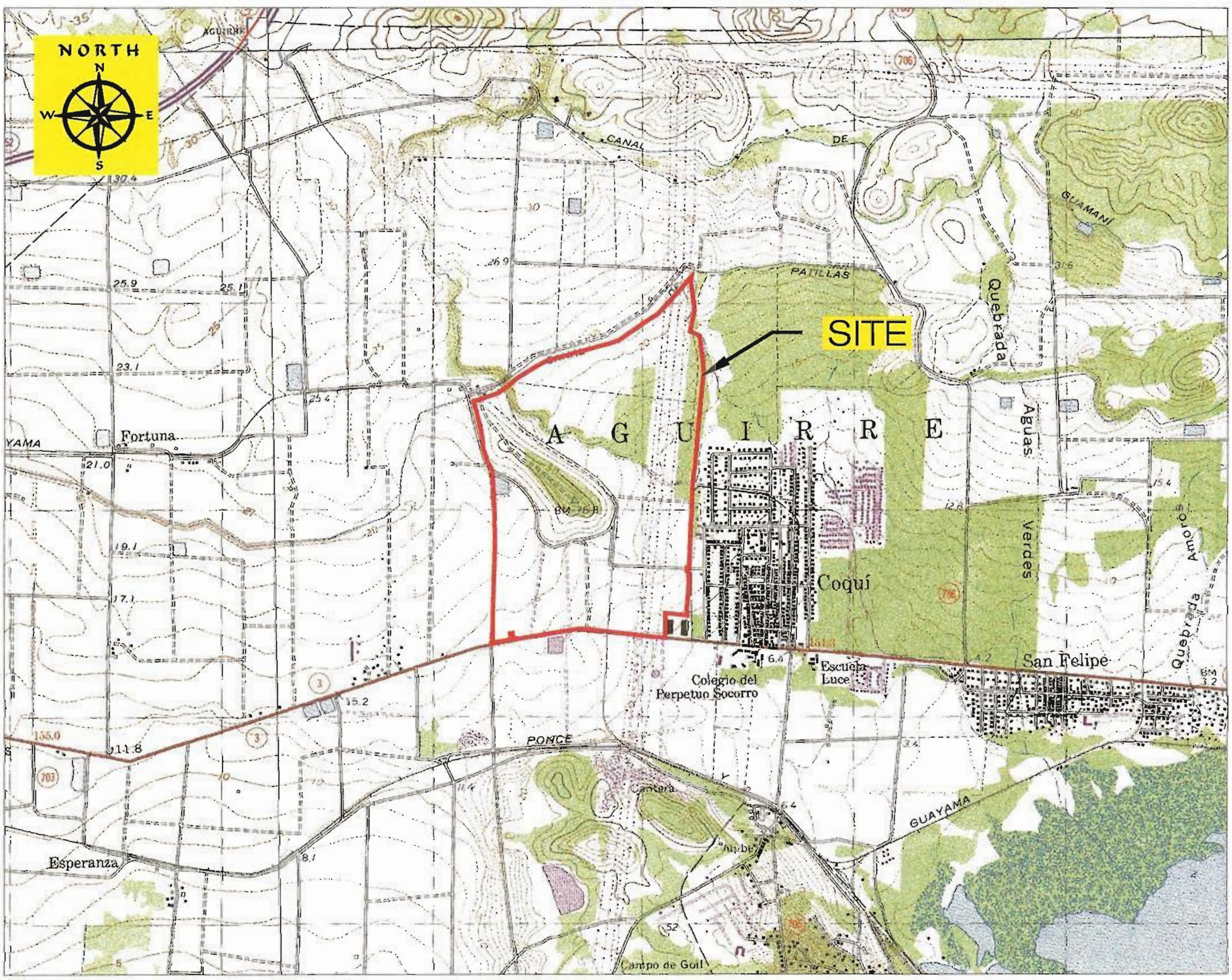
HYDROLOGIC-HYDRAULIC STUDY
SALINAS DEVELOPMENT
SALINAS, PR



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1. INTRODUCTION

1.1 Project Description and Location

Salinas Development is a residential project proposed on a site located at Km 152.7 of State Road PR-3 in Aguirre Ward, municipality of Salinas. **Figure 1** shows the project location on a partial reproduction of the USGS Central Aguirre topographic quadrangle. **Figure 2** illustrates the proposed project layout.

1.2 Scope and Purpose of Report

This report summarizes the results of the Hydrologic/Hydraulic (H/H) analysis for the proposed development site. The study evaluates the need for the sizing of stormwater detention structures, in accordance with Puerto Rico Planning Board Regulation #3. It also determines the 100-yr water level for an unnamed creek which crosses the site from northwest to southeast and provides an encroachment analysis for the stream. A bridge crossing over the unnamed creek is also designed in compliance with Puerto Rico Planning Board Regulation No. 13.

1.3 Report Limitations and Warnings

It shall be the responsibility of the site engineer or the project's geotechnical consultant to adapt the hydraulic design recommendations included in this report, to the soil and other conditions at the site on any matters concerning slope stability, conflicts with other infrastructure, etc.

The Department of Natural and Environmental Resources requires a minimum maintenance easement of 5 meters on either side of natural or artificial stream channels. In large projects you should anticipate that a larger easement may be required. This easement must be deeded to the Department. It shall be the responsibility of the Owner and the Site Engineer to coordinate easement requirements with the Department and incorporate this easement into the design.

1.4 Parties Involved

Project Name:	Salinas Development
Owner:	Mr. Guillermo López -Vives Construction
Civil Engineer:	Integra Design Group
H-H Consultant:	Osvaldo Rivera & Associates

1.5 Authorization

Preparation of this report was authorized by means of written contract with Eng. Carlos Báez in representation of Vives Construction.

2. STUDY AREA DESCRIPTION

2.1 Topography and Water Bodies

The topography of the project area presents elevations ranging from 21 meters to 10 meters. Two sections of the project site drain to an unnamed creek which crosses the project site from northwest to southeast. The other section of the site drains to the southeast crossing state road PR-3 and traveling superficially downstream until reaching eventually the unnamed creek. **Figure 3** presents the project site topography.

2.2 Prior Studies and Floodplain Mapping

Neither FEMA nor the Puerto Rico Planning Board has performed a study of the area before. **Figure 4** illustrates a partial reproduction of the FEMA Flood Insurance Rate Map showing the project site location.

2.3 Field Observations

The field visit to the project area was made on November 2003 and it revealed the following:

- The drainage pattern at the project site varies. Two sections of the site drain towards the unnamed creek which crosses the project site from northwest to southeast. Another section of the site drains to the southeast crossing road PR-3 and eventually reaching the unnamed creek (see **Figure 3**).

- Downstream the project site, the unnamed creek crosses community El Coquí. Five bridge crossings exist along this residential area. Another bridge crossing over the unnamed creek exists upstream the project site.

2.4 Field Data

A topographic survey of the site, referenced to mean sea level was provided by the project owner. Integra Design Group prepared the topographic plans for the project site and the cross sections for the stream. A copy of the certified topographic survey is included in the back pocket of this report, and is also reproduced as **Figure 3**. All elevations in this report are referenced to mean sea level vertical datum unless otherwise specified.

3. STUDY APPROACH

The project owner needs to know the water levels and flood limits of the unnamed creek, and to determine whether the proposed construction will represent excessive encroachment of the stream floodplain. A detention analysis is also required by P.R. Planning Board Regulation #3.

A hydraulic modeling was performed, for the encroachment analysis of the unnamed creek, using the one-dimensional steady-flow HEC-RAS model (U.S. Army Corps of Engineers, 2001). This model was considered appropriate given the one-dimensional flow condition in the study reach, the lack of significant storage effects in the area that will be flooded, and the availability of routines to simulate encroachment in the river. Sixty-three (63) surveyed stream cross-sections at the unnamed creek were used to define the model geometry. These sections were taken on- and offsite. Encroachment limits within the site were tested to insure that the water surface elevations would not increase by more than 0.15m.

The HEC-RAS model was also used to design a bridge crossing over the unnamed creek within the proposed project. Cross sections were used to insure that water surface levels do not increase by more than 0.15 meters due to the construction of the proposed bridge, in compliance with Planning Board Regulation #13.

A stormwater detention analysis was performed using the one-dimensional unsteady-flow adICPR model (Streamline Technologies, 2000). This model was selected due to its ability to simulate stormwater detention structures. The proposed development will produce an increase in site runoff as compared to the existing undeveloped condition. Three detention ponds are proposed to mitigate this increase.

4. HYDROLOGIC ANALYSIS

4.1 Methodology

Hydrologic modeling for the existing condition of the project site and the unnamed creek watershed was performed using the Soil Conservation Service Unit Hydrograph method, incorporated in the adICPR model version 2.02. Parameters used in this method include basin area, curve number and time of concentration.

For the proposed condition of the project site, the hydrologic modeling was performed using the Santa Barbara Unit Hydrograph for developed areas. This method uses hydrologic parameters that include Curve Number and time of concentration

4.2 Watershed Delimitation

In the existing condition model of the detention analysis, the project site was modeled as three basins according to the existing drainage pattern in the area. **Figure 5** presents watershed limits for the project site. As illustrated, basins Site 1E and Site 2E drain towards the unnamed creek. Basin Site 3E drains to the southeast.

In the proposed condition model, the project site basin division used in the pre-development condition was maintained as illustrates **Figure 5**. Three detention structures are proposed in order to mitigate the increase in runoff caused by the proposed project. Runoff from basins Site 1P and Site 2P will discharge to two proposed detention structures which will discharge to the unnamed creek. The third detention pond, which will collect runoff from basin Site 3P, will discharge to the south which is the natural point of discharge of basin Site 3E.

For the analysis of the unnamed creek, the tributary watershed was determined from the USGS Central Aguirre and Cayey topographic quadrangles. The watershed was divided in two sections, upstream and downstream the site as illustrated in **Figure 6**. Basins Site 1E and Site 2E are included in these watersheds. In the proposed condition, the area of the project site is subtracted from the creek's area. This small variance in area does not cause changes in other hydrologic parameters.

Table 1 presents watershed areas for the project site and the unnamed creek.

Table 1: Watershed Areas (acres)

Basin	Area
Site 1E	117.06
Site 2E	77.09
Site 3E	136.6
Unnamed Creek 1	2,595
Unnamed Creek 2	1,238
Proposed	
Site 1P	117.06
Site 2P	77.09
Site 3P	136.6
Unnamed Creek 1	2,500
Unnamed Creek 2	1,139

4.3 Soils and Curve Number

The curve number represents the runoff potential within the watershed and is estimated based on soil type (hydrologic soil group), land use, and antecedent moisture condition II. Soil types within the watershed areas were obtained using the Soil Survey of Humacao Area, Puerto Rico (**Figure 7**), published by the Natural Resources Conservation Service (Boccheciamp, 1977). Table 2 presents the corresponding hydrologic soil group for each identified soil within the site and the stream watersheds. Curve Numbers for the basins for existing and proposed conditions are presented in Table 3 and Table 4, respectively.

Table 2: Hydrologic Soil Groups

Soil	HSG
An	A
Vs	B
ClB	C
Po	D
Rs	D
FrB	D
PlB	D

Table 3: Curve Number for Existing Condition of Watersheds

Basin	HSG	Cover Type	$\overline{CN}$
Site 1E	B	Pasture (5.75acres, CN=69)	**83**
	D	Pasture (111.31acres, CN=84)	
Site 2E	B	Pasture (45.58acres, CN=69)	**75**
	D	Pasture (31.51acres, CN=84)	
Site 3E	B	Pasture (92.0acres, CN=69)	**75**
	D	Pasture (44.6acres, CN=84)	
Unnam. Creek 1	A	Pasture (15.87 acres, CN=49)	**81**
	B	Pasture (266.98 acres, CN=69)	
	C	Pasture (544.6acres; CN=79)	
	D	Pasture (1767 acres, CN=84)	
Unnam. Creek 2	B	Pasture (270.7acres, CN=69)	**81**
	C	Pasture (23.36acres, CN=79)	
	D	Pasture (943.9acres, CN=84)	

Table 4: Curve Number for Proposed Condition

Basin	HSG	Cover Type	$\overline{CN}$
Site 1P	B	Developed (5.75 acres, CN=90)	
	D	Developed (63.25 acres, CN=92)	**90**
	D	Undeveloped(48.1acres, CN	
Site 2P	B	Developed (29.86 acres, CN=85)	
	D	Developed (20.04 acres, CN=92)	**88**
	B	Undeveloped (15.72 acres, CN=69)	
	D	Undeveloped(11.47acres, CN=84)	
Site 3P	B	Developed (82.17 acres, CN=85)	
	D	Developed (36.23 acres, CN=92)	**87**
	B	Undeveloped (9.83 acres, CN=69)	
	D	Undeveloped(8.37acres, CN=84)	

4.4 Time of Concentration

Time of concentration was computed using the Soil Conservation Service method (TR-55).

Time of concentration was estimated with the following equation:

$$t_c = L/(3600 * V)$$

where,

t_c = time of concentration (hr)

L = flow length (ft)

V = average flow velocity (ft/s) from figure 3 of TR-55, and

3600 = conversion factor from seconds to hours.

Table 5 presents time of concentration computed for existing and proposed conditions.

Table 5: Time of Concentration (minutes) for Existing and Proposed Conditions

Basin	Tc
Existing	
Site 1E	37
Site 2E	40
Site 3E	20
Unnamed Creek 1	130
Unnamed Creek 2	110
Proposed	
Site 1P	25
Site 2P	30
Site 3P	15

4.4 Rainfall

The 24-hour precipitation depths for return periods of 2- and 100-years were obtained from Technical Paper #42 (U.S. Department of Commerce, 1961). Values of 4.6" and 11.5" were obtained for 2- and 100-yr return periods respectively.

4.5 Results of Hydrologic Analysis

Table 6 summarizes peak discharges for existing and proposed conditions. These results were obtained using the adICPR model for 2- and 100-yr return periods. Input and output files for hydrologic modeling of project site and the streams watersheds are included in Appendix A and B, respectively.

Table 6: Peak Discharges (cfs) for Watersheds

Basin	2-yr	100yr
	Existing	
Site 1E	243.9	783.2
Site 2E	113.1	444.2
Site 3E	293.8	1158.0
Unnam. Creek 1	2,044.9	7,004
Unnam. Creek 2	1,098.5	3,775
	Proposed	
Site 1P	278.4	808.0
Site 2P	141.2	457.1
Site 3P	405.0	1209.6
Unnam. Creek 1	1,971	6,752
Unnam. Creek 2	1,011	3,474

4.6 Verification of Peak Discharge

Peak discharges determined by the ICPR model, were checked for reasonableness using the Rational Method for the project site and the USGS Regional Regression Equations developed by López et.al. (1979) for the unnamed creek watersheds.

The Rational Method equation has the following form:

$$Q_{100} = CI_{100}A$$

where;

Q_{100}	=100- year peak discharge (cfs)
C	= runoff coefficient.
I_{100}	= Mean precipitation, (in./hr.)
A	= watershed area, (acres)

The López equation has the following form:

$$Q_{100} = 286*A^{0.832}*P^{0.531}$$

where;

Q_{100}	= 100- year peak discharge (cfs)
A	= watershed area (mi^2)
P	= Mean annual precipitation (in./yr.)

Table 7 and Table 8 summarize the parameters used in the verification methods for the watersheds and compares results with those obtained with the adICPR model.

Table 7: Rational Method Parameters for 100-yr event of Project Site

Basin	C	I (in/hr)	Area (acres)	Rational Method (cfs)	adICPR (cfs)
			Existing		
Site 1E	0.75	6.7	117.06	588.2	783.2
Site 2E	0.75	6.4	77.09	370.0	444.2
Site 3E	0.75	9.4	136.25	960.6	1158.0
			Proposed		
Site 1P	0.7	8.4	117.06	688.3	808.0
Site 2P	0.7	7.4	77.09	399.3	457.1
Site 3P	0.7	11	136.25	1049.1	1209.6

Table 8: Regression Equation Parameters for 100-yr Event of Unnamed Creek

Basin	A (mi2)	P (in)	Regression Equation (cfs)	adICPR (cfs)
Unnamed Creek 1	4.05	48	7,153	7,004
Unnamed Creek 2	1.94	48	3,878	3,775

Since the hydrologic results from the verification methods are similar, the adICPR hydrologic modeling results are accepted as reasonable.

5. HYDRAULIC ANALYSIS

5.1 Models Prepared

Encroachment Analysis

A HEC-RAS model was constructed to define the encroachment limits and flood levels in the unnamed creek.

Exiting Condition Model: This model was constructed with the cross-sections surveyed at the site. The model defines the existing 100-yr water surface profile along the unnamed creek. Six existing bridge crossings are included in this model.

Encroachment analysis: The existing condition model and the 100-yr discharge were used to perform the encroachment analysis. The analysis was made using as maximum increase +0.15m. The method of equal conveyance (#4) was used for this analysis.

A bridge crossing is proposed over the unnamed creek within the site. Cross sections were used to insure water surface levels do not increase by more than 0.15m due to the construction of the proposed bridge.

Detention Analysis

Two adICPR models were constructed to evaluate the effect of the proposed development:

Pre-development Condition: This model represents the existing condition at the project site. Peak discharges are determined for the identified basins.

Proposed Condition Model: The existing condition model was modified to incorporate the proposed land use change and detention structures as illustrated in the link-node diagram of

Figure 8. Three detention structures are proposed. Two of them will discharge to the unnamed creek and the third one will discharge to the south, which is the pre-development point of discharge.

5.2 Hydraulic Characteristics of the Unnamed Creek

Cross Sections

The location of the cross sections was selected based on field inspection, existing layout of hydraulic structures and proposed project layout. Sixty-three (63) surveyed cross sections at the unnamed creek were used in the analysis. **Figure 9a** shows cross sections location within the project site while **Figure 9b** presents the ones taken at Community El Coquí.

Roughness Coefficients

Values of Manning's hydraulic roughness coefficient (n-values) were based on field inspection and with reference to Chow (1959) and Barnes (1967). The following n-values were used at the unnamed creek; channel n = 0.04 and overbanks n = 0.06.

The contraction and expansion coefficients for the natural channel sections are 0.1 and 0.3 respectively, and for the bridges entrances and exits are 0.3 and 0.5, respectively.

Starting Water Surface Elevation

The starting water surface elevation at the downstream end of the HEC-RAS model was determined using the slope area method with a slope of 0.005 m/m.

6. RESULTS

6.1 Encroachment Analysis

Table 9 and Table 10 summarize water surface elevations and velocities, respectively for the existing and encroached conditions along the unnamed creek. The encroachment analysis was performed from cross section XS 12.5 to XS 0.3 since the rest of the sections lie outside the proposed project. Downstream the project site (El Coquí Community) results are presented for every other cross section and upstream the crossings. Complete simulation results are presented in Appendix C.

Table 9: Existing and Proposed Condition Water Surface Elevations (m) for 100-yr discharge of Unnamed Creek

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
18	22.90	22.88	-0.02
17	22.51	22.48	-0.03
16	22.19	22.18	-0.01
15	22.16	22.15	-0.01
	Bridge		
14.5	21.57	21.59	0.02
14	21.54	21.57	0.03
13	21.23	21.49	0.26
12.5	20.92	21.23	0.31
12	20.95	20.95	0
11	20.92	21.01	0.09
10	19.44	19.64	0.20
9	19.74	19.85	0.11
8.5	19.45	19.14	-0.31
	Proposed Bridge		
8	18.54	18.86	0.32
7	18.25	18.01	-0.24
6	16.43	17.31	0.88

Table 9: Existing and Proposed Condition Water Surface Elevations (m) for 100-yr discharge of Unnamed Creek (Cont.)

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
5	16.10	16.07	-0.03
4	15.62	16.08	0.46
3	15.22	15.93	0.71
2	14.58	14.54	-0.04
1	14.18	14.43	0.25
0.3	13.88	14.05	0.17
0.1	13.51	13.36	-0.15
0.08	13.46	13.26	-0.2
	Bridge		
0.06	13.45	13.24	-0.21
0.058	12.79	12.81	0.02
	Bridge		
0.057	12.54	12.54	0
0.055	11.73	11.76	0.03
0.535	11.40	11.41	0.01
	Bridge		
0.053	10.93	10.95	0.02
0.051	10.82	10.84	0.02
0.049	10.47	10.5	0.03

Table 9: Existing and Proposed Condition Water Surface Elevations (m) for 100-yr discharge of Unnamed Creek (Cont.)

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
		Bridge	
0.048	10.44	10.48	0.04
0.046	10.16	10.2	0.04
0.044	9.71	9.74	0.03
0.042	8.92	8.94	0.02
0.041	8.87	8.88	0.01
		Bridge	
0.040	8.82	8.83	0.01
0.038	8.38	8.38	0
0.036	6.49	6.52	0.03
0.034	6.52	6.55	0.03
0.032	6.39	6.41	0.02
0.03	5.49	5.49	0
0.028	5.29	5.31	0.02
0.026	5.06	5.09	0.03
0.024	4.76	4.75	-0.01

Table 10: Existing and Proposed Condition Water Surface Velocities (m/s) for 100-yr discharge of Unnamed Creek

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
18	1.95	1.91	-0.04
17	3.04	3.04	0
16	2.0	1.95	-0.05
15	1.91	1.87	-0.04
Bridge			
14.5	2.5	2.35	-0.15
14	2.22	2.08	-0.14
13	3.3	2.35	-0.95
12.5	2.67	2.31	-0.36
12	1.91	2.81	0.9
11	1.84	2.18	0.34
10	4.84	4.47	-0.37
9	1.21	1.25	0.04
8.5	2.54	3.51	0.97
Proposed Bridge			
8	4.45	3.74	-0.71
7	3.41	4.13	0.72
6	4.96	2.61	-2.35

Table 10: Existing and Proposed Condition Water Surface Velocities (m/s) for 100-yr discharge of Unnamed Creek (Cont.)

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
5	3.01	3.57	0.56
4	2.04	1.98	-0.06
3	2.94	2.28	-0.66
2	3.34	4.61	1.27
1	2.6	2.77	0.17
0.3	3.03	3.38	0.35
0.1	1.4	1.77	0.37
0.08	1.15	1.46	0.31
	Bridge		
0.06	1.2	1.58	0.38
0.058	1.96	1.99	0.03
	Bridge		
0.057	3.41	3.53	0.12
0.055	2.03	2.07	0.04
0.535	3.29	3.34	0.05
	Bridge		
0.053	3.25	3.27	0.02
0.051	2.2	2.24	0.04
0.049	1.95	1.95	0

Table 10: Existing and Proposed Condition Water Surface Velocities (m/s) for 100-yr discharge of Unnamed Creek (Cont.)

Section	Existing Condition	Proposed Condition (Encroachment)	Difference
		Bridge	
0.048	1.66	1.67	0.01
0.046	1.25	1.27	0.02
0.044	3.53	3.59	0.06
0.042	3.06	3.17	0.11
0.041	2.29	2.37	0.08
		Bridge	
0.040	1.41	1.47	0.06
0.038	2.02	2.12	0.1
0.036	3.44	3.46	0.02
0.034	1.22	1.25	0.03
0.032	1.59	1.62	0.03
0.03	2.82	2.96	0.14
0.028	1.83	1.86	0.03
0.026	2.01	2.02	0.01
0.024	2.92	3.1	0.18

As can be seen in the results, the encroachment analysis complies with Puerto Rico Planning Board Regulation # 13, because it does not increase water levels outside property limits over 0.15 m in comparison with the existing water levels. Community El Coqui will not be affected by the proposed project.

Figure 10 illustrates the water surface profile of the unnamed creek for existing and encroached conditions. **Figure 11** presents the encroachment limits of the stream.

The water level within the project increases over 0.15m in comparison with the existing water level, occurring this where both sides of the unnamed creek are within the project site without affecting the neighbors.

According to the hydraulic analysis, the existing bridges within the unnamed creek will be flooded during a 100-yr event. In the proposed condition (encroached) the analysis also considered the structures, to comply with P.R. Planning Board Regulation # 13.

6.2 Bridge Crossing

The proposed condition presents a bridge crossing over the unnamed creek. As presented in Table 9, water surface levels were compared with the existing ones to insure that they do not increase by more than 0.15 meters, complying in that way with Planning Board Regulation No.13. As illustrated in **Figure 12**, the bridge will be located between cross sections XS 8.5 and XS 8. This bridge was included in the encroachment analysis of the unnamed creek. The water levels presented in this report for encroached conditions represent the future condition of the area that includes the bridge and the encroachment. Table 11 presents the design parameters for the proposed structure which schematic design is presented in **Figure 13**.

