Santa Cruz River
Paseo de Las Iglesias,
Pima County, Arizona
Feasibility Study

Hydraulic Report

November 2001

Prepared by

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Pima County Department of Transportation
and Flood Control District

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I INTRODUCTION

The Paseo de Las Iglesias Study Area is traversed by several watercourses including the Santa Cruz River (SCR) and the West Branch of the Santa Cruz River (WBSCR). The study area is located between the Los Reales Road alignment and Congress Street within Township 14, Range 13, Sections 14, 22-24, 25-27, 34 and 35, as well as Township 15, Range 13, Sections 2-3, 10-11, 14, and 15 (Figure 1). Five separate studies contain hydraulic data for the watercourses traversing and immediately adjacent to this reach. This report summarizes the available hydraulic information, including HEC-2 analyses, work maps, and hydraulic information for bridges and culverts within and adjacent to the study area. Much of the information sited is available within the attached appendices.

II DESCRIPTION OF CURRENT HYDRAULIC STUDIES

1.1 The most recent SCR **Flood Insurance Study** (FIS) that includes the Paseo de Las Iglesias study area was performed on March 26th, 1990, by CMG Drainage Engineering Inc. The CMG Drainage Engineering study area covers the reach of the SCR downstream of the I-19 bridge (south of the study area) north past Congress Street through Tucson (Figure 1). The FIS was issued by the Federal Emergency Management Agency (FEMA) on February 8, 1999. The peak discharges of the SCR at both Drexel Road and Congress Street are reported to be 16800, 41000, 60000, and 93000 cfs for the 10-, 50-, 100-, and 500-year flood events, respectively. The drainage areas at Drexel Road and Congress Street are 2101 and 2222 square miles, respectively. The cross section elevations were determined using the 1984, 1"=200' aerial topography maps with a 2' contour interval based on the North American Vertical Datum (NAVD) 1929. The complete set of mylars of these orthophoto-topographic maps with floodplain delineations is available through the Pima County Department of Transportation, Mapping and Records Division. The FIS document is available through the FEMA Publication Center. Although no formal written report was prepared, CMG Drainage Engineering Inc. provided the input files for the HEC-2 analyses. A diskette containing the HEC-2 model input files for the 10-, 50-, 100-, and 500-year floodplain (PC25uf5.DAT) and the floodway (PC25ux5.DAT) for the Santa Cruz River from the I-19 bridge to Camino Del Cerro are available in Appendix 1.

1.2 **Master Drainage Study, Tohono O'odham Nation-San Xavier District Phase 1- Panhandle Area Existing Conditions** was prepared by McGovern, MacVittie, Lodge, and Associates, Inc. (MMLA) on July 31, 2001. The area studied is immediately adjacent to the south and west of the Paseo de Las Iglesias study area (Figure 1). Hydraulic information contained in this report includes details regarding four culvert crossings on Valencia Road, the Los Reales Improvement District collector and conveyance channels, and floodplain analysis utilizing HEC-RAS.

The culvert under Valencia Road at Valencia Wash (west of the Master Drainage Study area) is a seven-cell, 10' x 6' RCBC, with a design capacity (Q_{Design}) of 5257 cfs, which

will fully contain 100-year flood discharge (Q_{100}) of 3680 cfs. A single-cell 10' x 4' RCBC culvert at the southwest corner of Mission Road and Valencia Road conveys flows under Valencia Road into a concrete lined channel that conveys flows into the WBSCR. The Q_{Design} of 360 cfs is sufficient to pass the Q_{100} of 251 cfs, assuming all flow will concentrate at the headwall of the culvert. A three-cell, 71" x 47" CMPA is located in the historic alignment of the WBCSR at Valencia and Mission Road, 900' west of the WBSCR channel realignment. The Q_{Design} of 512 cfs conveys low flows under Valencia Road. The final culvert documented in this MMLA report conveys the flows from the relocated WBSCR under Valencia Road, east of Mission Road. It is a ten-cell 12' x 8' RCBC with upstream channel improvements. The Q_{Design} of 8000 cfs could pass the Q_{100} of 6900 cfs, as determined in this MMLA Master Drainage Study, under Valencia road without breakout, except earthen berms near the relocated WBSCR prevent some runoff from entering the channel, contributing to a wide floodplain in the area. This relocated WBSCR culvert design was also analyzed in the Midvale Park Master Drainage Report, which is presented in Section 1.4 (below).

Collector and conveyance channels information described in the MMLA Master Drainage Study are based on information more completely documented in the Arroyo Engineering Inc. report described in section 1.3 (below). HEC-RAS analyses of the floodplains in the Panhandle Study Area were performed based on discharges obtained from Manning Equation calculations. Topographic mapping based on aerial topography taken November 15, 1992 was completed by Kucera International Inc., with a horizontal scale of 1"=200' and a vertical contour interval of 2', based on NAVD 1929. A summing of hydrographs was done to obtain the 100-year discharge of 6809 cfs for Mission Wash upstream of Valencia Road. The HEC-RAS output files, as well as maps showing cross section locations are included in Appendix 2.

1.3 The **Request for a Letter of Map Revision for the Los Reales Improvement District Located in Pima County, Arizona, and the City of Tucson, Arizona** report was completed by Arroyo Engineering Inc. in December of 1994. This Letter of Map Revision (LOMR) was approved by FEMA prior to the issuance of the February 8, 1999 FIS, so the information contained in the current FIS reflects this LOMR. The Los Reales Improvement District (LRID) is located south of Valencia Road, entirely within Section 15 of Township 15 South, Range 13 East (Figure 1). The report contains detailed hydraulic analysis based on existing conditions including a new floodwall and associated drainage channels. The ground-profile data for the eastern portion of the report was based on 1984 Cooper Aerial Survey Co. aerial topographic maps, and the western portion was based on the 1986, McLain Aerial Surveys aerial topography maps. Both map sets have a horizontal scale of 1"=200' and a 2' contour interval based on NAVD 1929. Two HEC-2 models were assembled. The first detailed the depth of ponding against the floodwall, determined flood depths south of Valencia Road along the WBSCR, and performed split flow analysis to differentiate water flowing into the South Channel or westward into the SCR. The second HEC-2 model and split flow analysis was used to predict water surface elevations in the South Channel, and quantify the amount of floodwater that will either flow northward along Indian Agency Road, or eastward in the South Channel.

Ground profile data used to represent the improved portions of the South Channel were taken from field survey data and approved constructions plans. In evaluating breakout flows, a value of 2.6 was assigned to the weir-loss coefficient "C" to represent the flow over the roadways and channel levees. Areas of ineffective flow downstream of channel expansions were assigned specific cross sections, and an expansion ratio of 4:1 was used to delineate these areas. A 100-year peak discharge of 7638 cfs (determined by Buck Lewis and Associates, Inc., 1982) was used to establish flood heights for the WBSCR.

Based on the split flow calculations, output data predicted that 3131 cfs will flow northward in the "West Branch Channel" (WBSCR) during a 100-year flood, 3308 cfs will flow northward from the Reservation into the South Channel, and 1199 cfs will flow directly eastward into the SCR. A split flow calculation performed on the 3131 cfs flowing northward in the WBSCR predicted that approximately 219 cfs and 123 cfs will breakout at two locations and sheet flow to the east. This 342 cfs of break-out flow will concentrate south of Valencia Road, then be conveyed under the road by a 2-cell, 10'x 4' RCBC, into a 30' wide flood control channel that trends northwesterly and feeds back into the WBSCR. A separate split flow calculation predicted that the 3308 cfs that flows in the South Channel during the 100-year flood would be entirely contained within the South Channel. Full printouts of the input and output files, the plotted hydraulic cross sections, and river profiles for the HEC-2 model of the SCR are contained in Appendix 3. Printouts contain a summary of the split flow calculations.

1.4 The **Midvale Park Master Drainage Report** was completed in July of 1983 by Dooley-Jones & Associates, Inc. This study covers an irregular area south of Irvington Road and west of the SCR, within Township 15 South, Range 13 East, Sections 3, 10, and 15 (Figure 1). The report described the general design of numerous hydraulic structures. Tables and graphs for roadway capacities were provided, but were not tied to specific locations. Numerous generalized typical, as well as some alternative, cross sections and plans are provided for roadways, drainage channels, detentions basins, spillways, etc., but no specific location information was provided for this hydraulic information. The typical cross sections for the West Branch Channel are included in Appendix 4.

1.5 The **Old West Branch of the Santa Cruz River Letter of Map Revision Study** was completed in 1994 by McGovern, MacVittie, Lodge, and Associates, Inc. No project report document was prepared. The Letter of Map Revision was approved by FEMA on July 24, 2000. The area studied includes the historic WBSCR north of Irvington Road to its confluence with the SCR (Figure 1). The cross section elevations were based on 1983, 1"=200' Cooper Aerial Survey Co. aerial topography maps with a 2' contour interval based on the NAVD 1929. The discharges used in the models were based on the Tucson Stormwater Management Study. Copies of the applicable work maps, and a diskette with the WBSCR HEC-2 input files are located in Appendix 1.

III REFERENCES

Arroyo Engineering Inc**., Request for a Letter of Map revision for the Los Reales Improvement District Located in Pima County, Arizona, and the City of Tucson, Arizona**, 1994.

Buck Lewis and Associates, Inc., **Drainage Study for Mission Road, Valencia Road to Tucson City Limits**, (revised) 1982.

CMG Drainage Engineering Inc., **Santa Cruz River Input Data Files**, 1990.

Dooley-Jones & Associates, Inc., **Midvale Park Master Drainage Report**, 1983.

Federal Emergency Management Agency, **Flood Insurance Study**, 1999.

McGovern, MacVittie, Lodge, and Associates, Inc., **Old West Branch of the Santa Cruz River Letter of Map Revision Study Input Data Files and Maps**, 1994.

McGovern, MacVittie, Lodge, and Associates, Inc., **Master Drainage Study, Tohono O'odham Nation-San Xavier District Phase 1- Panhandle Area Existing Conditions**, 2001.

Pima County Department of Transportation and Flood Control District**, Pima County Drainage Development and Channel Design Standards**, 1982.

Simons, Li, & Associates et al., **Tucson Stormwater Management Study**, 1993.

Appendix 1

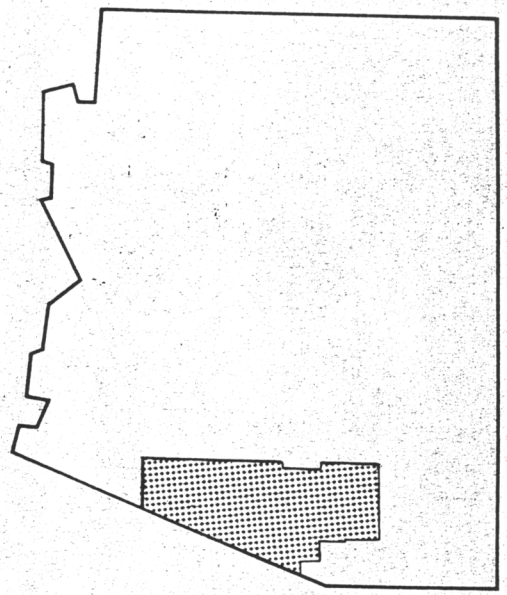
Flood Insurance Study: HEC-2 input files (Disk) for the Santa Cruz River and Old West Branch of the Santa Cruz River, Old West Branch of the Santa Cruz River work maps (5) and printout of HEC-2 Input Data (duplicate of file contents)

FLOOD INSURANCE STUDY

PIMA COUNTY, ARIZONA

AND INCORPORATED AREAS

VOLUME 1 OF 3



COMMUNITY NAME	COMMUNITY NUMBER
MARANA, TOWN OF	040118
ORO VALLEY, TOWN OF	040109
PIMA COUNTY, UNINCORPORATED AREAS	040073
SAHUARITA, TOWN OF	040137
SOUTH TUCSON, TOWN OF	040075
TUCSON, CITY OF	040076

REVISED: FEBRUARY 8, 1999

Federal Emergency Management Agency

Table 2. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Ruelas Canyon					
Downstream of confluence with Unnamed Canyon	56.6	--[1]	--[1]	6,562	--[1]
At Apex	3.58	1,800	4,460	5,990	10,470
Sabino Creek					
Above confluence with Tanque Verde Creek	66.4	4,900	12,000	18,000	36,000
Above confluence with Bear Creek	36.8	3,750	8,500	12,500	25,000
Sahuara Wash					
At Pima Street	0.4	--[1]	--[1]	622	--[1]
San Juan Wash		See LOMR 7-24-00			
At confluence with West Branch Santa Cruz River	1.2	--[1]	--[1]	2,165	--[1]
1,300 feet upstream of Mission Road	1.1	--[1]	--[1]	2,420	--[1]
At Greasewood Road	0.4	--[1]	--[1]	1,125	--[1]
Santa Clara Wash					
At Interstate Highway 19	0.3	--[1]	--[1]	705	--[1]
Santa Cruz River					
At Cortaro Road	3,503	21,800	48,000	70,000	107,400
Above confluence with Canada del Oro Wash	3,232	21,800	48,000	70,000	107,400
At Cortaro Farms Road	3,053	21,800	48,000	70,000	107,400
Above confluence with Rillito Creek	2,282	16,800	41,000	60,000	93,000
At Congress Street	2,222	16,800	41,000	60,000	93,000
At Drexel Road	2,101	16,800	41,000	60,000	93,000
At Continental Road	1,662	--[1]	--[1]	45,000	--[1]

