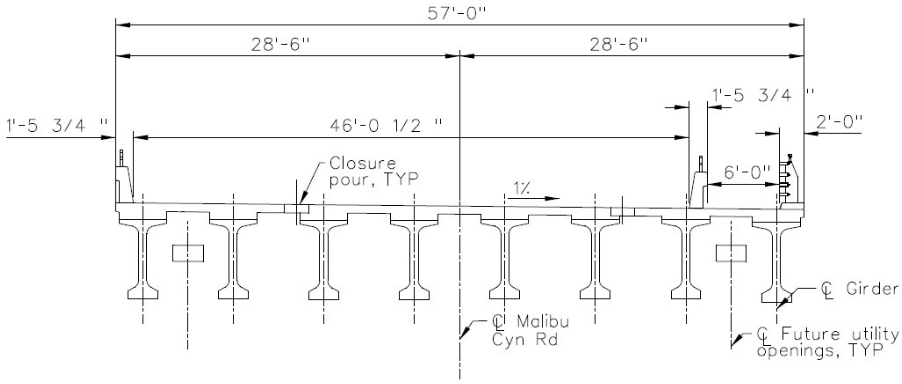

Figure 1.5 – Typical Cross Section of the Proposed Bridge

2 WATERSHED CHARACTERISTICS

The Malibu Creek Watershed covers approximately 110 square miles and is located at the northwestern end of Los Angeles County and the southern end of Ventura County. Roughly 80% of the Malibu Creek Watershed is open space with very few settlements and residences situated within its border. Much of this open space is under jurisdiction of the National and State Parks. The topography of the watershed includes steep ravines and densely vegetated hillsides. The watercourses in the watershed are primarily natural streams, with little flow during the summer months. Flow from the watershed directly discharges into the Pacific Ocean as seen in *Figure 2.1*.

The Malibu Canyon Road Bridge is located just upstream of the confluence of Cold Canyon Creek with Malibu Creek. The tributary drainage area corresponding to the project location is approximately 97.2 square miles.

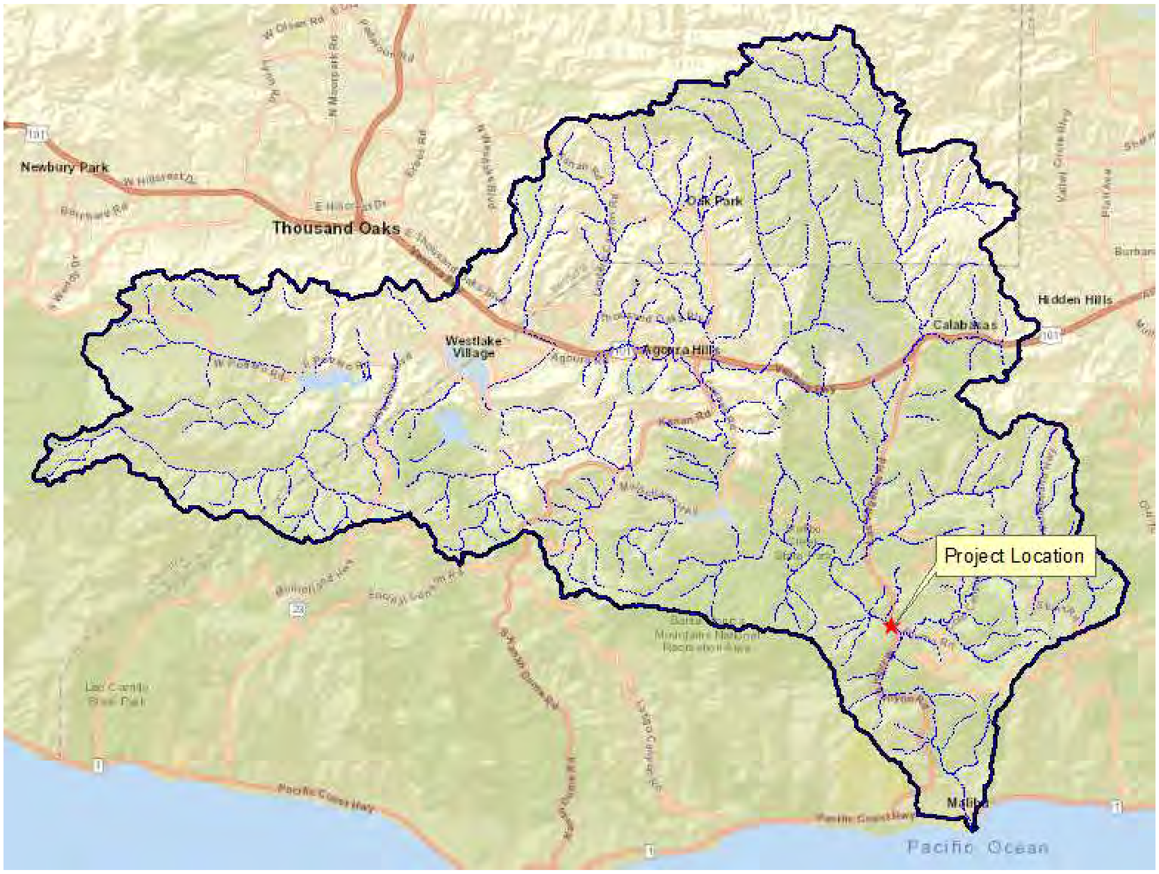

Figure 2.1 – Malibu Creek Watershed.

3 HYDROLOGY

3.1 FEMA FLOWRATES

The latest Flood Insurance Rate Map (FIRM) by FEMA (FEMA #06037C1529G, 12/21/2018) for Los Angeles County shows that the Malibu Canyon Road Bridge over Malibu Creek falls under FEMA Zone A as seen in *Figure 3.1*. The published FEMA Flood Insurance Study (FIS) provides summary tables depicting flood event discharges as well as roughness coefficients of the terrain for certain channels and canyons within Los Angeles County. It is important to note that there are no defined Base Flood Elevations for this location of Malibu Creek. The full FIRM can be found in Appendix A.

Table 1 contains the FEMA FIS published peak discharges for the 10-, 50-, 100-, and 500-year flood events. There are no published discharges for the 200-year flood. The 50-year and the 100-year floods are defined as the design and base floods, respectively.

Figure 3.1 – Aerial Overview of Flood Insurance Rate Map of Project Site by FEMA

Table 1 – List of FEMA Flowrates Used in Hydraulic Study

Flood Frequency	10-Year	50-Year	100-Year	500-Year
Discharge, cfs	14,183	31,648	40,544	63,934

3.2 LACPW FLOWRATES

A 1965 hydrology study by LACPW resulted in a Capital Flood of 41,800 cfs. The Capital Flood is defined as the runoff produced by a 50-year frequency design storm falling on a saturated watershed. A revised hydrology study was completed by LACPW in 2007 for Malibu Creek and was based on the Modified Rational Method available within the Watershed Modeling System program. The Malibu Creek Watershed is mostly undeveloped and subject to burning from wildfires. As a result, the revised study accounted for the increase in flow due to the effects of a burned watershed. Burned watersheds contribute debris to the runoff. Therefore, the burned flow rates were bulked to reflect increases in runoff volumes and peak flows related to the inclusion and transport of sediment and debris. *Table 2* lists the LACPW flow rates that were used in this hydraulic analysis.

Table 2 – List of LACPW Flowrates Used in Hydraulic Study

Flood Event	1965 Capital Flood	2008 Burned Flow Rate	2008 Burned & Bulked Flow Rate
Discharge, cfs	41,800	41,656	64,600

4 HEC-RAS MODEL

4.1 EXISTING AND PROPOSED BRIDGE

The U.S. Army Corps of Engineers' HEC-RAS 5.0.7 computer program was used to perform a steady-state one-dimensional hydraulic analysis. A field survey was taken around the proximity of the bridge and merged with a 3-foot spatial resolution Digital Elevation Model (DEM) derived from Light Detection and Ranging (LiDAR) data collected in 2015 and 2016 by the Los Angeles Regional Imagery Acquisition Consortium (LAR-IAC). This provided the terrain necessary for the hydraulic model. Bank lines, flow paths, and cross-sections were then drawn to configure and capture the natural shape of Malibu Creek. As shown in *Figure 4.1*, the length and extent of the hydraulic analysis started 4,200 feet upstream of Malibu Canyon Road Bridge and extended 3,800 feet downstream of the bridge.

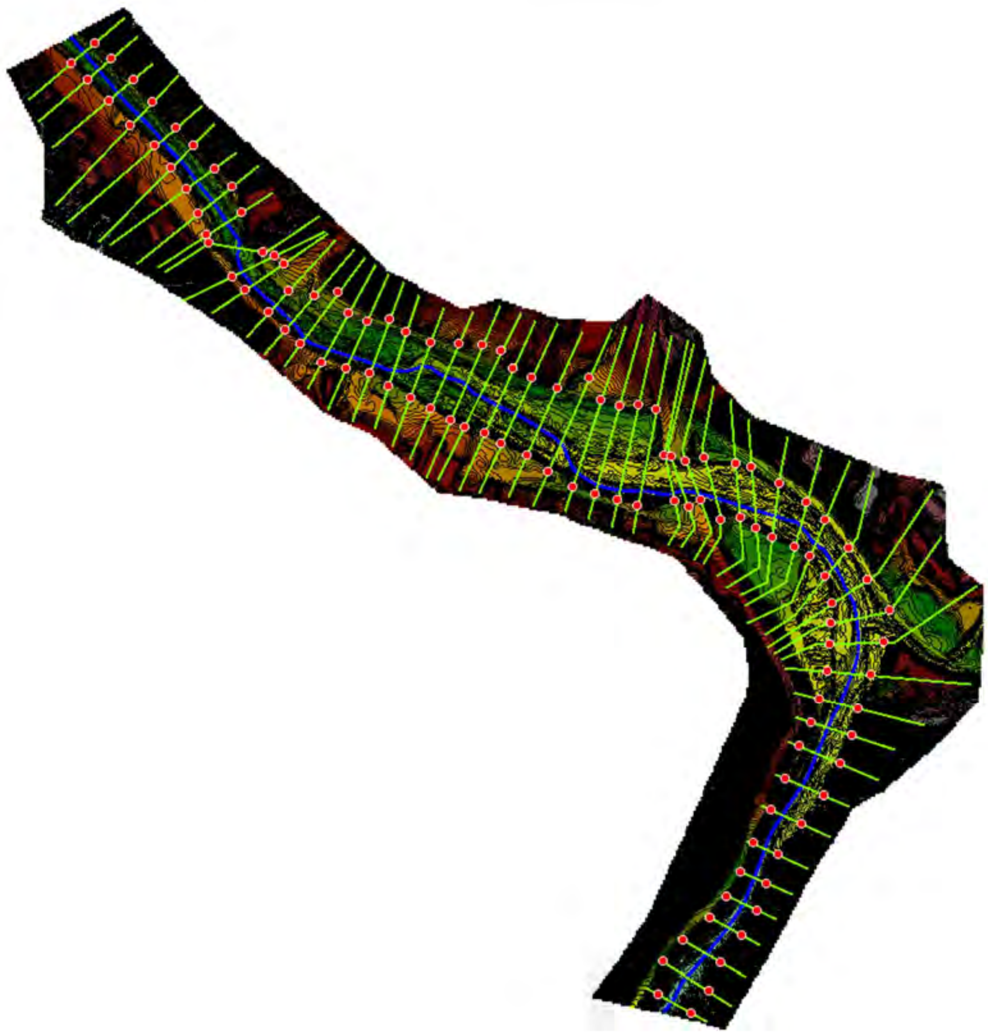

Figure 4.1 – Aerial Overview of the Combined 3-ft DEM & Survey Terrain

For the analyses, the roughness coefficients (n-value) that were inputted for the left bank, right bank, and channel are shown in *Figure 4.2*. The determination of the n-values came from a combination of comparing historical aerial overview imagery and field site inspections (*Figure 4.3*) with known n-values ranges from past report studies. *Figure 4.4* provides an overview of the project area delineated into various sections according to varying terrain roughness factors present (ex: vegetation levels, building facilities, road, etc.). Each section represents a different n-value.