Table 11: Design Parameters for Proposed Bridge over Unnamed Creek

Parameter	Value
High Chord Elevation	21.2 m
Low Chord Elevation	20.2 m
Bounding Cross Sections	XS 8.5 and XS 8
100-yr Water Level at XS 8.5	19.14 m
No. of Spans	1
Width	30.6 m

6.3 Detention Analysis

The detention analysis was performed by preparing an existing condition model and a proposed condition model. Three detention structures are proposed as part of the development. Two of the detention structures will discharge directly to the unnamed creek and the third one will discharge to the south through outlet pipes that will cross road PR-3 following the existing drainage pattern in the area.

The detention ponds will reduce the post-development peak discharge to not more than the existing condition discharge. Table 12 presents the design parameters determined for the structures. **Figure 14** through **Figure 16** presents the schematic design of the detention ponds; their location is presented in **Figure 17**.

Table 12: Design Parameters for Detention Ponds

Parameter	Pond 1	Pond 2	Pond 3
Tributary Basin	Site 1P	Site 2P	Site 3P
Pond invert elevation (m)	15.5	14.5	9.0
Minimum Top Area (m^2)	4,200	4,500	70,000
Minimum Bottom Area (m^2)	3,004	3,258	46,905
Depth (m)	2.5	2.5	2.0
100-yr water level within pond (m)	17.63	16.66	10.65
Pond bottom slope (m/m)	0	0	0
Lateral Slope (H:V)	2:1	2:1	12:1
Outlet Structure	Rectangular Weir	Rectangular Weir	Four-Barrel Box Culvert
Outlet Structure Size	4.5mW x 2.13mH	2.2mW x 2.16mH	4-1.22mW x 0.61mH
Free Board	0.37	0.34	0.35

Detention Pond 3 also incorporates an emergency spillway to handle overflow in a controlled manner in case the outlet becomes clogged for any reason, or for an event larger than 100-year return interval. The invert of the emergency spillway was set at the 100-yr water level in the detention pond (see Appendix B); a freeboard around the pond was set to allow the 100-year flow to discharge across the spillway, without overtopping any other part of the structure, with the normal outlet completely closed.

Figure 18 presents the minimum finished floor elevations for the project site, which are recommended to be 1m higher than the 100yr water surface elevation at the unnamed creek or at the detention pond, whichever is higher in each area.

Table 13 presents the pre- and post- development peak discharges showing the effect of the detention ponds for the 100-yr and 2-yr events. The input and output for the two models are presented in Appendixes A and B.

Table 13: Peak Discharge (cfs) for Existing and Proposed Conditions

Structure	Existing Condition		Proposed Condition	
	2yr	100yr	2yr	100yr
Pond 1	243.9	783.2	237.3	720.0
Pond 2	113.1	444.2	102.1	359.7
Pond3	293.8	1158.0	123.3	240.9

The proposed detention structures reduced the project peak discharge below the existing peak discharge.

Although the proposed ponds were designed to control the 2-yr and 100-yr events, the structures' hydraulic behavior was verified for all 24-hr recurrences. As expected, since the 2-yr and 100-yr events are extreme ones, the proposed structure can control all other recurrences, complying in that way with Planning Board Regulation # 3. Appendix D presents results for simulations of all recurrences and durations.

7. CONCLUSIONS AND RECOMMENDATIONS

1. Existing and proposed (without detention) 100-yr peak discharges for the onsite basins resulted in the following:

Basin	100-yr (cfs)
Existing	
Site 1E	783.2
Site 2E	444.2
Site 3E	1158.0
Proposed	
Site 1P	808.0
Site 2P	457.1
Site 3P	1209.6

2. The encroachment limits for the unnamed creek do not increase the water surface elevation by more than 0.15m at any point outside property limits, in compliance with Planning Board Regulation # 3.
3. A bridge crossing is proposed for the unnamed creek. The location of this structure is presented in **Figure 17** and its design parameters are presented in Table 11.
4. The proposed(with detention) peak discharges for the project site resulted in the following:

Pond	100-yr (cfs)
Pond 1	720.0
Pond 2	359.7
Pond 3	240.9

5. The proposed detention ponds reduce the proposed project peak discharges below the existing ones. The system complies with Planning Board Regulation # 3.
6. The minimum finished floor elevation for the proposed structure should be set at least 1 meter higher than the 100-yr water level within the ponds or the unnamed creek. Minimum finished floor elevations are presented in **Figure 18.**
7. The site engineer shall design storm water systems for the proposed project site to discharge into the detention structures. The site grading must provide overland flow paths to direct stormwater to the detention ponds.
8. The engineer should specifically state in the plans that no fill or rubbish of any kind should be deposited in or adjacent to the stream (beyond the encroachment limits), and that compliance with this requirement should be ascertain by periodic inspections.

8. REFERENCES

Boccheciamp, Rafael A. 1978. "Soil Survey of Humacao Area." U.S. Soil Conservation Service. San Juan.

Streamline Technology Inc. 2000. "ICPR- Stormwater Management "

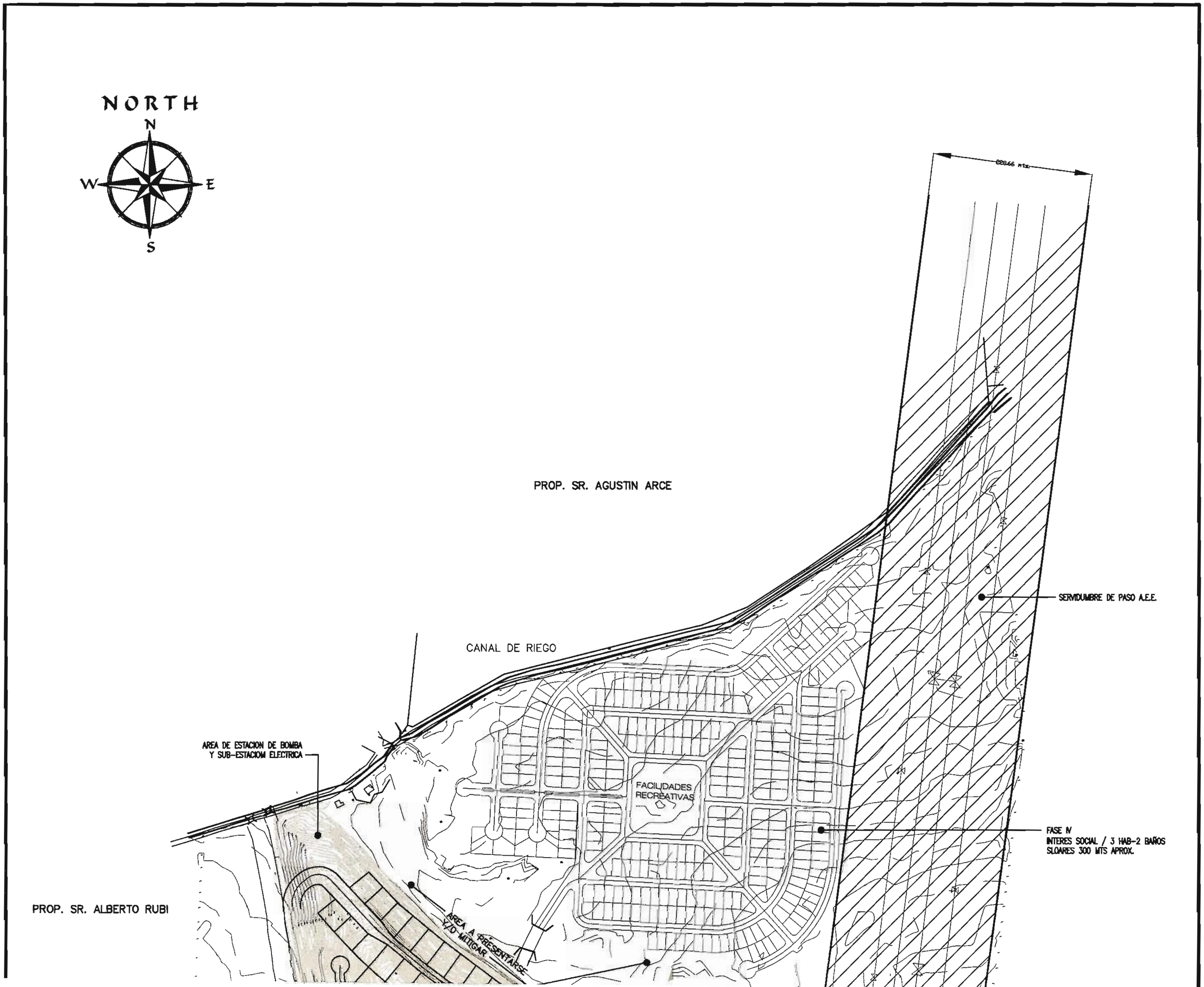
Technical Paper #42 U.S. Department of Commerce, Washington D.C. 1961.

U.S. Department of Transportation, Federal Highway Administration. "Hydraulic Design of Highway Culverts.", 1985. Virginia.

U.S. Geological Survey, Water Resources Division. "Water Resource Data for Puerto Rico and the Virgin Islands",1960 - 1995. San Juan.

FIGURES

Figure 1: Proposed Project Location on a Partial Reproduction of the U.S.G.S. Central Aguirre Topographic Quadrangle Scale 1: 20,000


NORTH
N
W
E
S
228.66 mts
PROP. SR. AGUSTIN ARCE
SERVIDUMBRE DE PASO A.E.E.
CANAL DE RIEGO
AREA DE ESTACION DE BOMBA
Y SUB-ESTACIOM ELECTRICA
FACILIDADES
RECREATIVAS
FASE IV
INTERES SOCIAL / 3 HAB-2 BAÑOS
SLOARES 300 MTS APROX.
PROP. SR. ALBERTO RUBI
AREA A PRESENTARSE
Y/O MITIGAR

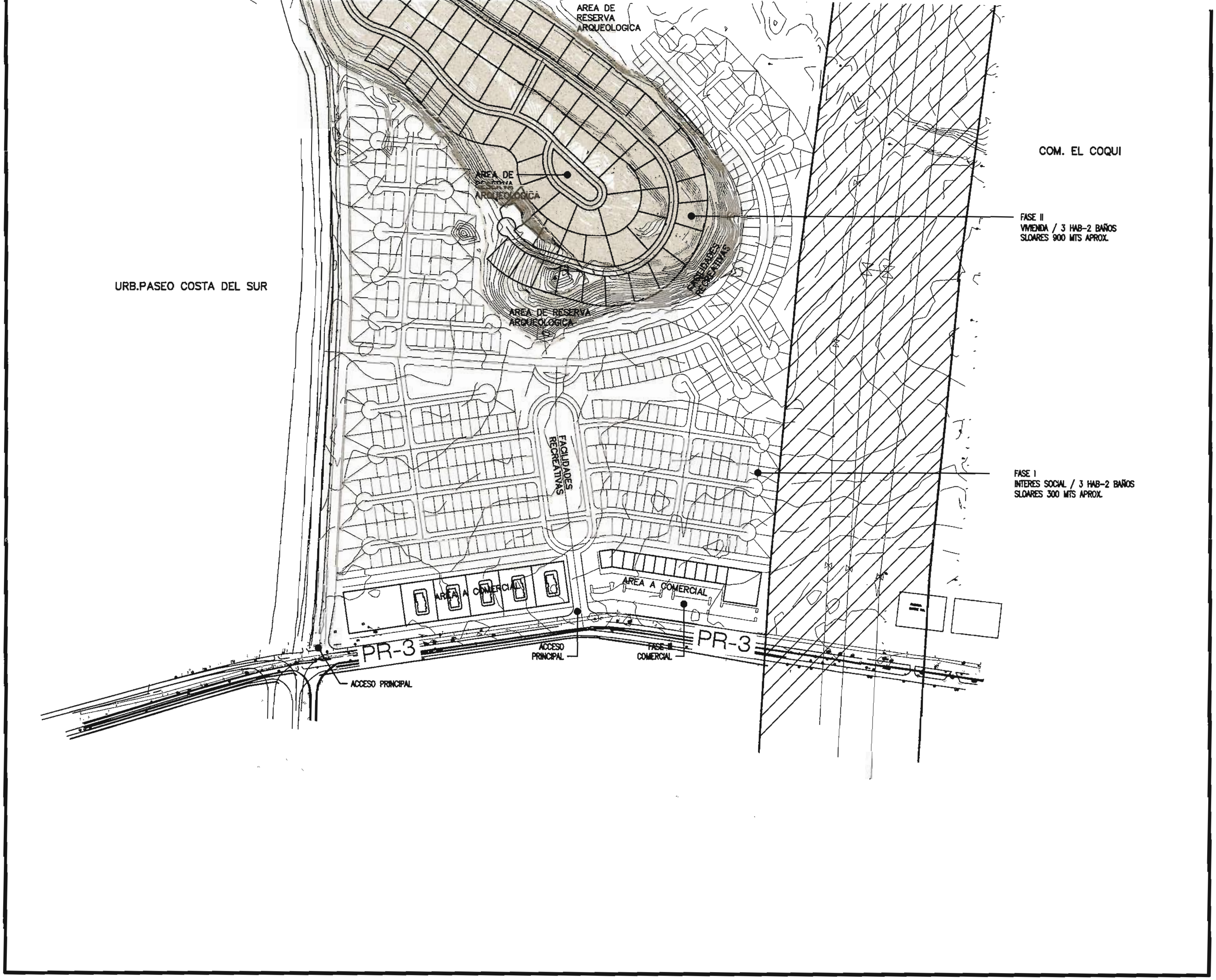
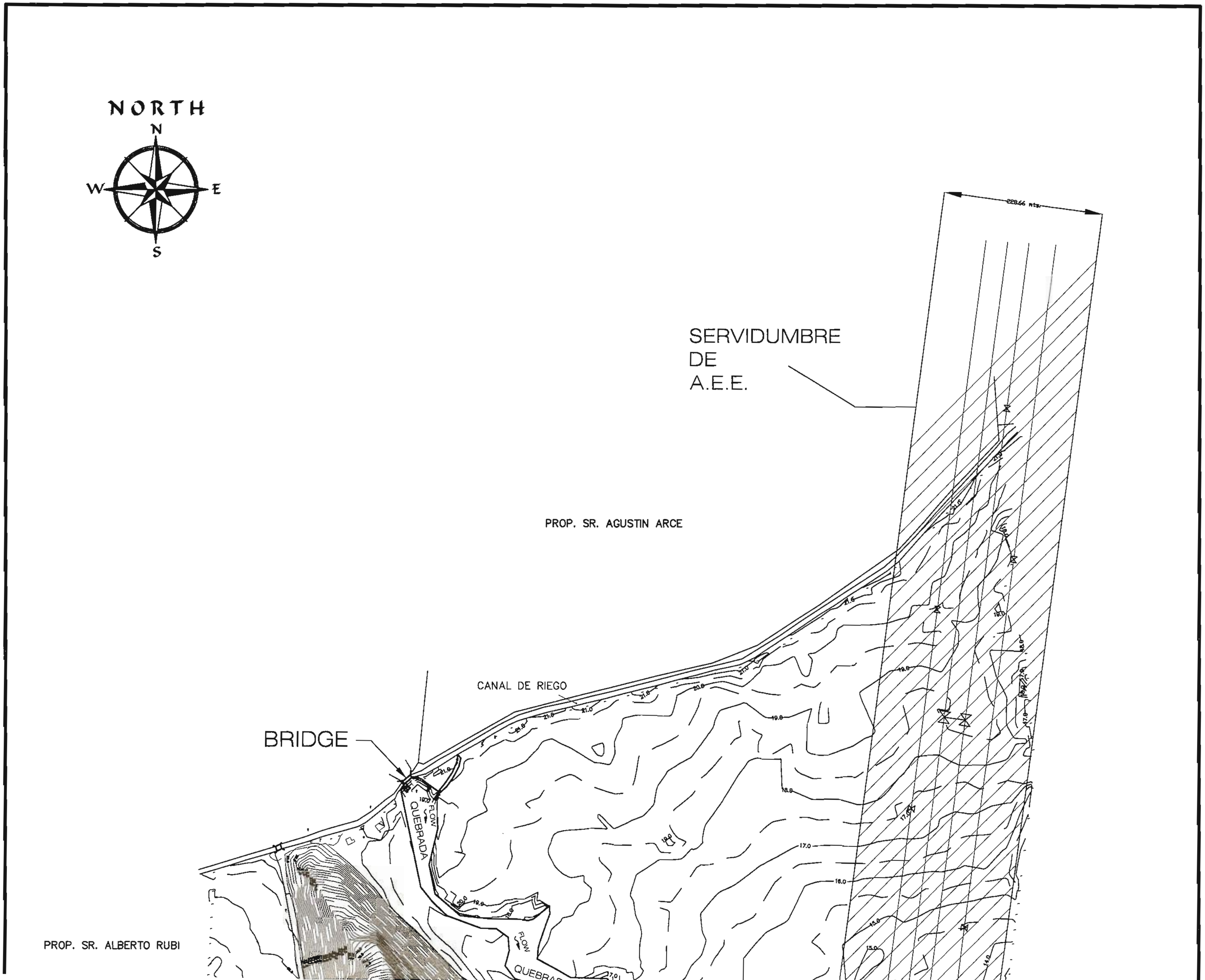


Figure 2: Proposed Project Layout

Scale 1: 7,000


NORTH
N
S
E
W
SERVIDUMBRE
DE
A.E.E.
228.66 mts.
PROP. SR. AGUSTIN ARCE
CANAL DE RIEGO
BRIDGE
FLOW
QUEBRADA
PROP. SR. ALBERTO RUBI
21.0
20.0
19.0
18.0
17.0
16.0
15.0