[1]Data not computed

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T1       EMW-94-C-4542 (MMLA Job No. 92145-03)
T2       City of Tucson FIS (FEMA '94)
T3       West Branch SCR 100-yr Floodplain
J1     0       2       0       0   0.011       0     0.0  6621.0
J2    -1       1     0.0     0.0     0.0     0.0     0.0     0.0     0.0
J6     1       0     0.0
NC 0.045   0.045   0.035     0.1     0.3
X1   0.5       9    67.5   117.5     0.0     0.0     0.0     1.0     0.0
GR2366.0     0.0  2366.0    50.0  2365.5    60.0  2365.0    67.5  2347.5    84.0
GR2347.5   101.0  2365.0   117.5  2365.5   125.0  2370.0   130.0
NC 0.055   0.055   0.035     0.1     0.3
X1     1       9   140.0   180.0   505.0   505.0   505.0     1.0     0.0
GR2370.0     0.0  2370.0   125.0  2360.0   140.0  2353.0   155.0  2353.0   165.0
GR2360.0   180.0  2370.0   190.0  2372.0   240.0  2374.0   300.0
NC 0.055   0.055   0.035     0.1     0.3
X1     2      10   168.0   200.0   520.0   520.0   520.0     1.0     0.0
GR2372.0     0.0  2370.0   130.0  2360.0   168.0  2356.0   180.0  2356.0   190.0
GR2360.0   200.0  2370.0   220.0  2372.0   225.0  2374.0   270.0  2376.0   315.0
NC 0.055   0.055   0.035     0.1     0.3
X1     3      10   245.0   330.0   400.0   400.0   400.0     1.0     0.0
GR2373.0     0.0  2372.0   190.0  2370.0   245.0  2360.0   275.0  2358.0   285.0
GR2358.0   300.0  2360.0   305.0  2370.0   330.0  2374.0   335.0  2376.0   660.0
NC 0.055   0.055   0.035     0.3     0.5
QT     1  6220.0
X1     4       7   220.0   273.0   345.0   345.0   345.0     1.0     0.0
X3     0     0.0     0.0   220.0  2376.0   273.0  2376.0     0.0     0.0
GR2376.0     0.0  2374.0   150.0  2372.8   220.0  2360.4   221.0  2360.4   272.0
GR2372.8   273.0  2376.0   550.0
NC 0.055   0.055   0.035     0.3     0.5
SC 4.012     0.4     3.0   100.0    12.0    12.0    90.0    10.1  2360.8  2360.4
X1   4.1       7   220.0   273.0   100.0   100.0   100.0     1.0     0.0
X2   0.0     0.0       2     0.0  2373.3     0.0       0     0.0     0.0
X3     0     0.0     0.0   220.0  2376.0   273.0  2376.0     0.0     0.0
GR2376.0     0.0  2374.0   150.0  2372.8   220.0  2360.8   221.0  2360.8   272.0
GR2372.8   273.0  2376.0   550.0
NC 0.055   0.065   0.035     0.1     0.3
X1     5      15   620.0   685.0   440.0   620.0   510.0     1.0     0.0
GR2380.0     0.0  2378.0    50.0  2376.0   620.0  2370.0   640.0  2364.0   645.0
GR2364.0   655.0  2370.0   665.0  2376.0   685.0  2377.0   705.0  2377.0  1030.0
GR2376.0  1031.0  2376.0  1055.0  2377.0  1060.0  2377.0  1560.0  2378.5  1580.0
NC 0.055   0.065   0.035     0.1     0.3
X1     6      12   455.0   495.0   670.0   370.0   590.0     1.0     0.0
GR2380.0     0.0  2378.0   330.0  2376.0   440.0  2372.0   455.0  2366.0   470.0
GR2366.0   482.0  2372.0   495.0  2378.0   512.0  2380.0   600.0  2378.0   750.0
GR2378.0  1600.0  2379.5  1660.0
NC 0.055    0.06   0.035     0.1     0.3
QT     1  5722.0
X1     7       8   185.0   240.0   580.0   460.0   560.0     1.0     0.0
GR2382.0     0.0  2380.0    80.0  2380.0   185.0  2369.0   205.0  2369.0   225.0
GR2380.0   240.0  2380.0  1160.0  2381.5  1210.0
NC 0.055   0.065   0.035     0.1     0.3
X1     8      11   747.0   770.0   550.0   650.0   680.0     1.0     0.0
GR2384.0     0.0  2382.0   120.0  2380.0   220.0  2380.0   747.0  2372.0   750.0
GR2372.0   760.0  2380.0   770.0  2382.0   780.0  2382.0  1230.0  2383.2  1620.0
GR2383.5  1955.0
NC 0.055   0.065   0.035     0.1     0.3
X1     9      12  1035.0  1080.0   400.0   500.0   470.0     1.0     0.0
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GR2384.0     0.0  2383.5   130.0  2382.0   660.0  2382.0  1035.0  2380.0  1045.0
GR2373.5  1050.0  2373.5  1070.0  2380.0  1080.0  2382.0  1100.0  2382.0  1155.0
GR2383.0  1390.0  2384.0  1760.0
NC 0.055    0.06   0.035     0.1     0.3
X1    10       9  1090.0  1130.0   470.0   470.0   480.0     1.0     0.0
GR2386.0     0.0  2384.0   400.0  2383.5   805.0  2382.0  1090.0  2378.0  1110.0
GR2378.0  1120.0  2382.0  1130.0  2384.0  1220.0  2386.0  1700.0
NC 0.055    0.06   0.035     0.1     0.3
NH     3    0.05   410.0   0.035   455.0    0.05  1080.0
X1    11      10   410.0   455.0   600.0   650.0   800.0     1.0     0.0
GR2388.0     0.0  2386.0   370.0  2384.0   410.0  2380.0   425.0  2380.0   450.0
GR2384.0   455.0  2386.0   475.0  2385.5   700.0  2386.0   950.0  2388.0  1080.0
NC  0.05    0.05   0.035     0.1     0.3
X1    12      13   410.0   470.0   520.0   620.0   695.0     1.0     0.0
GR2392.0     0.0  2390.0   165.0  2390.0   360.0  2388.0   410.0  2384.0   440.0
GR2384.0   460.0  2390.0   470.0  2390.0   560.0  2388.0   710.0  2387.5   800.0
GR2388.0   890.0  2390.0   900.0  2391.0   950.0
NC 0.055   0.055   0.035     0.1     0.3
QT     1  3614.0
X1    13      10   300.0   350.0   475.0   475.0   475.0     1.0     0.0
GR2392.5     0.0  2391.0   190.0  2390.0   300.0  2385.5   320.0  2385.5   335.0
GR2390.0   350.0  2391.5   355.0  2390.0   600.0  2390.0   770.0  2393.0   800.0
NC 0.055   0.055   0.035     0.1     0.3
X1  13.5      11   280.0   335.0   270.0   360.0   310.0     1.0     0.0
GR2394.0     0.0  2392.0   220.0  2390.0   280.0  2387.0   290.0  2387.0   330.0
GR2390.0   335.0  2392.0   340.0  2392.0   550.0  2391.5   600.0  2392.0   670.0
GR2394.0   680.0
NC 0.055   0.055   0.035     0.1     0.3
NH     4   0.055   160.0   0.035   220.0   0.045   310.0    0.06   910.0
X1    14       9   170.0   210.0   450.0   560.0   480.0     1.0     0.0
GR2396.0     0.0  2394.0   130.0  2392.0   160.0  2389.0   170.0  2389.0   210.0
GR2394.0   220.0  2394.0   310.0  2394.0   460.0  2395.5   910.0
NC   0.0     0.0     0.0     0.1     0.3
NH     4   0.055   110.0   0.035   160.0    0.04   230.0    0.07   620.0
X1  14.5      10   110.0   140.0   390.0   390.0   390.0     1.0     0.0
X3     0     0.0     0.0     0.0     0.0   280.0  2396.5     0.0     0.0
GR2398.0     0.0  2396.0    63.0  2392.0    85.0  2390.0   110.0  2390.0   140.0
GR2396.0   160.0  2396.0   230.0  2396.5   280.0  2396.0   340.0  2398.0   620.0
NC 0.055   0.055   0.035     0.1     0.3
X1    15       9   130.0   180.0   360.0   405.0   380.0     1.0     0.0
GR2400.0     0.0  2398.0    60.0  2396.0   100.0  2394.0   130.0  2390.7   135.0
GR2390.7   162.0  2396.0   180.0  2398.0   235.0  2400.0   350.0
NC 0.055   0.055   0.035     0.1     0.3
NH     3    0.05    65.0   0.035   135.0   0.055   300.0
X1  15.5       8    65.0   135.0   375.0   375.0   375.0     1.0     0.0
GR2402.0     0.0  2400.0    40.0  2398.0    65.0  2391.5    75.0  2391.5    90.0
GR2398.0   135.0  2400.0   215.0  2401.0   300.0
NC 0.055    0.05   0.035     0.1     0.3
X1    16       7    70.0   120.0   580.0   580.0   580.0     1.0     0.0
X3     0     0.0     0.0     0.0     0.0   190.0     0.0     0.0     0.0
GR2404.0     0.0  2402.0    70.0  2394.5    80.0  2394.5   110.0  2402.0   120.0
GR2403.0   190.0  2404.0   240.0
NC 0.055   0.055   0.035     0.1     0.3
X1    17      11    57.0   100.0   445.0   445.0   445.0     1.0     0.0
X3     0     0.0     0.0     0.0     0.0   190.0  2405.5     0.0     0.0
GR2406.0     0.0  2404.0    30.0  2402.0    40.0  2400.0    55.0  2398.0    57.0
GR2395.0    70.0  2395.0    95.0  2398.0   100.0  2400.0   115.0  2404.0   130.0
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GR2405.5   435.0
NC  0.04   0.065   0.035     0.1     0.3
X1  17.5       8    30.0   140.0   570.0   570.0   570.0     1.0     0.0
GR2410.0     0.0  2410.0    30.0  2396.5    75.0  2396.5   100.0  2400.0   110.0
GR2402.0   122.0  2408.0   140.0  2408.5   200.0
NC 0.055   0.055   0.035     0.3     0.5
X1    18       8   370.0   430.0   415.0   415.0   415.0     1.0     0.0
X3     0     0.0     0.0   370.0  2415.0   430.0  2415.0     0.0     0.0
GR2418.0     0.0  2414.0   190.0  2412.0   230.0  2411.0   370.0  2399.0   381.0
GR2399.0   419.0  2410.5   430.0  2411.0  1200.0
NC 0.055   0.055   0.035     0.3     0.5
SC 3.012     0.4     3.0    90.0    10.0    12.0    77.0     8.1  2399.2  2399.0
X1  18.1       8   370.0   430.0    80.0    80.0    80.0     1.0     0.0
X2   0.0     0.0       2     0.0  2411.0     0.0       0     0.0     0.0
X3     0     0.0     0.0   370.0  2415.0   430.0  2415.0     0.0     0.0
GR2418.0     0.0  2414.0   190.0  2412.0   230.0  2411.0   370.0  2399.2   381.0
GR2399.2   419.0  2410.5   430.0  2411.0  1200.0
NC 0.040   0.060   0.035     0.1     0.3
X1  18.5      12   420.0   465.0   265.0   265.0   265.0     1.0     0.0
GR2418.0     0.0  2416.0    95.0  2414.0   145.0  2414.0   245.0  2412.0   340.0
GR2410.0   417.0  2408.0   420.0  2400.0   430.0  2400.0   460.0  2408.0   465.0
GR2410.0   473.0  2412.0   520.0
NC 0.050   0.075   0.035     0.1     0.3
X1    19       8   390.0   425.0   280.0   305.0   315.0     1.0     0.0
GR2414.0     0.0  2412.0   280.0  2410.0   390.0  2400.5   405.0  2400.5   420.0
GR2410.0   425.0  2412.0   525.0  2413.5   570.0
NC 0.045    0.06   0.035     0.1     0.3
QT      1  1657.0
X1  19.5       9   310.0   335.0   185.0   230.0   210.0     1.0     0.0
GR2416.0     0.0  2414.0   170.0  2412.0   295.0  2410.0   310.0  2401.0   315.0
GR2401.0   325.0  2410.0   335.0  2412.0   360.0  2414.0   430.0
NC  0.05    0.05   0.035     0.1     0.3
X1    20      10   280.0   310.0   395.0   380.0   395.0     1.0     0.0
GR2416.0     0.0  2414.0   220.0  2412.0   270.0  2410.0   280.0  2401.7   290.0
GR2401.7   300.0  2410.0   310.0  2412.0   327.0  2414.0   330.0  2414.5   390.0
NC  0.04   0.045   0.035     0.1     0.3
X1  20.5       9   275.0   315.0   330.0   390.0   390.0     1.0     0.0
GR2416.0     0.0  2414.0   250.0  2412.0   254.0  2410.0   275.0  2402.5   287.0
GR2402.5   297.0  2410.0   315.0  2414.5   327.0  2416.0   427.0
NC 0.055   0.055   0.035     0.1     0.3
X1    21      10   200.0   228.0   330.0   330.0   330.0     1.0     0.0
GR2416.0     0.0  2414.0   190.0  2408.0   200.0  2404.0   210.0  2404.0   220.0
GR2408.0   228.0  2410.0   240.0  2414.0   250.0  2416.0   265.0  2417.5   400.0
NC 0.055   0.055   0.035     0.1     0.3
X1  21.5      10    75.0   100.0   380.0   510.0   510.0     1.0     0.0
GR2418.0     0.0  2416.0    55.0  2410.0    75.0  2406.0    78.0  2406.0    95.0
GR2410.0   100.0  2412.0   110.0  2414.0   127.0  2416.0   133.0  2418.0   250.0
NC 0.055   0.055   0.035     0.1     0.3
X1    22      13    89.0   105.0   370.0   370.0   370.0     1.0     0.0
GR2420.0     0.0  2418.0    50.0  2414.0    60.0  2412.0    75.0  2410.0    89.0
GR2408.0    90.0  2408.0   100.0  2410.0   105.0  2412.0   110.0  2414.0   137.0
GR2416.0   160.0  2416.0   190.0  2417.0   400.0
NC 0.055   0.055   0.035     0.1     0.3
X1    23      11    70.0    95.0   580.0   580.0   580.0     1.0     0.0
GR2420.0     0.0  2418.0    60.0  2416.0    65.0  2414.0    70.0  2410.5    75.0
GR2410.5    95.0  2414.0    98.0  2416.0   104.0  2418.0   140.0  2419.0   250.0
GR2420.0   380.0
```