Edit Manning's n or k Values

River: River 1 — Edit Interpolated XS's — Channel n Values have a light green background

Reach: Reach 1 — All Regions

Selected Area Edit Options: Add Constant ... | Multiply Factor ... | Set Values ... | Replace ... | Reduce to L Ch R ...

	River Station	Frctn (n/K)	n #1	n #2	n #3
1	8100	n	0.03	0.05	0.03
2	7974	n	0.03	0.05	0.03
3	7809	n	0.03	0.05	0.03
4	7637	n	0.03	0.045	0.03
5	7456	n	0.09	0.07	0.03
6	7313	n	0.09	0.07	0.03
7	7161	n	0.09	0.07	0.03
8	7016	n	0.09	0.07	0.03
9	6884	n	0.07	0.07	0.07
10	6718	n	0.05	0.015	0.09
11	6582	n	0.06	0.045	0.09
12	6490	n	0.06	0.045	0.09
13	6325	n	0.06	0.045	0.09
14	6195	n	0.09	0.04	0.09
15	6081	n	0.08	0.04	0.09
16	5932	n	0.07	0.04	0.09
17	5801	n	0.07	0.04	0.09
18	5677	n	0.07	0.04	0.03
19	5560	n	0.06	0.045	0.03
20	5404	n	0.07	0.045	0.03
21	5263	n	0.06	0.045	0.03
22	5137	n	0.05	0.045	0.03
23	5037	n	0.03	0.045	0.03
24	4928	n	0.05	0.045	0.03
25	4816	n	0.06	0.045	0.03
26	4665	n	0.05	0.05	0.03
27	4521	n	0.06	0.05	0.03
28	4329	n	0.03	0.05	0.09
29	4201	n	0.03	0.05	0.09
30	4078	n	0.03	0.05	0.09
31	3962	n	0.03	0.05	0.09
32	3785	n	0.03	0.05	0.09
33	3727	n	0.03	0.05	0.05
34	3704	Bridge			
35	3647	n	0.03	0.05	0.05
36	3543	n	0.07	0.06	0.05
37	3409	n	0.05	0.06	0.05
38	3319	n	0.05	0.06	0.05
39	3205	n	0.05	0.06	0.05
40	3052	n	0.05	0.06	0.05
41	2926	n	0.05	0.08	0.05
42	2760	n	0.03	0.08	0.05
43	2594	n	0.03	0.07	0.05
44	2447	n	0.03	0.07	0.06
45	2309	n	0.03	0.07	0.06
46	2139	n	0.09	0.05	0.07
47	1957	n	0.09	0.05	0.07
48	1809	n	0.09	0.05	0.03
49	1655	n	0.09	0.04	0.03

OK | Cancel | Help

Figure 4.2 – List of the Roughness Coefficients Determined

Figure 4.3 – Aerial Imagery of the Upstream Portion of Malibu Creek (Top) vs. Field Inspection Images of the Upstream Portion of Malibu Creek (Bottom)

Figure 4.4 – Delineation of Study Area by Varying Roughness Coefficients

Two bridge scenarios were simulated: the existing bridge and the proposed bridge. *Figure 4.5* represents the existing conditions of the bridge and *Figure 4.6* represents the proposed conditions of the bridge. The proposed bridge is 58 feet longer than the existing bridge and provides additional clearance with its 2-span configuration. The existing and proposed bridge scenarios were both run with the FEMA flowrates and the County flowrates. Results from the respective runs were compared and analyzed to determine impacts between the proposed and existing bridge.

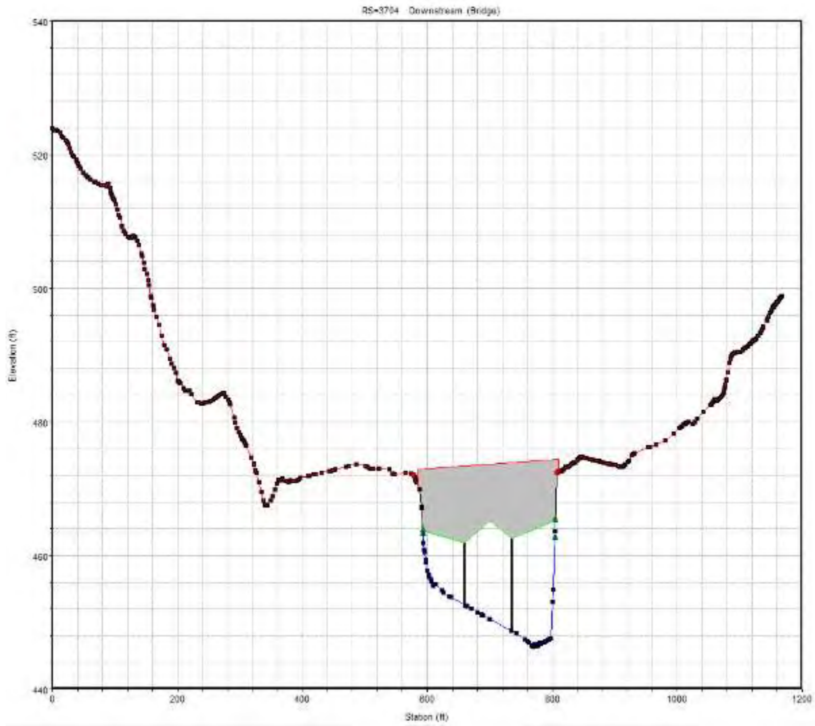

Figure 4.5 – Cross-Section View of the Existing Bridge in HEC-RAS

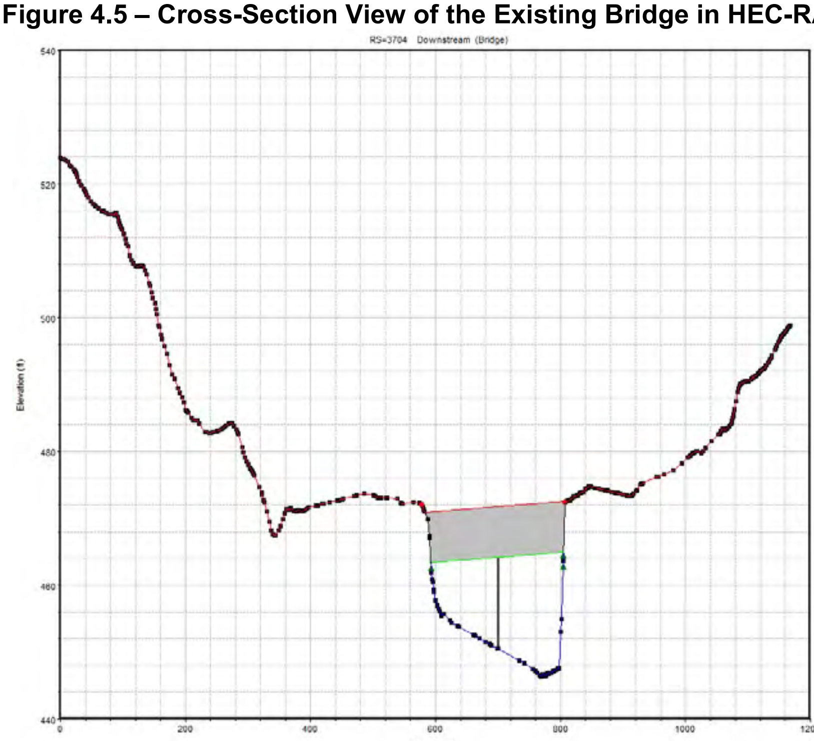

Figure 4.6 – Cross-Section View of the Proposed Bridge in HEC-RAS

5 HYDRAULIC RESULTS

5.1 EXISTING AND PROPOSED BRIDGE RESULTS

A variety of scenarios consisting of combinations of existing or proposed bridge configurations modeled with various flowrates (FEMA and LACPW flowrates) were examined to determine the hydraulic impacts of the proposed and existing bridge configurations in Malibu Creek. In reviewing the HEC-RAS output results, only the FEMA 10-year flow rate scenario resulted in water surface elevations below the bridge deck for both the existing and proposed bridge. All other flowrate scenarios resulted in water surface elevations above the bridge deck for both bridge cases. However, the configuration span and clearance of the proposed two-span bridge does provide additional capacity within the vicinity of the bridge and results in lower water surface elevations in Malibu Creek for most of the flow rates analyzed.

The results of the hydraulic analysis are provided in *Table 3*. The hydraulic results indicate that the proposed two-span bridge configuration does not increase water surface elevations when compared to the results of the existing three-span bridge. Freeboard was not taken into consideration of the bridge and effects of superelevation for curved alignments were not considered in this study.

The base flood (FEMA 100-year flow rate) inundation extent for the existing and proposed bridges can be seen in *Figure 5.1.*