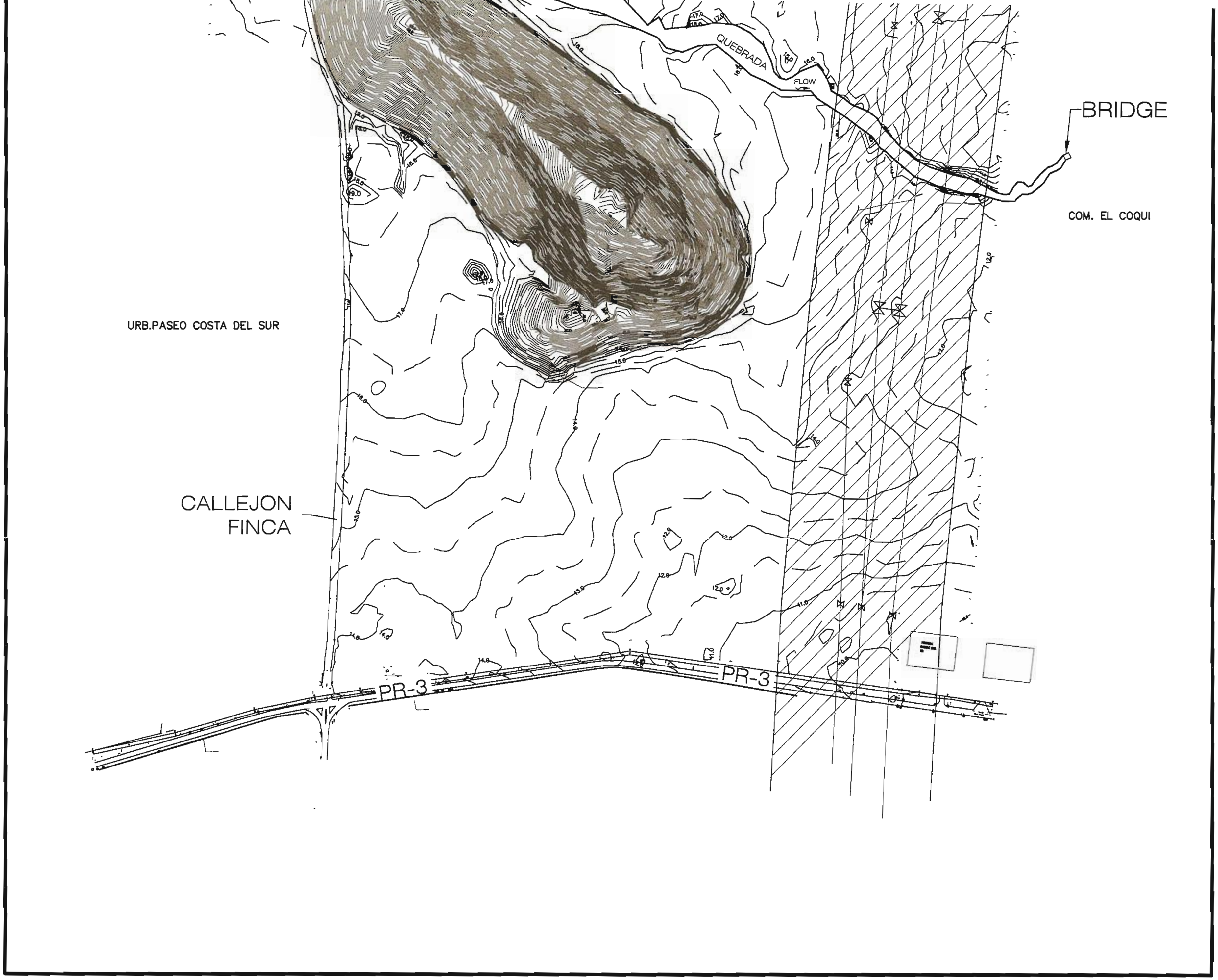


Figure 3: Project Area Topography and Storm Sewer System Scale 1: 7,000

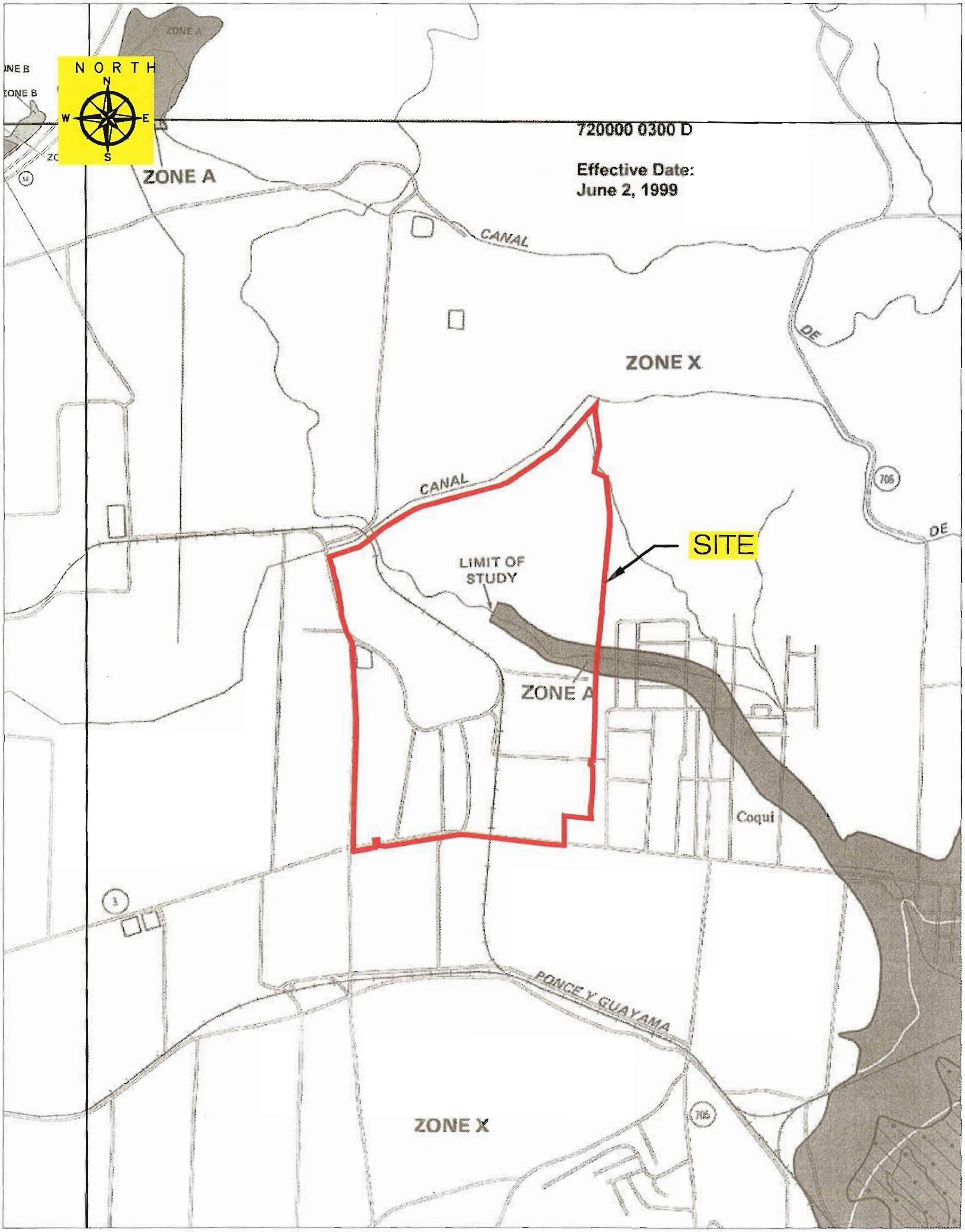
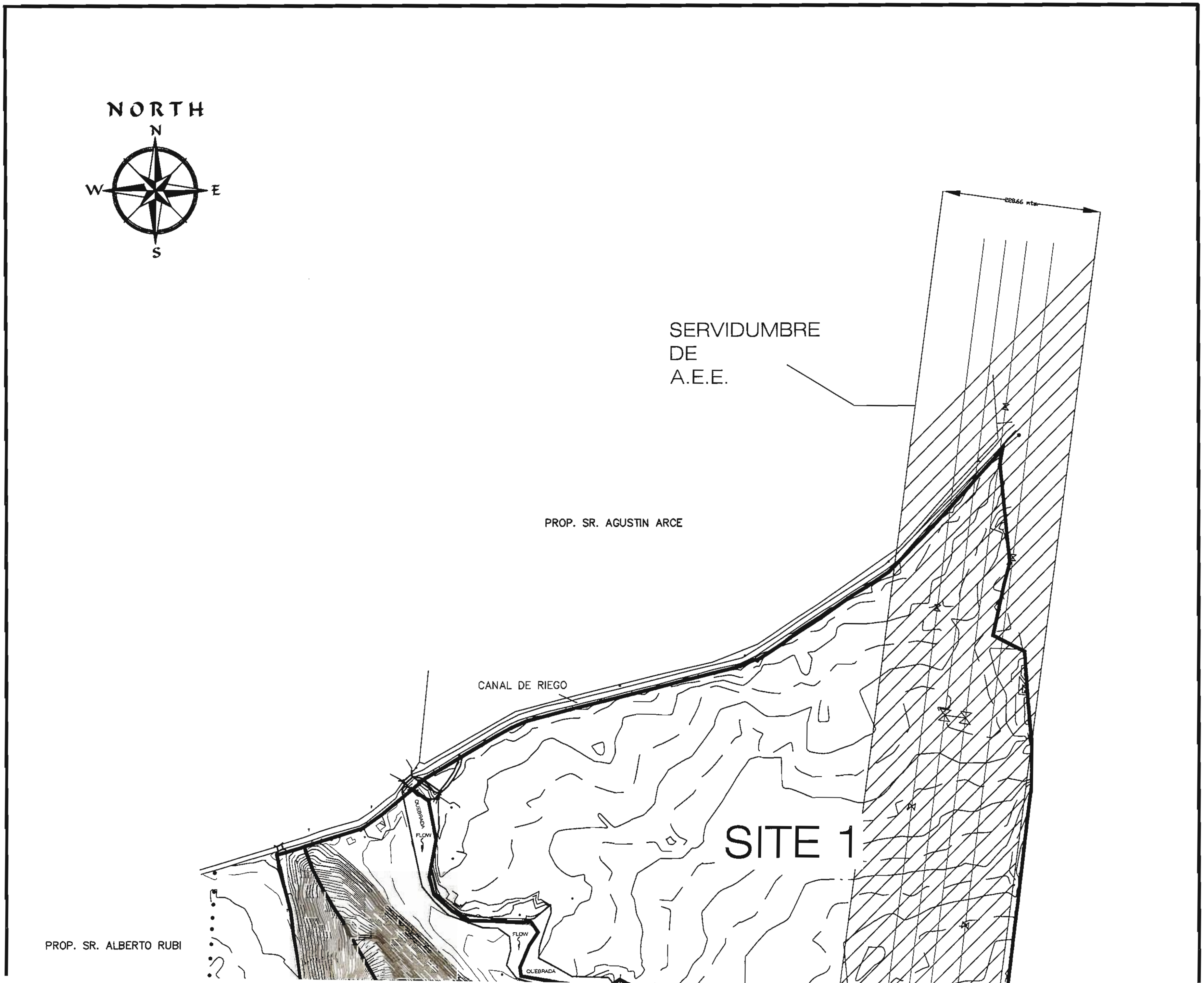


Figure 4: Project Location on a Partial Reproduction of the Fema FIRM Map.
Panel 300D, Dated June 2, 1999 Scale 1: 20,000


NORTH
N
W
E
S
228.66 mts
SERVIDUMBRE
DE
A.E.E.
PROP. SR. AGUSTIN ARCE
CANAL DE RIEGO
QUEBRADA
FLOW
SITE 1
PROP. SR. ALBERTO RUBI

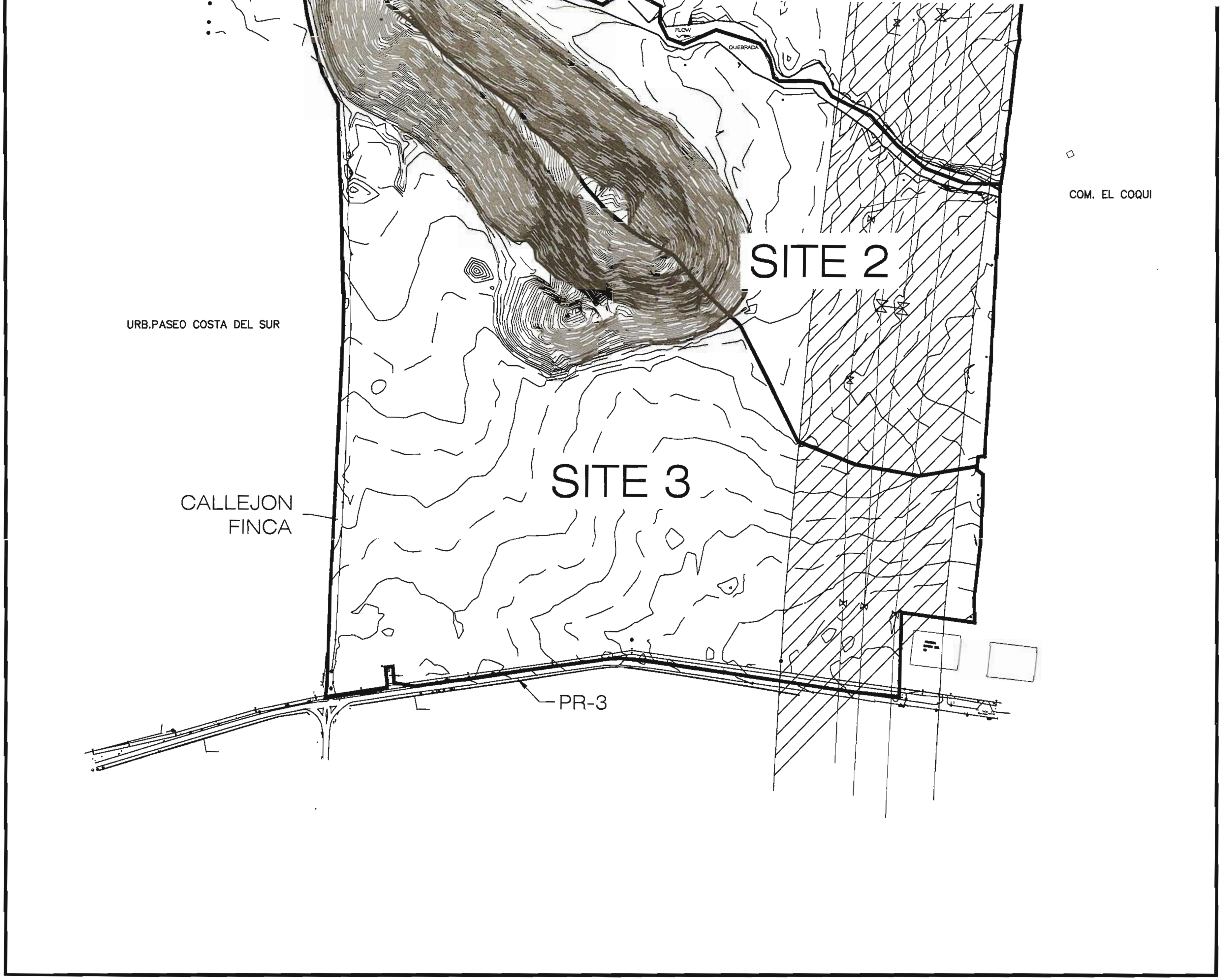


Figure 5: Watershed Limits for Project Site for Existing and Proposed Condition
Scale 1: 7,000

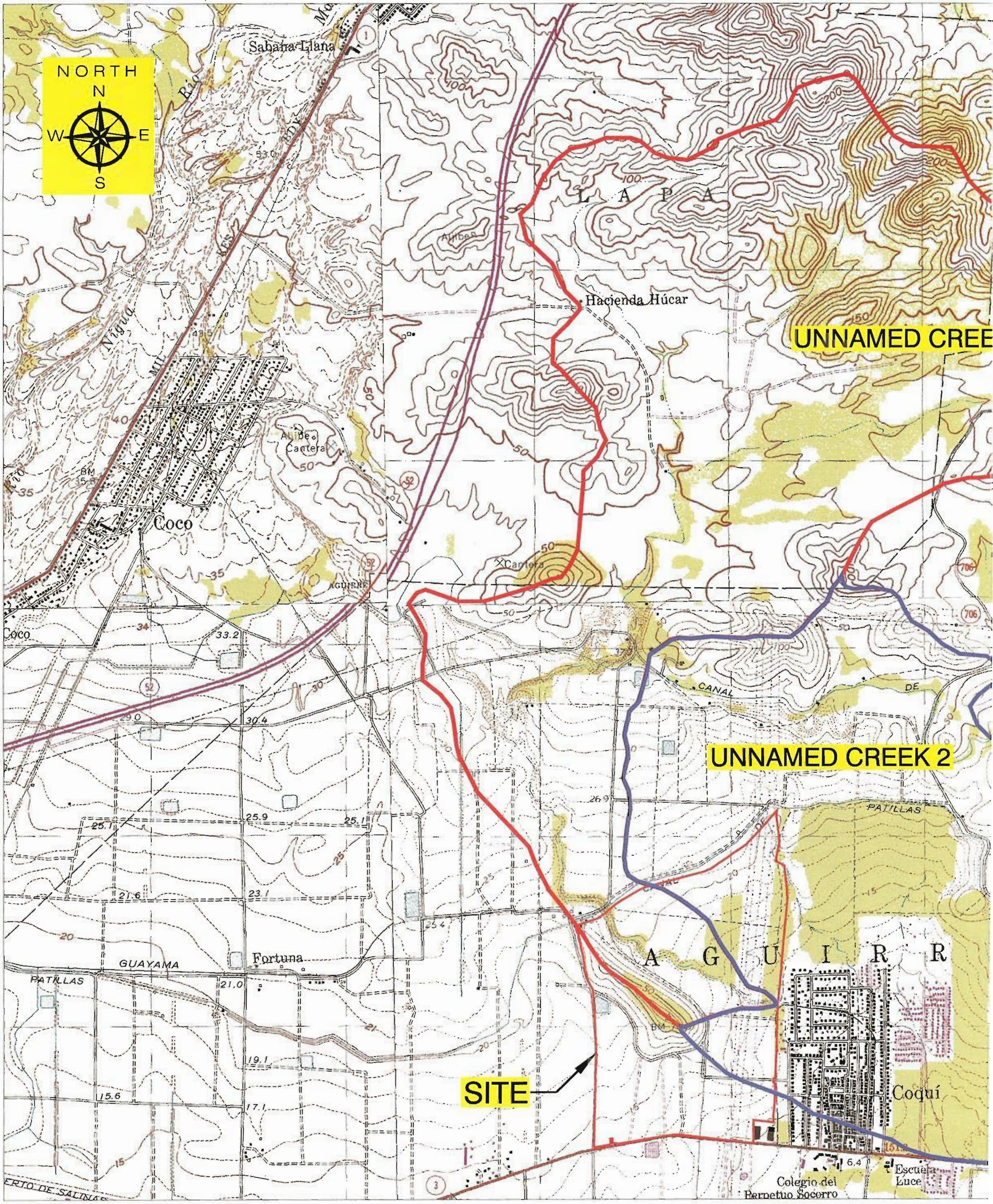
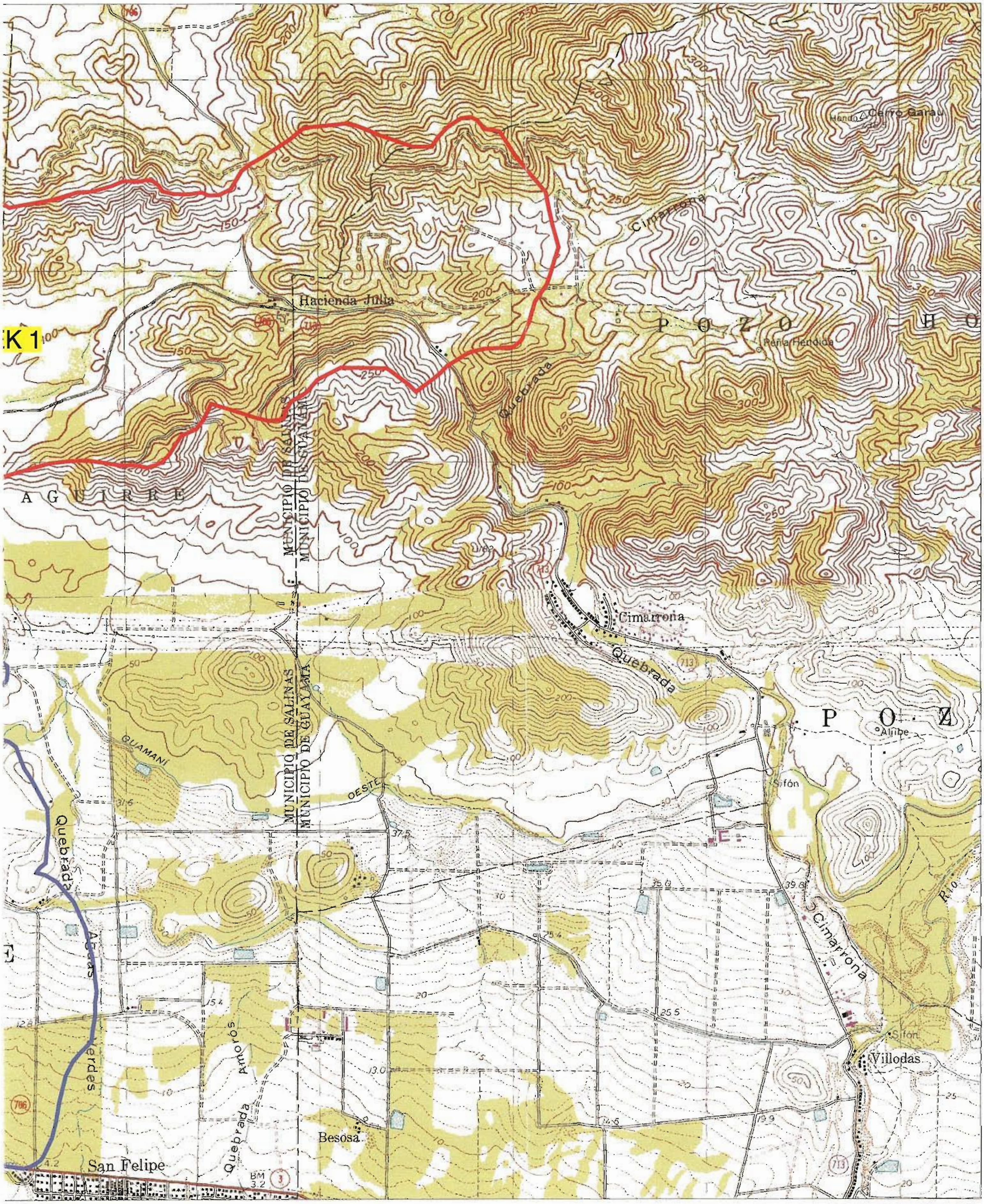


Figure 6: Watershed Limits for the Unnamed Creek



Scale 1: 25,000

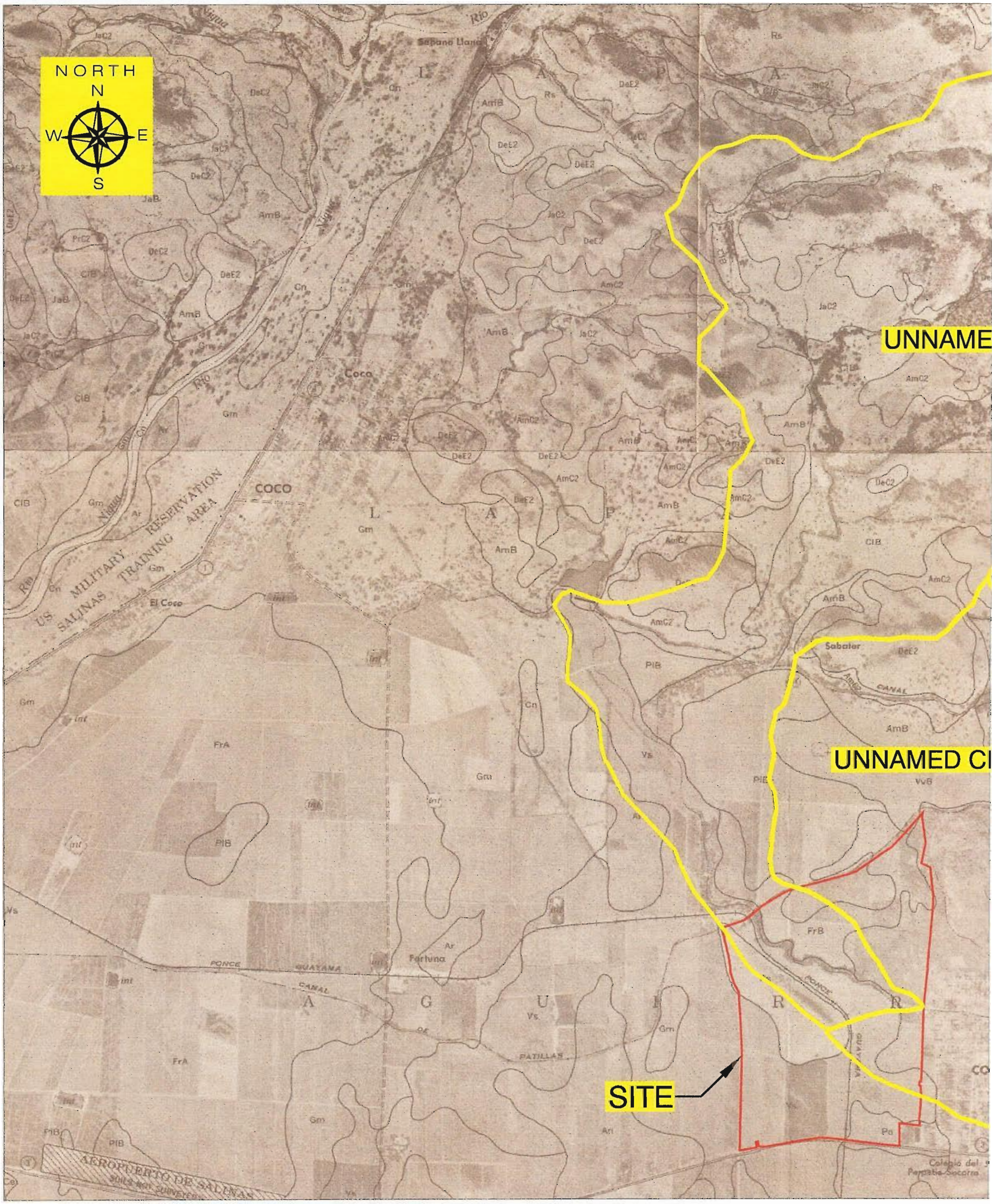
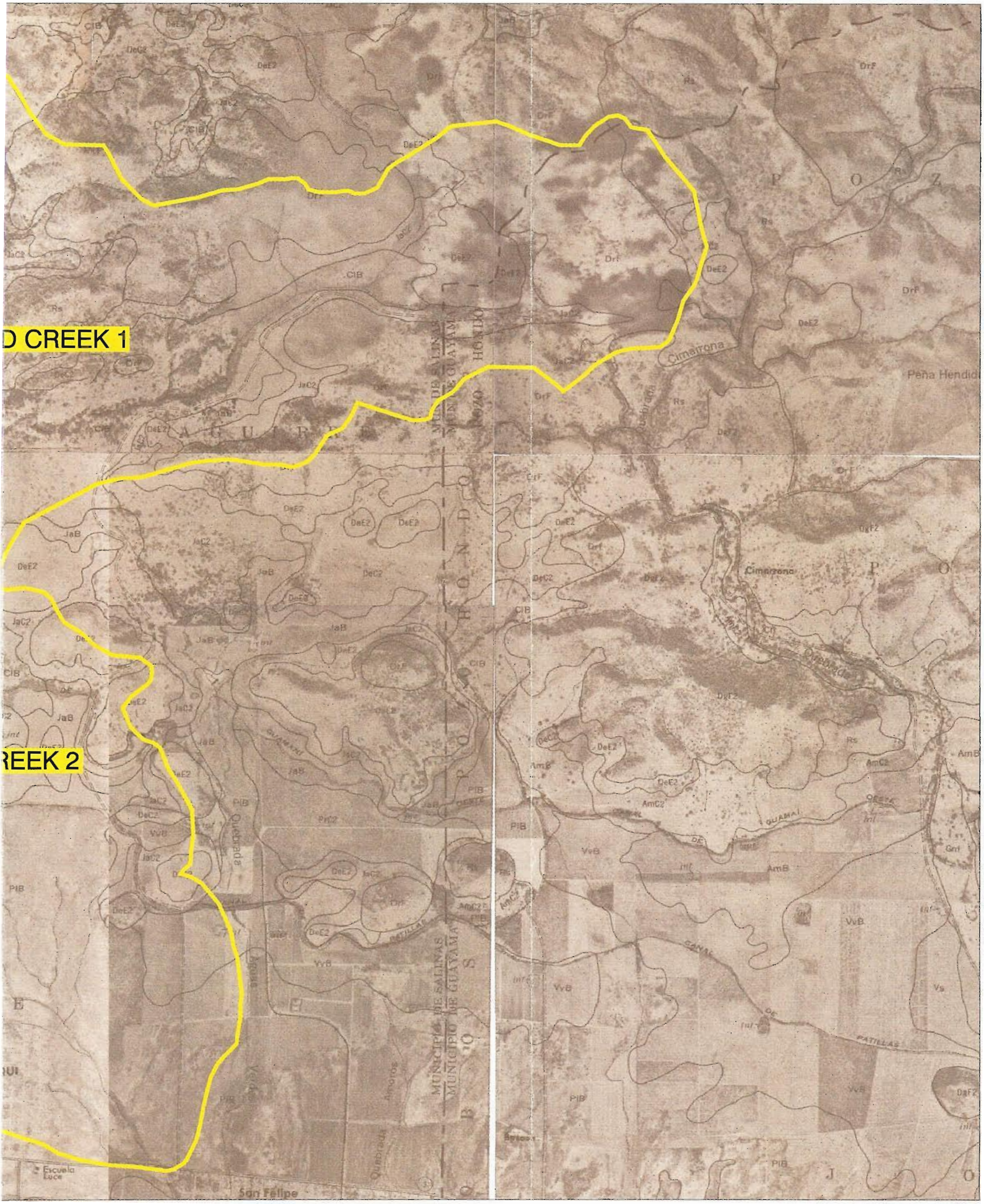