```
NC 0.055    0.055    0.035     0.3     0.5
X1     24       6    150.0   220.0   215.0   215.0   215.0     1.0     0.0
X3      0     0.0      0.0   150.0  2422.0   220.0  2422.0     0.0     0.0
GR2422.0      0.0   2421.5   150.0  2411.7   184.0  2411.7   216.0  2421.5   220.0
GR2422.0    500.0
NC 0.055    0.055    0.035     0.3     0.5
SC 3.012      0.4      3.0    50.0     7.0    10.0    50.0    10.1  2412.0 2411.75
X1   24.1       6    170.0   240.0    75.0    75.0    75.0     1.0     0.0
X2    0.0     0.0        2     0.0  2421.5     0.0       0     0.0     0.0
X3      0     0.0      0.0   170.0  2422.0   240.0  2422.0     0.0     0.0
GR2422.0      0.0   2421.5   170.0  2412.0   184.0  2412.0   216.0  2421.5   240.0
GR2422.0    500.0
NC 0.055    0.055    0.035     0.1     0.3
QT      1   768.0
X1     25      10    157.0   181.0   325.0   325.0   325.0     1.0     0.0
GR2421.0      0.0   2420.0   145.0  2414.0   157.0  2412.5   160.0  2412.5   170.0
GR2414.0    181.0   2416.0   183.0  2418.0   200.0  2420.0   290.0  2421.0   350.0
NC 0.055    0.055    0.035     0.1     0.3
X1     26       9     40.0    57.0   490.0   500.0   490.0     1.0     0.0
GR2422.0      0.0   2420.0    27.0  2416.0    37.0  2415.0    40.0  2415.0    53.0
GR2416.0     57.0   2418.0   110.0  2420.0   120.0  2422.0   150.0
NC 0.055    0.055    0.035     0.1     0.3
X1     27      10     65.0    95.0   500.0   500.0   500.0     1.0     0.0
GR2424.0      0.0   2422.0    45.0  2420.0    50.0  2418.0    65.0  2416.0    70.0
GR2416.0     85.0   2418.0    95.0  2420.0   120.0  2422.0   150.0  2424.0   185.0
NC 0.055    0.055    0.035     0.1     0.3
X1     28       9     40.0    65.0   425.0   475.0   435.0     1.0     0.0
GR2424.0      0.0   2422.0    29.0  2420.0    40.0  2418.0    50.0  2418.0    65.0
GR2420.0     65.0   2421.0   145.0  2422.0   220.0  2424.0   240.0
NC 0.055    0.055    0.035     0.1     0.3
X1     29      10     90.0   140.0     350     350     350     1.0     0.0
GR2426.0      0.0   2424.0    85.0  2421.5   100.0  2421.5   120.0  2424.0   125.0
GR2426.0    150.0   2426.0   210.0  2425.0   240.0  2425.0   420.0  2426.0   480.0

EJ


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Appendix 2

Master Drainage Study, Tohono O'Odham Nation-San Xavier District Phase 1- Panhandle Area Existing Conditions: study boundaries, hydraulic analysis, HEC-RAS output printout, and maps (2) of HEC-RAS cross section locations

MASTER DRAINAGE STUDY
TOHONO O'ODHAM NATION - SAN XAVIER DISTRICT
PHASE I – PANHANDLE AREA
EXISTING CONDITIONS

Location:

The study area is located in portions of
Section 9, 16, 21&22, Township 15 South, Range 13 East

Prepared for:

Pima County Flood Control District
201 N. Stone Avenue
Tucson, Arizona 85701

July 31, 2001

Prepared by:

MMLA Inc.
800 E. Wetmore Road, Suite 110
Tucson, AZ 85719

MMLA 99024-04-45

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
33984
MICHAEL E.
DALY
DATE SIGNED 9/12/01
ARIZONA U.S.A.

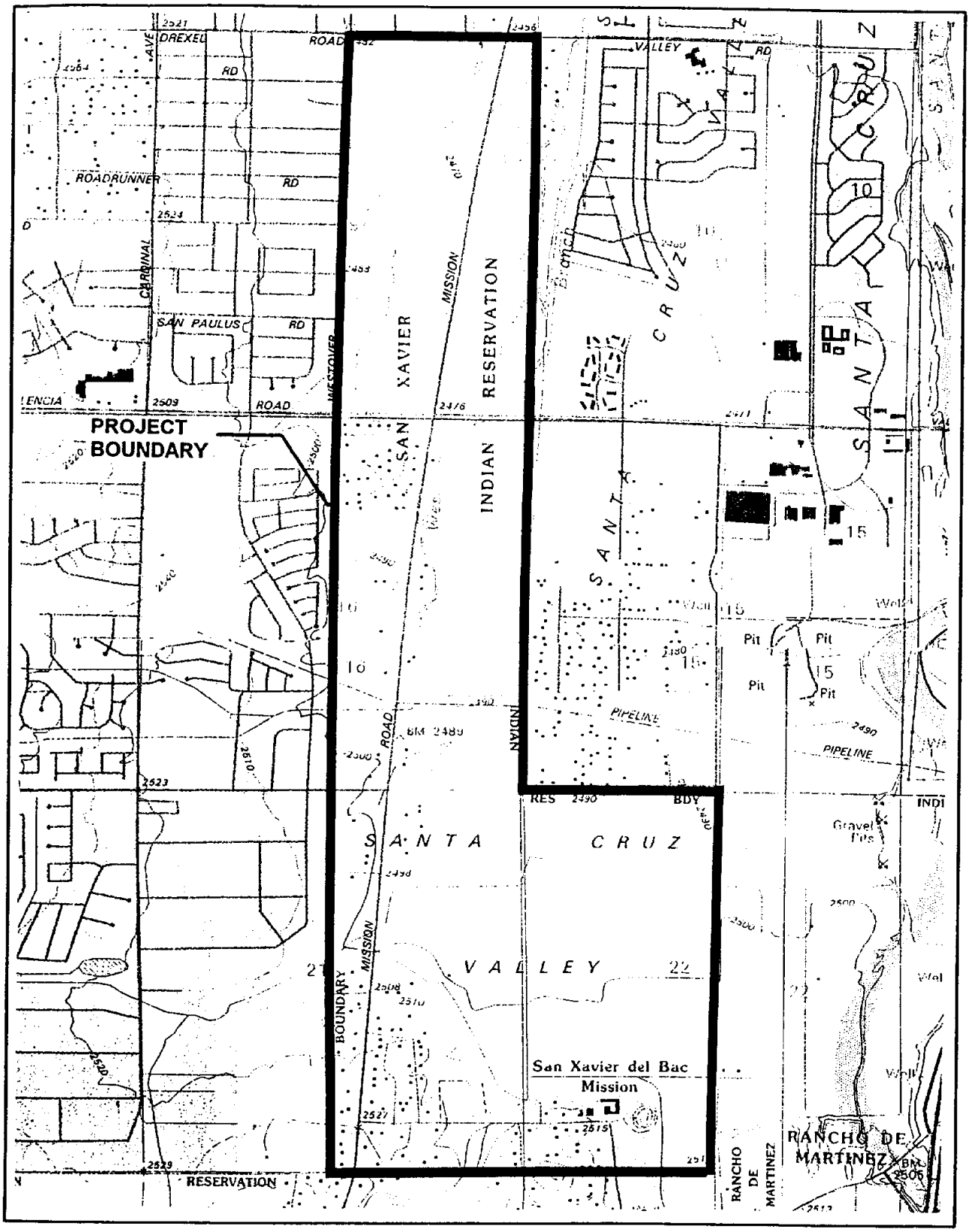

FIGURE 1
STUDY BOUNDARY MAP
Township 15S, Range 13E,
Portions of Sections 9,16, 21 & 22

MMLA
McGovern MacVittie Lodge & Associates, Inc.
MMLA Job No. 98013-05-45

3.3.3 Split Flow Analysis

In order to better quantify the peak discharges in Cemetery Wash at San Xavier Mission Road, a split flow analysis was completed on Black Mountain Wash (Watershed 21) using the HEC-2 split flow option. The analysis utilized the HEC-1 peak discharge calculated at Concentration Point (C.P.) 21, and it was assumed that breakout over Mission Road behaves as weir flow. The results of the split flow analysis were entered back into the HEC-1 model as a flow diversion.

Under existing conditions, conveyance in Black Mountain Wash is limited to approximately 1630 cfs upstream of Go:k Ka:wulk Wo:g. Excess flow breaks over Mission Road and enters Watershed 17. Downstream of Go:k Ka:wulk Wo:g, most of the remaining flow crosses Mission Road and enters the Cemetery Wash watershed. Flow that does not cross Mission Road, enters the Mission Wash watershed and causes problematic flooding along Su:dagi Wo:g, a local dirt road. A detailed analysis of this second flow split was not completed due to the lack of adequate topography, and all of the runoff downstream of Go:k Ka:wulk Wo:g was assumed to contribute to Cemetery Wash. A copy of the split flow output and a cross-section location map are provided in Appendix 8.8.

4.0 HYDRAULIC ANALYSIS

4.1 EXISTING DRAINAGE IMPROVEMENTS

4.1.1 CULVERT CROSSINGS

There are currently four culvert crossings that affect the study area, all of which are located along Valencia Road. The details and design capacities of the culverts were determined from as-built drawings obtained from Pima County Mapping and Records. The first crossing consists of a 7 cell, 10' x 6' RCBC which conveys flow in Valencia Wash under Valencia Road. The upstream channel and culvert have a design capacity of 5257 cfs, which will pass the calculated 100-year peak discharge without breakout over Valencia Road. The second crossing is located at the southwest corner of Mission Road and Valencia Road and consists of a single 10' x 4' RCBC. The crossing conveys flow at C.P. 5 (Figure 4a) under Valencia Road and into a concrete lined channel which conveys flow to WBCSR. The design capacity of the culvert is 360 cfs, which will pass the 100-year discharge if all flow can concentrate at the headwall of the culvert. The third crossing consists of a 3 cell, 71" x 47" CMPA which is located in the historic alignment of the WBSCR, approximately 900 feet west of the channel realignment. The design capacity of the crossing is 512 cfs and conveys low flows in the historic channel under Valencia Road. The final crossing consists of a 10 cell, 12' x 8' RCBC and upstream channel improvements that convey flow from the relocated WBSCR under Valencia Road. The upstream channel and culvert crossing have a design capacity of 8000 cfs, which assuming all flow is contained in the channel, could pass the calculated 100-year discharge without breakout over Valencia Road. However, the earthen berms near the improved WBSCR prevent runoff from entering the channel, contributing to the wide floodplain across the panhandle area and Co-op Farm. Table 2 provides a summary of culvert crossing details.

TABLE 2
SUMMARY OF CULVERT CROSSING DETAILS

LOCATION	TYPE	Q_{design} (cfs)	Q_{100}* (cfs)
Valencia Wash @ Valencia Road	10-12' x 8 RCBC	5257	3680
Mission Road @ Valencia Road	1-10' x 4' RCBC	360	251
900 ft. west of WBSCR	3-71" x 47" CMPA	512	N/A
WBSCR @ Valencia Road	7-10' x 6' RCBC	8000	6900

*As determined by this study

4.1.2 LOS REALES IMPROVEMENT DISTRICT

In order to mitigate flooding caused from Mission Wash, Cemetery Wash and the unnamed drainage located just east of San Xavier Mission, the residents of the Los Reales subdivision formed an improvement district with Pima County in 1986. The formation of the Los Reales Improvement District (LRID) resulted in the construction of collector and conveyance channels on the west and south boundaries of the subdivision. The channel on the west boundary ties into an existing channel improvement which was associated with the construction of the 10-12'x 8' RCBC under Valencia Road. The extent of the west LRID channel is shown on Figure 5 (Sheet 2). Along the southern boundary, a floodwall was constructed which diverts flow to the head of the southern conveyance channel. The floodwall extends approximately 1500' feet east from the southwest corner of the subdivision, and has a height of four feet. The southern channel conveys flow directly to the Santa Cruz River as shown on Figure 5 (Sheet 4).

Record drawings for the LRID were obtained from Pima County to estimate the conveyance capacity of the channels. The western channel consists of two distinct channel reaches. The first reach is fully lined with concrete and extends north from Los Reales Road for a distance of approximately 1100 feet. It has 1:1 side slopes, a depth that varies from 4.5 to 6 feet, and a bottom width of 34 feet with a slope of 0.32%. The channel then transitions into Reach 2 geometry, which extends north for a distance of approximately 1500 feet. The channel has a 26' bottom width with a slope of 0.35%. The sides are concrete lined with a 1:1 slope, and the channel depth ranges from 5.5 to 7.5 feet.

The southern channel consists of three distinct reaches, the first of which begins at the end of the flood wall. This reach extends approximately 2100' east and has a 30' to 40' bottom width, 1:1 concrete lined side slopes, and a depth ranging from 6 to 9 feet. The slope of the earthen bottom is 0.25%. The channel then transitions into Reach 2 geometry which extends approximately 2000 feet to the east. Reach 2 has an unlined bottom with a width of 15' to 30' feet and slope of 0.25%. The northern side of the channel is earthen with a 3:1 slope. The southern side of the channel is concrete lined with a 1:1 slope. The last segment of the channel (Reach 3) extends approximately 630 east where it discharges to the Santa Cruz River. The channel is completely unlined with 3:1 side slopes, a depth of 15 to 19 feet, and a 15' bottom width with a 1.2% slope.

A minimum and maximum capacity for each reach of the west and south channels was calculated using Manning's equation. A field inspection of channel integrity and more detailed backwater analysis may be completed on both channels as part of the Phase II study. Hydraulic calculation sheets and typical cross-sections for the channels taken from the record drawings are provided in Appendix 8.8. The approximate beginning and end for each channel reach is shown on Figure 5 (Sheets 2 & 4). The minimum full flow discharge for each segment is summarized in Table 3 below. The variances in full flow capacity are the results of both varying channel depth and bottom slope. As shown in the table, it does not appear the LRID channels were designed to convey the 100-year discharge. The capacity values calculated as part of this study correlate well with those presented in the *Letter of Map Revision for the Los Reales Improvement District*, completed by Arroyo Engineering in December 1994. The analysis presented in that document is the basis for the current FEMA floodplain mapping in the area of the collector channels.