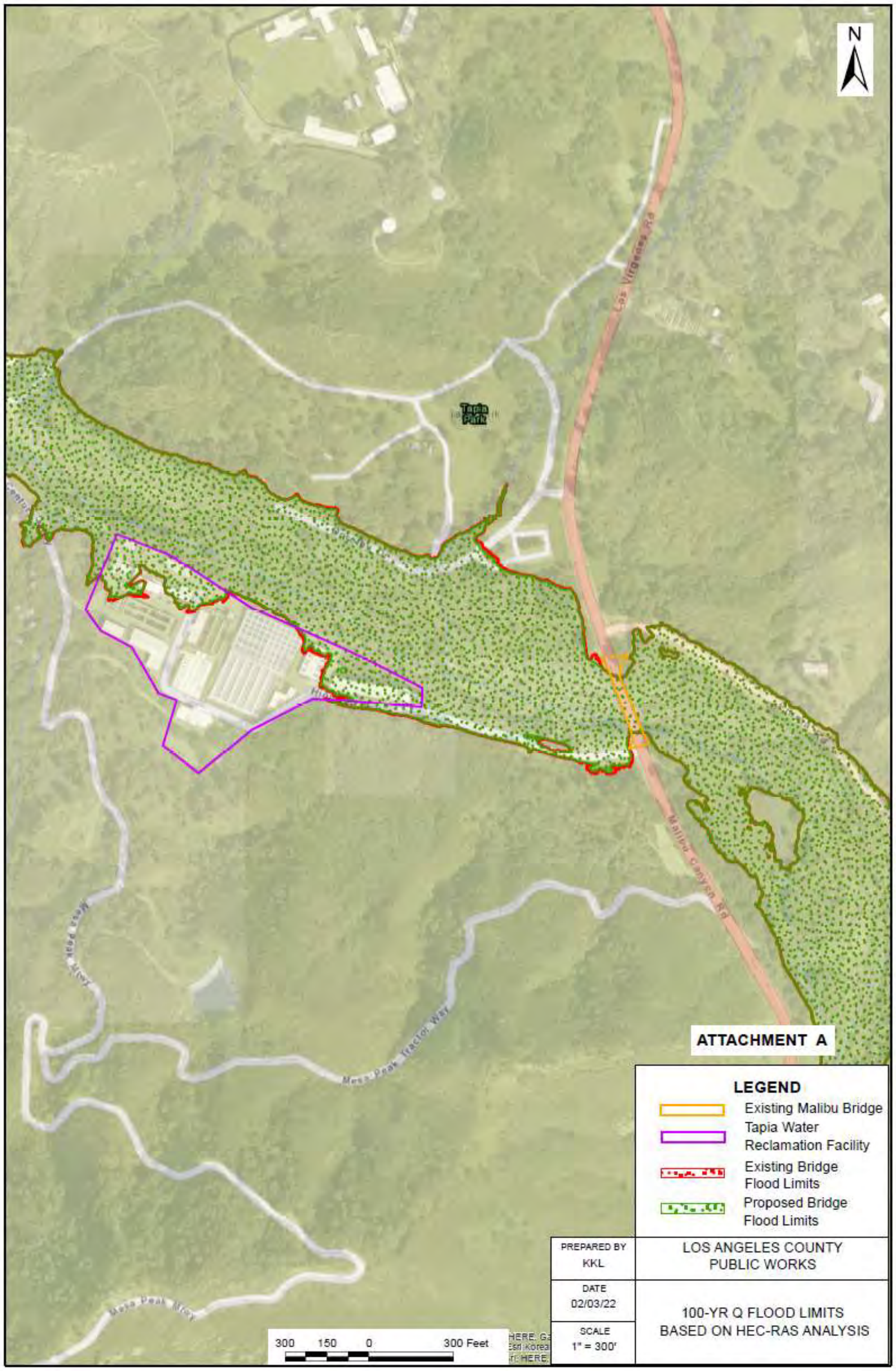

Figure 5.1 – Flood Limits Based on HEC-RAS Analysis for FEMA 100-yr Flow Rate

Table 3 – Summary of HEC-RAS Results for FEMA & LACPW Flow Rates on the Existing Bridge (3-Span) vs. the Proposed Bridge (2-Span)

FEMA	Flowrate (cfs)	Water Surface Elevation (ft)		Difference
		Existing 3-span Bridge	Proposed 2-Span Bridge	(ft)
10-Year	14,183	463.84	463.84	0
50-Year	31,648	471.84	470.60	-1.24
100-Year	40,544	474.16	473.58	-0.58
500-Year	63,934	476.72	476.84	0.12

LACPW	Flowrate (cfs)	W.S. Elevation (ft)		Difference
		Existing 3 span Bridge	Proposed 2 Span Bridge	(ft)
1965 Capital Flood	41,800	474.94	474.18	-0.76
2008 Burned Flowrate	41,656	474.91	474.13	-0.78
2008 Burned & Bulked	64,600	477.25	477.18	-0.07

5.2 FLOODPLAIN IMPACT ASSESSMENT

Per the Federal-Aid Policy Guide 23 Code of Federal Regulations, Chapter 1, Subchapter G – Engineering and Traffic Operations, Part 650 – Bridges, Structures and Hydraulics, Subpart A – Location and Hydraulic Design of Encroachments on Floodplains, Section 650.111 – Location Hydraulic Studies, Paragraph (b), (c), and (d), the Location Hydraulic Study shall include the discussion of the following items.

23 CFR 650.111(b) - Location studies shall include evaluation and discussion of the practicability of alternatives to any longitudinal encroachments

As defined by the Federal Highway Administration (FHWA), a longitudinal encroachment is an encroachment that is parallel to the direction of flow. For example, a highway that runs along the edge of a river is usually considered a longitudinal encroachment.

The flow direction of the floodplain for Malibu Creek is not parallel to the direction of the proposed retrofit bridge. Besides the modification of the existing two piers (3-span bridge) into one pier (2-span bridge) to include additional conveyance to the bridge, the proposed retrofit bridge is not considered a longitudinal encroachment.

23 CFR 650.111(c)(1) - The risks associated with implementation of the action

As defined by the FHWA, risk is the adverse consequences associated with the probability of flooding attributable to an encroachment, specifically including the potential for property loss and the hazard of life. The proposed retrofit bridge helps reduce the water surface elevation along the creek when compared to the existing bridge. The hydraulic results show that the configuration span and clearance of the proposed two-span bridge help provide additional capacity within the vicinity of the bridge. The additional conveyance underneath the bridge helps reduce the potential for overtopping and provides a safer crossing for the public, which helps reduce the risk to property and life. The risk associated with the encroachment resulting from the proposed retrofit bridge is not significant compared to existing conditions.

23 CFR 650.111(c)(2) - The impacts on natural and beneficial floodplain values

As defined by the FHWA, natural and beneficial floodplain values include, but are not limited to: fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge. The proposed retrofit bridge does not increase water surface elevations and construction work will be conducted in the immediate vicinity of the bridge. The risks associated with the proposed retrofit bridge concerning the impact on natural and beneficial floodplain values are not significant compared to existing conditions.

23 CFR 650.111(c)(3) - The support of probable incompatible floodplain development

As defined by the FHWA, the support of incompatible base floodplain development will encourage, allow, serve, or otherwise facilitate incompatible floodplain development. The proposed retrofit bridge does not increase or create new access routes on developed or undeveloped land in the floodplain and does not increase local traffic. The risk associated with the implementation of the proposed action concerning probable incompatible floodplain development is not significant compared to existing conditions.

23 CFR 650.111(c)(4) - The measures to minimize floodplain impacts associated with the action

The existing bridge for the 100-year flood (Base Flood) event results in overtopping and experiences pressure flow. By raising the road with the proposed retrofit bridge, it will provide a larger conveyance area under the structure. As a result, the water surface elevation is lowered from the existing to the proposed conditions. The proposed retrofit bridge does not worsen the existing bridge's conditions or cause an increase in the floodplain. The risks associated with the implementation of the proposed retrofit bridge concerning the floodplain impacts are not significant compared to existing conditions.

23 CFR 650.111(c)(5) - The measures to restore and preserve the natural and beneficial floodplain values impacted by the action

As defined by the FHWA, natural and beneficial floodplain values include, but are not limited to: fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge. The proposed retrofit bridge does not result in any identified significant permanent impacts to the natural and beneficial floodplain values. All environmental impacts that occur will be during the construction phase of the project. During the construction phase, best management practices and requirements will be reflected, and be part of the required project permit conditions issued by the regulatory agencies. The risks associated with the implementation of the proposed retrofit bridge regarding the natural and beneficial floodplain values are not significant compared to existing conditions.

23 CFR 650.111(d) - Location studies shall include evaluation and discussion of the practicability of alternatives to any significant encroachments or any support of incompatible floodplain development.

The proposed retrofit bridge replaces the existing 3-span bridge with a 2-span bridge capable of allowing for more conveyance of the design flood. The proposed retrofit bridge does not result in new floodplain encroachment. There is no significant encroachment to the Base Flood floodplain.

A Location Hydraulic Study form has been completed based on the hydraulic results and can be found in Appendix B.

6 REFERENCES

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Appendix H

LACDPW Memorandum dated March 31, 1986,

General Files No. 2-15.321/ Level of Flood Protection

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WYNN L. SMITH, Chief Deputy Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 2418
LOS ANGELES, CALIFORNIA 90051

IN REPLY PLEASE
REFER TO FILE:

March 31, 1986

TO WHOM IT MAY CONCERN:

FROM: T. A. Tidemanson
Director of Public Works

LEVEL OF FLOOD PROTECTION
FILE NO. 2-15.321

The following Level of Flood and Drainage Protection Standards has been adopted by the Department of Public Works:

I. Capital Flood Protection (Based on a rainfall with a probability of occurrence of once in 50 years).

A. Natural watercourses -

All facilities that are constructed in or intercept flood waters from natural watercourses shall be designed for the Capital Flood. These include open channels, closed conduits, bridges, and dams or debris basins (not under State of California jurisdiction). See Attachment A for definition of a watercourse.

B. Floodways - All areas mapped as floodways shall be mapped based on the Capital Flood.

C. Natural Depressions or Sumps -

All facilities that are constructed to drain natural depressions or sumps shall be designed for a Capital Flood. These include channels, closed conduits, retention basins, detention basins, pump stations and highway underpasses. See Attachment A for definition of sumps.

D. Culverts under major and secondary highways.

II. Urban Design Storm (Based on a rainfall with a probability of occurrence of once in 25 years).

The Urban Design Storm shall be the level of protection for all developed areas with other than conditions described in I above.

The surface capacity of the street or highway may be used up to a water surface level not exceeding the road right of way line. The available surface capacity of the street, however, may be restricted by vehicular or pedestrian traffic requirements see (Attachment A). If a storm drain is required to reduce the water surface level in the street to an acceptable level, it shall be designed for not less than 10-year frequency rainfall flow rates. The storm drain capacity shall be increased where necessary to lower the water surface level for the 25-year frequency storm to within road right of way or to meet other requirements as indicated in Attachment A.

III. Probable Maximum Flood -

All dams (earth embankment, concrete or other materials) that fall under the control of the State of California laws defining dams shall be constructed to safely pass the probable maximum flood as determined from the probable maximum precipitation as defined by the National Weather Service.

See Attachment B for background and other pertinent data.

GJP:yo

Attach (2)

Attachment A
Level of Flood Protection

Definitions:

1. Natural Watercourses -

A natural watercourse is a path along which water flows as a result of natural topographic features. Furthermore, for the purposes of this definition, a natural watercourse drains a watershed greater than 100 acres and also meets one or more of the following conditions:

a. Experiences flow velocities greater than five feet per second while carrying a Capital Flood.

b. Has flow depths greater than 1.5 feet while carrying a Capital Flood.

c. Would have water surface elevations, while carrying a Capital Flood, within one foot of the bases of adjacent habitable structures, if such water surface elevations would result from construction of facilities with less than a Capital Flood capacity.

2. Depression or sump -

A depression or sump is an area for which there is no surface route to outlet flows. Furthermore, for the purposes of this definition, a depression or sump also meets one or more of the following conditions:

a. Would have a ponded water surface elevation, during a Capital Flood, within one foot of the bases of adjacent habitable structures, if such elevation would result from construction of facilities with less than a Capital Flood capacity. This condition does not apply if there is a surface route for outflow such that the ponded water surface cannot reach the bases of adjacent structures during a Capital Flood.

b. In a roadway, would have a ponded water surface elevation higher than the elevation of the public right of way line if facilities with less than a Capital Flood capacity were constructed. This condition applies to flows which reach the roadway upstream of the sump and are conveyed to the sump by the roadway.

c. Has a ponded depth of three feet or greater.

3. Street Capacity -

Maximum street capacity as defined herein is the capacity of the street section to carry flows within street right of way (depth of flow does not exceed either property line). See Highway Design Manual for criteria on quantity of water to be removed from the road surface to provide favorable conditions for vehiclular and pedestrian traffic for particular level of protection. This may increase the level of protection required to be provided by the drain.

Attachment B

Level of Flood Protection

Background

The Hydrology SubCommittee has reviewed the level of protection standards of the three former Departments (County Engineer, Road, and Flood) as well as all major agencies in Southern California. In addition, we have met with the County Counsel for legal advice.

The Flood Control District (FCD) in cooperation with the United States Army Corps of Engineers (C of E) has constructed the major flood control facilities in Los Angeles County. These facilities which have channelized the rivers and major streams have been designed for Capital Flood protection and, in the case of the C of E, their Standard Project Flood (SPF). Analysis has indicated that these are comparable levels of protection. In most cases, the SPF equals or exceeds the Capital Flood.