Figure 7: Project Location on a Partial Reproduction of the Soil Survey Map o



f the Humacao Area, Sheet # 49

Scale 1: 25,000

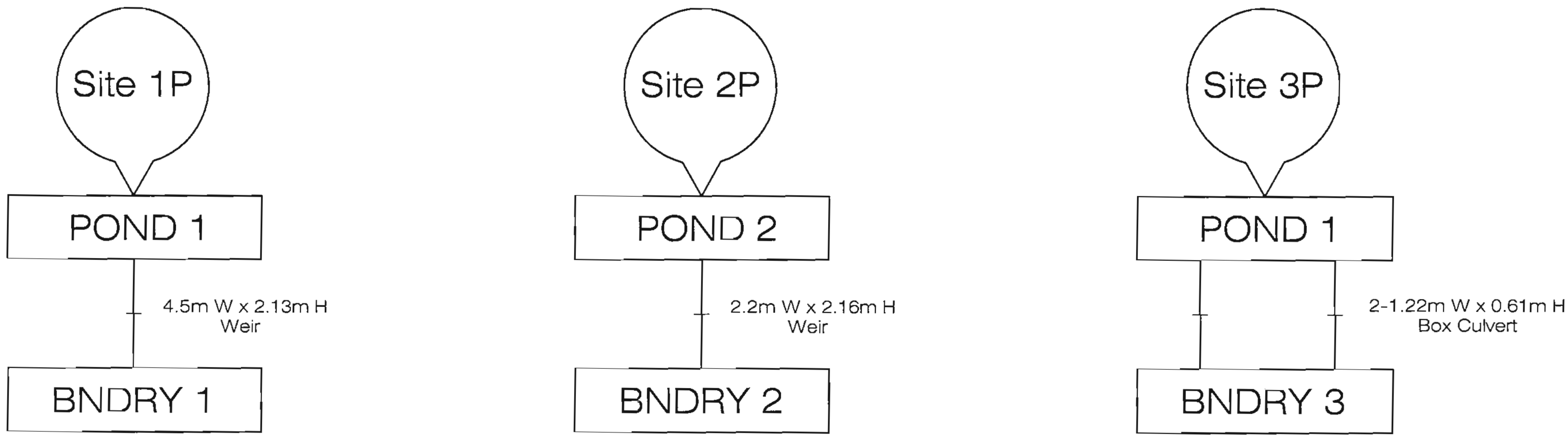
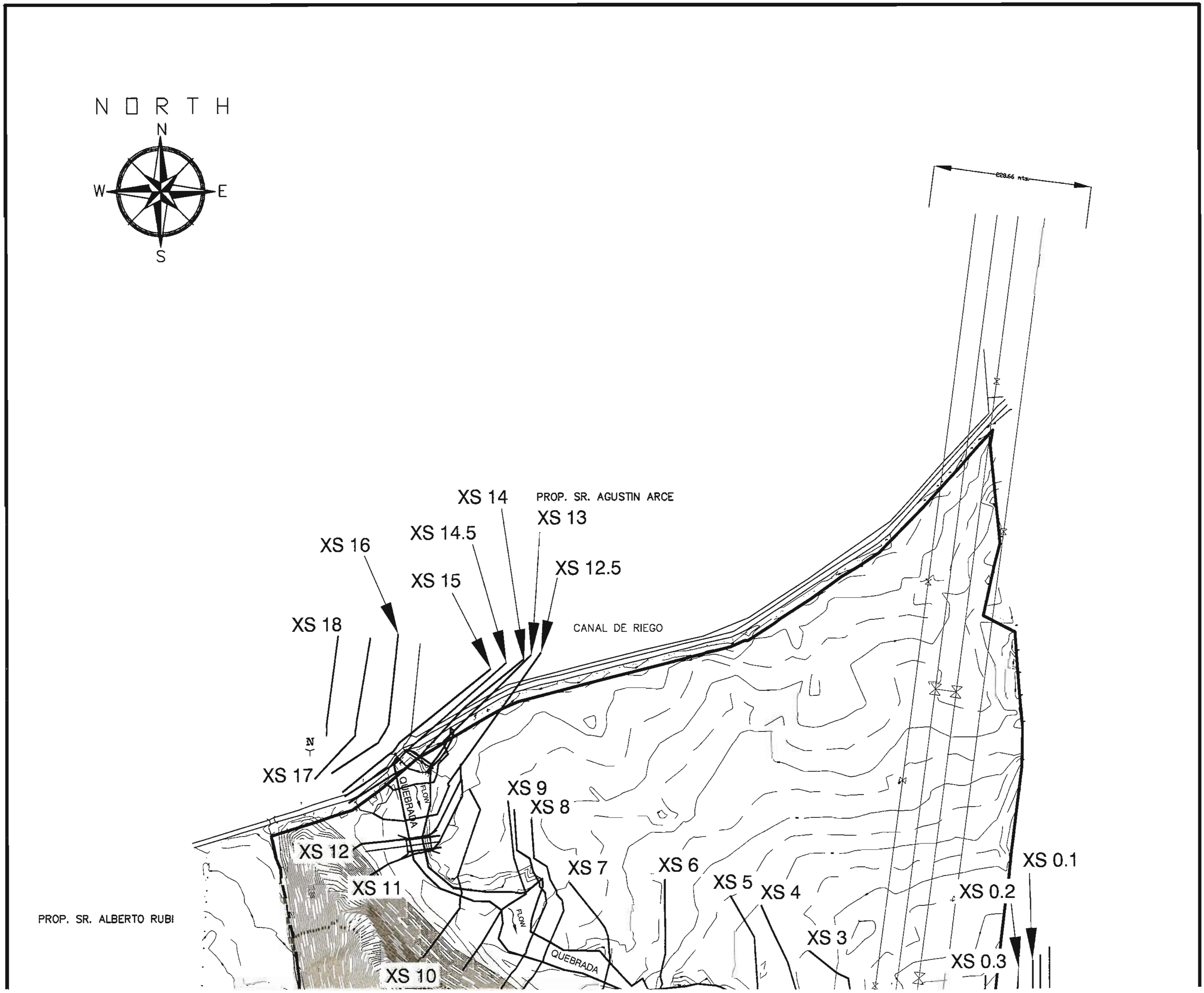


Figure 8: Schematic Link-Node Diagram for Proposed Condition


NORTH
N
W
E
S
228.66 mts
PROP. SR. AGUSTIN ARCE
CANAL DE RIEGO
XS 14
XS 13
XS 14.5
XS 16
XS 12.5
XS 15
XS 18
XS 17
N
QUEBRADA
FLOW
XS 9
XS 8
XS 12
XS 11
XS 7
XS 6
XS 5
XS 4
XS 3
XS 0.1
XS 0.2
XS 0.3
XS 10
QUEBRADA
FLOW
PROP. SR. ALBERTO RUBI

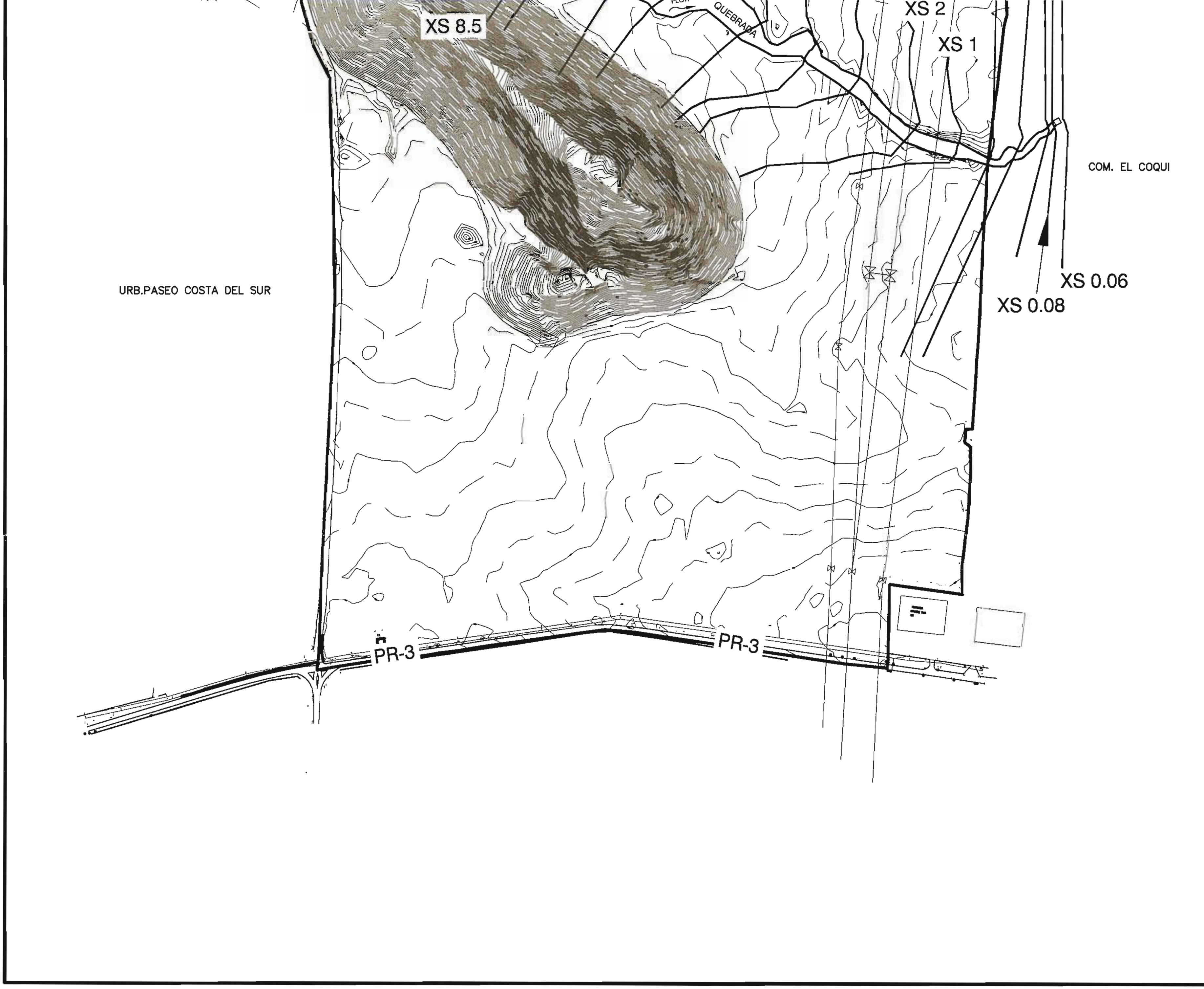


Figure 9a: Cross Sections Location Within Project Site

Scale 1: 7,000

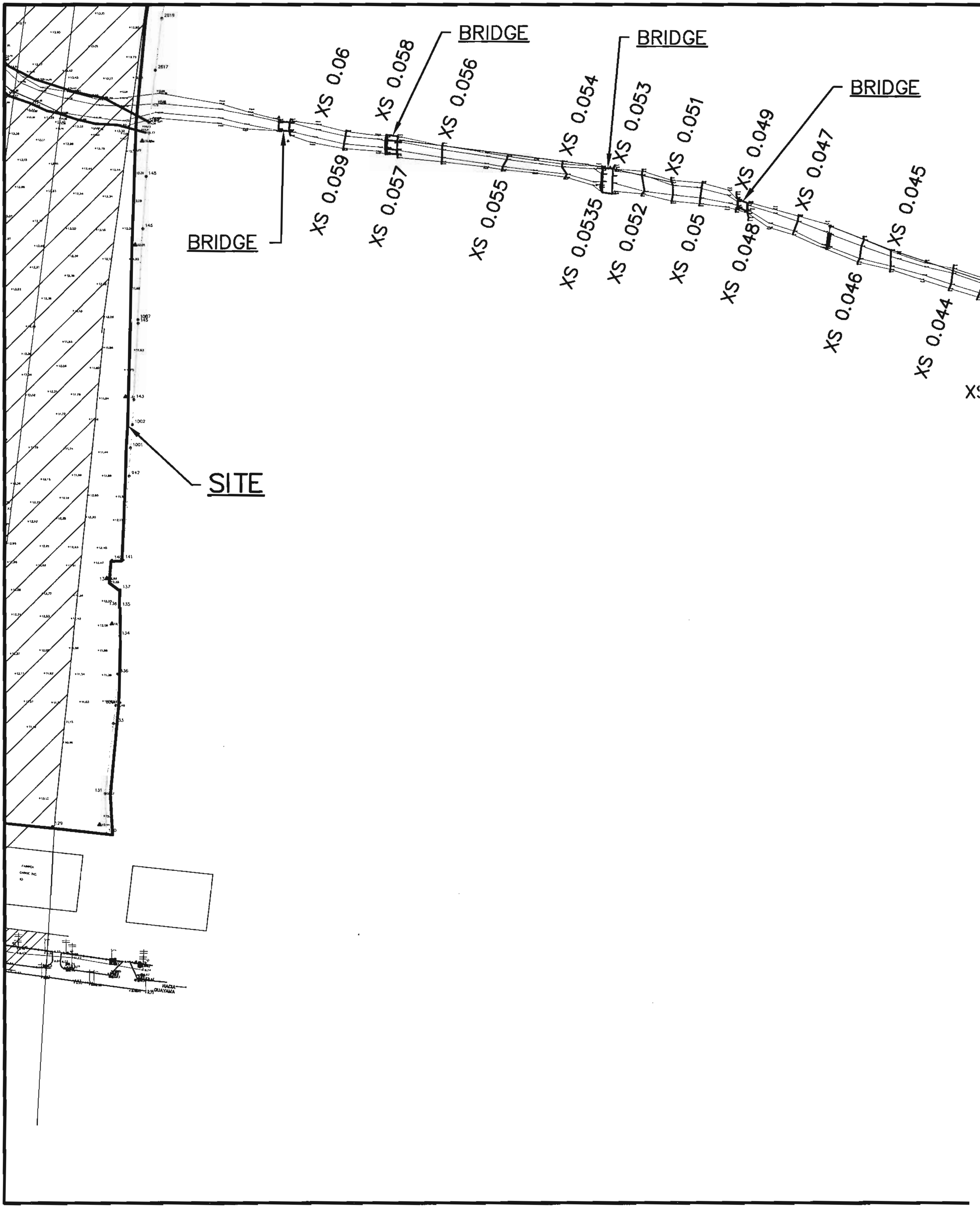
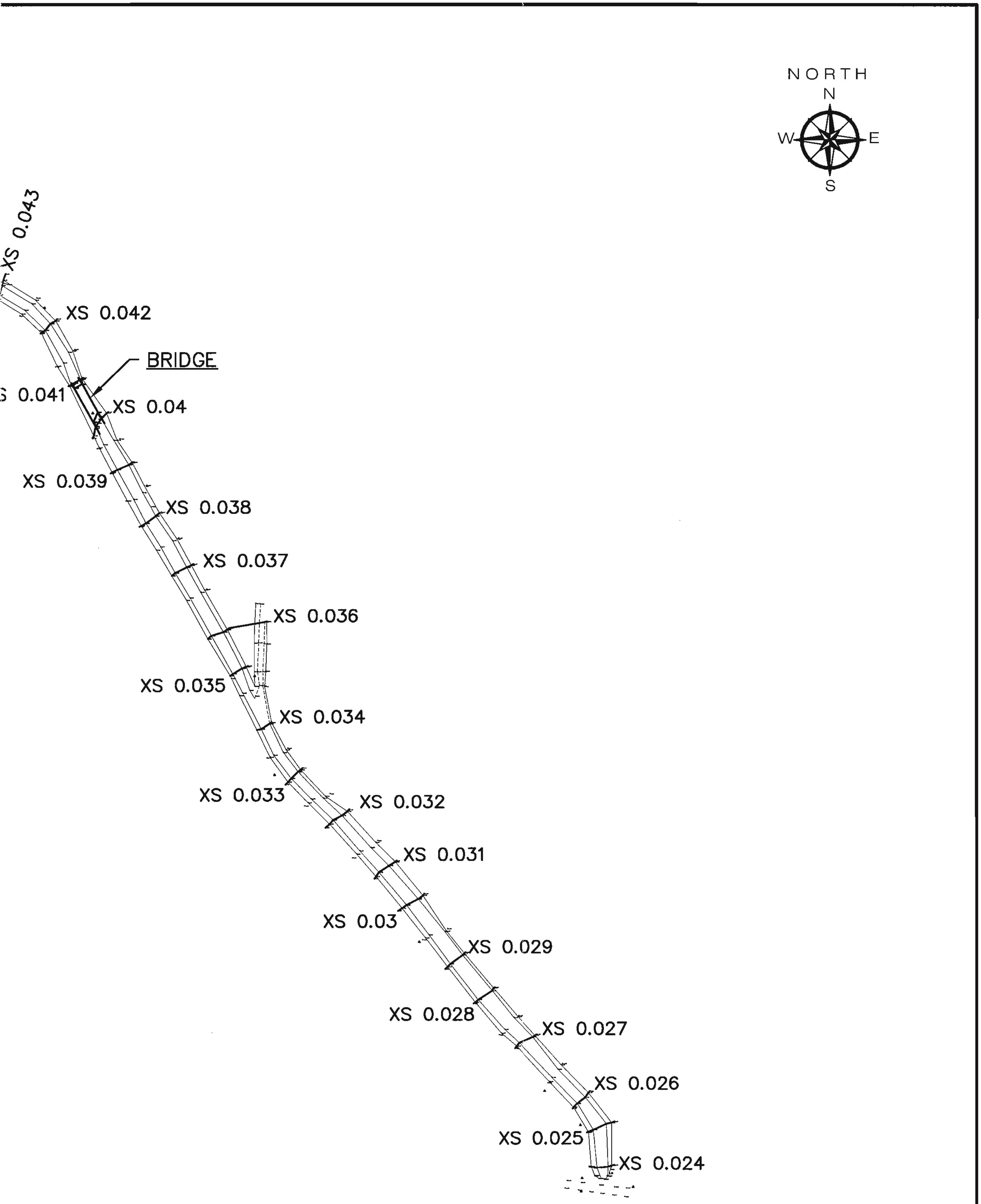


Figure 9b: Cross Sections Location along El Coqui Community



NORTH
N
W
E
S
XS 0.043
XS 0.042
BRIDGE
0.041
XS 0.04
XS 0.039
XS 0.038
XS 0.037
XS 0.036
XS 0.035
XS 0.034
XS 0.033
XS 0.032
XS 0.031
XS 0.03
XS 0.029
XS 0.028
XS 0.027
XS 0.026
XS 0.025
XS 0.024

Scale 1: 4,000

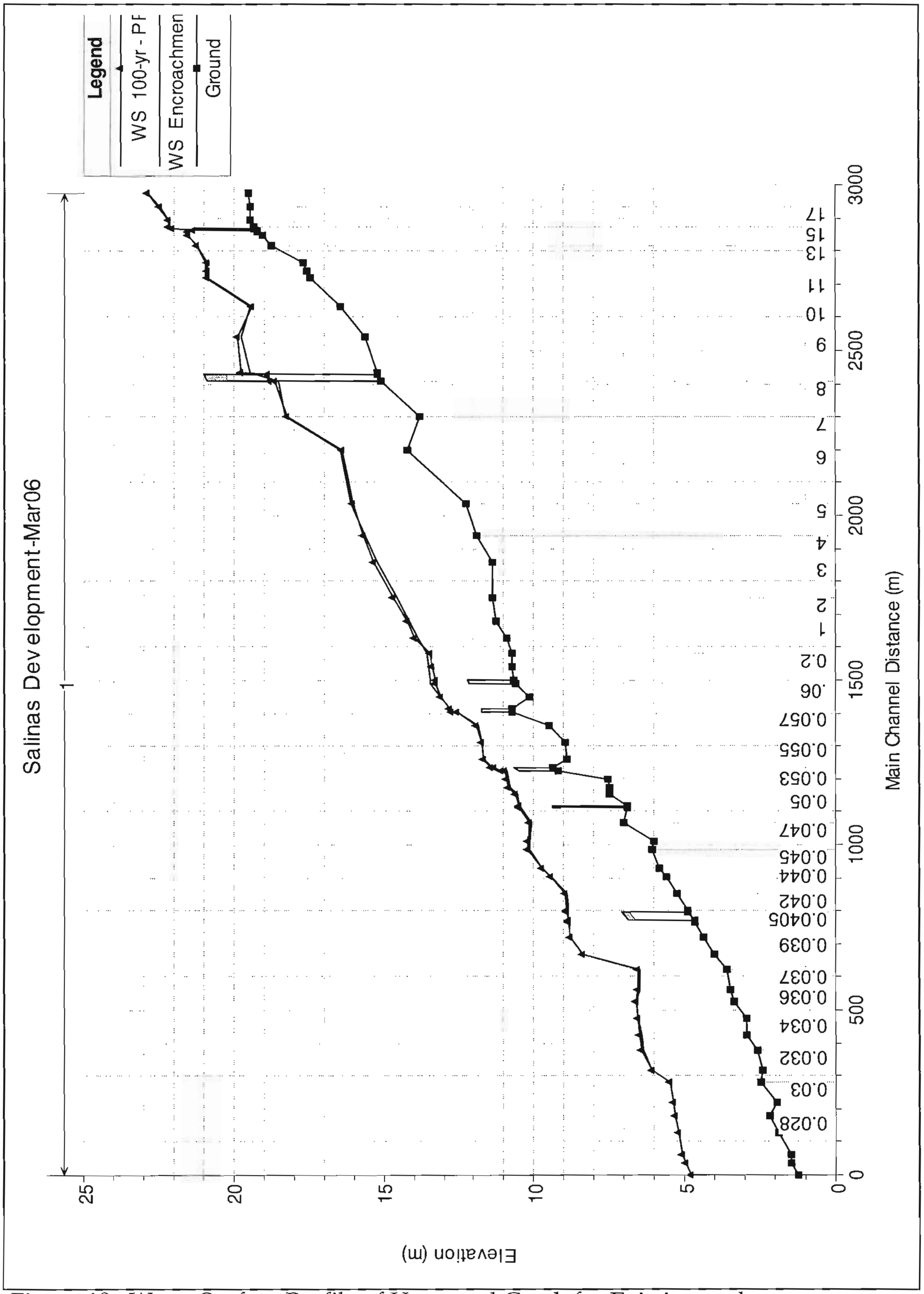
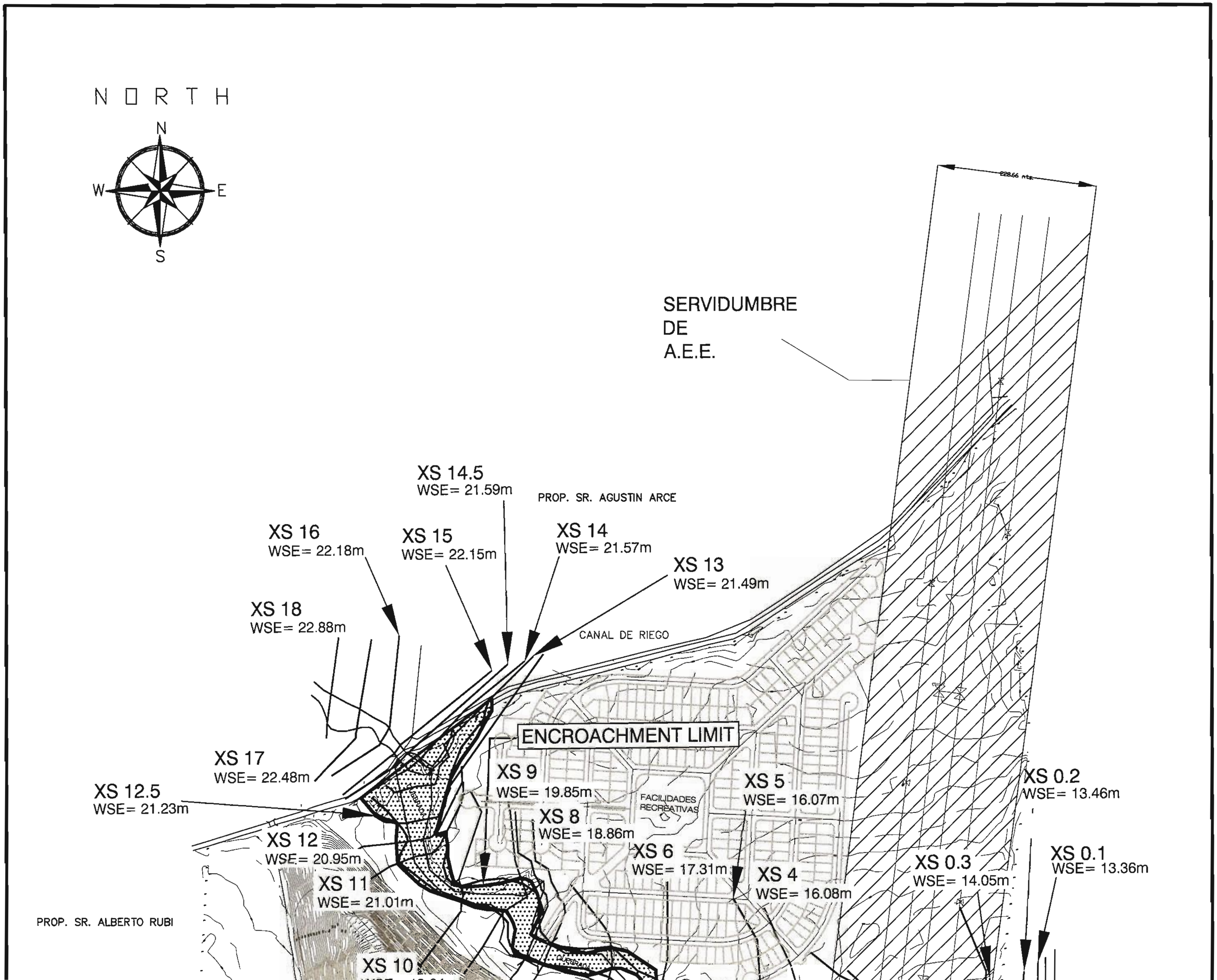