TABLE 3
SUMMARY OF MANNING'S CALCULATIONS
LOS REALES IMPROVEMENT DISTRICT CONVEYANCE CHANNELS

CHANNEL	SEGMENT	ESTIMATED CAPACITY (cfs)		INFLOW (cfs)		
		Min.	Max.	Q_2	Q_{10}	Q_{100}
West	1	1938	2858	2241	4215	6901
West	2	1578	2389	2241	4215	6901
South	1	2723	2829	1056	2355	5128
South	2	3559	4498	1056	2355	5128
South	3	17010	18500	1056	2355	5128

Based on field observations and available topographic mapping, the channels are not effectively receiving the flows they were intended to convey. The presence of earthen berms, as shown on Figure 5 (Sheets 2 & 4), is severely impeding conveyance into both the western and southern channels. Consequently, the channels are not providing any appreciable level of flood control or mitigation for the Nation. The presence of the berms is shown on the record drawings. However, it is unknown whether they were present prior to construction, or placed as part of construction.

4.2 FLOODPLAIN ANALYSIS

The purpose of the floodplain analysis was to delineate the 100-year floodplains impacting the study area, and determine the 100-year water surface elevations for planning of future improvements. Floodplain delineation was completed using Manning's equation, the HEC-RAS computer program, as well as the results of aerial photograph analysis and field reconnaissance in areas where computational methods were considered inappropriate due to topography and limited conveyance. Floodplain mapping was completed on 1"= 200', 2' contour interval aerial topography dated November 15, 1994 (Figure 5). The topography was supplied to Pima County Flood Control District by the Natural Resource Conservation Service (NRCS), Phoenix office, and is based on the North American Vertical Datum of 1929. An attempt was made in a memorandum dated April 16, 1999, to obtain the more recent

topography (April 1998) which is to be distributed by Pima Association of Governments. However, it was determined that this topography was not readily available at the time of this report, and that it did not extend far enough into the study area. Manning's calculation sheets and HEC-RAS output files are provided in Appendix 8.10.

The 100-year discharge of 6809 cfs used upstream of Valencia Road represents the hydrograph summation of the Mission Wash and Cemetery Wash watersheds. An additional 2440 cfs is contributed from the smaller watersheds to the west. However, this discharge was not added to the 6809 cfs due to the large difference in the time to peak discharge between the those smaller watersheds to the west, and the Cemetery Wash and Mission Wash watersheds which contribute the largest amount of flow. Mission Wash was modeled assuming an approximate 4:1 expansion from the point where flow crosses Mission Road. This approach was taken to ensure that water surface elevations on the west side of the floodplain were not underestimated as a result of the expansion of flows into the agricultural area east of Mission Road (see Figure 5, Sheet 3). The results of the floodplain analysis yielded the following conclusions:

- The agricultural area south of Valencia Road is **completely inundated** during the 100-year event because of flat topography and poor conveyance into the existing Los Reales Improvement District southern channel. Most existing residences in the panhandle area south of Valencia Road are not in the 100-year floodplain.

- Flow from Watershed 17 which enters the study area east of San Xavier Mission is conveyed east to the Santa Cruz River, either directly, or by way of the Los Reales Improvement District southern conveyance channel. This assumption is based on existing topography and the presence of a berm on both sides of Cemetery Wash that tends to promote conveyance to the east.

- For the purposes of future development, the entire panhandle area north of Valencia Road is considered as **completely inundated** during the 100-year event. This assumption is based on the results of the hydrologic analysis, and review of the existing topography which indicates flows in the various poorly defined drainages converge prior to reaching Mission Road creating large ponded areas. In addition, the actual location of discharge points across Westover Avenue is unpredictable due to poorly defined dip sections and periodic grading of the shoulder. Any "islands" which do exist in the panhandle area during the 100-year event would be inaccessible due to flooding in the surrounding areas.

- The 100-year discharge in the Santa Cruz River is contained within the existing channel banks as per FIRM Panel C2830K, dated February 8, 1999.

HEC-RAS September 1998 Version 2.2
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
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PROJECT DATA
Project Title: San Xavier District Master Drainage Study
Project File : FSPNIR.prj
Run Date and Time: 11/22/99 2:21:08 PM

Project in English units

Project Description:
100-year Floodplain Mission Wash, Mission Road to Valencia Road

PLAN DATA

Plan Title: Plan 06
Plan File : e:\mike\98013-05\FSPNIR.p06

Geometry Title: Mission Wash - South of Valencia
Geometry File : e:\mike\98013-05\FSPNIR.g02

Flow Title : Mission Wash
Flow File : e:\mike\98013-05\FSPNIR.f04

Plan Summary Information:

Number of:	Cross Sections	= 11	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

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

FLOW DATA

Flow Title: Mission Wash
Flow File : e:\mike\98013-05\FSPNIR.f04

Flow Data (cfs)

River	Reach	RS	PF#1
Mission Wash	1	11	6901

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Mission Wash	1	PF#1		Normal S = .003

GEOMETRY DATA

Geometry Title: Mission Wash - South of Valencia
Geometry File : e:\mike\98013-05\FSPNIR.g02

CROSS SECTION RIVER: Mission Wash

REACH: 1 RS: 11

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2504.9	240	2502	490	2500	590	2498	620	2498
720	2500	990	2502	1050	2504	1150	2505		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1150	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1150	720	720	720	.1	.3

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 10

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2502	220	2500	420	2498	530	2498	640	2498.2
660	2496.3	770	2496.3	790	2498	830	2498	840	2496
1070	2495.5	1690	2494.5	1870	2494.2	2380	2496	2540	2496
2640	2495	2720	2496	2730	2498				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	2730	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	2730	640	640	640	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
820	2730	2502

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 9

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2500	320	2498	370	2497.8	490	2497	590	2496.2
650	2496	750	2495	810	2494	820	2495	850	2495
900	2494	970	2493	1000	2492.4	1025	2491.9	1160	2492
1270	2491.9	1470	2491.3	1800	2492	1835	2492	1960	2491.8
1970	2491.7	2120	2492	2440	2494				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	2440	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	2440	600	600	600	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
950	2440	2498

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 8

INPUT
Description: 0
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2496	150	2495	370	2494	470	2493	550	2492
600	2492.5	610	2492	800	2491.1	900	2490	1200	2490.3
1500	2490.5	1600	2490.4	1700	2490.5	1800	2490.7	2000	2492.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	2000	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	2000	460	460	460	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1050	2000	2498

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 7

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2494	150	2492	207	2490.9	360	2490.5	500	2490
510	2492	517	2492	650	2490.6	840	2490	1040	2489.6
1110	2489.4	1300	2489.2	1570	2488.9	1740	2489.9	1800	2490
1850	2491								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1850	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1850	500	500	500	.1	.3

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 6

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2492	25	2492	165	2490	400	2488	585	2488.3
1340	2488	1760	2486	1772	2484	1800	2486	1810	2488
1815	2490.5	1825	2481.2	1855	2481.2	1865	2491		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1815	.025

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1815	800	800	800	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1815	1865	2490.5

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 5

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2488	60	2488	180	2487	220	2486	260	2486
620	2485.3	1045	2485.4	1255	2485.3	1625	2484	1720	2482
1740	2481	1750	2482	1760	2484	1765	2486	1770	2488
1780	2479.5	1810	2479.5	1820	2489				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1770	.025

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1770	800	800	800	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1770	1820	2488

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 4

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2486	35	2486	100	2484	260	2482	750	2481
1050	2480.2	1404	2481.4	1535	2480	1650	2478	1660	2476
1670	2474	1680	2478	1690	2480	1700	2478	1710	2483
1720	2475	1750	2475	1760	2484				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1710	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1710	800	800	800	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1710	1760	2484

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 3

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2486	20	2485	40	2486	75	2484	120	2482
179	2482	300	2483	370	2482	410	2480	900	2479.5
1250	2479.7	1560	2478	1575	2477	1590	2478	1615	2480
1630	2480	1645	2472	1665	2472	1675	2481		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1675	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1675	780	780	780	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1630	1675	2482

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 2

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2481	20	2480	150	2478	430	2477.6	700	2478
1220	2478	1330	2477.6	1490	2478	1580	2480	1615	2467.5
1635	2467.5	1645	2481						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1645	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1645	800	800	800	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1580	1645	2480

CROSS SECTION RIVER: Mission Wash
REACH: 1 RS: 1

INPUT
Description:
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	2479	50	2478.5	70	2478	130	2476	145	2476
160	2476	320	2474	505	2472	560	2472	650	2474
1150	2474	1312	2474	1370	2474	1440	2472	1460	2474
1471	2476	1485	2478	1500	2478	1508	2476	1512	2474
1520	2470	1530	2468	1550	2466	1580	2464	1590	2463
1600	2464	1630	2470						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.035	1630	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	1630	800	800	800	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1485	1630	2478

SUMMARY OF REACH LENGTHS

River: Mission Wash

Reach	River Sta.	Left	Channel	Right
1	11	720	720	720
1	10	640	640	640
1	9	600	600	600
1	8	460	460	460
1	7	500	500	500
1	6	800	800	800
1	5	800	800	800
1	4	800	800	800
1	3	780	780	780
1	2	800	800	800
1	1	800	800	800

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	11	6901.00	2498.00	2502.75		2502.97	0.002764	3.77	1830.75	834.10	0.45
1	10	6901.00	2494.20	2500.85	2499.53	2501.09	0.002462	3.92	1761.19	2604.05	0.43
1	9	6901.00	2491.30	2497.54	2497.26	2498.22	0.010125	6.62	1043.21	2031.29	0.84
1	8	6901.00	2490.00	2493.52	2492.81	2493.92	0.005165	5.08	1357.99	1581.78	0.61
1	7	6901.00	2488.90	2490.97		2491.20	0.006484	3.81	1809.73	1536.06	0.62
1	6	6901.00	2484.00	2489.53	2488.58	2489.63	0.001777	2.55	2708.14	1640.44	0.34
1	5	6901.00	2481.00	2485.87	2485.87	2486.31	0.018049	5.33	1295.82	1479.79	0.99
1	4	6901.00	2474.00	2482.68	2481.44	2482.77	0.001369	2.41	2863.17	1551.81	0.31
1	3	6901.00	2472.00	2481.52	2480.40	2481.63	0.001474	2.65	2599.29	1295.44	0.32
1	2	6901.00	2467.50	2479.05	2478.80	2479.33	0.008439	4.22	1636.64	1516.79	0.70
1	1	6901.00	2463.00	2475.36	2474.63	2475.53	0.003002	3.28	2103.99	1376.97	0.45

Profile Output Table - Standard Table 2

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
1	11	2502.97	2502.75	0.22	1.87	0.00		6901.00		834.10
1	10	2501.09	2500.85	0.24	2.83	0.04		6901.00		2604.05
1	9	2498.22	2497.54	0.68	4.22	0.08		6901.00		2031.29
1	8	2493.92	2493.52	0.40	2.67	0.05		6901.00		1581.78
1	7	2491.20	2490.97	0.23	1.53	0.04		6901.00		1536.06
1	6	2489.63	2489.53	0.10	3.29	0.03		6901.00		1640.44
1	5	2486.31	2485.87	0.44	2.69	0.11		6901.00		1479.79
1	4	2482.77	2482.68	0.09	1.14	0.00		6901.00		1551.81
1	3	2481.63	2481.52	0.11	2.29	0.02		6901.00		1295.44
1	2	2479.33	2479.05	0.28	3.77	0.03		6901.00		1516.79
1	1	2475.53	2475.36	0.17				6901.00		1376.97

Appendix 3

Request for a Letter of Map Revision for the Los Reales Improvement District Located in Pima County, Arizona, and the City of Tucson, Arizona: study boundaries, HEC-2 input and output printout for the West Branch of the Santa Cruz River from Valencia Road to the Reservation Boundary, HEC-2 input and output printout for the South Channel

REQUEST FOR A
LETTER OF MAP REVISION FOR THE
LOS REALES IMPROVEMENT DISTRICT
LOCATED IN PIMA COUNTY, ARIZONA,
AND IN THE CITY OF TUCSON, ARIZONA

Submitted to:
PIMA COUNTY DEPARTMENT OF TRANSPORTATION
AND FLOOD CONTROL DISTRICT
Floodplain Planning Section
Fourth Floor, Public Works Building
201 North Stone Avenue
Tucson, Arizona 85701-1207
(602) 740-6350

and to:
CITY OF TUCSON DEPARTMENT OF TRANSPORTATION
Engineering Division, Floodplain Section
P.O. Box 27210
Tucson, Arizona 85726-7210
(602) 791-4914

Prepared By:
ARROYO ENGINEERING, INC.
P.O.Box 2668
Tucson, Arizona 85702
(602) 882-0206

Registered Professional Engineer (Civil)
CERTIFICATE NO.
18683
ROBERT J.
SMOLINSKY
DATE SIGNED 1-10-95
ARIZONA, U.S.A.

December, 1994

ARROYO ENGINEERING, INC.