The Los Angeles County Road Department has also used the criterion of the FCD Capital Flood when providing facilities to cross over (bridge) major streams.

The County Engineer required Capital Flood protection in all instances where the FCD had indicated a comprehensive plan channel or had hydrology for a major stream. They required the developers to use FCD flow rates.

The level of protection for urban areas differed between the three Departments. The County Engineer required all new tract developments to use the 25-year frequency level. This could be obtained with a combination of storm drain and surface street capacity. However, if off site capability to accept the excess surface flows was limited, they required the drain exiting the development to carry the 25-year frequency flows. In the majority of the cases, therefore, the developers chose to construct the entire storm drain system for the 25-year frequency flow rates. The Road Department followed the County Engineer requirements for new tract developments. Road Department Cash Contract projects utilized a 10-year frequency protection level obtained by a combination of a storm drain and street surface capacity. The quantity of surface flow varied dependent upon whether the project fell under local or federal requirements. Sumps were designed to the Capital Flood protection level.

The FCD required the 10-year frequency level for storm drains in streets for the four Storm Drain Bond Issue Programs 1952-1970 and/or District projects constructed since the 1970's. Prior to these Storm Drain Bond Issues, the FCD was not involved to any great extent in other than major drainage channels. However, all projects including tributary storm drains in this period were constructed to the 50-year frequency level.

This background suggests that certain standards have been determined to be reasonable levels of protection. Our opinion, based on discussions with County Counsel, is that any lower levels of protection in future projects or approvals would increase the chances of liability should damage occur.

Compatibility to Federal Flood Insurance Requirements

The Federal Insurance Agency (FIA) has set the 100-year flood as their standard. The hydrology is based on historical runoff records to produce the 100-year flow rate. There is no allowance made for future urbanization. In developed areas the standard requires the finished floor elevation of proposed habitable structures to equal or exceed the water surface of the 100-year flood.

Our investigation indicates the recommended levels of protection, Capital Flood and Urban Design Storm, will meet or exceed FIA requirements.

A frequency analysis of the entire County shows that the FIA standard is between the 25-year and 10-year rainfall frequency levels. In most areas, facilities designed for the 10-year rainfall frequency level, when combined with the available street capacity, provide sufficient protection to meet FIA requirements. However, if development of an area changes and FIA restudies the area, 10-year rainfall frequency facilities may prove inadequate.

The proposed 25-year rainfall frequency level will meet FIA standards even if development changes.

The recommended protection levels are based on meeting FIA standards.

Compatibility with Existing Systems

The level of protection standards recommended may have to be modified in cases where the capacity of the conduit into which the proposed drain outlets has limited capacity. Where no relief drain is planned, it is recommended that the drain be restricted to the capacity available at its outlet. In cases where a relief drain is anticipated, the proposed drain is recommended to be sized for the appropriate level of protection.

There are enumerable possible situations, and all cannot be covered in this policy statement. The appropriate Section Head in the Department should review the proposed drainage system and the outlet conditions based on this policy and determine the required level of protection. In situations where the determination may not be clear-cut, the Section Head should recommend to his Division Head that it be referred to the Q Committee for its recommendations to the Director of Public Works.

Economics

We believe the proposed level of protection will not result in a change in cost for either design or construction for Department-constructed drains or developer-constructed drains in a majority of the situations.

The Urban Design Storm (25-year) will not increase requirements for drains required in new developments. The Department-constructed drains may increase in size in areas where the terrain is very flat and street capacity is limited. We have analyzed a number of different situations on prior projects and concluded that design costs would not increase more than one percent and construction costs would increase between two percent and five percent. However, we believe the number of projects affected will be fewer than 20 percent.

There may be some situations where under previous County Engineer policy construction in or intercepting watercourses used a 25-year level, whereas now a 50-year level will be required. It is difficult to determine exactly what percentage of the projects will be affected. In any event, the cost increase for these projects would be approximately 8 percent.

Rainfall vs. Runoff Records

The Committee recommends the continued use of rainfall records to determine the design storm. The major reason for this is that rainfall records are not affected by urbanization, whereas runoff records tend to be poor predictors of future runoff in areas where development is changing. Although we now have considerable length of runoff records, there has been constant urbanization throughout the record period. In addition, there is continued urbanization in the Santa Clara Valley, Antelope Valley, and certain areas on the south slope of the San Gabriel Mountains and in the West County area.

Discussion of Comments

Comment: Use a straight 10-year rainfall level of protection for all storm drains in streets.

Reply: The proposed level of protection should in the majority of the cases result in storm drains designed for 10-year Q's. The proposed level of protection is a combined system of utilizing street capacity and drain. It will in all cases meet Federal Flood Insurance standards. It will not lower present levels of protection required by the County Engineer, whereas a straight 10-year would in some cases.

Comment: The proposed level of protection will increase cost.

Reply: An analysis of drains in a number of different areas indicate that in the majority of the cases, the street sections have adequate capacity for the difference between a 25-year and 10-year Q. In the areas with flat street slopes or other areas where street capacity may be limited for one reason or another, the increased costs for the drain and appurtenances range between two percent and five percent. Design costs will be increased approximately one percent.

Comment: We feel you must prepare a precise policy regarding the handling of the situation where the new hydrology method produces flows that are greater than the outletting system's capacity. We feel the new method will produce greater Q's in almost all cases based on the results of hydrology reviews made during the Bond Issue Programs. As you are aware, the Bond Issue Programs guideline was to accept flow rates based on the County Engineer's hydrologic method when the resultant Q's were as much as 15 percent lower than the Q's generated by the District's short-cut rational method. It is recommended that you adapt this 15 percent figure as a guideline for future hydrologic studies.

Reply: A policy regarding the compatibility of a proposed drain to an existing outletting system is given in this statement and if interpetation is required, it will be given by the appropriate Department Section Head. Difficult situations will be referred to the Q Committee for its recommendation to the Director. The 15 percent guideline would no longer be appropriate. It was used up through the 1964 Bond Issue Projects. At that time, there was a difference in some coefficients used, and on very large areas the Q's near the end of the drain using the County Engineer method were sometimes lower than the District method. However, the Q's at the upper end of the drain were usually larger than the District's using the County Engineer method.

Comment: Will a 10-year rainfall frequency drain result in acceptable flooding levels during the FIA 100-year flood? Will the flooding levels be below finished floor elevations? Can we use a standard that will adjust the drain size to account for this if necessary?

Reply: Our investigation indicates that in most cases 10-year drains will give protection such that flooding levels will not exceed FIA standards. A frequency analysis when considering the entire County indicates that the FIA flooding levels are between the 10-year and 25-year rainfall frequency flooding levels. A standard could be developed to adjust drain sizes to meet FIA standards, however, it would be more complex. It also would not produce uniform results throughout the County.

Summary

The Hydrology SubCommittee has evaluated all the comments received on the proposed level of protection policy. After careful consideration of all points of view, we believe we have recommended a policy that is in the best interests of the public and the Department. We believe this policy will provide adequate flooding protection for Los Angeles County with insignificant, if any, increase in costs and minimize future Department liability.

GJP:yo

AGENDA ITEM NO. 6.E

DATE: June 5, 2023

TO: JPA Board of Directors

FROM: Engineering and External Affairs

SUBJECT: Pure Water Project Las Virgenes-Triunfo: Update on Public Outreach Plan

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SUMMARY:

Effective public outreach is a critical component for the success of the Pure Water Project Las Virgenes-Triunfo. In February 2017, a Public Outreach Plan was developed for the project and has since been implemented. The Public Outreach Plan has been updated several times with the latest update presented to the JPA Board on March 2, 2020. Most components of the plan have been completed or are on-going efforts. New items have been added to the plan over the past several years, including but not limited to the special tasting events. As with any large, multi-year project, it is important to periodically gauge progress and make necessary adjustments to outreach efforts to ensure continued success.

At the Board meeting, staff will provide an overview of the progress to-date on implementation of the Public Outreach Plan for the Pure Water Project Las Virgenes-Triunfo.

RECOMMENDATION(S):

Receive and file an update on the public outreach plan and provide feedback on new or additional outreach activities that should be considered for the Pure Water Project Las Virgenes-Triunfo.

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

There is no financial impact associated with this action.

DISCUSSION:

In collaboration with staff, Katz and Associates developed a Public Outreach Plan for the Pure Water Project Las Virgenes-Triunfo. The plan was initially presented to the JPA Board on February 6, 2017, and provides a roadmap for conveying timely, accurate, and clear information about the project to local leaders, stakeholders and customers. The main categories of the plan include data collection and research, informational materials and branding, stakeholder engagement, media/social media, partnerships, and tracking and measurement.

Updates have been periodically provided to the JPA Board with the latest on March 2, 2020. Since the last update, outreach efforts have been focused primarily on conducting tours of the Pure Water Demonstration Facility, which was inaugurated on September 11, 2020, and holding special tasting events. New items have been added to the plan over the past several years, including but not limited to special tasting events in 2022 for Pure Coffee Brew, Pure Gelato/Sorbet and Pure Beer, which recently won the California Association of Public Information Officials *Epic Award for Communication or Marketing Plans and Campaigns* .

Additional outreach efforts have also revolved around the CEQA/environmental review process and adoption of the Programmatic Environmental Impact Report in December 2022. Most items in the plan have either been completed or are on-going. The Pure Water Project Outreach Plan Update (Attachment A) summarizes the status of the various elements organized by each of the main categories in the plan. New elements of the plan are highlighted and shown in italics, including the following:

2.17 Constituents of Emerging Concern (CEC) Fact Sheet (see Attachment C)
3.9 Event Tabling with Beer Tasting
3.10 Special Tasting Event at Demonstration Facility
4.8 Full Circle Podcast Series
5.1 City of Thousand Oaks (partnership to augment water supply)
5.2 City of Agoura Hills (partnership to augment water supply)
5.3 MWD, WateReuse, Los Angeles Department of Water and Power, et al. (partnerships to receive endorsement from Los Angeles County Medical Association)

As part of the plan implementation, staff has kept track of the various outreach activities that are summarized in Attachment B. Following are some of the highlights since the Pure Water Demonstration Facility was completed:

- Over 126 tours of the Demonstration Facility, with approximately 1,853 attendees since September 11, 2020, including but not limited to:
    - 5 "Taste The Water, Explore The Garden" Tours
    - 31 Pure Water School Tours totaling 730 students
    - 57 Pure Water Tours (General Public)
    - 26 Pure Water Tours for consultants, water boards, LVMWD and TWSD staff, and elected officials and their staff
    - 5 Pure Water Tours with special tasting events (Coffee and Sorbet)
    - 2 Earth Day Tours (2021 and 2022)

- 3 special tasting events (Pure Coffee, Pure Gelato/Sorbet, Pure Beer) with a total of 545 attendees
- 8,871 website visits for OurPureH2o.com (since April 2022)
- 103 social media posts totaling 28,417 reaches (since July 2021)
- 11,318 digital media advertisement reaches (since July 2021)
- 11 newspaper ad placements (since July 2021)

The main observation or takeaway with regards to the current plan is that, while much has been accomplished to-date, there is still a significant amount of work to be done to inform and educate the public about the Pure Water Project Las Virgenes-Triunfo. Based on the latest results of an LVMWD customer survey, 46 percent of its customers are aware of the project. However, earlier surveys conducted in collaboration with Pepperdine University in 2020 before the Pure Water Demonstration Facility was completed and available for tours indicated that 53 percent of customers are supportive of the concept of purified recycled water to at least some degree with nine percent unsure and 38 percent either not supportive or uncomfortable with drinking the water. This data reflects a major shift from 20 years ago when the "toilet to tap" campaign dissuaded and incorrectly created negative public sentiment for using purified recycled water as a viable source of drinking water. Surveys conducted by other water agencies indicate that closer to 75 percent of customers are supportive of purified recycled water once they are educated on the concept.