Figure 10: Water Surface Profile of Unnamed Creek for Existing and Encroached Conditions


NORTH
N
W
E
S
228.66 mts.
SERVIDUMBRE
DE
A.E.E.
XS 14.5
WSE= 21.59m
PROP. SR. AGUSTIN ARCE
XS 16
WSE= 22.18m
XS 15
WSE= 22.15m
XS 14
WSE= 21.57m
XS 13
WSE= 21.49m
XS 18
WSE= 22.88m
CANAL DE RIEGO
ENCROACHMENT LIMIT
XS 17
WSE= 22.48m
XS 9
WSE= 19.85m
XS 5
WSE= 16.07m
XS 0.2
WSE= 13.46m
XS 12.5
WSE= 21.23m
FACILIDADES
RECREATIVAS
XS 8
WSE= 18.86m
XS 12
WSE= 20.95m
XS 6
WSE= 17.31m
XS 4
WSE= 16.08m
XS 0.3
WSE= 14.05m
XS 0.1
WSE= 13.36m
XS 11
WSE= 21.01m
PROP. SR. ALBERTO RUBI
XS 10

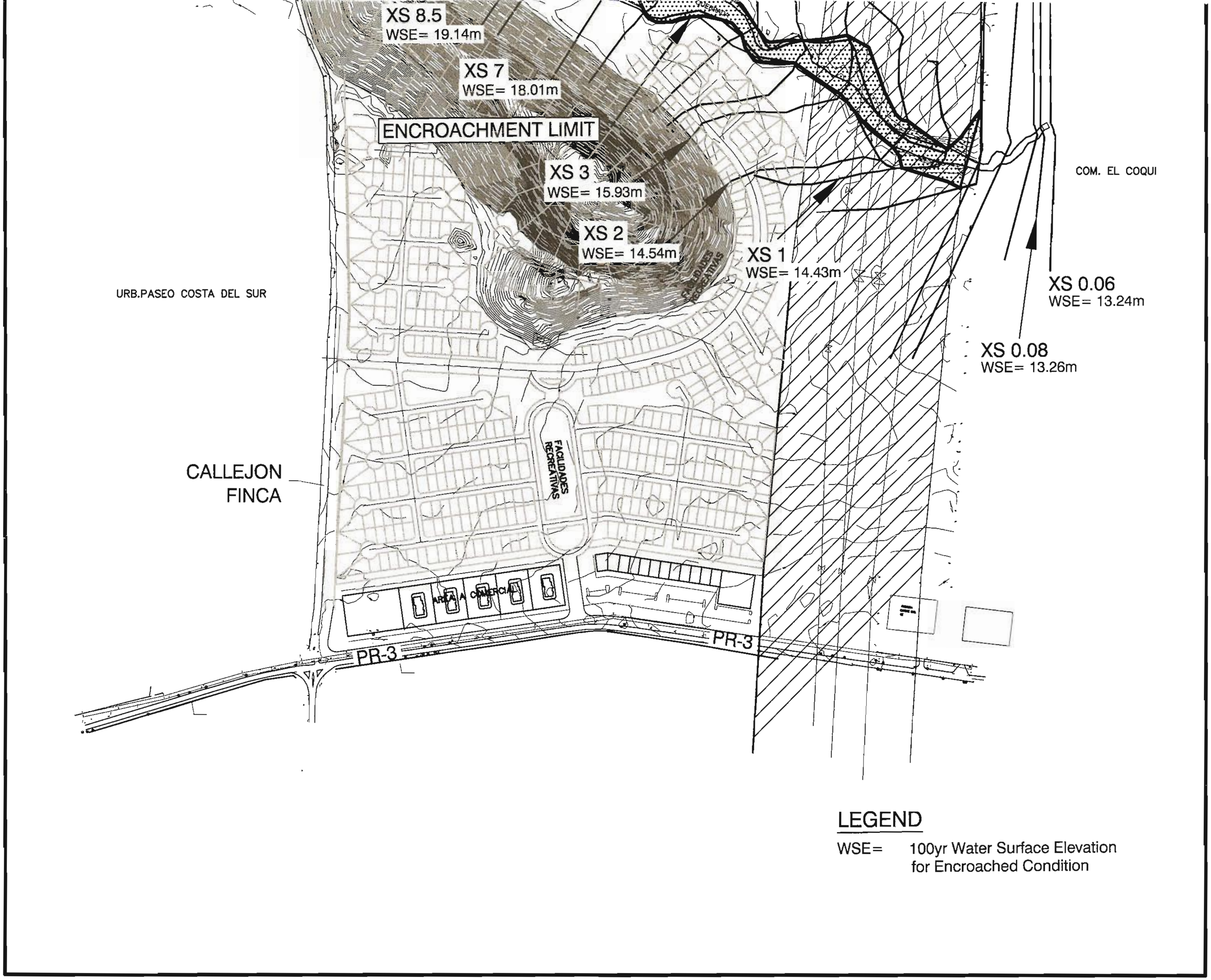
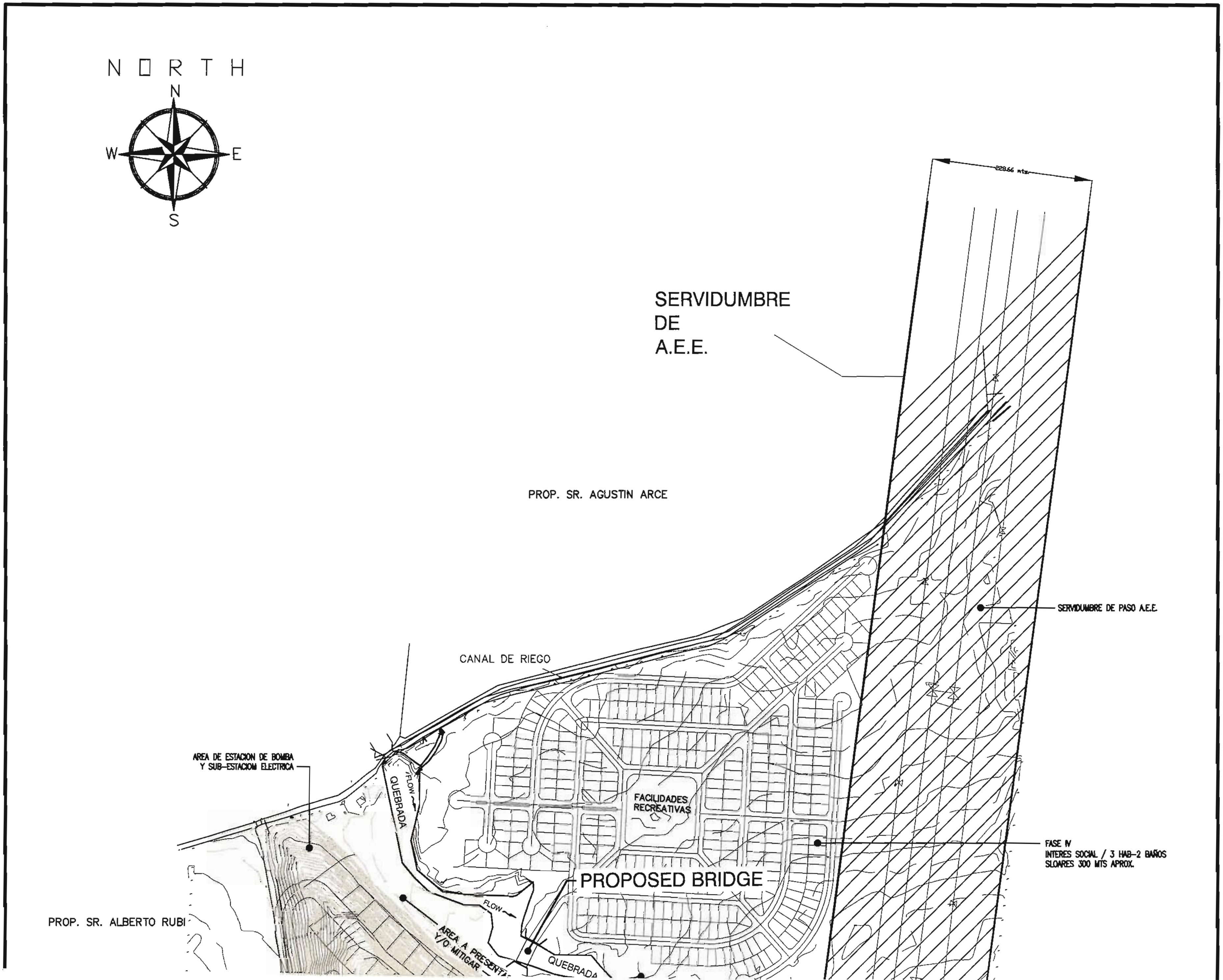


Figure 11: Encroachment Limits of the Unnamed Creek

Scale 1: 7,000


NORTH
N
W
E
S
SERVIDUMBRE
DE
A.E.E.
228.66 mts.
PROP. SR. AGUSTIN ARCE
SERVIDUMBRE DE PASO A.E.E.
CANAL DE RIEGO
AREA DE ESTACION DE BOMBA
Y SUB-ESTACIOM ELECTRICA
QUEBRADA
FLOW
FACILIDADES
RECREATIVAS
FASE IV
INTERES SOCIAL / 3 HAB-2 BAÑOS
SLOARES 300 MTS APROX.
PROPOSED BRIDGE
PROP. SR. ALBERTO RUBI
FLOW
QUEBRADA

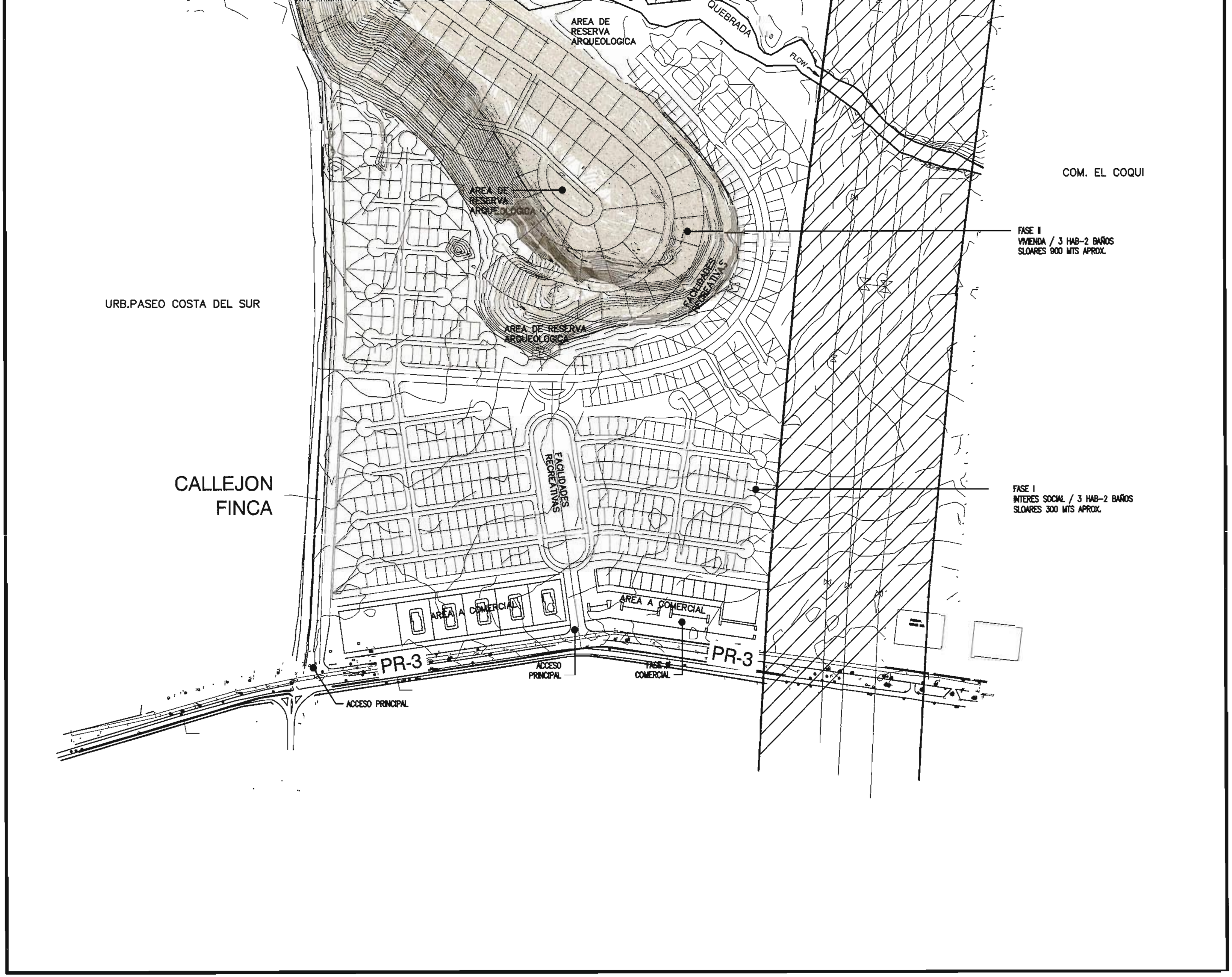


Figure 12: Location of Proposed Bridge

Scale 1: 7,000

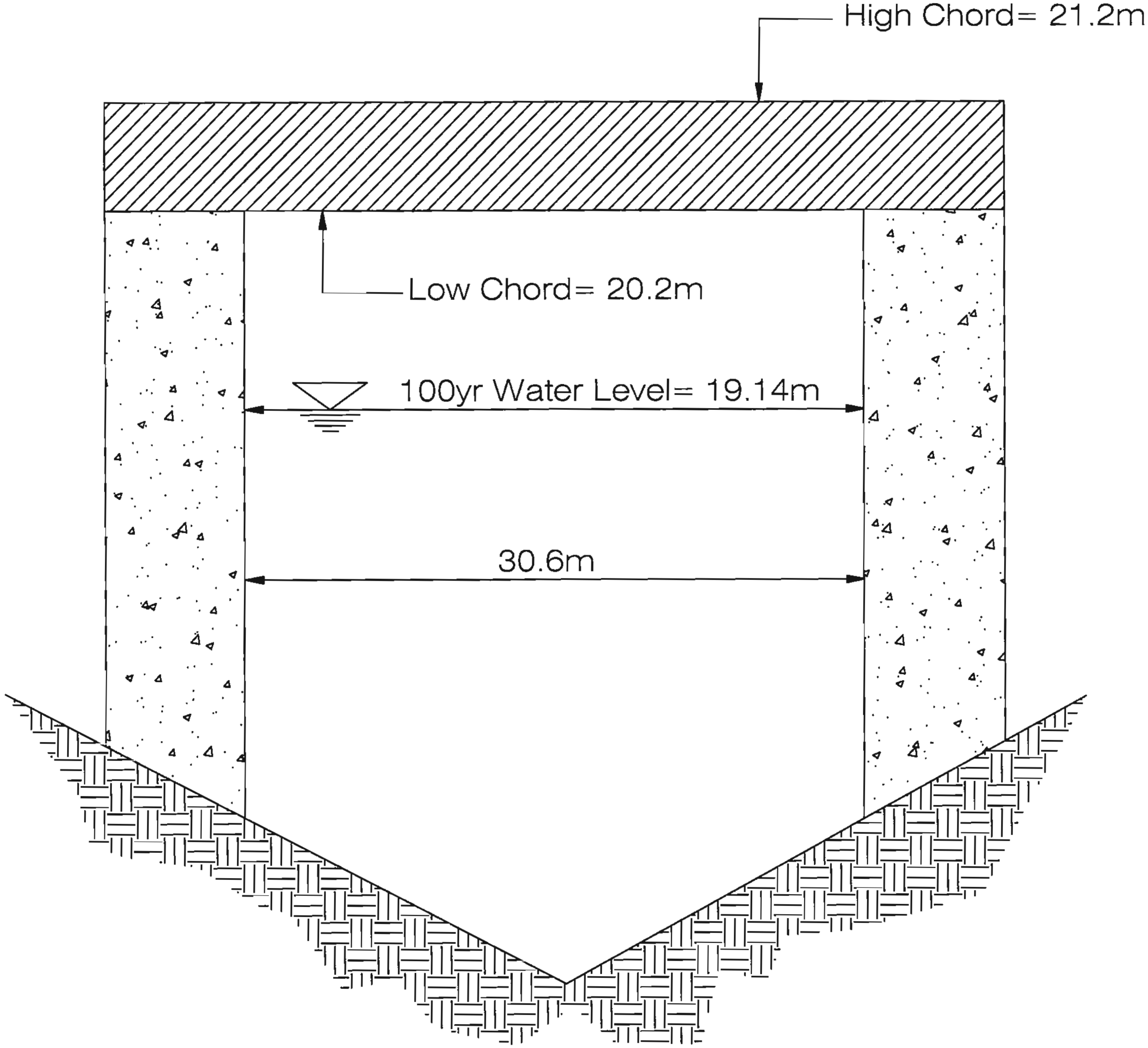
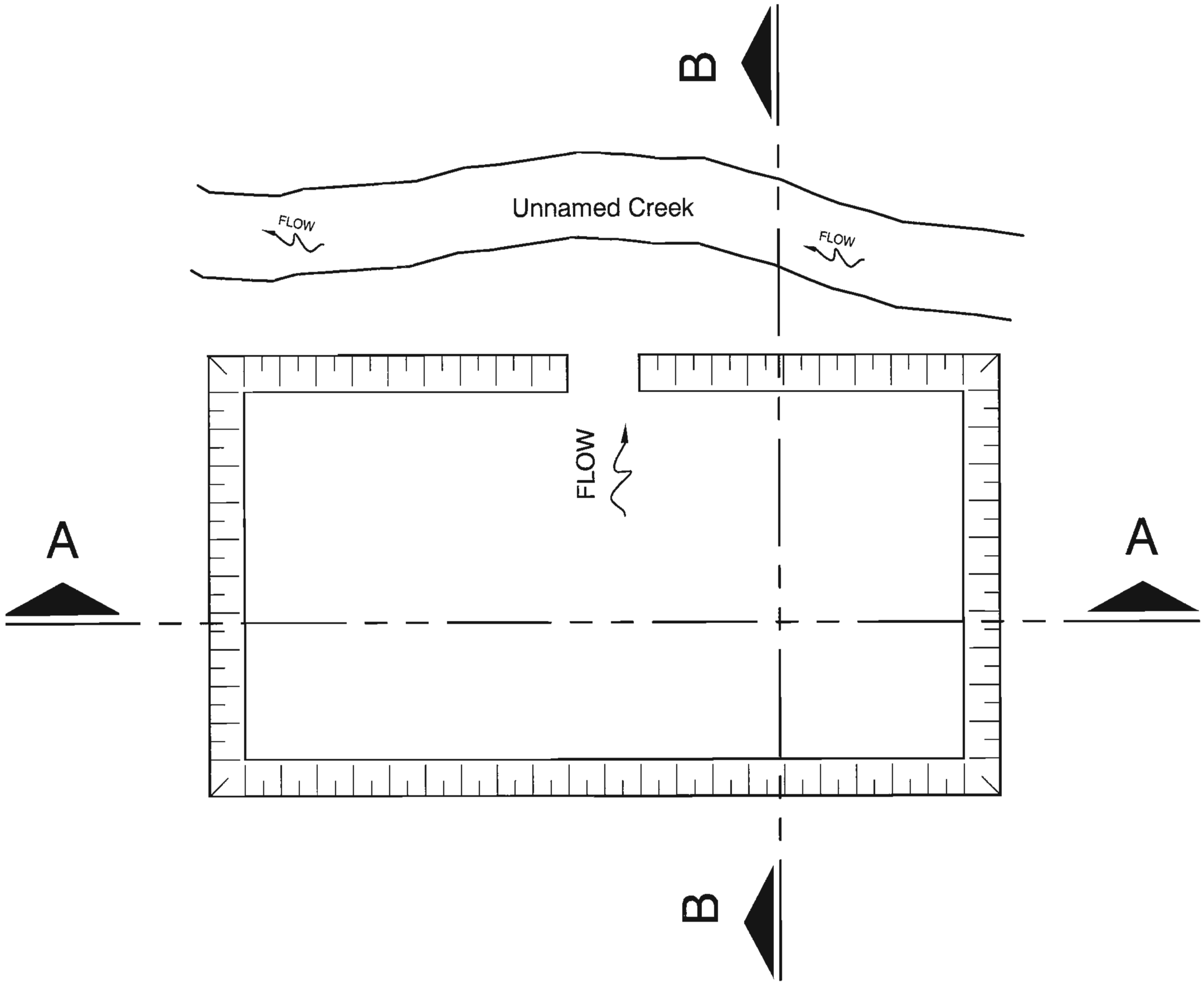
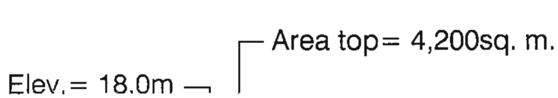