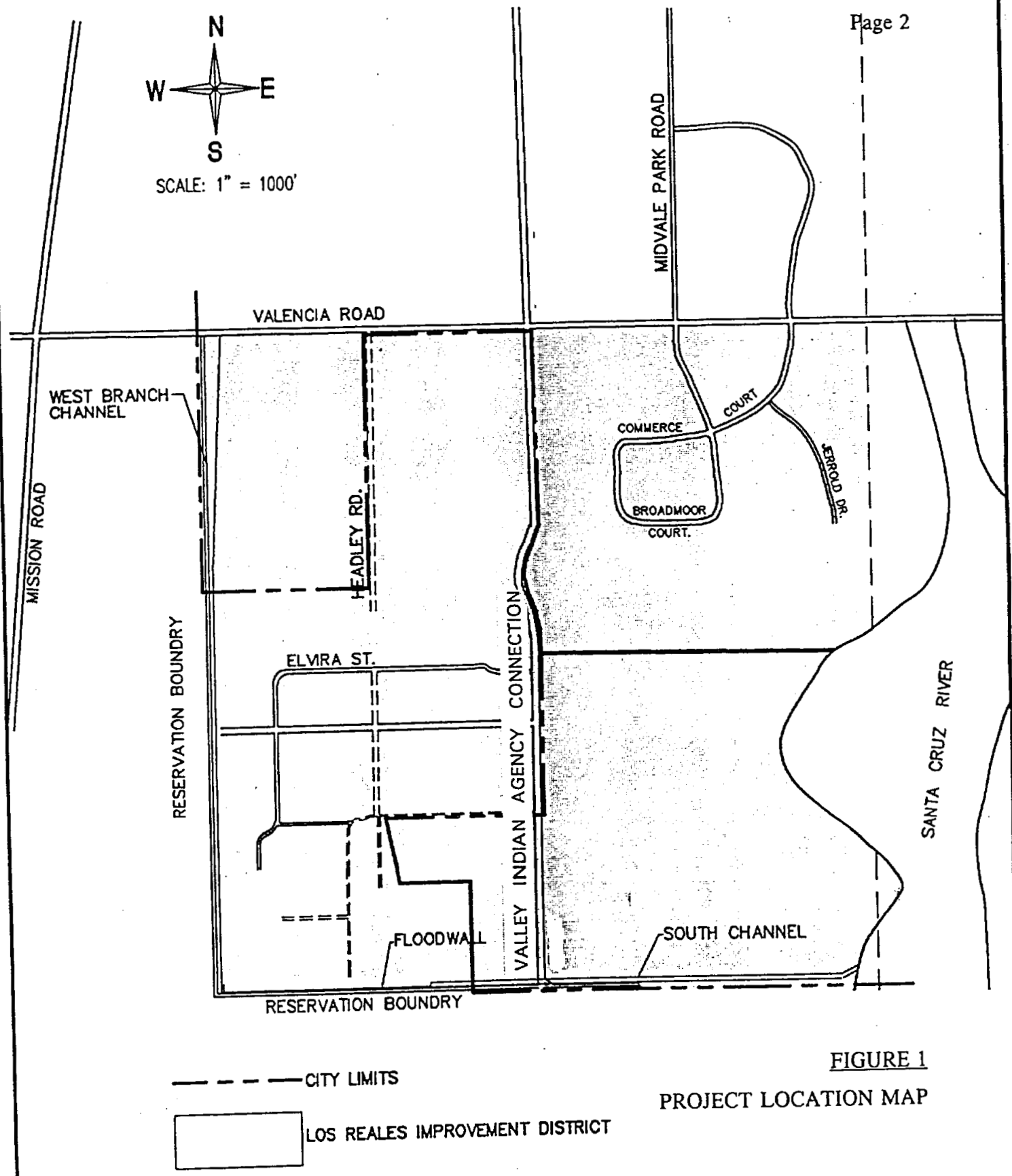

FIGURE 1

PROJECT LOCATION MAP

Appendix C

HEC-2 Input and Output Files for the West Branch of the Santa Cruz River from Valencia Rd to the Reservation Boundary

```
SF  Splitflow Analysis of the Los Reales Floodwall and Diversion Channels
JC  Splitflow Analysis
JP     0       0     100       0       0
TN  Normal depth split flow  - Sections 11 to 12
NS     2      11      12      -1    0.06   0.004
NG     0  2477.2     200  2478.0
TN  Normal depth split flow - Sections 12 to 13
NS     2      12      13      -1    0.06   0.004
NG     0  2478.0     200  2478.5
TN  Normal depth split flow - Section 13 to 14
NS     2      13      14      -1    0.06   0.004
NG     0  2478.5     112  2478.6
TN  Normal depth split flow - Sections 14 to 15
NS     2      14      15      -1    0.06   0.004
NG     0  2478.6     100  2479.5
TN  Normal depth split flow - Sections 21 to 22
NS     2      21      22      -1    0.06   0.003
NG     0  2484.3      44  2484.4
TN  Normal depth split flow - Sections 22 to 23
NS     2      22      23      -1    0.06   0.003
NG     0  2484.4     231  2484.5
TC  Rating curve outflow data set for Splitflow into South Diversion Channel
CS     3      28    28.1      -1
CR  3250 2489.90    3300 2489.93    3350 2489.97
TW  Splitflow #28 to #28.1 (Splitflow goes directly into the Santa Cruz River)
WS     9      28    28.1      -1     2.6
WC6750.0  2491.3  6760.0  2488.3  6950.0  2489.1  7150.0  2489.2  7350.0  2490.0
WC7550.0  2491.6  7750.0  2491.8  7850.0  2492.5  7950.0  2494.1
EE
T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: WEST.H2I
T3      West Branch Santa Cruz  River
T4      West Branch Santa Cruz River, from Valencia Rd. to Los Reales Rd.

J1     0       2       0       0       0       0       0       0  2466.7
J2     1       0      -1       0       0       0       0       0       0
J3    38      43      13      14      15       1       2       3       8      53
J3     4      54      61              150
NC  .030    .030   .0275     0.1     0.3
QT     1    7638

X1     1      15    1390    2002       0       0       0
*  X-Sec  1: Same as Sta 448+00 on West Branch Bank Protection Plan 4BVALE
GR  2474    1300    2474    1390    2472    1520    2470    1695    2468    1780
GR  2466    1810    2465    1836  2463.7  1861.5    2463    1864    2463    1995
GR  2470    2002  2470.3    2022    2470    2172    2472    2860    2472    3020

X1     2      23    1800    2002     100     100     100
*  X-Sec  2: Same as Sta 447+00 on West Branch Bank Protection Plan 4BVALE
GR  2475    1250    2474    1430    2472    1560    2470    1710    2470    1778
GR  2472    1785    2472    1794    2474    1800    2472    1805    2470    1810
GR  2468    1825    2466  1835.5  2464.9    1841  2465.2    1852    2464    1864
GR2463.5  1865.5  2463.5    1995  2470.5    2002  2470.8    2022  2471.4    2024
GR2471.7    2074    2472    2164    2472    3050

X1     3      18    1820    2002     200     200     200
*  X-Sec  3: Same as Sta 445+00 on West Branch Bank Protection Plan 4BVALE
GR2475.5    1200    2474    1470    2472    1565    2470    1650    2472    1680
GR  2472    1750    2472    1790    2476    1805    2476    1820  2471.5  1836.5
GR2465.8    1858  2464.5    1878  2464.3  1879.5  2464.4    1995  2471.2    2002
GR2471.5    2022  2471.8    2023    2473    3050

X1     4      16    1838    2002     200     200     200
*  X-Sec  4: Same as Sta 443+00 on West Branch Bank Protection Plan 4BVALE
GR  2476    1260    2474    1515    2472    1600    2472    1660    2474    1820
GR  2476    1830    2479    1838    2474    1848  2466.8    1873  2464.7    1939
GR  2465  1945.5    2465    1995    2472    2002  2472.3    2022  2472.5    2023
GR2473.5    3100

X1     5      15    1841    2002     200     200     200
*  X-Sec  5: Same as Sta 441+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    3090
GR2476.0    1250    2476    1530    2474    1790    2474    1820    2476    1830
GR2479.5    1841  2465.5    1901  2464.8    1918  2465.6  1925.5  2465.6    1995
GR2472.6    2002    2473    2022  2473.8    2023    2472    2720  2472.5    3100

X1     6      15    1868    2002     200     200     200
*  X-Sec  6: Same as Sta 439+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    3040
GR  2476    1300    2476    1840    2480    1850    2480    1868    2474    1879
GR  2467    1913    2465    1913  2466.5  1965.5  2466.5    1995  2473.5    2002
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GR2473.7  2026.5    2474    2028    2472    2100    2473    2800  2474.0    3100

X1     7      14    1886    2002     200     200     200
*  X-Sec  7: Same as Sta 437+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    3000
GR  2477    1300    2476    1870    2478    1875    2480    1880    2481    1886
GR2475.3    1894  2469.5    1922  2466.7    1930  2467.1  1982.5  2467.1    1995
GR  2474    2002  2474.4    2022  2472.5    2400    2474    3000

X1     8      12    1880    2000     200     200     200
*  X-Sec  8: Same as Sta 435+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2970
GR  2477    1300    2478    1880    2480    1890  2480.0    1895  2476.5    1905
GR  2470    1930    2467    1948    2468    1992  2474.8    2000    2475    2020
GR  2474    2400  2475.5    3150

X1     9      17    1920    1998     164     164     164
*  X-Sec  9: Same as Sta 433+36 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2930
GR  2478    1500    2478    1900    2480    1905    2480    1920  2476.8    1934
GR2467.7    1953  2467.5    1978    2469  1982.6    2469  1991.3  2475.5    1998
GR2475.6    2018    2476    2019    2476  2043.5  2474.5  2230.0  2475.0    2550
GR2476.0    2900    2476    3150

NC  .030    .030    .029     0.1     0.3
X1    10      18    1946  2004.5     136     136     136
*  X-Sec 10: Same as Sta 432+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2920
GR  2482     400    2480     420    2478     540    2478     780    2478    1730
GR  2477    1850  2478.0    1920    2480    1940  2482.8    1946  2477.5    1955
GR2469.5    1977    2469    1980    2469    1998  2475.9  2004.5  2476.1    2064
GR  2475    2300  2476.0    2700  2476.5    3200
NC  .030    .060    .029     0.1     0.3

X1    11      18    1960    2003     200     200     200
*  X-Sec 11: Same as Sta 430+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2860
GR  2480     580    2478     660    2478    1840  2477.0    1880    2480    1935
GR  2480    1960  2478.4    1965  2477.4    1972  2472.8    1972  2469.8    1978
GR2469.6  1979.5  2469.6    1996  2476.6    2003  2476.8    2015  2476.0    2040
GR2475.8    2200  2476.0    2520  2477.2    3350

X1    12      17    1955    2003     200     200     200
*  X-Sec 12: Same as Sta 428+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2810
GR  2482     680    2480     720  2478.4    1600    2478    1875  2477.5    1900
GR  2478    1925    2480    1950  2483.1    1955    2477    1965  2470.8    1979
GR2470.3  1982.8  2470.3    1995  2478.4    2003  2478.7    2015    2476    2300
GR2477.5  2850.0  2478.0    3320

X1    13      19    1955    2003     200     200     200
*  X-Sec 13: Same as Sta 426+00 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2765
GR  2482     680    2480     770  2479.1    1300    2478    1870  2477.7    1885
GR  2478    1920    2480    1932    2480    1945    2484    1955    2479    1965
GR  2478    1971    2473    1971    2471  1976.5    2471  1995.5  2478.5    2003
GR2478.5    2015  2477.5    2280    2478    2700  2478.5    3450

NC  .030    .060    .020     0.1     0.3
X1    14      16    1960    2000     112     112     112       0
*  X-Sec 14: Same as Sta 52+66 on Los Reales Improvement District Plan ID-101
*                and Sta 424+88 on West Branch Bank Protection Plan 4BVALE
X3     0       0       0       0       0    2740
GR  2482     720    2480     800    2479    1200    2479    1800    2478    1870
GR2477.8    1900    2478    1920    2480    1950  2480.0    1960  2476.3    1966
GR2471.9    1970  2471.9    1996  2479.2    2000  2477.5    2400  2478.0    2650
GR2478.6    3500

NC  .030    .060   .0235     0.1     0.3
X1    15      16    2000    2040     100     100     100       0
*  X-Sec 15: Same as Sta 51+66 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2765
GR  2482     760    2480     820    2480    1180  2479.5    1820  2478.0    1895
GR  2476    1908    2474    1930    2474    1990  2478.8    2000  2472.2    2007
GR2472.2    2033  2479.7    2040    2478    2420    2478    2420    2479    2900
GR2479.5    3500

X1    16      20    1993    2040     250     250     250       0
*  X-Sec 16: Same as Sta 49+16 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2680
GR  2484     510    2482     890    2480    1310  2479.8    1750    2480    1870
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GR  2480    1920    2478    1927    2476    1932    2476    1940    2478    1948
GR  2480    1960    2482    1967    2482    1993  2480.3    2000 2473.11    2007
GR2473.1    2033  2480.5    2040  2478.5    2160  2480.0    2590  2481.5    3350

X1    17      14    1995    2040     250     250     250       0
*  X-Sec 17: Same as Sta 46+66 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2620
GR  2484     490    2482    1190    2480    1740    2481    1900    2480    1940
GR  2482    1970    2482    1995  2480.7    2000 2474.02    2007 2474.02    2033
GR2481.1    2040  2480.5    2250  2481.0    2900  2481.8    3300

X1    18      18    1990    2040     250     250     250       0    2000
*  X-Sec 18: Same as Sta 44+16 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2550
GR   486     450     484     580     482    1300   481.6    1530     482    1740
GR 482.2    1830     482    1910     480    1950     477    1970     480    1980
GR   483    1990   481.1    2000  474.92    2007  474.92    2033   481.7    2040
GR 481.5    2480     482    3300   482.2    3450

X1    19      17    1995    2040     250     250     250       0    2000
*  X-Sec 19: Same as Sta 41+66 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2480
GR   488     500     486     520     484     830   482.2    1500     482    1940
GR   480    1960     479    1980     480    1990     487    1995   481.6    2000
GR475.80    2007  475.80    2033   482.3    2040   481.8    2250     482    2500
GR   482    3000     483    3680

X1    20      18    1995    2040     250     250     250       0    2000
*  X-Sec 20: Same as Sta 39+16 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2420
GR   488     445     486     695     484     810   482.9    1065   482.2    1860
GR   478    1950     480    1960     482    1970     484    1980     486    1990
GR   487    1995   482.3    2000  476.67    2007  476.67    2033   483.0    2040
GR 482.2    2280     483    2930     484    3310

NC  .030    .060    .020
X1    21      16    1990    2048     197     197     197       0    2000
*  X-Sec 21: Same as Sta 37+19 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2375
GR   488     410     486     670     484    1060     484    1930     482    1949
GR   482    1962     484    1972     486    1980     487    1990   483.0    2000
GR477.37    2015  477.37    2041   484.0    2048   483.3    2300     484    2595
GR 484.3    3330

X1    22      19    1990    2046      44      44      44       0    2000
*  X-Sec 22: Same as Sta 36+75 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2365
GR   488     390     488     650     486     720     484     780     484    1600
GR   482    1660     482    1910     482    1965     484    1975     486    1982
GR   487    1990   483.2    2000  478.87    2006  478.87    2040   484.2    2046
GR   484    2080   483.4    2300     484    2640   484.4    3335

X1    23      15    1980    2046     231     231     231       0    2000
*  X-Sec 23: Same as Sta 34+44 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2310
GR   490     450     488     470     486    1230   484.3    1800     484    1910
GR   482    1935   481.5    1940     487    1980   484.2    2000   479.6    2006
GR 479.6    2040   485.2    2046   484.1    2140   484.5    3000   484.5    3400

X1    24      13    1985    2046     231     231     231       0    2000
*  X-Sec 24: Same as Sta 32+13 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2250
GR   488     370   487.4     820     486    1380     484    1950   482.2    1960
GR   488    1985     486    1995   485.8    2000   480.4    2006   480.4    2040
GR 485.4    2046   485.5    2400     486    3150

X1    25      15    2000    2046     300     300     300       0    2000
*  X-Sec 25: Same as Sta 29+13 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2170
GR   488     410     486    1850     484    1950   483.5    1955     484    1970
GR   486    1982     488    1995   488.3    2000   481.3    2006   481.3    2040
GR 488.3    2046   486.5    2430     487    3040   486.2    3450   487.5    4100

X1    26      13    2000    2046     235     235     235       0    2000
*  X-Sec 26: Same as Sta 26+78 on Los Reales Improvement District Plan ID-101
X3     0       0       0       0       0    2100
GR   490     420     488     650     487    1200     486    1940     485    1950
GR   486    1975     488    1990   488.5    2000   482.1    2006   482.1    2040
GR 488.5    2046     487    2500     488    3400

X1    27      16    2000    2046     234     234     234       0
```