While staff continues with efforts to engage the community and implement on-going items outlined in the plan, additional focus will be placed on outreach efforts in the TWSD/Ventura County area, including speaking engagements and "tabling" events in and around Oak Park. Staff is also preparing for another special tasting event to be held in Fall 2023. Additionally, a podcast series is being recorded called the "Full Circle Podcast," focusing on the Pure Water Project Las Virgenes-Triunfo. The first few episodes are available to view on-line at www.ourpureh2o.com and will also be available on popular apps including Audible, Spotify and Apple Music.

It has been over two years since the 2020 JPA Community-Wide Survey was conducted, which provided insight on the level of acceptance of purified recycled water from JPA customers before tours were available at the Pure Water Demonstration Facility. Since there has been significant outreach since that time, staff intends to conduct a follow-up survey to see how these efforts have helped garner support for the project. The survey is tentatively scheduled to be conducted towards the end of this calendar year.

GOALS:

Sustain Community Awareness and Support

Prepared by: Joe McDermott, Director of Engineering and External Affairs

ATTACHMENTS:

Attachment A - Public Outreach Plan
Attachment B - Pure Water Outreach Tracking Matrix
Attachment C - CEC Brochure and Fact Sheet

ATTACHMENT A

Pure Water Outreach Plan (updated 5.18.23)

Item	Element	Status	Date Completed/ Target Completion	Notes
1.0 - Data Collection and Research				
1.1	In-Depth Interviews	Completed	Sept. 2016	Katz report dated Sept. 16, 2016
1.1a	2nd round interviews	Pending	Summer/Fall 2021	Katz to facilitate
1.2	Online Secondary Research	Started	On-going	includes participation in WateReuse
1.3	Formalized Survey(s) (Random throughout JPA Service Area)	Progress	Fall 2021	Modifications due to COVID, Preliminary results presented to JPA 3/1/21
1.4	Design and Build Demonstration Facility	Completed	Sept. 2020	Grand Opening Sept. 11, 2020
1.5	Pre and Post Demonstration Facility Tour Surveys	Progress	On-Going	Initiated with Taste the Water / Tour the Garden
2.0 - Informational Materials and Branding				
2.1	Branding (logo and theme line)	Completed	October 2016	updates as needed
2.2	Malibu Creek Watershed Brochure	Completed	Feb. 2016	
2.3	Pure Water Project Brochure	On-Going	on-going	last update fall 2022
2.4	Fact Sheets	On-Going	on-going	CEC fact sheet spring 2023
2.5	Key Message Graphics/Infographics	On-Going	On-Going	Path to Pure Water Graphic
2.6	Frequently Asked Questions (FAQs)	Completed	On-going	updates as needed
2.7	Presentation Template (various modules for various audiences)	Completed (different versions)	Varies	updates as needed
2.8	Quick Facts Card (for use by field personnel and at presentations)	Started	Summer 2023	
2.9	Animated Videos	Completed	Sepember 2021	utilized WateReuse videos
2.10	Material Translated into Spanish	Not Started	TBD	Select Material Only
2.11	Newsletter/E-Newsletter	Started	On-going	incorporated into Current Flow
2.12	Website (www.ourpureh2o.com) - standalone	Completed	Feb. 2019	ourpureh2o.com - updates as needed
2.13	Utility Branding Network Initiative	in progress	On-Going	e-mails to influential people
2.14	Pure Water Lunch Pale	Completed	March 2019	
2.15	Demonstration Project Orientation Video	Completed	November 2019	
2.16	Demonstration Facility Visitor Experience	On-Going	On-going	
2.17	***CEC Fact Sheet***	***Completed***	***Completed***	
3.0 - Stakeholder Engagement				
3.1	Identify Project Liaison	Completed	varies	liaisons are the GM and Board of Directors. Alternates (EEA Director and Public Affairs Manager)
3.2	Key Stakeholder Briefings	Started	On-going	***focus on Ventura County side for 2023***
3.3	One-on-One Meetings	Started	On-going	
3.4	Speakers Bureau / Speaking Events	Started	On-going	***focus on Ventura County side for 2023***
3.5	Events and Forums	Started	On-going	***focus on Ventura County side for 2023***
3.6	Pure Water Beer Brew-Off	Completed	November 2022	
3.7	Pure Water Coffee Brew	Completed	May 2022	
3.8	Pure Water Gelato	Completed	July 2022	
3.9	***Event Tabling with Beer Tasting***	***Planning***	***October 2023***	***potentially Reyes Adobe Days & Pumpkin Festival***
3.10	***Speical Tasting Event at Demonstration Facility***	***Planning***	***November 2023***	***Pizza (crust), sparkling water/soda, etc***
4.0 - Media / Social Media				
4.1	Enhance traditional and social media outreach	Started	On-going	added Instagram, Nextdoor, Pinterest
4.2	Provide media with continuously stimulating and newsworthy content related to water supply diversity and indirect potable reuse	Started	On-going	press-releases after critical JPA decisions
4.3	Cultivate working relationships with local/regional media representatives, bloggers and specialty reporters to facilitate accurate and balanced media coverage	Started	On-going	
4.4	Develop short video presentations featuring indirect potable reuse descriptions and benefits that can be shared with the media and stakeholders	Started	On-going	Pure Water Project Episodes, WateReuse Video
4.5	Engage multicultural publications and media outlets that reach a diverse readership	Started	On-going	
4.6	Increase the presence, audience and level of engagement on social media	Started	On-going	will "boost" high importance items on Facebook, utilize digital media platform
4.7	Rapid Response Program	Not Started	Fall 2021	
4.8	***Full Circle Podcast Series***	***Started***	***Spring 2023***	
5.0 - Partnerships		Started	On-going	
5.1	***City of Thousand Oaks***	***Started***	***TBD***	***Los Robles Well / Excess Sewage***
5.2	***City of Agoura Hills***	***Started***	***TBD***	***Urban Runoff Diversions***
5.3	***Endorsement by Los Angeles County Medical Association***	***Planning***	***Fall/Winter 2023***	***Need to partner with MWD, WateReuse, et al***
6.0 - Tracking and Measurement		Started	On-going	per tracking sheet

ATTACHMENT B

Pure Water Outreach Tracking Matrix (updated 5.18.23)

Type	Liason	Audience	Date	~ # Attendees	Notes
Key Stakeholder Briefings					
		Staff of Congressman Ted Lieu	5/3/2017		Ted Lieu's staff
	Pedersen	Hilton Fdn	6/8/2017	2	Pat Madugno, Kathryn Miller
	McDermott	State Senator	4/11/2018	2	Henry Stern and staff
	Various	Federal lawmakers and staffers, BOR, EPA	4/2019	20+	Annual JPA Washington DC Lobby Trip
	Slosser	CEQA Scoping Meeting	9/23/2021	10	
	Slosser	CEQA/EIR Presentation to City Council City of Agoura Hills	8/24/2022	40	
	Slosser	CEQA EIR Hearing	9/8/2022	20	
	Slosser	CEQA/EIR Presentation to City Council City of Westlake Village	9/14/2022	40	
	Slosser	CEQA/EIR Presentation to City of Thousand Oaks	9/27/2022	100	
	Slosser	CEQA/EIR Presentation to Oak Park MAC	9/29/2022	30	
	Slosser	CEQA/EIR Presentation to Oak Park MAC	10/31/2022	30	
	Various	Asm Jacqui Irwin	2/1/2023	7	Gave her and her state and DC staff pure water tour
	Slosser	Calleguas Municipal Water District / staff and select Board Members	12/15/2021	15	Tour of Demo Facility
	Slosser	City of Thousand Oaks / staff and select citycouncil members	10/20/2021	5	
	Slosser	CEQA Public Draft Availability	8/22/2022	100+	Issued Notice of Preperation, Notice of Availability, provided copies of the draft report at Calabasas, Agoura Hills, Westlake Village, Oak Park, Hidden Hills Libraries an/or city halls, notified over 100 people through email or letter
	Slosser	Division of Drinking Water Staff Tours	3/29/23,	3	Tour of Demo Facility and Tapia
	Wolf	Senator Ben Allen	4/3/2023	3	Gave him and his staff tour
	Wolf	Ventura County Supervisor Jeff Gorell	3/13/2023	8	Meeting at Gorell's Office
Speakers Bureau / Speaking Events					
		Westlake Lake Management Association	3/21/2017	NR	
		Calabasas HOA	3/29/2017	NR	
		Calabasas Chamber of Commerce Government	4/3/2017	NR	
		League of Women Voters	4/11/2017	NR	
		Agoura Hills City Council	4/26/2017	NR	
		Las Virgenes HOA	5/16/2017	NR	
		Calabasas City Council	5/24/2017	NR	
		Sierra Club	5/25/2017	NR	
		County Special District's Association	6/6/2017	NR	
		Greater Conejo Chamber Government Affairs Comm.	6/21/2017	NR	
		Oak Park Municipal Advisory Council	7/25/2017	NR	
		Metropolitan Water District	7/26/2017	1	Carolyn Schaffer
		Lt. Governor's Office	7/26/2017	1	Joey Freeman
		Malibu Sunrise Rotary	9/8/2017	NR	
		Malibou Lake HOA	9/26/2017	NR	
	Pedersen	Kiwanis Club (Thousand Oaks)	5/31/2018	45	
	Pedersen	ACWA Conference	11/28/2018	80	Potable Reuse Panel
	McDermott	Conejo/Las Virgenes Future Foundation	10/24/2019	120	10x10 Speaker Event
	Clark	Cal Cities Environmental Quality Policy Committee	1/26/2023	NR	Virtual PWP Presentation requested by Mayor Pro-tem Buckley-Weber
	McNutt/Wolf	Thousand Oaks Rotary Club	3/25/2023	50	
	Clark	Calabasas Planning Commission Meeting	4/6/2023	NR	Virtual PWP Presentation

NR – Not Recorded

CONTNUED NEXT PG.