Figure 13: Schematic Design of Proposed Bridge



PLAN VIEW
NOT TO SCALE



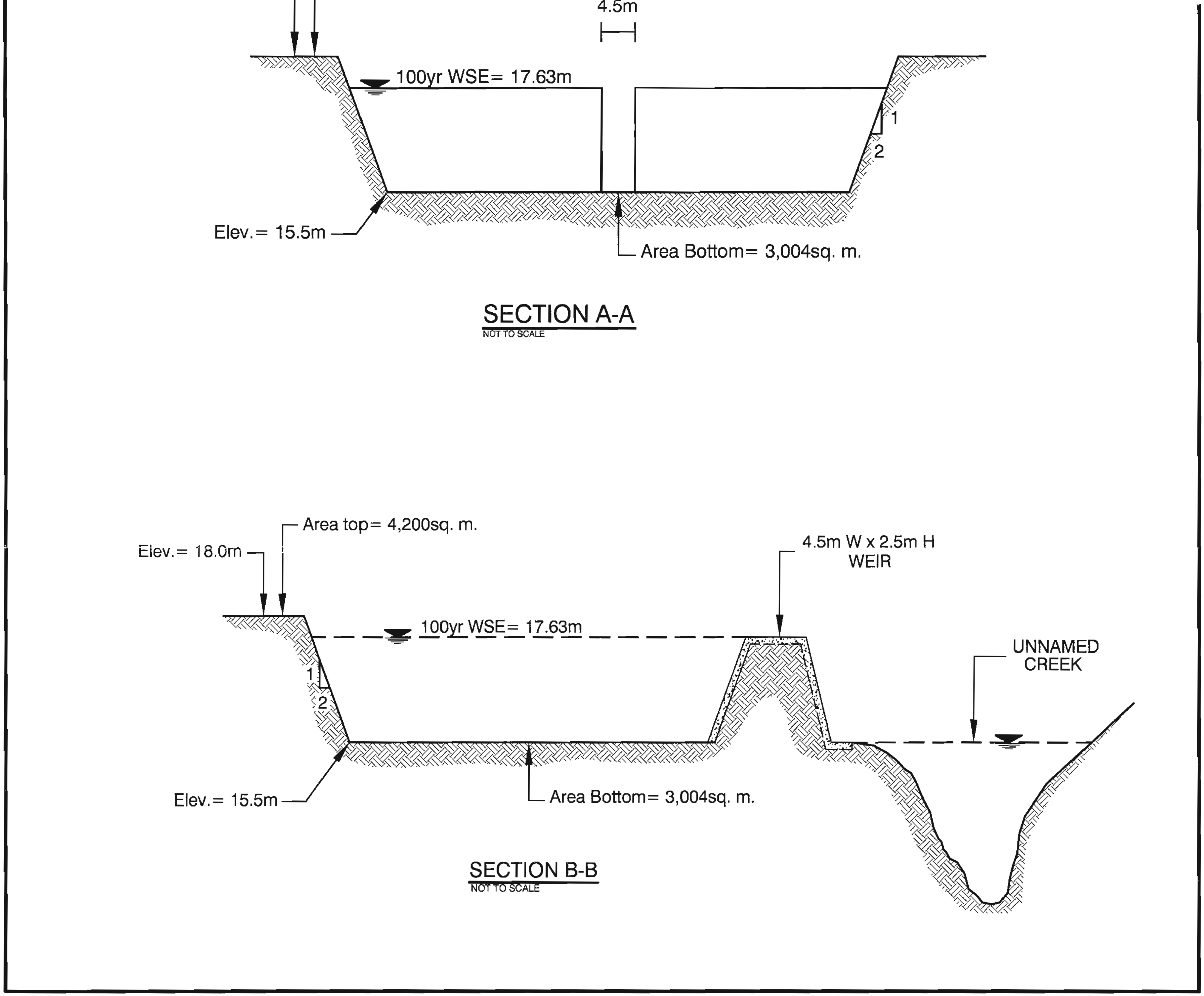
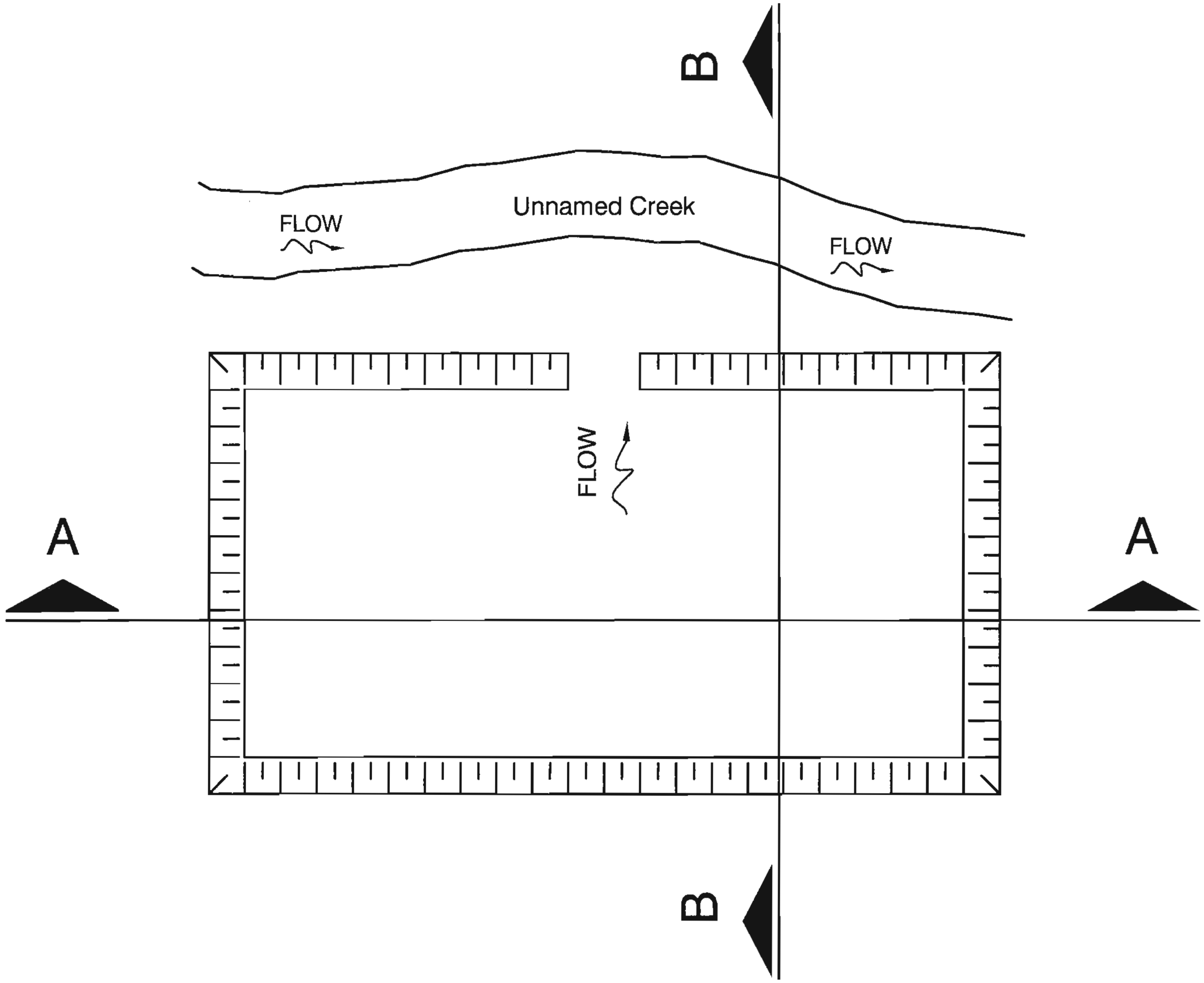


Figure 14: Schematic Design of Detention Pond 1



PLAN VIEW
NOT TO SCALE

A top= 4,500sq. m.

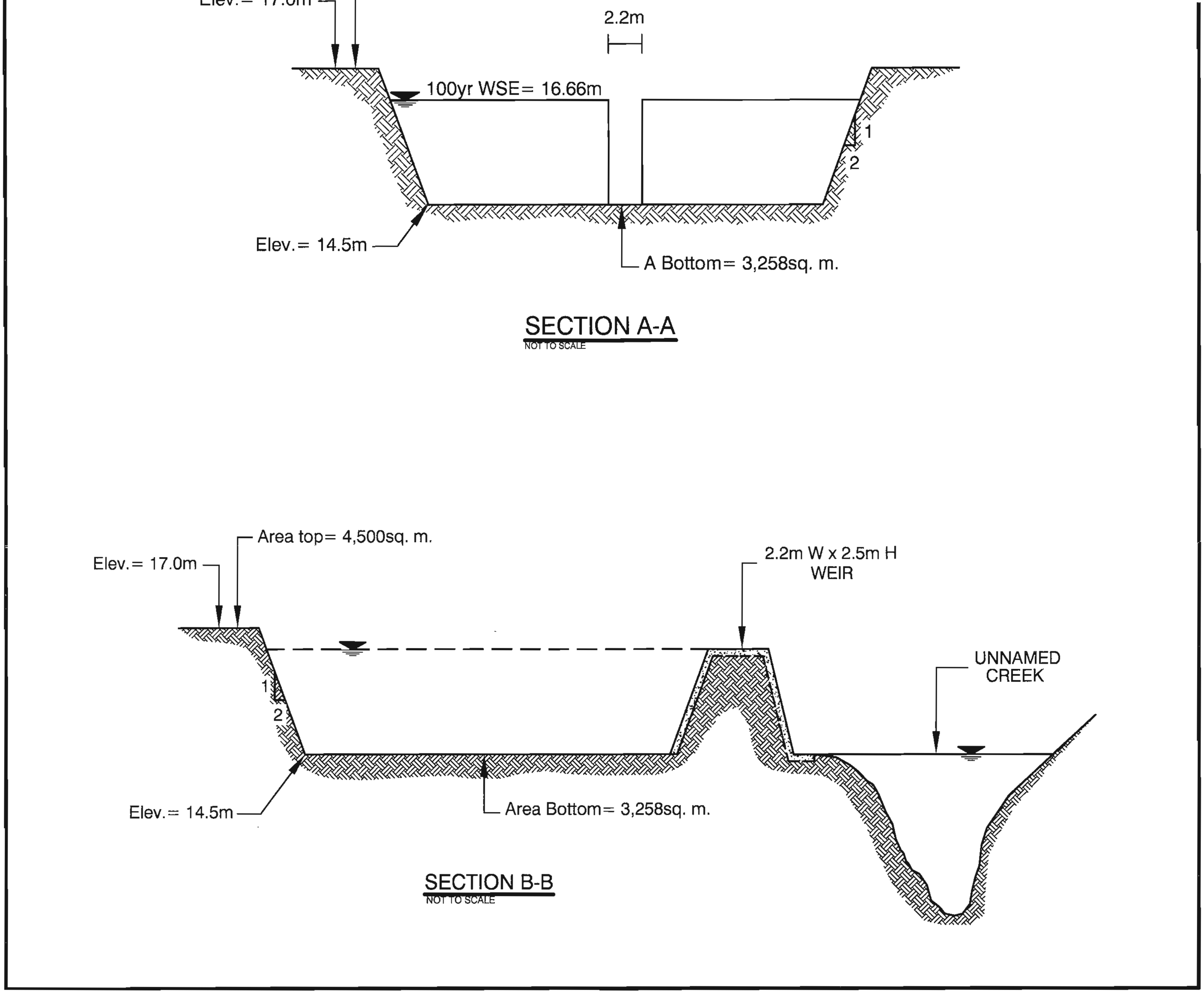
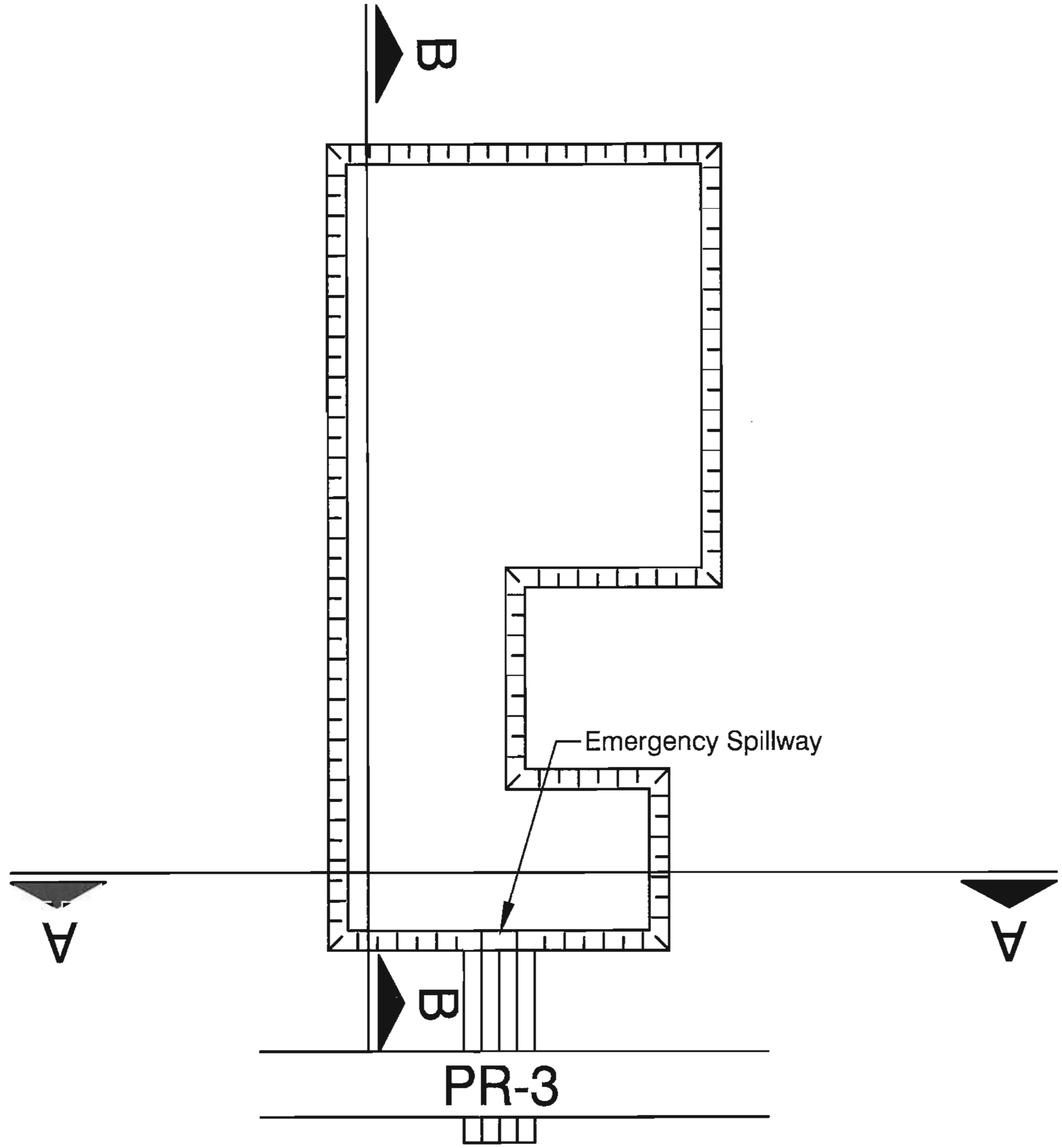


Figure 15: Schematic Design of Detention Pond 2



PLAN VIEW
NOT TO SCALE

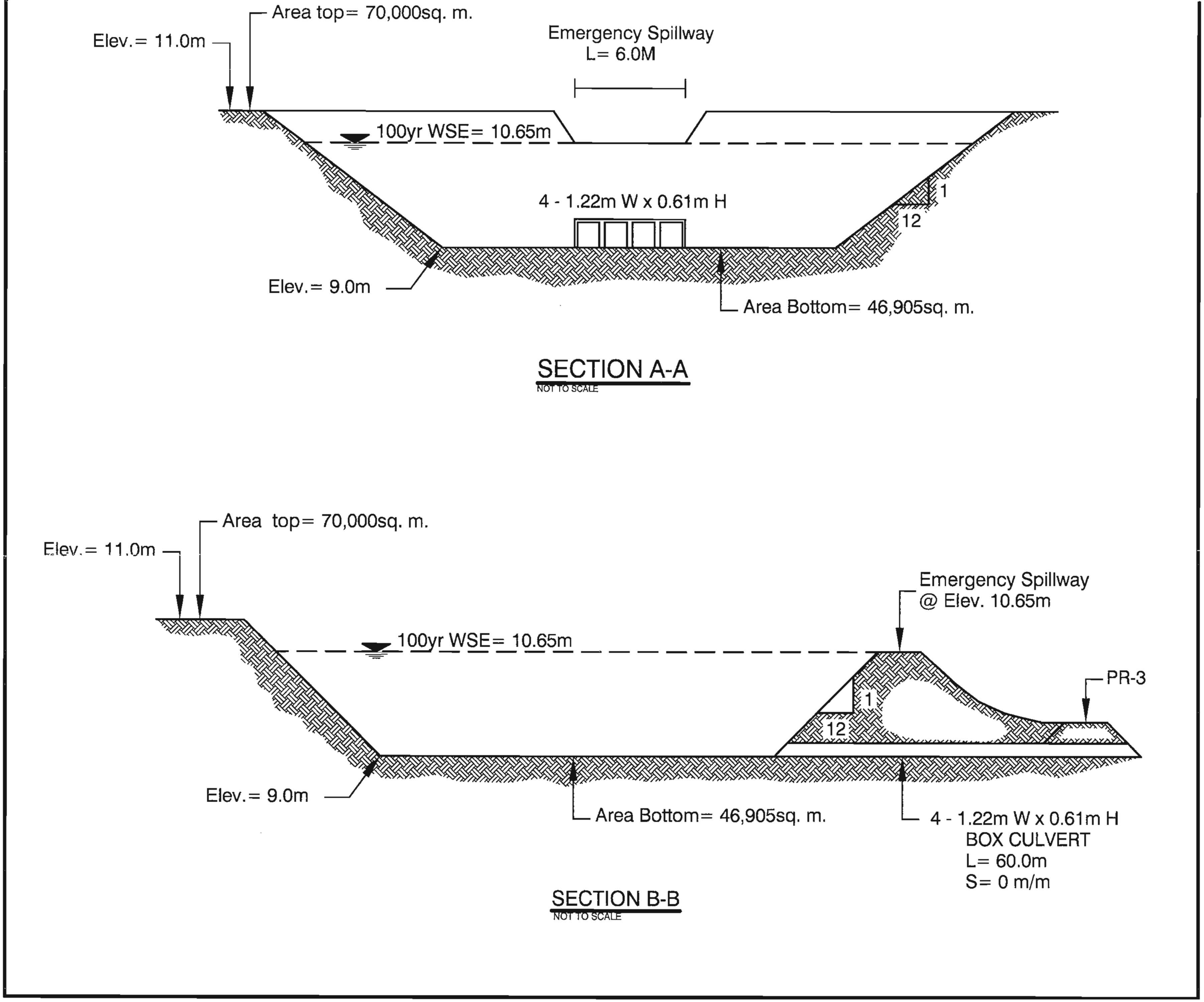
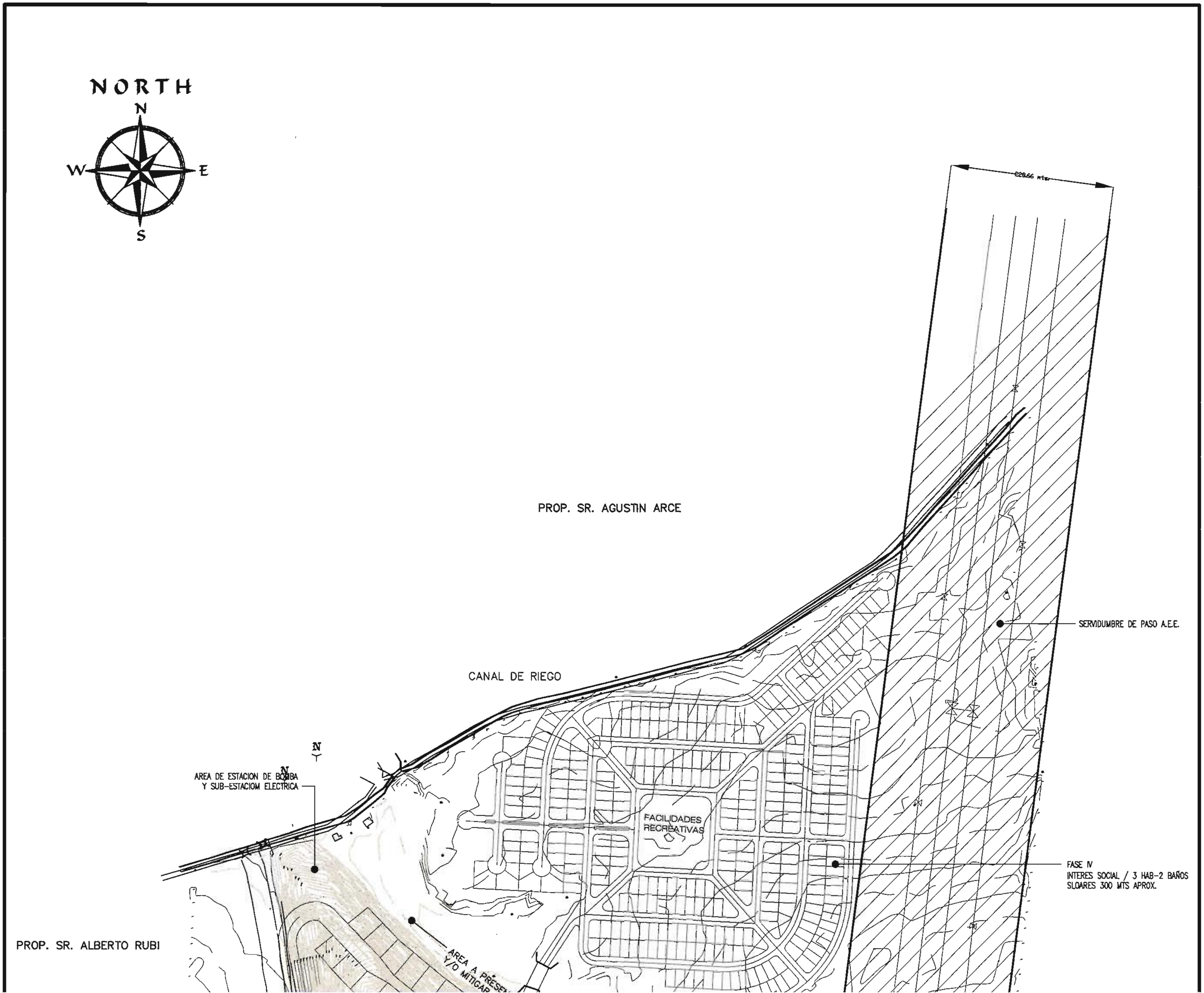


Figure 16: Schematic Design of Detention Pond 3



NORTH
N
W
E
S
228.66 mts.
PROP. SR. AGUSTIN ARCE
CANAL DE RIEGO
SERVIDUMBRE DE PASO A.E.E.
N
AREA DE ESTACION DE BOMBA
Y SUB-ESTACIOM ELECTRICA
FACILIDADES
RECREATIVAS
FASE IV
INTERES SOCIAL / 3 HAB-2 BAÑOS
SLOARES 300 MTS APROX.
PROP. SR. ALBERTO RUBI