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*  X-Sec 2444  Located at u/s end of channel
GR2494.0      50  2492.0     200  2490.0     490  2488.0    1900  2487.4  1931.5
GR2485.6  1957.5  2488.5  1961.5  2488.8  1967.5  2488.2  1975.5  2489.1  1984.5
GR2488.8  1998.9  2488.8    2000  2482.8    2006  2482.8    2040  2488.8  2045.5
GR2493.4  2046.0

NC 0.030   0.060   0.022      .1      .3
X1    28      44    2000    3340      52      52      52       0
*  X-Sec 2392  Located at u/s end of channel and 31 ft u/s from Floodwall
*  Ground-profile data along upstream side of floodwall were determined by
*  field survey (NGVD-1929 datum).
GR2494.0       0  2492.0     150  2491.0     400  2489.5     650  2489.5     800
GR2490.0    1000  2490.0    1200  2490.0    1400  2490.0    1600  2490.0  1746.5
GR2490.3    1800  2490.2  1846.5  2490.0  1889.5  2488.6    1903  2488.6  1912.5
GR2487.4  1931.5  2485.6  1957.5  2488.5  1961.5  2488.8  1967.5  2488.2  1975.5
GR2489.1  1984.5  2488.8  1998.9  2488.7  2000.0  2488.9  2042.3  2489.4  2046.4
GR2488.7  2046.5  2489.3  2260.0  2489.2  2520.0  2489.0  2770.0  2489.2  3020.0
GR2489.3  3340.0  2488.9    3470  2488.9  3546.5  2488.2  4046.5  2488.7  4346.5
GR2487.9  4546.5  2489.5  4633.5  2489.5    4650  2489.5    5200  2488.7    5500
GR2488.6  5800.5  2488.7    6100  2488.3    6400  2491.3    6750

NC 0.030   0.060   0.022      .1      .3
X1  28.1      52    2000    3340       2       2       2       0
*  X-Sec 2390  Located at u/s end of channel and 33 ft u/s from Floodwall
*  Ground-profile data along upstream side of floodwall were determined by
*  field survey (NGVD-1929 datum).
GR2494.0       0  2492.0     150  2491.0     400  2489.5     650  2489.5     800
GR2490.0    1000  2490.0    1200  2490.0    1400  2490.0    1600  2490.0  1746.5
GR2490.3    1800  2490.2  1846.5  2490.0  1889.5  2488.6    1903  2488.6  1912.5
GR2487.4  1931.5  2485.6  1957.5  2488.5  1961.5  2488.8  1967.5  2488.2  1975.5
GR2489.1  1984.5  2488.8  1998.9  2488.7  2000.0  2488.9  2042.3  2489.4  2046.4
GR2488.7  2046.5  2489.3  2260.0  2489.2  2520.0  2489.0  2770.0  2489.2  3020.0
GR2489.3  3340.0  2488.9    3470  2488.9  3546.5  2488.2  4046.5  2488.7  4346.5
GR2487.9  4546.5  2489.5  4633.5  2489.5    4650  2489.5    5200  2488.7    5500
GR2488.6  5800.5  2488.7    6100  2488.3    6400  2491.3    6750  2488.3    6760
GR2489.1    6950  2489.2    7150    2490    7350  2491.6    7550  2491.8    7750
GR2492.5    7850  2494.1    7950
EJ
ER
```