Pure Water Outreach Tracking Matrix (updated 5.18.23)

Type	Liason	Audience	Date	~# Attendees	Notes
Events and Forums					
		General Public/Influential Persons	3/26/2017	32	Colorado River Aqueduct Tour
		General Public	5/6/2017	NR	Quarterly Tour (Potable Water)
	McDermott	General Public	2/10/2018	36	Quarterly Tour (Wastewater)
	Pedersen	Water ReUse	3/25/2018	NR	Professional Symposium
	McDermott	General Public/Influential Persons	4/14/2018	30	Colorado River Aqueduct Tour
	McNutt	General Public	5/6/2018	39	Quarterly Tour (Potable Water)
		General Public	11/18/2018	28	Quarterly Tour (Potable Water)
	McDermott	General Public/Influential Persons	10/28/2018	35	State Water MWD Insp. Tour
	McNutt	MWD Education and Public Affairs Staff	9/25/2018	6	
	Levitt	Senior Luncheon for Reyes Adobe Days	10/11/2018	50	Brief mention of Pure Water Project
		Parade Float, T-Shirt Giveaway / Fans	10/13/2018	1000+	Reyes Adobe Days
	McDermott	General Public	8/11/2018	20	Quarterly Wastewater Tour
	McNutt	LVMWD Employees	9/19/2018	100	All Hands Meeting
	McNutt	MWD Public Affairs/Education Group	9/25/2018	6	Pure Water PPT and tour of facilities
	McNutt/McDermott	Other Agencies/Districts persuing Potable Reuse	10/17/2018	100+	WaterReuse Communications Committee - shared Pure Water Project info.
	McNutt	General Public/Influential Persons	4/12/2019	38	Colorado River Aqueduct Tour
	Clark	General Public	8/17/2019	30	Quarterly Tour (Wastewater)
	Clark	General Public/Influential Persons	10/27/2019	34	State Water MWD Insp. Tour
	Clark	Elementary Schools	2019	600+	School Education Program
	McNutt	Conejo/Las Virgenes Future Foundation	2/5/2020	60+	Highschool Program
	Clark	General Public	2/8/2020	29	Quarterly Tour (Wastewater)
	McNutt	Tap-In 2019 Forum	11/7/2020	100	Business/Water Forum in Agoura
	McNutt	Virtual Tour for Association of Water Agencies (AWA)	7/24/2020	35	
	McNutt	Grand Opening/Ribbon Cutting of Demonstration Facility	9/11/2020	50	
	McNutt	Virtual Tour for Central Coast Chapter WateReuse	9/24/2020	30	
	McNutt	Tap-In 2020 (Online Session 1)	11/5/2020	27	Information about Pure Water Project
	McNutt	Tap-In 2020 (Online Session 2)	11/12/2020	33	Virtual Tour
	Baird	E-Notifications for Community Wide Survey	Summer 2020	8,427	57% Open Rate/498 Responses
	Clark	Pure Water Coffee Brew	5/14/2022	145	conducted 3 tours - all attendees went on one
	Clark	Pure Water Gelato	8/13/2022	250	conducted 5 tours - all attendees attended
	Slosser	Presentation at WateReuse California 2022 Annual Conference	9/12/2022		
	Clark	Pure Water Beer Brew	11/10/2022	150	played future of water video and discussed role of water in products like beer
	Slosser	Presentation of Pure Water Project to Cental Coast Chapter of WaterReuse	3/2/2023	NR	
	Clark	Demonstration Plant Tours	count 9.11.20 through 4.4.23	total tours: 126+, person count: 1853	includes general public, consultants, and students (730)

CONTNUED NEXT PG.

Pure Water Outreach Tracking Matrix (updated 5.18.23)

Type	Liason	Audience	Date	~# Attendees		Notes
Newspaper Print Advertisements		***Author/ Paper***				
	McNutt	Agoura Hills Acorn	7/15/2021			
	McNutt	Las Virgenes Enterprise	7/15/2021			
	McNutt	Agoura Hills Acorn	7/22/2021			
	McNutt	Calabasas Chamber Ad	9/10/2022			
	McNutt	California Water	9/15/2021			
	McNutt	Las Virgenes Enterprise	3/10/2022			
	McNutt	Agoura Hills Acorn	3/11/2022			
	McNutt	Agoura Hills Acorn	7/24/2022			
	McNutt	Las Virgenes Enterprise	8/4/2022			
	McNutt	Agoura Hills Acorn	8/5/2022			
	McNutt	Agoura Hills Acorn	8/12/2022			
Digital Media Ads				**#Posts**	**# Reach**	
	Baird		7/1/21-9/30/21	NR	883	
	Baird		10/1/21-12/31/21	NR	697	
	Baird		1/1/22-3/3/22	NR	867	
	Baird		4/1/22-6/30/22	NR	1,689	
	Baird		7/1/22-9/30/22	NR	2,403	
	Baird		10/1/22-12/31/22	NR	1,861	
	Baird		1/1/23-3/31/23	NR	2,918	
		Totals (Digital Media)			11,318	
Social Media Posts				**#Posts**	**#Reach**	
Facebook/Instagran	Baird		7/1/21-9/30/21	11	1,370	
	Baird		10/1/21-12/31/21	3	15	
	Baird		1/1/22-3/3/22	8	731	
	Baird		4/1/22-6/30/22	10	2,598	
	Baird		7/1/22-9/30/22	14	8,472	
	Baird		10/1/22-12/31/22	6	1,157	
	Baird		1/1/23-3/31/23	2	661	
Twitter	Baird		7/1/21-9/30/21	6	2,207	
	Baird		10/1/21-12/31/21	3	549	
	Baird		1/1/22-3/3/22	5	933	
	Baird		4/1/22-6/30/22	4	904	
	Baird		7/1/22-9/30/22	8	1,229	
	Baird		10/1/22-12/31/22	4	478	
	Baird		1/1/23-3/31/23	1	605	
Linkedin	Baird		7/1/21-9/30/21	2	2,038	
	Baird		10/1/21-12/31/21	1	171	
	Baird		1/1/22-3/3/22	2	942	
	Baird		4/1/22-6/30/22	1	474	
	Baird		7/1/22-9/30/22	2	661	
	Baird		10/1/22-12/31/22	4	860	
	Baird		1/1/23-3/31/23	4	1,300	
Youtube	Baird		7/1/21-9/30/21	0	0	
	Baird		10/1/21-12/31/21	1	32	
	Baird		1/1/22-3/3/22	1	30	
	Baird		4/1/22-6/30/22	0	0	
	Baird		7/1/22-9/30/22	0	0	
	Baird		10/1/22-12/31/22	0	0	
	Baird		1/1/23-3/31/23	0	0	
		Totals (Social Media)		103	28,417	

Should I be worried about pharmaceuticals and other CECs in purified recycled water?

The short answer is

NO

Testing at the Pure Water Demonstration Facility has shown that advanced purified recycled water is safe for our customers.

PURE WATER PROJECT
LAS VIRGENES-TRIUNFO
Bringing Our Water Full Circle

Constituents of Emerging Concern and Advanced Water Purification

Constituents of Emerging Concern (CECs) are typically unregulated chemicals that include hormones, pharmaceuticals, and personal care products. The National Research Council (NRC) published a 2012 study that examined the presence of CECs in purified recycled water[1]. A similiar study was conducted by Stanford University in 2022[2]. These and other studies like them consistently confirm the safety of water purified by advanced treatment systems, like the one being proposed by Las Virgenes-Triunfo. When compared to conventional water supplies, including mountain runoff and groundwater, purified recycled water is repeatedly shown to be the highest quality water.

The advanced treatment process proposed by the Las Virgenes - Triunfo Joint Powers Authority (JPA) has undergone extensive testing at the Pure Water Demonstration Facility located at the Las Virgenes Municipal Water District Headquarters in Calabasas, California. This Facility takes water that has been treated at the JPA's Tapia Water Reclamation Facility for non-potable reuse and purifies it through advanced treatment. The results show that advanced treatment completely removed CECs, removed them to levels that could not be detected, or reduced CECs to levels so low that there would be NO health impact. The same treatment process has been used for many years at other locations throughout the world.

1 - https://nap.nationalacademies.org/catalog/13303/water-reuse-potential-for-expanding-the-nations-water-supply-through

2 - https://www.nature.com/articles/s41893-022-00985-7

Parts Per Million
(milligrams per liter)

3 drops added to a 42-gallon rain barrel

Parts Per Billion
(micrograms per liter)

1 drop added to a large tanker truck

Parts Per Trillion
(nanograms per liter)

10 drops added to the Rose Bowl filled with water

Parts Per Quadrillion
(picograms per liter)

2 teaspons added to the Great Salt Lake

Expert research teams and public health professionals have concluded that the concentrations of CECs in purified reycled water, if even detectable, are orders of magnitude lower than a biological response or health impact. For example, acetaminophen (Tylenol) was detected in one sample after advanced treatment at 8.4 nanograms per liter or parts per trillion. To put this into perspective, knowing that one dose of acetaminophen is typically 500 milligrams, a person would need to drink the equivalent of 24 Olympic-size swimming pools all at once to receive one dose – which of course is not possible! The purification process is so complete that minerals need to be added back into the purified water before its use.

A complete list of CECs and test results can be located and reviewed by accessing the QR code below and proceeding to page 181 of the report:

This report can also be accessed at
OurPureH2O.com/PerformanceReports

PFAS

PFAS, a class of compounds commonly referred to as “forever chemicals,” includes two regulated and closely scrutinized chemicals: perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Although PFAS are starting to be regulated, these compounds are still considered an “emerging concern.”

PFOA and PFAS are proposed for drinking water standards. **PFOA and PFAS were NOT detected in advanced treated water.**

PFAS can be found in many consumer products, including non-stick cookware and water-proof clothing and enters our water systems through use and degradation of these products.

Pharmaceuticals and Personal Care Products (PPCP)

The JPA’s advanced treated water was tested for a suite of PPCPs. **Most pharmaceuticals were NOT detected in the advanced treated water**.

Some pharmaceuticals were detected at extremely low levels in the advanced treated water. Their detection at such low levels does not constitute a health and safety concern. For example, Naproxen was detected in one sample at 0.4 parts per trillion, which is 500,000 times less than the concnernation needed to have any impact on the human body.

Pharmaceuticals find their way into the wastewater system through human excretion or from flushing them down the drain.

Hormones

Estrogen is a compound that was tested for in the advanced treated water. Testing for estrogen provides evidence of the ability for advanced treatment to remove a broader group of hormones. **Estrogen was NOT detected in the advanced treated water.**

Hormones also enter our water through human excretion.

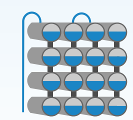
Proven Technology

The Pure Water Project will use a state-of-the-art advanced water purification process to transform recycled water into drinking water. This proven process has been used throughout California, the U.S., and internationally for more than a decade.

STEP 1

MEMBRANE FILTRATION

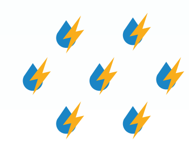
Bundles of membrane filters remove large particles hormones and bacteria.



STEP 2

REVERSE OSMOSIS

High pressure filters remove smaller bacteria & viruses, salts, pharmaceuticals, pesticides, and PFAS from the water.



STEP 3

ADVANCED OXIDATION

UV light and schlorine is used to break down any remaining contaminants and disinfect water.

STEP 4

PURE WATER

The final product is a highly purified water that exceeds federal and state drinking water standards.

AGENDA ITEM NO. 6.F

DATE: June 5, 2023

TO: JPA Board of Directors

FROM: Engineering and External Affairs

SUBJECT: Pure Water Project Las Virgenes-Triunfo: Continued Engagement of Independent Advisory Panel

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SUMMARY:

On May 4, 2018, the JPA convened an Independent Advisory Panel (IAP) of experts to validate the results of hydrodynamic reservoir modeling and to comment on the feasibility of the Pure Water Project Las Virgenes-Triunfo to meet the state's Surface Water Augmentation (SWA) regulations. The IAP summarized its findings, conclusions and recommendations in a June 26, 2018 memorandum that identified future tasks to be completed by the JPA. The National Water Research Institute (NWRI) prepared a proposal, in the amount of $77,704, to reconvene the IAP to further consult on the reservoir modeling, validate the tracer testing protocol and answer technical questions about the Pure Water Project Las Virgenes-Triunfo. Staff recommends accepting NWRI's proposal, so the IAP can be reconvened in support of completing the required reservoir modeling and tracer study.