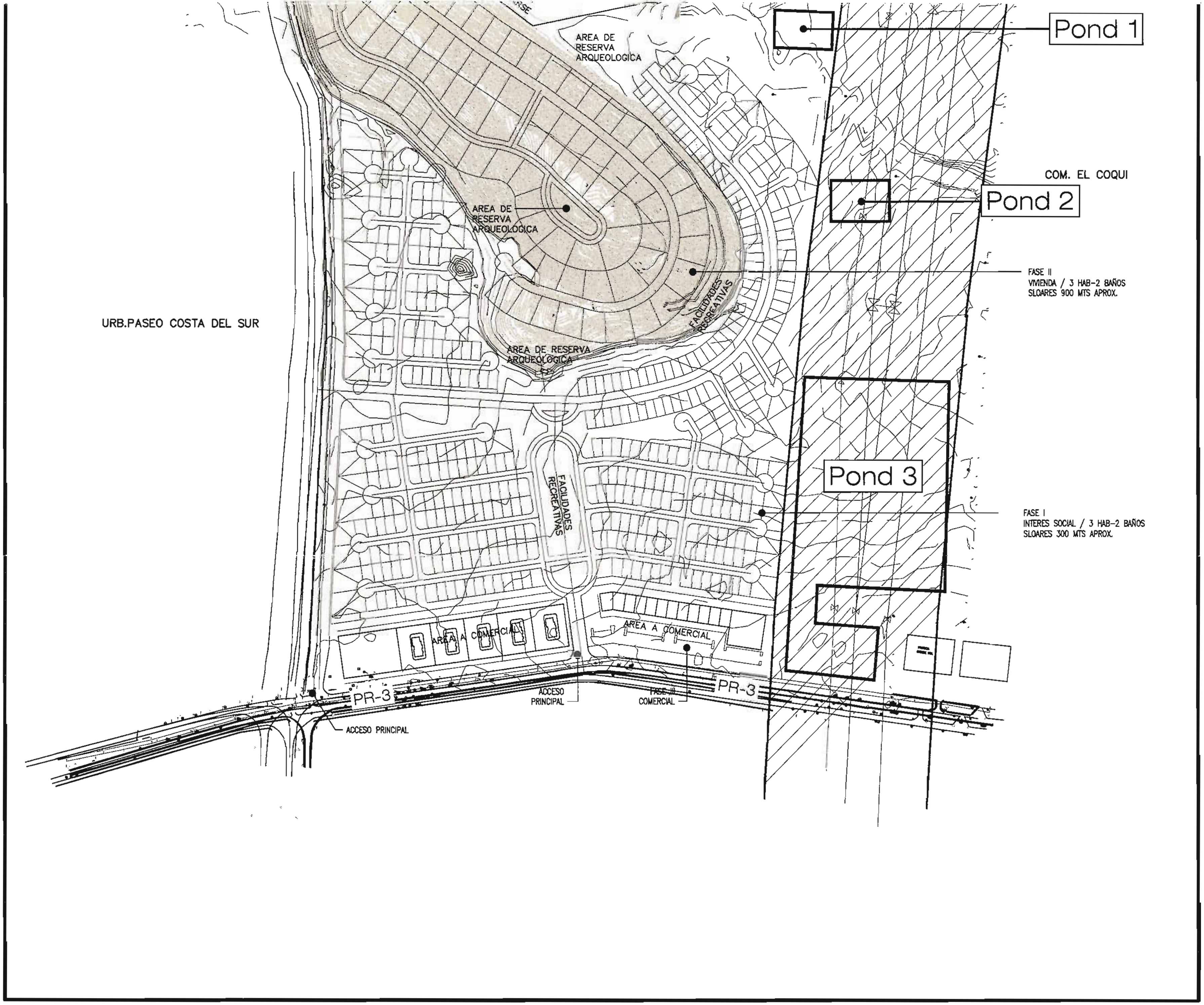
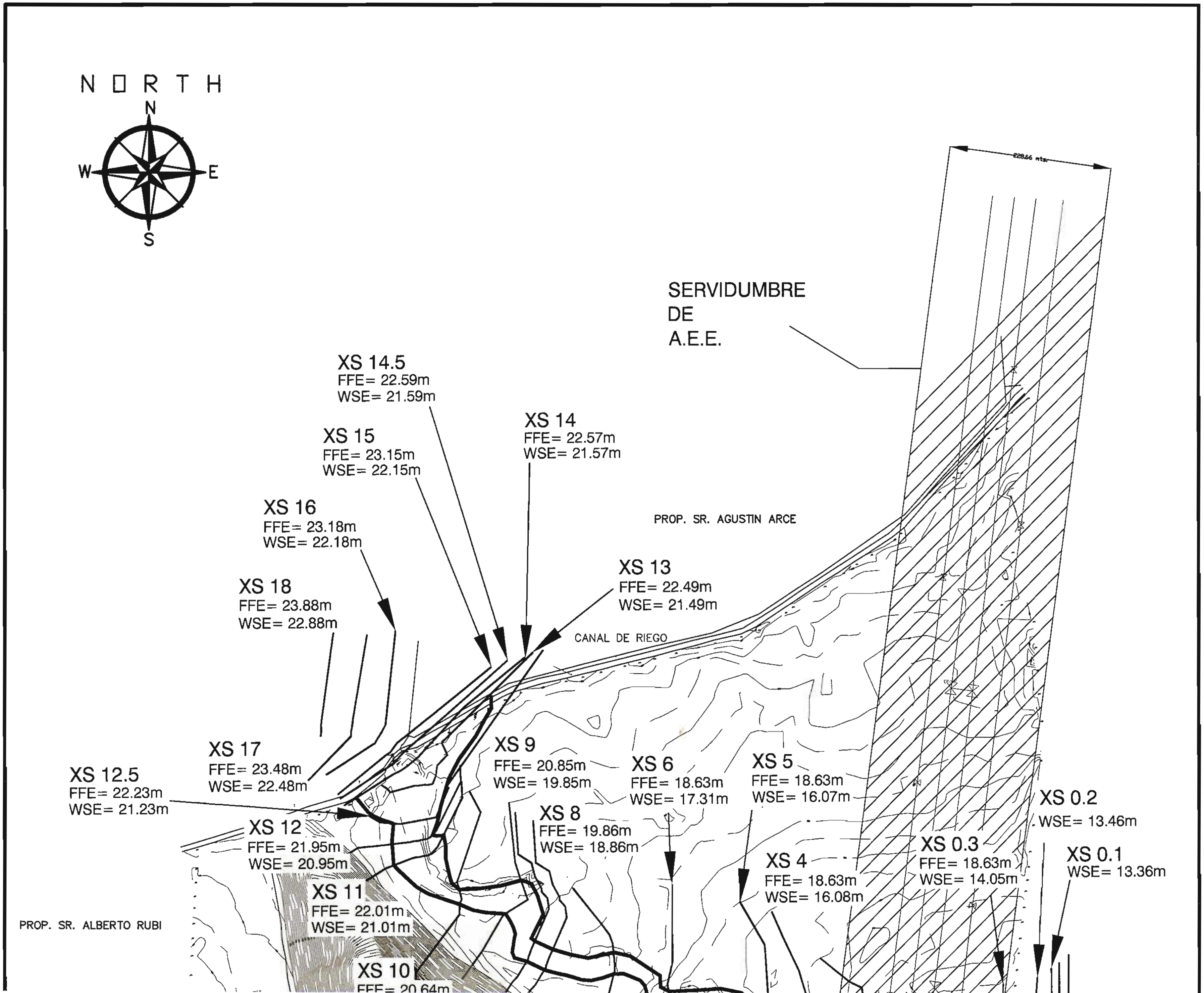


Figure 17: Location of Detention Ponds

Scale 1: 7,000


NORTH
N
W
E
S
SERVIDUMBRE
DE
A.E.E.
XS 14.5
FFE= 22.59m
WSE= 21.59m
XS 14
FFE= 22.57m
WSE= 21.57m
XS 15
FFE= 23.15m
WSE= 22.15m
XS 16
FFE= 23.18m
WSE= 22.18m
PROP. SR. AGUSTIN ARCE
XS 13
FFE= 22.49m
WSE= 21.49m
XS 18
FFE= 23.88m
WSE= 22.88m
CANAL DE RIEGO
XS 17
FFE= 23.48m
WSE= 22.48m
XS 9
FFE= 20.85m
WSE= 19.85m
XS 6
FFE= 18.63m
WSE= 17.31m
XS 5
FFE= 18.63m
WSE= 16.07m
XS 12.5
FFE= 22.23m
WSE= 21.23m
XS 0.2
WSE= 13.46m
XS 8
FFE= 19.86m
WSE= 18.86m
XS 12
FFE= 21.95m
WSE= 20.95m
XS 0.3
FFE= 18.63m
WSE= 14.05m
XS 0.1
WSE= 13.36m
XS 4
FFE= 18.63m
WSE= 16.08m
XS 11
FFE= 22.01m
WSE= 21.01m
PROP. SR. ALBERTO RUBI
XS 10

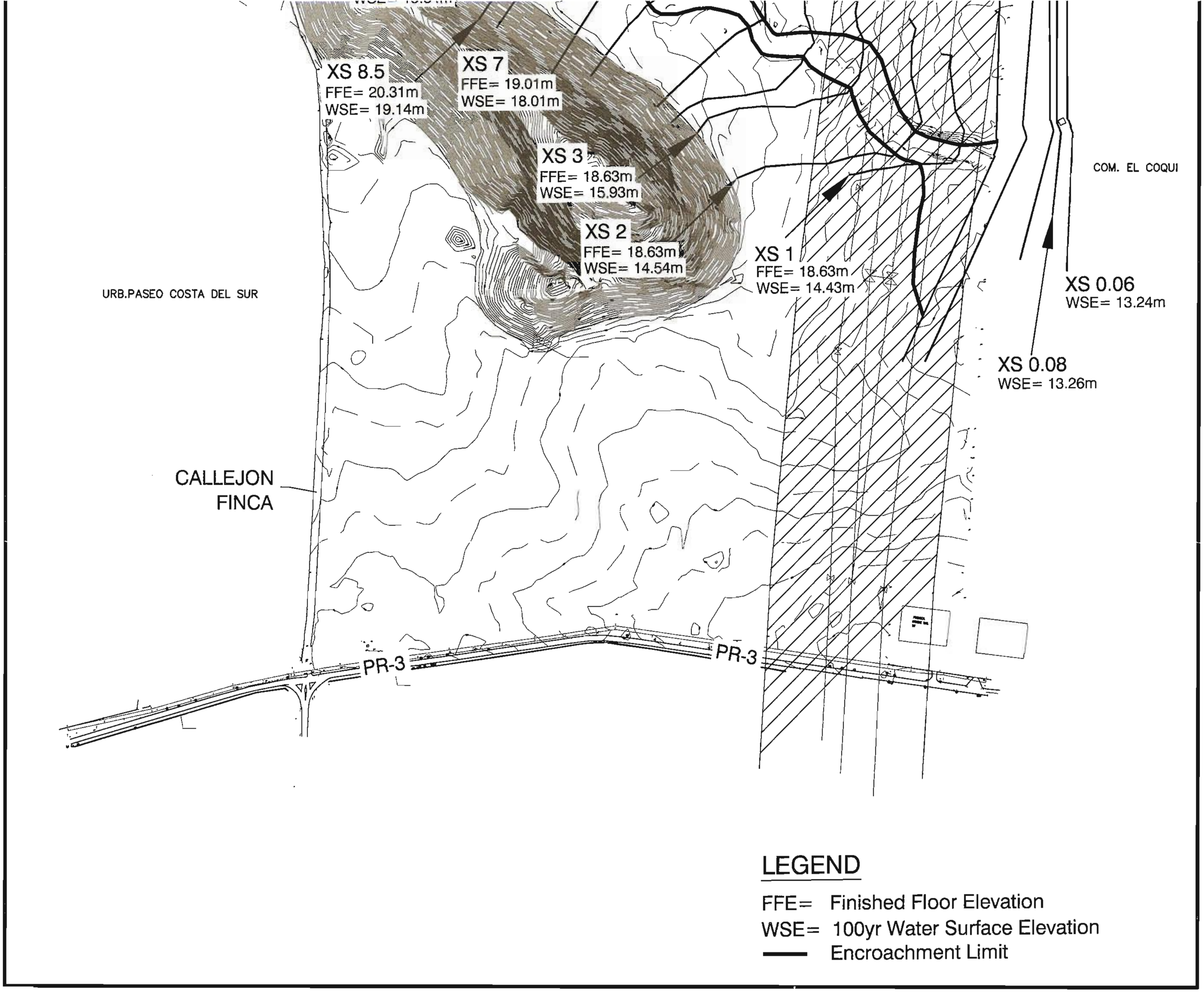


Figure 18: Minimum Finished Floor Elevation for the Proposed Project

Scale 1: 7,000

APPENDIX A:

adICPR Hydrologic Input and Output Files for Existing Condition

Salinas Development
Input Data
Existing Condition

```
================================================================================
==== Basins ====================================================================
================================================================================

        Name: Site1E                      Node: ex                      Status: Onsite
       Group: BASE                        Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh484                     Peaking Factor: 484.0
         Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
   Rainfall Amount(cm): 29.210                 Time of Conc(min): 37.00
              Area(ha): 47.350                   Time Shift(hrs): 0.00
          Curve Number: 83.00             Max Allowable Q(cms): 28316.822
               DCIA(%): 0.00

--------------------------------------------------------------------------------
        Name: Site2E                      Node: ex                      Status: Onsite
       Group: BASE                        Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh484                     Peaking Factor: 484.0
         Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
   Rainfall Amount(cm): 29.210                 Time of Conc(min): 40.00
              Area(ha): 31.200                   Time Shift(hrs): 0.00
          Curve Number: 75.00             Max Allowable Q(cms): 28316.822
               DCIA(%): 0.00

--------------------------------------------------------------------------------
        Name: Site3E                      Node: ex                      Status: Onsite
       Group: BASE                        Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh484                     Peaking Factor: 484.0
         Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
   Rainfall Amount(cm): 29.210                 Time of Conc(min): 20.00
              Area(ha): 55.280                   Time Shift(hrs): 0.00
          Curve Number: 74.00             Max Allowable Q(cms): 28316.822
               DCIA(%): 0.00

--------------------------------------------------------------------------------
        Name: Unnamed Creek               Node: ex                      Status: Onsite
       Group: BASE                        Type: SCS Unit Hydrograph

       Unit Hydrograph: Uh484                     Peaking Factor: 484.0
         Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
   Rainfall Amount(cm): 29.210                 Time of Conc(min): 130.00
              Area(ha): 1049.800                 Time Shift(hrs): 0.00
          Curve Number: 81.00             Max Allowable Q(cms): 28316.822
               DCIA(%): 0.00

================================================================================
==== Nodes =====================================================================
================================================================================

     Name:                  Base Flow(cms): 0.000          Init Stage(m): 0.000
```

```
     Group: BASE                                                  Warn Stage(m): 0.000
      Type: Stage/Area


       Stage(m)        Area(ha)
--------------- ---------------

==========================================================================================
==== Cross Sections ======================================================================
==========================================================================================


==========================================================================================
==== Operating Tables ====================================================================
==========================================================================================


==========================================================================================
==== Pipes ===============================================================================
==========================================================================================


==========================================================================================
==== Channels ============================================================================
==========================================================================================


==========================================================================================
==== Drop Strcutures =====================================================================
==========================================================================================


==========================================================================================
==== Weirs ===============================================================================
==========================================================================================


==========================================================================================
==== Bridges =============================================================================
==========================================================================================


==========================================================================================
==== Breaches ============================================================================
==========================================================================================


==========================================================================================
==== Rating Curves =======================================================================
==========================================================================================


==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: 100yr-24hrsde
     Filename: H:\Salinas\Salinas Develop\ICPR3\100yr-24hrsde.R32

      Override Defaults: No
```

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 10yr-24hrsde
Filename: H:\Salinas\Salinas Develop\ICPR3\10yr-24hrsde.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(cm): 19.05

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 1yr-24hrsde
Filename: H:\Salinas\Salinas Develop\ICPR3\1yr-24hrsde.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(cm): 8.89

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 25yr-24hrsde
Filename: H:\Salinas\Salinas Develop\ICPR3\25yr-24hrsde.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(cm): 23.37

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 2yr-24hrsde
Filename: H:\Salinas\Salinas Develop\ICPR3\2yr-24hrsde.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(cm): 11.68

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 50yr-24hrsde
Filename: H:\Salinas\Salinas Develop\ICPR3\50yr-24hrsde.R32

```
      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 25.91

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

----------------------------------------------------------------------------------------------------
         Name: 5yr-24hrsde
     Filename: H:\Salinas\Salinas Develop\ICPR3\5yr-24hrsde.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 16.51

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

==========================================================================================
==== Routing Simulations =================================================================
==========================================================================================
```

Salinas Development
Peak Discharges
Existing Condition

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
100yr-24hrsde	Site1E	BASE	12.25	783.162	9.342	*********
100yr-24hrsde	Site2E	BASE	12.27	444.180	8.273	*********
100yr-24hrsde	Site3E	BASE	12.09	1158.041	8.136	*********
100yr-24hrsde	Unnamed Creek	BASE	13.25	7003.980	9.093	*********
2yr-24hrsde	Site1E	BASE	12.25	243.884	2.807	*********
2yr-24hrsde	Site2E	BASE	12.27	113.070	2.125	*********
2yr-24hrsde	Site3E	BASE	12.09	293.778	2.046	*********
2yr-24hrsde	Unnamed Creek	BASE	13.25	2044.856	2.632	*********

APPENDIX B:

adICPR Hydrologic Input and Output Files for Proposed Condition

Salinas Development
Input Data
Proposed Condition

```
=====================================================================================
==== Basins =========================================================================
=====================================================================================

         Name: Site1P                    Node: Pond1                  Status: Onsite
        Group: BASE                      Type: Santa Barbara

          Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
     Rainfall Amount(cm): 29.210                 Time of Conc(min): 25.00
               Area(ha): 47.350                   Time Shift(hrs): 0.00
           Curve Number: 88.00              Time Increment(min): 1.00
                DCIA(%): 0.00              Max Allowable Q(cms): 28316.822

-------------------------------------------------------------------------------------
         Name: Site2P                    Node: Pond2                  Status: Onsite
        Group: BASE                      Type: Santa Barbara

          Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
     Rainfall Amount(cm): 29.210                 Time of Conc(min): 30.00
               Area(ha): 31.200                   Time Shift(hrs): 0.00
           Curve Number: 83.00              Time Increment(min): 1.00
                DCIA(%): 0.00              Max Allowable Q(cms): 28316.822

-------------------------------------------------------------------------------------
         Name: Site3P                    Node: Pond3                  Status: Onsite
        Group: BASE                      Type: Santa Barbara

          Rainfall File: Scsii-24             Storm Duration(hrs): 24.00
     Rainfall Amount(cm): 29.210                 Time of Conc(min): 15.00
               Area(ha): 55.280                   Time Shift(hrs): 0.00
           Curve Number: 86.00              Time Increment(min): 1.00
                DCIA(%): 0.00              Max Allowable Q(cms): 28316.822

=====================================================================================
==== Nodes ==========================================================================
=====================================================================================

      Name: bndry1             Base Flow(cms): 0.000            Init Stage(m): 15.520
     Group: BASE                                                Warn Stage(m): 0.000
      Type: Time/Stage

      Time(hrs)         Stage(m)
--------------- ---------------
          0.00          15.520
         24.00          15.520

-------------------------------------------------------------------------------------
      Name: bndry2             Base Flow(cms): 0.000            Init Stage(m): 14.500
     Group: BASE                                                Warn Stage(m): 0.000
      Type: Time/Stage
```

Time(hrs)	Stage(m)
0.00	14.500
24.00	14.500

Name: bndry3 Base Flow(cms): 0.000 Init Stage(m): 9.800
Group: BASE Warn Stage(m): 0.000
Type: Time/Stage

Time(hrs)	Stage(m)
0.00	9.800
24.00	9.800

Name: Pond1 Base Flow(cms): 0.000 Init Stage(m): 15.500
Group: BASE Warn Stage(m): 0.000
Type: Stage/Area

Stage(m)	Area(ha)
15.500	0.3004
18.000	0.4200

Name: Pond2 Base Flow(cms): 0.000 Init Stage(m): 14.500
Group: BASE Warn Stage(m): 0.000
Type: Stage/Area

Stage(m)	Area(ha)
14.500	0.3258
17.000	0.4500

Name: Pond3 Base Flow(cms): 0.000 Init Stage(m): 9.000
Group: BASE Warn Stage(m): 0.000
Type: Stage/Area

Stage(m)	Area(ha)
9.000	4.6900
11.000	7.0000

==== Cross Sections ====

Name: Group: BASE
Encroachment: No

Station(m)	Elevation(m)	Manning's N

==== Operating Tables ====

==== Pipes ====

```
         Name: outletpipe3        From Node: pond3            Length(m): 60.00
        Group: BASE                 To Node: bndry3               Count: 4
                                                      Friction Equation: Average Conveyance
              UPSTREAM         DOWNSTREAM            Solution Algorithm: Automatic
     Geometry: Rectangular     Rectangular                         Flow: Both
     Span(cm): 121.95          121.95               Entrance Loss Coef: 0.50
     Rise(cm): 60.96           60.96                    Exit Loss Coef: 1.00
    Invert(m): 9.000           9.000                    Bend Loss Coef: 0.00
  Manning's N: 0.013000        0.013000             Outlet Ctrl Spec: Use dc or tw
 Top Clip(cm): 0.000           0.000                 Inlet Ctrl Spec: Use dn
 Bot Clip(cm): 0.000           0.000               Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

Downstream FHWA Inlet Edge Description:
Rectangular Box: 30° to 75° wingwall flares

==== Channels ====

```
         Name:                    From Node:                  Length(m): 0.00
        Group: BASE                 To Node:                      Count: 1

              UPSTREAM         DOWNSTREAM             Friction Equation: Average Conveyance
     Geometry: Trapezoidal     Trapezoidal           Solution Algorithm: Automatic
    Invert(m): 0.000           0.000                               Flow: Both
 TClpInitZ(m): 3047.695        3047.695               Contraction Coef: 0.000
  Manning's N: 0.000000        0.000000                 Expansion Coef: 0.000
  Top Clip(m): 0.000           0.000                Entrance Loss Coef: 0.000
  Bot Clip(m): 0.000           0.000                    Exit Loss Coef: 0.000
   Main XSec:                                        Outlet Ctrl Spec: Use dc or tw
  AuxElev1(m):                                        Inlet Ctrl Spec: Use dn
    Aux XSec1:                                      Stabilizer Option: None
  AuxElev2(m):
    Aux XSec2:
 Top Width(m):
     Depth(m):
 Bot Width(m): 0.000           0.000
 LtSdSlp(h/v): 0.00            0.00
 RtSdSlp(h/v): 0.00            0.00
```

```
=========================================================================================
==== Drop Strcutures ====================================================================
=========================================================================================

        Name:                     From Node:                     Length(m): 0.00
       Group: BASE                  To Node:                         Count: 1

              UPSTREAM       DOWNSTREAM                   Friction Equation: Average Conveyance
     Geometry: Circular      Circular                    Solution Algorithm: Automatic
     Span(cm): 0.00          0.00                                      Flow: Both
     Rise(cm): 0.00          0.00                        Entrance Loss Coef: 0.000
    Invert(m): 0.000         0.000                           Exit Loss Coef: 0.000
  Manning's N: 0.000000      0.000000                      Outlet Ctrl Spec: Use dc or tw
 Top Clip(cm): 0.000         0.000                          Inlet Ctrl Spec: Use dn
 Bot Clip(cm): 0.000         0.000                            Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall



=========================================================================================
==== Weirs ==============================================================================
=========================================================================================

        Name: Spillway            From Node: pond3
       Group: BASE                  To Node: bndry3
        Flow: None                    Count: 1
        Type: Vertical: Mavis      Geometry: Rectangular

                   Span(cm): 600.00
                   Rise(cm): 35.00
                  Invert(m): 10.650
       Control Elevation(m): 10.650
                                                 TABLE
            Bottom Clip(cm): 0.000
               Top Clip(cm): 0.000
         Weir Discharge Coef: 2.650
      Orifice Discharge Coef: 0.850


-----------------------------------------------------------------------------------------
        Name: Weir1               From Node: Pond1
       Group: BASE                  To Node: bndry1
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Rectangular

                   Span(cm): 450.00
                   Rise(cm): 250.00
                  Invert(m): 15.500
       Control Elevation(m): 15.500
                                                 TABLE
            Bottom Clip(cm): 0.000
               Top Clip(cm): 0.000
```

```
         Weir Discharge Coef: 2.650
      Orifice Discharge Coef: 0.850

---------------------------------------------------------------------------------------------------
         Name: Weir2               From Node: Pond2
        Group: BASE                  To Node: bndry2
         Flow: Both                    Count: 1
         Type: Vertical: Mavis      Geometry: Rectangular

                    Span(cm): 220.00
                    Rise(cm): 250.00
                   Invert(m): 14.500
        Control Elevation(m): 14.500
                                                TABLE
              Bottom Clip(cm): 0.000
                 Top Clip(cm): 0.000
         Weir Discharge Coef: 2.650
      Orifice Discharge Coef: 0.850

==========================================================================================
==== Bridges =============================================================================
==========================================================================================

==========================================================================================
==== Breaches ============================================================================
==========================================================================================

==========================================================================================
==== Rating Curves =======================================================================
==========================================================================================

==========================================================================================
==== Hydrology Simulations ===============================================================
==========================================================================================

         Name: 100yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\100yr-24hrsdp.R32

      Override Defaults: No

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

---------------------------------------------------------------------------------------------------
         Name: 10yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\10yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 19.05

Time(hrs)       Print Inc(min)
```

```
--------------- ---------------
24.000          5.00

------------------------------------------------------------------------------------------------
         Name: 1yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\1yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 8.89

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

------------------------------------------------------------------------------------------------
         Name: 25yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\25yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 23.37

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

------------------------------------------------------------------------------------------------
         Name: 2yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\2yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 11.68

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

------------------------------------------------------------------------------------------------
         Name: 50yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\50yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 25.91

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

------------------------------------------------------------------------------------------------
         Name: 5yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\5yr-24hrsdp.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
```

```
          Rainfall File: Scsii-24
    Rainfall Amount(cm): 16.51

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

================================================================================
==== Routing Simulations =======================================================
================================================================================

         Name: 100yr-24hrsdp        Hydrology Sim: 100yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\100yr-24hrsdp.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

         Max Delta Z(m): 0.50                    Delta Z Factor: 0.00500
    Time Step Optimizer: 0.000
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

--------------------------------------------------------------------------------
         Name: 10yr-24hrsdp         Hydrology Sim: 10yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\10yr-24hrsdp.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

         Max Delta Z(m): 0.50                    Delta Z Factor: 0.00500
    Time Step Optimizer: 0.000
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