```
*****************************************
* HEC-2 WATER SURFACE PROFILES          *
*                                       *
* Version   4.6.2;  May 1991            *
*                                       *
* RUN DATE    30NOV94    TIME   11:37:31 *
*****************************************
```

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

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

WEST BRANCH SANTA CRUZ RIVER

EXISTING CONDITIONS

REVISED 12-1-94

INCLUDES SPLIT FLOWS TO EAST

THIS RUN EXECUTED 30NOV94 11:37:31

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**********************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
**********************************


SPLIT FLOW BEING PERFORMED

SF  Splitflow Analysis of the Los Reales Floodwall and Diversion Channels

JC  Splitflow Analysis
JP     0       0     100       0       0

TN  Normal depth split flow  - Sections 11 to 12
NS     2      11      12      -1    0.06   0.004
NG     0  2477.2     200  2478.0

TN  Normal depth split flow - Sections 12 to 13
NS     2      12      13      -1    0.06   0.004
NG     0  2478.0     200  2478.5

TN  Normal depth split flow - Section 13 to 14
NS     2      13      14      -1    0.06   0.004
NG     0  2478.5     112  2478.6

TN  Normal depth split flow - Sections 14 to 15
NS     2      14      15      -1    0.06   0.004
NG     0  2478.6     100  2479.5

TN  Normal depth split flow - Sections 21 to 22
NS     2      21      22      -1    0.06   0.003
NG     0  2484.3      44  2484.4

TN  Normal depth split flow - Sections 22 to 23
NS     2      22      23      -1    0.06   0.003
NG     0  2484.4     231  2484.5

TC  Rating curve outflow data set for Splitflow into South Diversion Channel
CS     3      28    28.1      -1
CR  3250 2489.90    3300 2489.93    3350 2489.97

TW  Splitflow #28 to #28.1 (Splitflow goes directly into the Santa Cruz River)
WS     9      28    28.1      -1     2.6
WC6750.0  2491.3  6760.0  2488.3  6950.0  2489.1  7150.0  2489.2  7350.0  2490.0
WC7550.0  2491.6  7750.0  2491.8  7850.0  2492.5  7950.0  2494.1
```

```
T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: WEST.H2I
T3      West Branch Santa Cruz  River
T4      West Branch Santa Cruz River, from Valencia Rd. to Los Reales Rd.

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ
     0        2        0        0        0        0        0        0        2466.7

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

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
     38       43       13       14       15       1        2        3        8        53
      4       54       61                150

NC    .030     .030     .0275    0.1      0.3
QT       1     7638

X1       1       15     1390     2002        0        0        0
   X-Sec  1: Same as Sta 448+00 on West Branch Bank Protection Plan 4BVALE
GR    2474     1300     2474     1390     2472     1520     2470     1695     2468     1780
GR    2466     1810     2465     1836   2463.7   1861.5     2463     1864     2463     1995
GR    2470     2002   2470.3     2022     2470     2172     2472     2860     2472     3020

X1       2       23     1800     2002      100      100      100
   X-Sec  2: Same as Sta 447+00 on West Branch Bank Protection Plan 4BVALE
GR    2475     1250     2474     1430     2472     1560     2470     1710     2470     1778
GR    2472     1785     2472     1794     2474     1800     2472     1805     2470     1810
GR    2468     1825     2466   1835.5   2464.9     1841   2465.2     1852     2464     1864
GR  2463.5   1865.5   2463.5     1995   2470.5     2002   2470.8     2022   2471.4     2024
GR  2471.7     2074     2472     2164     2472     3050

X1       3       18     1820     2002      200      200      200
   X-Sec  3: Same as Sta 445+00 on West Branch Bank Protection Plan 4BVALE
GR  2475.5     1200     2474     1470     2472     1565     2470     1650     2472     1680
GR    2472     1750     2472     1790     2476     1805     2476     1820   2471.5   1836.5
GR  2465.8     1858   2464.5     1878   2464.3   1879.5   2464.4     1995   2471.2     2002
GR  2471.5     2022   2471.8     2023     2473     3050

X1       4       16     1838     2002      200      200      200
   X-Sec  4: Same as Sta 443+00 on West Branch Bank Protection Plan 4BVALE
GR    2476     1260     2474     1515     2472     1600     2472     1660     2474     1820
GR    2476     1830     2479     1838     2474     1848   2466.8     1873   2464.7     1939
GR    2465   1945.5     2465     1995     2472     2002   2472.3     2022   2472.5     2023
GR  2473.5     3100
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X1          5          15        1841        2002         200         200         200
  X-Sec  5: Same as Sta 441+00 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        3090
GR     2476.0        1250        2476        1530        2474        1790        2474        1820        2476        1830
GR     2479.5        1841      2465.5        1901      2464.8        1918      2465.6      1925.5      2465.6        1995
GR     2472.6        2002        2473        2022      2473.8        2023        2472        2720      2472.5        3100

X1          6          15        1868        2002         200         200         200
  X-Sec  6: Same as Sta 439+00 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        3040
GR       2476        1300        2476        1840        2480        1850        2480        1868        2474        1879
GR       2467        1913        2465        1913      2466.5      1965.5      2466.5        1995      2473.5        2002
GR     2473.7      2026.5        2474        2028        2472        2100        2473        2800      2474.0        3100

X1          7          14        1886        2002         200         200         200
  X-Sec  7: Same as Sta 437+00 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        3000
GR       2477        1300        2476        1870        2478        1875        2480        1880        2481        1886
GR     2475.3        1894      2469.5        1922      2466.7        1930      2467.1      1982.5      2467.1        1995
GR       2474        2002      2474.4        2022      2472.5        2400        2474        3000

X1          8          12        1880        2000         200         200         200
  X-Sec  8: Same as Sta 435+00 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        2970
GR       2477        1300        2478        1880        2480        1890      2480.0        1895      2476.5        1905
GR       2470        1930        2467        1948        2468        1992      2474.8        2000        2475        2020
GR       2474        2400      2475.5        3150

X1          9          17        1920        1998         164         164         164
  X-Sec  9: Same as Sta 433+36 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        2930
GR       2478        1500        2478        1900        2480        1905        2480        1920      2476.8        1934
GR     2467.7        1953      2467.5        1978        2469      1982.6        2469      1991.3      2475.5        1998
GR     2475.6        2018        2476        2019        2476      2043.5      2474.5      2230.0      2475.0        2550
GR     2476.0        2900        2476        3150

NC       .030        .030        .029         0.1         0.3
X1         10          18        1946      2004.5         136         136         136
  X-Sec 10: Same as Sta 432+00 on West Branch Bank Protection Plan 4BVALE
X3          0           0           0           0           0        2920
GR       2482         400        2480         420        2478         540        2478         780        2478        1730
GR       2477        1850      2478.0        1920        2480        1940      2482.8        1946      2477.5        1955
GR     2469.5        1977        2469        1980        2469        1998      2475.9      2004.5      2476.1        2064
GR       2475        2300      2476.0        2700      2476.5        3200
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NC     .030       .060       .029       0.1        0.3
X1       11         18       1960       2003        200        200        200
   X-Sec 11: Same as Sta 430+00 on West Branch Bank Protection Plan 4BVALE
X3        0          0          0          0          0       2860
GR     2480        580       2478        660       2478       1840     2477.0       1880       2480       1935
GR     2480       1960     2478.4       1965     2477.4       1972     2472.8       1972     2469.8       1978
GR   2469.6     1979.5     2469.6       1996     2476.6       2003     2476.8       2015     2476.0       2040
GR   2475.8       2200     2476.0       2520     2477.2       3350

X1       12         17       1955       2003        200        200        200
   X-Sec 12: Same as Sta 428+00 on West Branch Bank Protection Plan 4BVALE
X3        0          0          0          0          0       2810
GR     2482        680       2480        720     2478.4       1600       2478       1875     2477.5       1900
GR     2478       1925       2480       1950     2483.1       1955       2477       1965     2470.8       1979
GR   2470.3     1982.8     2470.3       1995     2478.4       2003     2478.7       2015       2476       2300
GR   2477.5     2850.0     2478.0       3320

X1       13         19       1955       2003        200        200        200
   X-Sec 13: Same as Sta 426+00 on West Branch Bank Protection Plan 4BVALE
X3        0          0          0          0          0       2765
GR     2482        680       2480        770     2479.1       1300       2478       1870     2477.7       1885
GR     2478       1920       2480       1932       2480       1945       2484       1955       2479       1965
GR     2478       1971       2473       1971       2471     1976.5       2471     1995.5     2478.5       2003
GR   2478.5       2015     2477.5       2280       2478       2700     2478.5       3450

NC     .030       .060       .020       0.1        0.3
X1       14         16       1960       2000        112        112        112          0
   X-Sec 14: Same as Sta 52+66 on Los Reales Improvement District Plan ID-101
                 and Sta 424+88 on West Branch Bank Protection Plan 4BVALE
X3        0          0          0          0          0       2740
GR     2482        720       2480        800       2479       1200       2479       1800       2478       1870
GR   2477.8       1900       2478       1920       2480       1950     2480.0       1960     2476.3       1966
GR   2471.9       1970     2471.9       1996     2479.2       2000     2477.5       2400     2478.0       2650
GR   2478.6       3500

NC     .030       .060      .0235       0.1        0.3
X1       15         16       2000       2040        100        100        100          0
   X-Sec 15: Same as Sta 51+66 on Los Reales Improvement District Plan ID-101
X3        0          0          0          0          0       2765
GR     2482        760       2480        820       2480       1180     2479.5       1820     2478.0       1895
GR     2476       1908       2474       1930       2474       1990     2478.8       2000     2472.2       2007
GR   2472.2       2033     2479.7       2040       2478       2420       2478       2420       2479       2900
GR   2479.5       3500
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X1      16      20    1993    2040     250     250     250       0
  X-Sec 16: Same as Sta 49+16 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2680
GR    2484     510    2482     890    2480    1310  2479.8    1750    2480    1870
GR    2480    1920    2478    1927    2476    1932    2476    1940    2478    1948
GR    2480    1960    2482    1967    2482    1993  2480.3    2000  2473.11    2007
GR  2473.1    2033  2480.5    2040  2478.5    2160  2480.0    2590  2481.5    3350

X1      17      14    1995    2040     250     250     250       0
  X-Sec 17: Same as Sta 46+66 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2620
GR    2484     490    2482    1190    2480    1740    2481    1900    2480    1940
GR    2482    1970    2482    1995  2480.7    2000 2474.02    2007 2474.02    2033
GR  2481.1    2040  2480.5    2250  2481.0    2900  2481.8    3300

X1      18      18    1990    2040     250     250     250       0    2000
  X-Sec 18: Same as Sta 44+16 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2550
GR     486     450     484     580     482    1300   481.6    1530     482    1740
GR   482.2    1830     482    1910     480    1950     477    1970     480    1980
GR     483    1990   481.1    2000  474.92    2007  474.92    2033   481.7    2040
GR   481.5    2480     482    3300   482.2    3450

X1      19      17    1995    2040     250     250     250       0    2000
  X-Sec 19: Same as Sta 41+66 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2480
GR     488     500     486     520     484     830   482.2    1500     482    1940
GR     480    1960     479    1980     480    1990     487    1995   481.6    2000
GR  475.80    2007  475.80    2033   482.3    2040   481.8    2250     482    2500
GR     482    3000     483    3680

X1      20      18    1995    2040     250     250     250       0    2000
  X-Sec 20: Same as Sta 39+16 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2420
GR     488     445     486     695     484     810   482.9    1065   482.2    1860
GR     478    1950     480    1960     482    1970     484    1980     486    1990
GR     487    1995   482.3    2000  476.67    2007  476.67    2033   483.0    2040
GR   482.2    2280     483    2930     484    3310

NC    .030    .060    .020
X1      21      16    1990    2048     197     197     197       0    2000
  X-Sec 21: Same as Sta 37+19 on Los Reales Improvement District Plan ID-101
X3       0       0       0       0       0    2375
GR     488     410     486     670     484    1060     484    1930     482    1949
GR     482    1962     484    1972     486    1980     487    1990   483.0    2000
GR  477.37    2015  477.37    2041   484.0    2048   483.3    2300     484    2595
GR   484.3    3330
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X1       22        19      1990      2046        44        44        44         0      2000
   X-Sec 22: Same as Sta 36+75 on Los Reales Improvement District Plan ID-101
X3        0         0         0         0         0      2365
GR      488       390       488       650       486       720       484       780       484      1600
GR      482      1660       482      1910       482      1965       484      1975       486      1982
GR      487      1990     483.2      2000    478.87      2006    478.87      2040     484.2      2046
GR      484      2080     483.4      2300       484      2640     484.4      3335

X1       23        15      1980      2046       231       231       231         0      2000
   X-Sec 23: Same as Sta 34+44 on Los Reales Improvement District Plan ID-101
X3        0         0         0         0         0      2310
GR      490       450       488       470       486      1230     484.3      1800       484      1910
GR      482      1935     481.5      1940       487      1980     484.2      2000     479.6      2006
GR    479.6      2040     485.2      2046     484.1      2140     484.5      3000     484.5      3400

X1       24        13      1985      2046       231       231       231         0      2000
   X-Sec 24: Same as Sta 32+13 on Los Reales Improvement District Plan ID-101
X3        0         0         0         0         0      2250
GR      488       370     487.4       820       486      1380       484      1950     482.2      1960
GR      488      1985       486      1995     485.8      2000     480.4      2006     480.4      2040
GR    485.4      2046     485.5      2400       486      3150

X1       25        15      2000      2046       300       300       300         0      2000
   X-Sec 25: Same as Sta 29+13 on Los Reales Improvement District Plan ID-101
X3        0         0         0         0         0      2170
GR      488       410       486      1850       484      1950     483.5      1955       484      1970
GR      486      1982       488      1995     488.3      2000     481.3      2006     481.3      2040
GR    488.3      2046     486.5      2430       487      3040     486.2      3450     487.5      4100

X1       26        13      2000      2046       235       235       235         0      2000
   X-Sec 26: Same as Sta 26+78 on Los Reales Improvement District Plan ID-101
X3        0         0         0         0         0      2100
GR      490       420       488       650       487      1200       486      1940       485      1950
GR      486      1975       488      1990     488.5      2000     482.1      2006     482.1      2040
GR    488.5      2046       487      2500       488      3400

X1       27        16      2000      2046       234       234       234         0
   X-Sec 2444  Located at u/s end of channel
GR   2494.0        50    2492.0       200    2490.0       490    2488.0      1900    2487.4    1931.5
GR   2485.6    1957.5    2488.5    1961.5    2488.8    1967.5    2488.2    1975.5    2489.1    1984.5
GR   2488.8    1998.9    2488.8      2000    2482.8      2006    2482.8      2040    2488.8    2045.5
GR   2493.4    2046.0
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NC    0.030     0.060     0.022       .1        .3
X1       28        44      2000     3340        52        52        52         0
   X-Sec 2392  Located at u/s end of channel and 31 ft u/s from Floodwall
   Ground-profile data along upstream side of floodwall were determined by
   field survey (NGVD-1929 datum).
GR   2494.0         0    2492.0      150    2491.0       400    2489.5       650    2489.5       800
GR   2490.0      1000    2490.0     1200    2490.0      1400    2490.0      1600    2490.0    1746.5
GR   2490.3      1800    2490.2   1846.5    2490.0    1889.5    2488.6      1903    2488.6    1912.5
GR   2487.4    1931.5    2485.6   1957.5    2488.5    1961.5    2488.8    1967.5    2488.2    1975.5
GR   2489.1    1984.5    2488.8   1998.9    2488.7    2000.0    2488.9    2042.3    2489.4    2046.4
GR   2488.7    2046.5    2489.3   2260.0    2489.2    2520.0    2489.0    2770.0    2489.2    3020.0
GR   2489.3    3340.0    2488.9     3470    2488.9    3546.5    2488.2    4046.5    2488.7    4346.5
GR   2487.9    4546.5    2489.5   4633.5    2489.5      4650    2489.5      5200    2488.7      5500
GR   2488.6    5800.5    2488.7     6100    2488.3      6400    2491.3      6750

NC    0.030     0.060     0.022       .1        .3
X1     28.1        52      2000     3340         2         2         2         0
   X-Sec 2390  Located at u/s end of channel and 33 ft u/s from Floodwall
   Ground-profile data along upstream side of floodwall were determined by
   field survey (NGVD-1929 datum).
GR   2494.0         0    2492.0      150    2491.0       400    2489.5       650    2489.5       800
GR   2490.0      1000    2490.0     1200    2490.0      1400    2490.0      1600    2490.0    1746.5
GR   2490.3      1800    2490.2   1846.5    2490.0    1889.5    2488.6      1903    2488.6    1912.5
GR   2487.4    1931.5    2485.6   1957.5    2488.5    1961.5    2488.8    1967.5    2488.2    1975.5
GR   2489.1    1984.5    2488.8   1998.9    2488.7    2000.0    2488.9    2042.3    2489.4    2046.4
GR   2488.7    2046.5    2489.3   2260.0    2489.2    2520.0    2489.0    2770.0    2489.2    3020.0
GR   2489.3    3340.0    2488.9     3470    2488.9    3546.5    2488.2    4046.5    2488.7    4346.5
GR   2487.9    4546.5    2489.5   4633.5    2489.5      4650    2489.5      5200    2488.7      5500
GR   2488.6    5800.5    2488.7     6100    2488.3      6400    2491.3      6750    2488.3      6760
GR   2489.1      6950    2489.2     7150      2490      7350    2491.6      7550    2491.8      7750
GR   2492.5      7850    2494.1     7950
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 *PROF 1
0

 CCHV=     .100 CEHV=     .300
 *SECNO 1.000
     1.000      3.70   2466.70        .00   2466.70   2467.04        .34        .00        .00   2474.00
    2786.7        .0    2786.7         .0        .0     594.7         .0        .0         .0   2470.00
       .00       .00      4.69        .00      .000      .027       .000      .000    2463.00   1799.50
   .001769        0.        0.         0.         0         0          0        .00     199.20   1998.70

 *SECNO 2.000
     2.000      3.31   2466.81        .00        .00   2467.30        .49        .21        .05   2474.00
    2786.7        .0    2786.7         .0        .0     494.0         .0       1.2         .4   2470.50
       .00       .00      5.64        .00      .000      .027       .000      .000    2463.50   1831.24
   .002603      100.      100.       100.          2         0          0        .00     167.07   1998.31

 *SECNO 3.000
     3.000      2.99   2467.29        .00        .00   2468.06        .77        .68        .08   2476.00
    2786.7        .0    2786.7         .0        .0     395.3         .0       3.3        1.1   2471.20
       .01       .00      7.05        .00      .000      .027       .000      .000    2464.30   1852.38
   .004552      200.      200.       200.          2         0          0        .00     145.60   1997.98

 *SECNO 4.000
     4.000      3.47   2468.17        .00        .00   2469.18       1.00       1.05        .07   2479.00
    2786.7        .0    2786.7         .0        .0     346.4         .0       5.0        1.8   2472.00
       .02       .00      8.04        .00      .000      .027       .000      .000    2464.70   1868.25
   .006089      200.      200.       200.          3         0          0        .00     129.92   1998.17

 *SECNO 5.000

 3470 ENCROACHMENT STATIONS=          .0    3090.0  TYPE=      1  TARGET=     3089.999
     5.000      4.51   2469.31        .00        .00   2470.07        .77        .87        .02   2479.50
    2786.7        .0    2786.7         .0        .0     397.0         .0       6.7        2.3   2472.60
       .03       .00      7.02        .00      .000      .027       .000      .000    2464.80   1884.69
   .003274      200.      200.       200.          3         0          0        .00     114.02   1998.71

 *SECNO 6.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

3470 ENCROACHMENT STATIONS=        .0    3040.0  TYPE=      1  TARGET=     3039.999
   6.000      4.89   2469.89      .00       .00   2470.91      1.02       .77       .08   2480.00
  2786.7        .0    2786.7       .0        .0     343.5        .0       8.4       2.8   2473.50
     .03       .00      8.11      .00      .000      .027      .000      .000   2465.00   1898.96
 .004534      200.      200.     200.         3         0         0       .00     99.43   1998.39

*SECNO 7.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    3000.0  TYPE=      1  TARGET=     2999.999
   7.000      3.92   2470.62   2470.62       .00   2472.29      1.66      1.17       .19   2481.00
  2786.7        .0    2786.7       .0        .0     269.1        .0       9.8       3.2   2474.00
     .04       .00     10.35      .00      .000      .027      .000      .000   2466.70   1916.57
 .007778      200.      200.     200.         3        15         0       .00     82.00   1998.58

*SECNO 8.000

3470 ENCROACHMENT STATIONS=        .0    2970.0  TYPE=      1  TARGET=     2969.999
   8.000      5.17   2472.17      .00       .00   2473.59      1.42      1.28       .02   2478.00
  2786.7        .0    2786.7       .0        .0     291.6        .0      11.1       3.6   2474.80
     .05       .00      9.56      .00      .000      .027      .000      .000   2467.00   1921.61
 .005332      200.      200.     200.         3         0         0       .00     75.31   1996.92

*SECNO 9.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2930.0  TYPE=      1  TARGET=     2929.999
   9.000      5.59   2473.09   2473.09       .00   2475.29      2.21      1.02       .24   2480.00
  2786.7        .0    2786.7       .0        .0     233.8        .0      12.1       3.8   2475.50
     .05       .00     11.92      .00      .000      .027      .000      .000   2467.50   1941.75
 .007384      164.      164.     164.        20         8         0       .00     53.76   1995.51
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

CCHV=     .100 CEHV=     .300
*SECNO 10.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL.CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2920.0  TYPE=      1  TARGET=     2919.999
   10.000      7.35   2476.35   2476.35       .00   2476.79       .44       .49       .18   2482.80
   2786.7       .0    1647.8    1138.9        .0     243.4     600.5      13.8       5.4   2475.90
      .06       .00      6.77      1.90      .000      .029      .030      .000   2469.00   1958.17
  .002148     136.      136.      136.        20        12         0       .00    961.83   2920.00

CCHV=     .100 CEHV=     .300
*SECNO 11.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL.CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2860.0  TYPE=      1  TARGET=     2859.999
   11.000      7.53   2477.13   2477.13       .00   2477.67       .54       .48       .03   2480.00
   2786.7       .2    1549.3    1237.3        .5     198.6     914.3      18.3       9.7   2476.60
      .07       .41      7.80      1.35      .030      .029      .060      .000   2469.60   1874.80
  .002642     200.      200.      200.        20         9         0       .00    895.58   2860.00

*SECNO 12.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL.CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2810.0  TYPE=      1  TARGET=     2809.999
   12.000      7.54   2477.84   2477.84       .00   2478.46       .61       .58       .02   2483.10
   2786.7       5.1    1647.0    1134.6       5.9     203.6     764.9      23.1      13.5   2478.40
      .08       .86      8.09      1.48      .030      .029      .060      .000   2470.30   1882.82
  .003187     200.      200.      200.        20         5         0       .00    777.78   2810.00
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 13.000

3265 DIVIDED FLOW

3280 CROSS SECTION     13.00 EXTENDED       .35 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2765.0  TYPE=      1  TARGET=     2764.999
    13.000      7.85   2478.85   2478.85       .00   2479.28       .43       .54       .02   2484.00
    2798.7     374.6    1538.9     885.3     240.4     219.8     746.9      28.1      18.3   2478.50
       .09      1.56      7.00      1.19      .030.      .029      .060      .000   2471.00   1428.52
   .002295      200.      200.      200.        20         9         0       .00   1295.70   2765.00

CCHV=     .100 CEHV=     .300
*SECNO 14.000

3265 DIVIDED FLOW

3280 CROSS SECTION     14.00 EXTENDED       .74 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2740.0  TYPE=      1  TARGET=     2739.999
    14.000      7.44   2479.34   2479.34       .00   2479.77       .43       .16       .00   2480.00
    2863.0     403.1    1631.8     828.1     372.5     237.1     912.2      31.6      22.1   2479.20
       .10      1.08      6.88       .91      .030      .020      .060      .000   2471.90   1063.48
   .000965      112.      112.      112.        20         9         0       .00   1655.57   2740.00

CCHV=     .100 CEHV=     .300
*SECNO 15.000
3280 CROSS SECTION     15.00 EXTENDED       .23 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.64
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


3470 ENCROACHMENT STATIONS=          .0    2765.0  TYPE=      1  TARGET=     2764.999
   15.000      7.53    2479.73       .00        .00    2479.85       .12        .06        .03    2478.80
   2910.1    1534.3      952.3     423.5      624.2      251.9     807.6       35.2       25.4    2479.70
      .11      2.46       3.78       .52       .030       .023      .060       .000    2472.20    1525.00
  .000369     100.       100.      100.          2          0         0        .00    1240.00    2765.00


*SECNO 16.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    2680.0  TYPE=      1  TARGET=     2679.999
   16.000      7.19    2480.29   2480.29        .00    2480.80       .51        .17        .12    2482.00
   2910.1     648.1     1728.1     534.0      344.7      236.4     562.5       43.4       32.9    2480.50
      .12      1.88       7.31       .95       .030       .023      .060       .000    2473.10    1248.73
  .001503     250.       250.      250.         20          9         0        .00    1379.59    2680.00


*SECNO 17.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    2620.0  TYPE=      1  TARGET=     2619.999
   17.000      7.44    2481.46   2481.46        .00    2481.94       .48        .36        .00    2482.00
   2910.1     804.7     1766.3     339.1      498.5      250.4     438.7       50.1       40.5    2481.10
      .14      1.61       7.05       .77       .030       .023      .060       .000    2474.02    1339.65
  .001400     250.       250.      250.         20          9         0        .00    1245.09    2620.00


*SECNO 18.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2550.0  TYPE=      1  TARGET=     2549.999
   18.000      7.36   2482.28   2482.28       .00   2482.75       .46       .35       .00   2483.00
   2910.1     907.9    1743.4     258.9     431.5     252.8     353.8      56.4      47.9   2481.70
      .15      2.10      6.90       .73      .030      .023      .060      .000   2474.92   1198.13
  .001422      250.      250.      250.         3         6         0       .00   1345.70   2550.00

*SECNO 19.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL.CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        .0    2480.0  TYPE=      1  TARGET=     2479.999
   19.000      6.92   2482.72   2482.72       .00   2483.23       .50       .37       .01   2487.00
   2910.1     934.1    1707.9     268.1     459.4     234.5     332.8      62.4      55.1   2482.30
      .17      2.03      7.28       .81      .030      .023      .060      .000   2475.80   1304.99
  .001520      250.      250.      250.        20         9         0       .00   1168.00   2480.00

*SECNO 20.000

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE.  KRATIO =  1.57

3470 ENCROACHMENT STATIONS=        .0    2420.0  TYPE=      1  TARGET=     2419.999
   20.000      6.69   2483.36       .00       .00   2483.50       .14       .23       .04   2487.00
   2910.1    1691.2    1028.6     190.4    1035.4     226.4     333.3      69.9      62.6   2483.00
      .19      1.63      4.54       .57      .030      .023      .060      .000   2476.67    957.99
  .000616      250.      250.      250.         2         0         0       .00   1439.95   2420.00

*SECNO 21.000

3265 DIVIDED FLOW
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 2375.0 TYPE= 1 TARGET= 2374.999

21.000	7.21	2484.58	2484.58	.00	2485.05	.47	.15	.10	2487.00
2910.1	747.2	1917.0	245.9	617.0	283.7	323.5	76.3	69.0	2484.00
.20	1.21	6.76	.76	.030	.020	.060	.000	2477.37	946.98
.000948	197.	197.	197.	20	9	0	.00	1406.29	2375.00

*SECNO 22.000

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.39

3470 ENCROACHMENT STATIONS= .0 2365.0 TYPE= 1 TARGET= 2364.999

22.000	6.20	2485.07	.00	.00	2485.11	.04	.01	.04	2487.00
2927.5	2036.2	713.8	177.5	1990.5	261.3	442.5	78.2	70.5	2484.20
.21	1.02	2.73	.40	.030	.020	.060	.000	2478.87	747.59
.000168	44.	44.	44.	2	0	0	.00	1601.14	2365.00

*SECNO 23.000

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 2310.0 TYPE= 1 TARGET= 2309.999

23.000	5.76	2485.36	2485.36	.00	2485.92	.56	.09	.16	2487.00
3129.9	1007.9	1833.4	288.7	454.4	239.3	275.1	88.0	77.0	2485.20
.22	2.22	7.66	1.05	.030	.020	.060	.000	2479.60	1443.49
.001612	231.	231.	231.	20	10	0	.00	842.91	2310.00

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

*SECNO 24.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 2250.0 TYPE= 1 TARGET= 2249.999

24.000	5.65	2486.05	2486.05	.00	2486.52	.48	.35	.01	2488.00
3129.9	1364.6	1679.4	86.0	657.9	229.3	125.9	93.2	81.6	2485.40
.24	2.07	7.33	.68	.030	.020	.060	.000	2480.40	1361.64
.001453	231.	231.	231.	20	6	0	.00	870.17	2250.00

*SECNO 25.000

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 2170.0 TYPE= 1 TARGET= 2169.999

25.000	5.67	2486.97	2486.97	.00	2487.56	.59	.45	.03	2488.30
3129.9	1366.4	1763.5	.0	627.6	220.4	.0	99.6	87.6	2488.30
.25	2.18	8.00	.00	.030	.020	.000	.000	2481.30	1150.92
.001560	300.	300.	300.	20	5	0	.00	881.11	2044.86

*SECNO 26.000

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS= .0 2100.0 TYPE= 1 TARGET= 2099.999

26.000	5.42	2487.52	.00	.00	2487.91	.40	.33	.02	2488.50
3129.9	1631.4	1498.6	.0	912.5	212.0	.0	104.9	93.0	2488.50
.27	1.79	7.07	.00	.030	.020	.000	.000	2482.10	911.98
.001280	235.	235.	235.	3	0	0	.00	1118.62	2045.08

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

*SECNO 27.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   27.000      6.45    2489.25    2489.25        .00    2489.87        .62        .30        .07    2488.80
   3129.9    1111.0     2019.0         .0      695.7      258.8         .0      110.5       98.7    2493.40
      .28      1.60       7.80        .00       .030       .020       .000       .000    2482.80    1021.68
  .001267      234.       234.       234.         20         12          0        .00    1023.87    2045.55

CCHV=     .100 CEHV=     .300
*SECNO 28.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.15

   28.000      4.35    2489.95        .00        .00    2489.96        .01        .03        .06    2488.70
   3129.9     343.6     1052.1     1734.3      331.3     1084.8     3660.8      114.1      102.4    2489.30
      .30      1.04        .97        .47       .030       .022       .060       .000    2485.60     575.13
  .000273       52.        52.        52.          3          0          0        .00    5106.97    6592.40

CCHV=     .100 CEHV=     .300
*SECNO 28.100

3265 DIVIDED FLOW

   28.100      4.32    2489.92        .00        .00    2489.97        .05        .00        .01    2488.70
   7638.0     798.0     2394.2     4445.8      318.5     1051.1     4036.4      114.4      102.7    2489.30
      .30      2.51       2.28       1.10       .030       .022       .060       .000    2485.60     579.32
  .001573        2.         2.         2.          2          0          0        .00    5665.98    7331.02
```