RECOMMENDATION(S):

Accept the proposal from the National Water Research Institute and authorize the Administering Agent/General Manager to execute a professional services agreement, in the amount of $77,704, for administration and facilitation of an Independent Advisory Panel on the Pure Water Project Las Virgenes-Triunfo.

FISCAL IMPACT:

Yes

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

The cost of the work is $77,074. Sufficient funding is available in the adopted Fiscal Year 2022-23 JPA Budget.

DISCUSSION:

On February 5, 2018, the results of 3-D hydrodynamic modeling of Las Virgenes Reservoir were presented to the JPA Board. The purpose of the modeling was to confirm that the Pure Water Project Las Virgenes-Triunfo would comply with SWA regulations that had recently been issued by the State Water Resources Control Board. Overall, the modeling results were favorable and demonstrated that the Pure Water Project would meet the SWA regulations under most scenarios. However, there were three tracer simulations that resulted in dilution values of less than the minimum of 100:1. In each case, a strong southeast wind pushed the warmer purified water from the discharge point along the surface of the reservoir to the inlet of the Westlake Filtration Plant. Possible solutions to avoid the condition include a submerged and diffused discharge point and/or improved aeration/mixing in the reservoir.

The modeling was performed by Trussell Technologies and included review by an Independent Advisory Panel (IAP) of experts administered by NWRI. The purpose of the IAP was to validate the results of the hydrodynamic model and comment on the feasibility of the project to meet the SWA regulations. The IAP met on May 4, 2018, and was briefed on the project by JPA staff and Trussell Technology representatives.

Following is a summary of the IAP's conclusions:

- The JPA’s Board and executive leadership appear committed to appropriate planning and investment to ensure regional water supply reliability.
- The proposed project effectively addresses the necessary water supply, regulatory and environmental considerations.
- The preliminary model analysis and scenarios are reasonable and provided the panel with valuable insight into the project.
- The proposed project, as presented to the IAP, appears to be capable of complying with the SWA regulations.

However, the IAP had the following recommendations for additional study:

- Perform additional modeling with a submerged diffuser inlet rather than a surface water inlet to predict if the regulatory dilution criterion is met in even the most challenging meteorological conditions.
- Conduct a probabilistic analysis to provide a high confidence level that the required dilution will be achieved consistently.
- Develop a monitoring plan that specifically identifies the constituents that will be monitored in the advanced water treatment plant product water, at Las Virgenes Reservoir and in the product water from the Westlake Filtration Plant.

At this time, staff recommends that the JPA re-engage the IAP to address the outstanding recommendations from the previous meeting, and assist with new questions that are pertinent to the successful delivery of the project.

NWRI’s scope of work consists of engaging an IAP of five experts for the following tasks: one technical orientation (on-line) and one hybrid-format IAP meeting that will include a mix of remote and in-person participation. The IAP will prepare one technical memo to present its consensus findings and recommendations following the IAP Meeting. NWRI will provide the following services:

- Administer and manage the IAP. NWRI recruits and contracts with qualified experts, communicates with the IAP members and reimburses IAP-related expenses in conformance with the contract requirements.

- Facilitate one technical orientation meeting (on-line) and one hybrid-format IAP meeting. NWRI will prepare IAP members for participation in meetings; work with the JPA team members to develop, contextualize, and organize the agenda and meeting materials; and distribute client-created review materials before each IAP meeting.
- Produce one IAP meeting memo following the IAP meeting. NWRI will edit and produce the draft and final reports that include the consensus findings, conclusions and recommendations of the IAP.

NWRI was able to confirm that four of the five original IAP members are available to provide continuity from the previous effort. The IAP would help inform the continued reservoir modeling, tracer testing for the reservoir to validate the model and offer opinions on other technical questions from the Pure Water Project team for the Advanced Water Purification Facility (AWPF), which may include classification of different categories of water being conveyed to and from the AWPF and the potential use of an air gap for brine disposal. These findings will be necessary in the JPA's continued consultation with the Division of Drinking Water (DDW) and other regulators for final acceptance of the AWPF and the Pure Water Project Las Virgenes-Triunfo.

Many agencies pursuing pure water facilities utilize and engage their IAP's through the duration of their program. The IAP can be used as a resource to address confidence in regulatory compliance and address other challenges or uncertainties along the way. It is expected that the IAP will continue to be engaged during the delivery of the Pure Water Project beyond the current contract with future panel meetings to be defined and contracted separately, as needed.

The IAP meeting will include the Pure Water Project team, consultants, state and regional regulators and other stakeholders. Engagement of project stakeholders, especially regulatory staff such as those from DDW and the Los Angeles Regional Water Quality Control Board, is one of the key benefits the IAP provides as it helps engage their input on the project specifics to meet regulations and build their confidence, which assists in guiding the permitting of the future facility. The contract would include coordination with such stakeholders to ensure they are integrated into the process and their concerns are addressed through the IAP.

Staff recommends accepting the proposal from the National Water Research Institute and authorizing the Administering Agent/General Manager to execute a professional services agreement, in the amount of $77,704, for the administration and facilitation of an Independent Expert Advisory Panel to support the Pure Water Project Las Virgenes-Triunfo.

GOALS:

Construct, Manage and Maintain all Facilities and Provide Services to Assure System Reliability and Environmental Compatibility

Prepared by: Oliver Slosser, Engineering Program Manager

ATTACHMENTS:

Proposal by NWRI for Independent Advisory Panel

NATIONAL WATER RESEARCH INSTITUTE
18700 Ward St. • Fountain Valley, CA 92708 • (714) 378-3278

Proposal for Independent Advisory Services

Date:	May 16, 2023
To:	John Zhao, Director of Facilities, Las Virgenes Municipal Water District
From:	Kevin Hardy, Executive Director, NWRI
Subject:	Proposal for Independent Advisory Services in Support of Las Virgenes-Triunfo Pure Water Project

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The National Water Research Institute (NWRI) is pleased to transmit this proposal to administer and facilitate an Independent Advisory Panel (Panel) to support the Las Virgenes Municipal Water District (Client) in the Las Virgenes-Triunfo Pure Water Project.

This proposal outlines the scope of work to engage a Panel of up to five experts (with an option to add a sixth expert) for the following tasks:

- One Technical Orientation (online)
- One hybrid-format Panel Meeting (a mix of remote and in-person participation at Client's headquarters).
- One technical memo report written by the Panel that presents its consensus findings and recommendations following the Panel Meeting.

The estimated cost for the services described in this scope of work is $77,074 for a five-member Panel (Attachment 1).

The National Water Research Institute

Founded in 1991 by water utilities and civic leaders, NWRI is a 501c3 nonprofit that collaborates with water utilities, regulators, and researchers in innovative ways to help develop new, healthy, and sustainable sources of drinking water. We assemble Panels of scientific, technical, and policy experts that provide credible, independent peer review of water projects. Our Panels make recommendations that support water resource management decisions grounded in science and best practices.

Kevin M. Hardy • Executive Director • khardy@nwri-usa.org • www.nwri-usa.org

Our approach is collaborative by design, and we customize our processes and service offerings to meet the needs of our clients and the communities they serve. Our Panels support water resources projects in various stages of development in the United States and around the world.

Proposal Overview

NWRI will provide the following services:

- Administer and manage the Panel. We recruit and contract with qualified experts, maintain communication with the Panel members, and reimburse Panel-related expenses in conformance with the contract requirements.
- Facilitate one technical orientation meeting (online) and one hybrid-format Panel Meeting. We prepare Panel members for participation in meetings, work with client project team members to develop, contextualize, and organize the agenda and meeting material, and distribute client-created review materials to panel members before each Panel meeting.
- Produce one Panel meeting memo report following the Panel Meeting. We edit and produce the draft and final report that include the consensus findings, conclusions, and recommendations of the Panel.

Schedule

We will schedule and plan Panel meetings in collaboration with the project team. Planning a Panel meeting takes about 8 to 12 weeks and completing the Panel's final consensus report also takes about 8 to 12 weeks. Our planning processes are collaborative and communication intensive.

Expert Panel engagements typically span the life of a project. The Panel and project team usually meet annually, depending on the project needs and regulatory requirements. We collaborate with our clients and customize our processes and services to meet the needs of each client and the communities they serve.

Scope of Work

Each task in this scope of work is necessary to plan, facilitate, and report on a Panel meeting. This proposed scope of work and deliverables are intended to:

- Establish the Panel's membership, leadership, and independence.
- Plan meetings that meet the needs of the project team, regulators, and Panel members through each stage of the work.

- Report the Panel's consensus findings and recommendations in draft and final documents. Deliverables may consist of memos, technical memos, or formal reports, depending on the project.

Project Management and Administration

This task includes administering the expert Panel and managing project tasks to conform with the scope of work.

Identify, Engage, and Support Experts. Find, engage, administer, manage, reimburse, and compensate subject matter experts in each required discipline or area of relevant technical expertise.

- Work with the Client Project Team to develop a qualifications profile for prospective independent experts, including disqualifying potential conflicts of interest.
- Contact qualified individuals and develop a list of experts who are willing and available to participate on the Panel.
- Transmit a proposed Panel roster to the Project Team to review for approval and potential conflicts of interest.
- Prepare and transmit a final Panel roster to the Project Team.
- Engage Panel members with a letter that defines the project terms, conditions, expectations, and compensation.
- Notify the Project Team when all Panel members have confirmed their participation.

If a Panel member must leave the Project for personal or professional reasons, we will recruit and contract with another qualified expert to fill that role.

Panel Chair. NWRI will designate one Panel member as Panel Chair. The Chair will be responsible for providing guidance to the Panel and Project to stay in alignment with meeting objectives.

Manage and Administer Project. Conduct all necessary and appropriate project administration and management duties. These duties include communications, records management, billing, scope management, and related logistics to support the Project Team, Client, Panel, and stakeholders.

Meeting Planning and Preparation

We will schedule, plan, and prepare for Panel meetings in compliance with relevant contract requirements and/or milestones.

Panel Meeting Planning. We will work with the Project Team to plan and articulate the full scope of the Panel meeting. This collaborative process includes but is not limited to the following tasks:

- Plan the Panel meeting objectives, agenda, facilitation processes, and key questions for the Panel to support the Project.
- Curate scientific, technical, policy, and related questions that the Project Team would like the Panel to advise on, referred to as the Panel Charge.
- Develop and share relevant Project background information and data that will quickly orient Panel members to the Project before the meeting.
- Identify meeting attendees, including the Project Team, consultants, state and regional regulators, and other stakeholders.
- Discuss and clarify roles and expectations for all Panel meeting participants.

Pre-Meeting Workshop with Project Team and Panel Chair. NWRI will schedule an online one-hour Chair's workshop (estimated six to eight weeks before the Panel meeting) to develop the meeting objectives, including:

- Refining the Panel Charge.
- Discussing the agenda and facilitation processes to support the Panel.
- Ensuring that the pre-meeting review and meeting presentations contain the information the Panel will need as the basis for its findings, conclusions, and recommendations.

Panel Meeting Preparation. NWRI will work with the Project Team to prepare for each Panel meeting. Tasks include:

- Working with the Project Team to develop the meeting agenda.
- Supporting the Project Team and consultants as they define, develop, and prepare presentations on agenda topics. The Project Team will prepare and provide materials for the Panel members to review before and during the meeting.
- Facilitating the Panel meeting and distributing materials provided by the Project Team to support their presentations.
- Collecting background material from the Project Team, its partners, and other stakeholders as appropriate.
- Distributing an official pre-meeting review transmittal to the Panel members by email approximately ten (10) business days before the meeting so the Panel has time to review and consider the materials. **The Project Team should provide all pre-meeting review documents to the NWRI Project Manager at least two weeks before the meeting.**

- Preparing and transmitting a Panel meeting agenda to identified stakeholders and relevant panel meeting attendees.