--------------------------------------------------------------------------------
         Name: 1yr-24hrsdp          Hydrology Sim: 1yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\1yr-24hrsdp.I32
```

```
      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(m): 0.50                   Delta Z Factor: 0.00500
   Time Step Optimizer: 0.000
      Start Time(hrs): 0.000                   End Time(hrs): 24.00
    Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
       Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

--------------------------------------------------------------------------------
         Name: 25yr-24hrsdp       Hydrology Sim: 25yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\25yr-24hrsdp.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(m): 0.50                   Delta Z Factor: 0.00500
   Time Step Optimizer: 0.000
      Start Time(hrs): 0.000                   End Time(hrs): 24.00
    Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
       Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

--------------------------------------------------------------------------------
         Name: 2yr-24hrsdp        Hydrology Sim: 2yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\2yr-24hrsdp.I32

      Execute: No          Restart: No            Patch: No
  Alternative: No

       Max Delta Z(m): 0.50                   Delta Z Factor: 0.00500
   Time Step Optimizer: 0.000
      Start Time(hrs): 0.000                   End Time(hrs): 24.00
    Min Calc Time(sec): 0.5000             Max Calc Time(sec): 60.0000
       Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
```

```
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

-----------------------------------------------------------------------------------------------
         Name: 50yr-24hrsdp        Hydrology Sim: 50yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\50yr-24hrsdp.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

         Max Delta Z(m): 0.50                    Delta Z Factor: 0.00500
    Time Step Optimizer: 0.000
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.000

Group           Run
--------------- -----
BASE            Yes

-----------------------------------------------------------------------------------------------
         Name: 5yr-24hrsdp         Hydrology Sim: 5yr-24hrsdp
     Filename: H:\Salinas\Salinas Develop\ICPR3\5yr-24hrsdp.I32

      Execute: No          Restart: No           Patch: No
  Alternative: No

         Max Delta Z(m): 0.50                    Delta Z Factor: 0.00500
    Time Step Optimizer: 0.000
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          0.500

Group           Run
--------------- -----
BASE            Yes
```

Salinas Development
Maximum Stages
Proposed Condition

Name	Group	Simulation	Max Time Stage hrs	Max Stage m	Warning Stage m	Max Delta Stage m	Max Surf Area m2	Max Time Inflow hrs	Max Inflow cms	Max Time Outflow hrs	Max Outflow cms
Pond1	BASE	100yr-24hrsdp	3.68	17.628	0.000	0.0025	4022	12.00	22.874	12.07	20.421
Pond2	BASE	100yr-24hrsdp	3.72	16.659	0.000	0.0025	4331	12.00	12.941	12.19	10.210
Pond3	BASE	100yr-24hrsdp	3.86	10.646	0.000	0.0020	65917	12.00	33.900	12.67	6.808

APPENDIX C:

Hec-Ras Hydraulic Input and Output files for Existing and Proposed Conditions

EXISTING CONDITION

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X    X  XXXXXX   XXXX        XXXX     XX     XXXX
X    X  X       X    X       X   X   X  X   X
X    X  X       X            X   X  X    X  X
XXXXXXX XXXX    X     XXX    XXXX   XXXXXX   XXXX
X    X  X       X            X X    X    X       X
X    X  X       X    X       X  X   X    X       X
X    X  XXXXXX   XXXX        X   X  X    X  XXXXX
```

PROJECT DATA
Project Title: Salinas Development-Mar06
Project File : SalinasMar06.prj
Run Date and Time: 3/7/2006 2:01:16 PM

Project in SI units

PLAN DATA

Plan Title: Existing
Plan File : C:\Projects\Salinas\Hec-Ras\SalinasMar06.p03

Geometry Title: EXISTING
Geometry File : C:\Projects\Salinas\Hec-Ras\SalinasMar06.g01

Flow Title : Salinas-Existing
Flow File : C:\Projects\Salinas\Hec-Ras\SalinasMar06.f01

Plan Summary Information:
Number of: Cross Sections = 63 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 6

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

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

FLOW DATA

Flow Title: Salinas-Existing
Flow File : C:\Projects\Salinas\Hec-Ras\SalinasMar06.f01

Flow Data (m3/s)

River	Reach	RS	100-yr	2-yr
Creek	1	18	198.3	57.9
Creek	1	0.2	305.2	89

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Creek	1	100-yr	Critical	Normal S = .005
Creek	1	2-yr	Critical	Normal S = .005

GEOMETRY DATA

Geometry Title: EXISTING
Geometry File : C:\Projects\Salinas\Hec-Ras\SalinasMar06.g01

CROSS SECTION RIVER: Creek
REACH: 1 RS: 18

INPUT
Description: XS 18
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-120	23	-30.66	21.88	-18.78	21.73	0	21.5	.9	21.35
8.9	19.98	14.5	19.54	19.7	21.33	19.9	21.4	20.87	21.73
21.2	21.84	23.7	22.71						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-120	.06	-30.66	.04	21.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-30.66	21.2	43	42.7	42.5	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 17

INPUT
Description: XS 17
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-119.6	23	-3.46	21.43	-3.2	21.43	0	21.38	2.7	20.92
3.05	20.86	10.5	19.59	15.9	19.45	19.04	20.85	19.17	20.91
20.3	21.41	20.31	21.41	22.2	22.26	107.16	22.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-119.6	.06	-3.2	.04	20.31	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-3.2	20.31	45	40	34.3	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 16

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-115.7	23	-29.2	21.47	0	20.96	1.8	20.72	11.2	19.47
24	19.62	27.3	20.67	28.24	20.97	29.76	21.45	31.2	21.91
100.8	22.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-115.7	.06	-29.2	.04	29.76	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-29.2	29.76	22.5	22	17.6	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 15

INPUT
Description: XS 15
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214.2	23	-156.7	22	0	21.44	5.5	21.57	5.9	21.42
7.58	20.81	8	20.66	11.7	19.32	28.2	19.7	31	20.61
31.98	20.93	33	21.26	35.6	21.31	49.4	21.42	121.79	22

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-214.2	.06	5.9	.04	49.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
5.9	49.4	15.5	14.9	15.5	.3	.5

BRIDGE RIVER: Creek
REACH: 1 RS: 14.7

INPUT
Description:
Distance from Upstream XS = 6.8
Deck/Roadway Width = 4.7
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
5.45	21.56		11.65	21.7	21.3	25.04	21.7	21.3
32.98	21.3							

Upstream Bridge Cross Section Data
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214.2	23	-156.7	22	0	21.44	5.5	21.57	5.9	21.42
7.58	20.81	8	20.66	11.7	19.32	28.2	19.7	31	20.61
31.98	20.93	33	21.26	35.6	21.31	49.4	21.42	121.79	22

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-214.2	.06	5.9	.04	49.4	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
5.9	49.4	.3	.5

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
3	21.4		8	21.7	21.3	21.4	21.7	21.3
23.9	21.4							

Downstream Bridge Cross Section Data

Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-184.9	22	0	21.12	3.1	21.02	3.3	20.97	4.78	20.61
10.3	19.25	20	19.39	21.44	19.77	23.73	20.38	23.9	20.42
28.1	20.35	35.37	20.54	58.1	20.91	125.97	22		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-184.9	.06	3.3	.04	58.1	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
3.3	58.1	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 18.35 Downstream= 14.7
Upstream num= 2

Width	Elev	Width	Elev
.27	0	.27	22

Downstream num= 2

Width	Elev	Width	Elev
.27	0	.27	22

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Creek
REACH: 1 RS: 14.5

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-184.9	22	0	21.12	3.1	21.02	3.3	20.97	4.78	20.61
10.3	19.25	20	19.39	21.44	19.77	23.73	20.38	23.9	20.42
28.1	20.35	35.37	20.54	58.1	20.91	125.97	22		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-184.9	.06	3.3	.04	58.1	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
3.3	58.1	10.9	10.9	10.9	.3	.5

CROSS SECTION RIVER: Creek
REACH: 1 RS: 14

INPUT
Description: XS 14
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-190	22	0	21	8	20.95	14.2	20.91	15.94	20.59
16.4	20.5	18.9	20	23.7	19.5	34.1	19.02	45.1	19.8
53.44	20.6	56.8	20.92	59	20.95	137.72	22		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-190	.06	8	.04	59	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
8	59	28	32.2	25.9	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 13

INPUT
Description: XS 13
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-178.4	22	0	21	15.8	20.5	52.5	20.5	72.7	20.62
76.2	18.77	85.4	19.19	91.2	20.54	122	20.5	125.7	20.25
131.2	20.5	142	21	197	22				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-178.4	.06	72.7	.04	91.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
72.7	91.2	23.5	47	43.8	.1	.3

Left Levee Station= 72.7 Elevation= 20.62
Right Levee Station= 91.2 Elevation= 20.54

CROSS SECTION RIVER: Creek
REACH: 1 RS: 12.5

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-231	22	0	20.5	55.5	20.38	56.25	19.79	58.9	17.69
61.5	17.96	63.14	19.26	68.5	19.18	77.5	19.67	81.25	19.79
93.51	20.17	96.6	20.4	126.3	20.5	143.5	21		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-231	.06	55.5	.04	96.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
55.5	96.6	10.3	27.2	32.3	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 12

INPUT
Description: Copy of XS 11
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-193	23	0	20.36	68.9	20.14	110.3	20.1	114.2	19.6

115.9	20.06	116.35	19.81	117.11	19.38	117.6	19.1	122	18.69
126.6	18.65	128.6	17.74	130.8	17.56	132.7	18.22	138.4	19.62
148.24	19.84	175.6	20.44	212.3	21	225.9	22	230.4	23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-193	.06	116.35	.04	148.24	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
116.35	148.24	11.9	22.3	36.2	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 11

INPUT
Description: XS 11
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-248	22	0	20.26	68.9	20.04	110.3	20	114.2	19.5
115.9	19.96	116.36	19.7	117.11	19.28	117.6	19	122	18.59
126.6	18.55	128.6	17.64	130.8	17.46	132.7	18.12	138.4	19.52
144.2	19.66	178.6	20.49	194.2	21	202.6	22	210.3	24

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-248	.06	116.36	.04	144.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
116.36	144.2	36.5	87.5	123.4	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 10

INPUT
Description: XS 10
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	20	10.2	19.84	33.7	19.8	131.4	19.5	134.9	19
145.1	18.5	148.2	18.24	151	18	159.2	17.42	160.6	16.43
165.3	17.3	166.2	18.26	166.3	18.37	167.9	20.08	181.3	19.5
211.4	20	227	21	232.1	22	239.1	24	246.4	26
253.4	28	264.2	31	267.8	32	279.1	36	283.7	38

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	145.1	.04	166.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
145.1	166.3	65.2	88.9	56.3	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 9

INPUT
Description: XS 9
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-70	21	0	19.5	43.4	19.39	99.8	19.49	107.7	18
125.1	17.46	136.96	17.1	141.4	15.66	145.4	15.6	151	16.93
155.1	17.46	158.1	17.84	162.76	18.03	165.9	18.15	174	18.37
179.4	19.3	236.6	19	265.8	21	273.1	23	284	26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-70	.06	107.7	.04	162.76	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

107.7	162.76	19	107	61	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 8.5

INPUT
Description: XS 8.5
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19.31	58.5	19.28	80.5	19.22	99.5	19.2	117.8	19.13
123.5	19.1	134.9	19.04	150	18.86	198.3	18.94	206.3	17.33
209	16.78	213.8	15.24	219.3	15.2	221.2	17.04	222.1	17.27
228.9	19.05	231.3	18.56	264.7	18.63	276.2	19.13	287.8	21.13
291	22.13	294.1	23.13	297.3	24.13	304	26.13	306.6	27.13
313.6	29.13	319.6	31.13	326	33.13	336	36.13		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	206.3	.04	222.1	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

206.3	222.1	27.8	27.8	27.8	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 8

INPUT
Description: XS 8
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19.18	58.5	19.15	80.5	19.09	99.5	19.07	117.8	19
123.5	18.97	134.9	18.91	150	18.73	198.3	18.81	206.3	17.2
209	16.65	213.8	15.11	219.3	15.07	221.2	16.91	222.1	17.14
228.9	18.92	231.3	18.43	264.7	18.5	276.2	19	287.8	21
291	22	294.1	23	297.3	24	304	26	306.6	27
313.6	29	319.6	31	326	33	336	36		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	206.3	.04	222.1	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

206.3	222.1	56.5	103.6	98	.1	.3

Right Levee Station= 228.9 Elevation= 18.92

CROSS SECTION RIVER: Creek
REACH: 1 RS: 7

INPUT
Description: XS 7
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	19	62.6	18.51	80.8	18.24	93.6	18.27	104.7	17.5
107.5	16.66	109.8	15.97	112.5	14.14	117	13.77	121.3	16.84
125.3	17.28	129.2	17.34	131	17.39	169.4	17.83	229.6	18
243.2	19	248.9	21	252	22	257.8	24	263.9	26
269.4	28	277.5	31	285.6	34	294	37	299.7	39
304.5	41	306.9	42						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	107.5	.04	121.3	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
107.5 121.3 96.3 102.3 53.5 .1 .3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 6

INPUT
Description: XS 6
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	17.47	47.3	17.4	68.4	17.38	106.8	17.29	127.7	17
139.6	16.5	148.45	16.15	155.78	15.86	169.8	15.31	174.1	15.64
177.4	14.21	184.3	14.71	185.8	15.69	186.3	16.02	188.8	17.64
190.9	17.38	229.6	17.5	272.8	18	282.7	19	288.8	21
294.7	23	316.8	31						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	148.45	.04	186.3	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
148.45 186.3 131.9 163.1 110.8 .1 .3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 5

INPUT
Description: XS 5
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	16.5	19.7	16.09	40.4	16	68.7	15.75	138.7	15.56
181.6	16	188.7	14.4	189.6	14.2	190.9	13.91	192.7	13.02
194.8	12.69	199	12.26	199.5	13.36	201.9	13.55	206.5	14.28
208.3	14.56	211.8	15.54	220.1	15.25	226.4	16.05	229.7	16.38
265.4	16.5	352.9	17.5	360.8	18	364.4	19	372.8	22
378.1	24								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	188.7	.04	208.3	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
188.7 208.3 41.8 100.9 65 .1 .3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 4

INPUT
Description: XS4
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	16	37.7	15.55	90.5	15.73	134.8	15.55	176.5	15.72
189.7	14.33	193.8	13.9	204.9	12.73	209.5	11.89	213.3	12.34
217.6	13.06	225.1	13.88	228.2	14.22	228.6	14.31	233.7	15.52
239.6	16.63	289.8	15.8	306.8	16	334.5	16.5	388.3	17
397.8	17.02	431.6	18	434.8	19	442.2	21	448.9	23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	189.7	.04	228.6	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
189.7 228.6 80.2 80.9 29 .1 .3
Left Levee Station= 176.5 Elevation= 15.72

CROSS SECTION RIVER: Creek
REACH: 1 RS: 3

INPUT
Description: XS 3
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	15.5	52.6	15	120.9	14.8	137.6	14.78	155.3	14.73
205.5	14.92	207.6	13.97	208.3	13.65	211.2	12.33	212.6	11.62
212.8	11.38	218.25	11.63	218.5	11.87	222.3	12.81	227.6	13.9
228.5	14.1	232.4	14.94	236.6	14.67	249.7	16	263.1	16
274.6	15.5	285.5	15.5	313.4	15.81	338.2	15.96	360.2	16.18
394.1	16.7	436.5	17	462.7	18				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	207.6	.04	228.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
207.6	228.5	79.2	106.7	99.2	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 2

INPUT
Description: XS 2
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-103.5	15.5	0	14	82.4	13.85	148.7	13.67	156.6	13.84
162.3	14.79	164.63	13.51	167.8	11.78	177.3	11.37	177.8	12.12
179.5	12.91	184.5	13.39	186.2	13.55	190.8	14	238.2	14
273.5	14.5	304.03	15	340.8	15.5	391.9	16	435.7	16.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-103.5	.06	164.63	.04	186.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
164.63	186.2	55.5	69.8	36.3	.1	.3

Left Levee Station= 162.29 Elevation= 14.79

CROSS SECTION RIVER: Creek
REACH: 1 RS: 1

INPUT
Description: XS 1
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	13.5	14.1	13.32	30.8	13.32	91.2	13.01	121.1	13.17
127.1	14	137.2	15.09	139.5	14.42	141.3	13.34	144.5	11.41
155.2	11.29	165.1	13.5	231.5	13.38	254.9	13.5	281.3	14
306.7	14.37	315	14.5	407	16				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	141.3	.04	165.1	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
141.3	165.1	46.4	50.3	65.6	.1	.3

Left Levee Station= 137.2 Elevation= 15.09

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.3

INPUT

Description: XS 0.3
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-336	15	-235	14	-33	13	0	13.69	2.61	13.78
4.34	13.08	4.55	13	9.5	11	11.3	10.92	19.12	10.99
22.3	12.99	22.44	13.08	23.9	14	27.2	13.91	96.17	13
218	14	300	15						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-336	.06	4.34	.04	22.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
4.34	22.3	41.3	49.4	51.7	.1	.3

Right Levee Station= 23.9 Elevation= 14

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.2

INPUT
Description: XS 0.2
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-320	15	-218	14	-96	13	0	12.59	5	12.68
9.08	10.74	14.46	10.92	18.8	12.57	155	13	277	14
352	15								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-320	.06	5	.04	18.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
5	18.8	38.8	38.8	39	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.1

INPUT
Description: XS 0.1
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-218.6	14	-44.8	12.81	-28.55	12.7	0	12.44	2.9	12.53
6.2	10.71	11.2	10.78	15.1	12.55	15.38	12.68	16.3	13.1
134.36	12	255	13	362	14				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-218.6	.06	-44.8	.04	15.38	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-44.8	15.38	56	43	51	.1	.3

Right Levee Station= 16.3 Elevation= 13.1

CROSS SECTION RIVER: Creek
REACH: 1 RS: .08

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-447	16	-388	15	-307	14	-147	13	0	12.57
1.7	12.6	2.68	10.7	8.65	10.7	9.14	12.6	10.26	12.62
225	11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-447	.06	1.7	.04	9.14	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1.7	9.14	9.2	9.2	9.2	.3	.5

BRIDGE RIVER: Creek
REACH: 1 RS: .07

INPUT
Description:
Distance from Upstream XS = .1
Deck/Roadway Width = 9
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
1.7	12.6		2.68	12.6	12.23	8.65	12.6	12.16
9.14	12.6							

Upstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-447	16	-388	15	-307	14	-147	13	0	12.57
1.7	12.6	2.68	10.7	8.65	10.7	9.14	12.6	10.26	12.62
225	11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-447	.06	1.7	.04	9.14	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
1.7	9.14	.3	.5

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
2.3	12.6		2.77	12.6	12.15	9.78	12.6	12.14
10.18	12.57							

Downstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-476	16	-410	15	-327	14	-185	13	-28	12
0	12.77	2.3	12.6	2.77	10.66	9.78	10.63	10.18	12.57
14.03	12.97	216	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-476	.06	2.3	.04	10.18	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
2.3	10.18	.3	.5

Left Levee Station= 0 Elevation= 12.77
Right Levee Station= 14.03 Elevation= 12.97

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Creek
REACH: 1 RS: .06

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-476	16	-410	15	-327	14	-185	13	-28	12
0	12.77	2.3	12.6	2.77	10.66	9.78	10.63	10.18	12.57
14.03	12.97	216	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-476	.06	2.3	.04	10.18	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2.3	10.18	42	42	42	.3	.5

Left Levee Station= 0 Elevation= 12.77
Right Levee Station= 14.03 Elevation= 12.97

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.059

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-564	16	-499	15	-414	14	-295	13	-107	12
0	12.86	.91	13.24	4.88	10.12	11.5	10.17	15.35	13.11
16.62	12.85	139	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-564	.06	.91	.04	15.35	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
.91	15.35	34	34	34	.1	.3

Left Levee Station= .91 Elevation= 13.24
Right Levee Station= 15.35 Elevation= 13.11

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.058

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-645	16	-558	15	-480	14	-409	13	-342	12.4
-188	12	0	12.13	5.4	10.76	11.6	10.75	16.1	12.23
16.7	12.42	100.5	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-645	.06	0	.04	16.1	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	16.1	10.2	10.2	10.2	.3	.5

Right Levee Station= 16.7 Elevation= 12.42

BRIDGE RIVER: Creek
REACH: 1 RS: 0.0575

INPUT
Description:
Distance from Upstream XS = 1.5
Deck/Roadway Width = 8.6
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	12.13		5.4	12.23	11.75	11.6	12.22	11.75
16.1	12.23							

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-645	16	-558	15	-480	14	-409	13	-342	12.4
-188	12	0	12.13	5.4	10.76	11.6	10.75	16.1	12.23
16.7	12.42	100.5	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-645	.06	0	.04	16.1	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	16.1	.3	.5

Right Levee Station= 16.7 Elevation= 12.42

Downstream Deck/Roadway Coordinates
num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	12.22		4.2	12.22	11.75	11.47	12.22	11.76
14.76	12.23		15.91	12.23				

Downstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-693	16	-589	15	-511	14	-437	13	-278	11.9
0	12.22	4.2	10.75	11.47	10.77	14.76	12.23	15.91	12.23
18.91	12.03	52	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-693	.06	0	.04	14.76	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	14.76	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.057

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-693	16	-589	15	-511	14	-437	13	-278	11.9
0	12.22	4.2	10.75	11.47	10.77	14.76	12.23	15.91	12.23
18.91	12.03	52	11						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-693	.06	0	.04	14.76	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	14.76	38	38	38	.3	.5

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.056

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-733	16	-622	15	-544	14	-471	13	-394	12
-266	11.7	-61	10	0	11.44	2.16	12.01	5.36	9.49
12.01	9.57	15.58	11.12	17.19	11.25	210	10		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-733	.06	2.16	.04	15.58	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2.16	15.58	53	53	53	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.055

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-763	16	-658	15	-572	14	-496	13	-394	12
-229	11.2	-63	11	0	11.15	.77	11.23	3.62	8.99
10.4	9.06	13.04	10.75	14.16	11.07	150	10		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-763	.06	.77	.04	13.04	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
.77	13.04	51	51	51	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.054

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-771	16	-674	15	-580	14	-493	13	-406	12
-324	11	-182	10.9	0	10.29	2.35	11.03	4.87	8.89
12.3	8.89	15.15	10.83	16.95	10.94	114	10		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-771	.06	2.35	.04	15.15	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2.35	15.15	28	26	24	.1	.3

CROSS SECTION RIVER: Creek
REACH: 1 RS: .0535

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-780	16	-676	15	-578	14	-494	13	-415	12
-332	11	-169	10.8	0	11.21	1.9	11.29	6.7	9.4
13.4	9.4	18.08	11.3	22.88	10.96	74	10		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-780	.06	1.9	.04	18.08	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1.9	18.08	9.1	9.1	9.1	.3	.5

Right Levee Station= 18.08 Elevation= 11.3

BRIDGE RIVER: Creek
REACH: 1 RS: 0.0533

INPUT
Description:
Distance from Upstream XS = .7
Deck/Roadway Width = 8.3
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
1.9	11.29		6.7	11.29	10.67	13.4	11.29	10.69
22.9	10.96							

Upstream Bridge Cross Section Data
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-780	16	-676	15	-578	14	-494	13	-415	12
-332	11	-169	10.8	0	11.21	1.9	11.29	6.7	9.4
13.4	9.4	18.08	11.3	22.88	10.96	74	10		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-780	.06	1.9	.04	18.08	.06

Bank Sta: Left Right Coeff Contr. Expan.
1.9 18.08 .3 .5
Right Levee Station= 18.08 Elevation= 11.3

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
3.6	11.1		9.51	11.1	10.47	15.6	11.1	10.45
24.4	10.84							

Downstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-794	16	-682	15	-581	14	-500	13	-425	12
-342	11	-160	10.5	0	11.17	3.6	11.1	9.51	9.2
15.6	9.18	24.5	10.84	119	9				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-794	.06	3.6	.04	24.5	.06

Bank Sta: Left Right Coeff Contr. Expan.
3.6 24.5 .3 .5
Right Levee Station= 24.5 Elevation= 10.84

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 10.05 Downstream= 12.56
Upstream num= 2

Width	Elev	Width	Elev
.2	0	.2	100

Downstream num= 2

Width	Elev	Width	Elev
.2	0	.2	100

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Creek
REACH: 1 RS: 0.053