Communicate Panel Meeting Logistics. NWRI will communicate logistics for each meeting to the Panel. If requested, NWRI can support the Project Team in notifying interested parties about Panel meetings and the availability of Panel meeting reports.

Meeting Facilitation

This task includes facilitating each Panel meeting and preparing and delivering the draft Panel meeting report.

Facilitate Panel Meetings. Panel meetings are planned to be completed in one day. The specific timing and length of panel meetings vary depending on the scope of the meeting as determined collaboratively by the Project Team and NWRI. NWRI will administer, facilitate, and moderate the meetings, including stakeholder participation at the meeting. Responsibilities include:

- **Administer the Panel meeting.** Duties include welcome, introducing NWRI to the participants, explaining the panel process, attendance, taking notes, and Panel support as described including editing, presenting, and transmitting the Panel's draft and final reports.
- **Facilitate the meeting.** NWRI and the Panel Chair will moderate the meeting. Meetings typically include an open session for the Project Team and invited stakeholders, and a private closed working session of the Panel.
- **Support the Panel process.** NWRI and the Panel Chair will keep the meeting on schedule to create a balance of Panel member engagement to exchange ideas and to have time for questions and answers.

As described above, the Project Team is responsible for the content and preparation of all scientific, technical, and policy presentations made at the meeting.

Closed Working Session. At the conclusion of the meeting presentations, the Panel will meet privately to plan and initiate drafting the Panel Meeting Report. During this private session, NWRI staff and Panel members will generally:

- Determine consensus on key findings and recommendations to anchor the Panel Meeting Report.
- Prepare a general outline of the Panel Meeting Report based on the questions presented and the information presented.
- Assign writing tasks for the Panel Meeting Report to Panel members based on their interests and expertise. In authoring their assigned sections, Panel members will consider information and other materials presented at the meeting and relevant

findings from other concurrent efforts. Panel members will apply their expert judgment to develop informed and useful recommendations.

Panel Meeting Report

The draft and final Panel meeting reports reflect the Panel's consensus on the questions presented at the meeting as well as related scientific, technical, and policy issues.

This task provides for the research, writing, editing, and review of the draft and final Panel meeting reports. NWRI panel reports are authored by the Panel under the leadership of the Panel Chair starting during the Panel's private working session at the conclusion of the meeting presentations.

The report is a consensus report of the Panel, meaning that each finding and recommendation will have the support of all Panel members.

NWRI will coordinate the Panel's efforts in drafting, editing, and transmitting the reports to the Project Team for review, and ensuring the final report is clear, accurate, and timely. NWRI and the Panel members will:

- Write and submit assigned sections to the Panel Chair and the NWRI Project Manager, who work collaboratively to compile the draft report.
- Review and edit the draft report. This process is coordinated by the Panel Chair and NWRI. The first work product is the draft Panel Meeting Report.
- Transmit the draft report to the Project Team for their review to identify mistakes of fact, unintended inconsistencies, and errors or omissions in the application of relevant science. To ensure Panel independence and credibility, neither the Panel nor NWRI will negotiate findings and recommendations absent a mistake of fact or mistaken application of fact by the Panel.
- A draft meeting report is typically completed within 8 to 12 weeks of the Panel meeting, but the report production timeframes depend upon the complexity of the meeting subject matter, the quality of the meeting materials prepared by the Client and its consultants, Panel requests for additional data and/or information, expert availability, and report writing and production logistics.
- NWRI will communicate and discuss report delivery expectations with the Project Team as necessary and appropriate.

Additional Services

Additional services not included in this scope of work may be necessary or appropriate. If needed, we can provide additional services by using a change order at the rates and terms set forth in this proposal.

Deliverables

Project Management and Administration. This deliverable provides communication, coordination, and billing through delivery of the final report.

Transmit Panel Roster to Project Team and Stakeholders. NWRI will transmit a draft Panel Roster to the Client for review, and a Final Roster once all experts have signed an engagement letter.

Transmit Meeting Agenda to Project Team and Stakeholders. In collaboration with the Project Team, we will develop and produce a Panel meeting agenda and will distribute the pre-meeting review materials provided by the Project Team. The agenda will define objectives for the meeting; list the scientific, technical, and policy questions for the Panel to address; list the presenters, topics, and time for each topic to be covered; and allocate time to cover all subject matter necessary for the Panel members to reach consensus and give expert recommendations in the Panel report.

Facilitate Panel Meeting. Our Executive Director, Project Manager, or contracted facilitator will lead each meeting to achieve the objectives stated in the agenda in the allocated time.

Produce Draft and Final Panel Meeting Reports. Following the Panel Meeting, the Panel, as directed by the Chair, will author a draft recommendation report. We will edit, produce, and transmit the draft Panel Meeting Report to the Project Team about 8 to 12 weeks after the meeting. We will transmit the final Panel Meeting Report to the Project Team as soon as possible after receiving the Project Team's comments on the draft report.

Proposed Budget

The proposed budget estimate **of $77,074** includes the following Panel meetings:

Panel Technical Orientation will be an online meeting of one to two hours to orient the Panel to the Project history and to develop questions that will be addressed at the full Panel Meeting.

Panel Meeting will be in a hybrid format, with the NWRI Executive Director and some Panel members attending in-person at Client facilities, and NWRI staff and others attending remotely. The meeting will include presentations by the Project Team to support the questions they seek the Panel's feedback on. The Panel will write and deliver a draft report to the Client about 8 to 12 weeks after the meeting.

The budget is an estimate of the time and materials required to deliver each Panel meeting. Within the budgeted amounts for each task, we reserve the discretion to shift funds between tasks so long as the total contract sum is not exceeded.

Contracts longer than 24 months will be subject to staff rate revisal to current NWRI Board-approved rates not to exceed the cost-of-living cumulative increase.

Proposed Payment Terms

Progress Payment No. 1. We will invoice the Client for 25 percent of the project budget when the final Panel roster is transmitted to the Project Team.

Quarterly invoices. We will invoice the Client quarterly through the end of the contract period. If the Client requires monthly billing, then we will update the budget estimate to include 12 additional hours for finance staff.

Considerations for In-Person Meetings

Proposals for in-person meetings include a Travel Allowance line item for reasonable travel expenses including transportation, accommodations, and meals for Panel members and NWRI support staff, along with the additional billable hours needed for Panel and staff to prepare for and attend the meeting.

Although we manage travel costs closely, most travel expenses including airfare and hotel rates are beyond our control. If travel costs are projected to exceed the budgeted amount, we will talk to the Contract Manager about options and prepare a change order for Client approval.

If the Client has a rate cap or a government reimbursement rate clause for hotel accommodations, then we ask that the Client book and pay for the hotel rooms. We do not have access to government rates.

For in-person meetings, the Client will provide the following:

- A computer and screen in the meeting room to serve slide presentations
- Audio/visual equipment that will support both in-person and remote participants
- Meals during the meeting, usually a light breakfast and lunch
- Drinking water, preferably in reusable/refillable cups instead of single-use containers

NWRI's Commitment to Sustainability. NWRI is committed to incorporating sustainability into our business practices as part of our responsibility to the communities we serve and the environment. As part of this commitment, NWRI kindly encourages clients to provide plant-based meals and refreshments, which use up to 50 percent less water than meals containing animal products, and set-up drinking water stations that refrain from using single-use cups/containers like plastic water bottles, which create about 2.5 million tons of CO_2 emissions each year.

Contact

If you have questions or would like to discuss this proposal further, please contact Suzanne Sharkey, Project Manager, at ssharkey@nwri-usa.org or (949) 258-2093.

About NWRI

NWRI is organized as both a Joint Powers Agency (JPA) pursuant to the California Government Code and a 501c3 nonprofit corporation pursuant to the Internal Revenue Code. Based in Fountain Valley, California, NWRI's JPA members include:

- Inland Empire Utilities Agency
- Irvine Ranch Water District
- Los Angeles Department of Water and Power
- Metropolitan Water District of Southern California
- Orange County Sanitation District
- Orange County Water District

NWRI Project Staff

The titles, project duties, and qualifications of NWRI staff who may work on this project are listed on our website at https://www.nwri-usa.org/staff.

Current or Related Projects

Recent or ongoing projects include:

- Statewide DPR Guidance for Stakeholders and/or Regulators in Colorado, Arizona, New Mexico, and Texas
- California State Water Resources Control Board, Division of Drinking Water on:
    - DPR Public Health Determination for Preliminary Statewide Regulations
    - DPR Statewide Source Control Regulatory Guidance
    - DPR Feasibility of Uniform Statewide Criteria
    - Uniform Statewide On-Site Nonpotable Water Regulations
    - Livestock Hydration Regulatory Guidance
    - California State Water Board Division of Water Quality to Optimize Evaluation of Bioanalytical Tools for Recycled Water Policy
- Orange County Water District (CA) Integrated Groundwater Replenishment System and Santa Ana River Public Health Monitoring projects
- Los Angeles Department of Water and Power (CA) Operation NEXT and Groundwater Replenishment Projects

- City of San Diego (CA) Pure Water San Diego
- Metropolitan Water District of Southern California (CA) Pure Water Southern California Program, Advanced Purification Center Demonstration Project
  - Los Angeles Bureau of Sanitation (CA) Hyperion Membrane Bioreactor Pilot Project
  - Hampton Roads Sanitation District (VA) Sustainable Water Initiative for Tomorrow
  - City of Boise (ID) Water Renewal Utility Plan
  - LOTT Clean Water Alliance (WA) Recycled Water Infiltration Study
  - East County (CA) Advanced Water Purification Project
  - Valley Water District (CA) Regional Potable Reuse Program (San Jose)
  - Anne Arundel County (MD) OurwAAter Managed Aquifer Recharge Program
  - Soquel Creek Water District (CA) Pure Water Soquel Groundwater Replenishment Project
  - One Water Monterey (CA) Pure Water Monterey Groundwater Replenishment Project
  - Palmdale Water District (CA) Regional Water Augmentation Program

Attachment 1: Proposed Panel Meeting Budget

NATIONAL WATER RESEARCH INSTITUTE

Proposed Budget for One Orientation Call and One Hybrid Meeting of the NWRI Panel for Las Virgenes Municipal Water District

	Proposed Budget for This Contract			
Expert Panel Member Honoraria at $1,000 per day/$125.00 per hour	**Panelists**	**Hours**	**Total Hours**	**Cost**
Technical Orientation Call (1.5 hour, Remote): Preparation, Participation, Follow-Up	5	8	40	$5,000
Workshop One (Hybrid): Preparation, Participation, Report Writing and Editing	5	32	160	$20,000
Panel Chair Additional Effort for Planning Calls, Managing Expert Assignments, etc.	1	24	24	$3,000
Subtotal - Panel Honorarium				$28,000
Nonprofit Institution Support Contribution (Thank you for your support!)				$5,000
Direct NWRI Staff Costs for Setup, Administration, Planning, Facilitation, Reporting	**Hourly Rates**		**Hours**	**Cost**
Executive Director	$264.00		40	$10,560
Project Manager	$173.00		88	$15,224
Communications Manager	$159.00		30	$4,770
Administrative, Finance, and Events Staff	$142.00		60	$8,520
Subtotal - Direct NWRI Staff Costs				$39,074
Travel Allowance				$5,000
Total Cost				**$77,074**