TN Normal depth split flow - Sections 11 to 12

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	200.0	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	.00	.00	.00	10	2477.130	2477.844	11.000	12.000

TN Normal depth split flow - Sections 12 to 13

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
24.4	.49	.35	.18	200.0	138.5

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
12.00	11.99	.10	12.00	11.99	.10	10	2477.844	2478.852	12.000	13.000

TN Normal depth split flow - Section 13 to 14

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
61.2	1.05	.74	.55	112.0	112.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
64.27	64.11	.25	76.27	76.10	.22	10	2478.852	2479.341	13.000	14.000

TN Normal depth split flow - Sections 14 to 15

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
48.6	.97	.74	.49	100.0	100.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
47.12	47.03	.19	123.39	123.13	.21	10	2479.341	2479.730	14.000	15.000

TN Normal depth split flow - Sections 21 to 22

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
20.9	.83	.67	.48	44.0	44.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
17.34	17.29	.32	140.73	140.42	.22	10	2484.580	2485.071	21.000	22.000

TN Normal depth split flow - Sections 22 to 23

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
177.3	1.14	.86	.77	231.0	231.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
202.49	201.53	.48	343.23	341.95	.37	10	2485.071	2485.363	22.000	23.000

TC Rating curve outflow data set for Splitflow into South Diversion Channel

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
3308.07	3308.22	.00	3651.30	3650.17	.03	10	2489.949	2489.924	28.000	28.100

TW Splitflow #28 to #28.1 (Splitflow goes directly into the Santa Cruz River)

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
1199.98	1197.65	.19	4851.28	4847.82	.07	10	2489.949	2489.924	28.000	28.100

THIS RUN EXECUTED 30NOV94 11:41:02

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

West Branch Santa Cruz

SUMMARY PRINTOUT

	SECNO	Q	QLOB	QCH	QROB	CWSEL	CRIWS	EG	DEPTH	SSTA	TOPWID	ENDST	DIFEG
	1.000	2786.72	.00	2786.72	.00	2466.70	.00	2467.04	3.70	1799.50	199.20	1998.70	.00
	2.000	2786.72	.00	2786.72	.00	2466.81	.00	2467.30	3.31	1831.24	167.07	1998.31	.00
	3.000	2786.72	.00	2786.72	.00	2467.29	.00	2468.06	2.99	1852.38	145.60	1997.98	.00
	4.000	2786.72	.00	2786.72	.00	2468.17	.00	2469.18	3.47	1868.25	129.92	1998.17	.00
	5.000	2786.72	.00	2786.72	.00	2469.31	.00	2470.07	4.51	1884.69	114.02	1998.71	.00
	6.000	2786.72	.00	2786.72	.00	2469.89	.00	2470.91	4.89	1898.96	99.43	1998.39	.00
*	7.000	2786.72	.00	2786.72	.00	2470.62	2470.62	2472.29	3.92	1916.57	82.00	1998.58	.00
	8.000	2786.72	.00	2786.72	.00	2472.17	.00	2473.59	5.17	1921.61	75.31	1996.92	.00
*	9.000	2786.72	.00	2786.72	.00	2473.09	2473.09	2475.29	5.59	1941.75	53.76	1995.51	.00
*	10.000	2786.72	.00	1647.79	1138.94	2476.35	2476.35	2476.79	7.35	1958.17	961.83	2920.00	.00
*	11.000	2786.72	.20	1549.26	1237.26	2477.13	2477.13	2477.67	7.53	1874.80	895.58	2860.00	.00
*	12.000	2786.72	5.10	1646.98	1134.64	2477.84	2477.84	2478.46	7.54	1882.82	777.78	2810.00	.00
*	13.000	2798.72	374.61	1538.86	885.25	2478.85	2478.85	2479.28	7.85	1428.52	1295.70	2765.00	.00
*	14.000	2862.99	403.09	1631.77	828.13	2479.34	2479.34	2479.77	7.44	1063.48	1655.57	2740.00	.00
*	15.000	2910.11	1534.34	952.28	423.49	2479.73	.00	2479.85	7.53	1525.00	1240.00	2765.00	.00
*	16.000	2910.11	648.07	1728.09	533.95	2480.29	2480.29	2480.80	7.19	1248.73	1379.59	2680.00	.00
*	17.000	2910.11	804.66	1766.34	339.11	2481.46	2481.46	2481.94	7.44	1339.65	1245.09	2620.00	.00

	SECNO	Q	QLOB	QCH	QROB	CWSEL	CRIWS	EG	DEPTH	SSTA	TOPWID	ENDST	DIFEG
*	18.000	2910.11	907.86	1743.38	258.88	2482.28	2482.28	2482.75	7.36	1198.13	1345.70	2550.00	.00
*	19.000	2910.11	934.13	1707.91	268.07	2482.72	2482.72	2483.23	6.92	1304.99	1168.00	2480.00	.00
*	20.000	2910.11	1691.17	1028.56	190.38	2483.36	.00	2483.50	6.69	957.99	1439.95	2420.00	.00
*	21.000	2910.11	747.23	1916.99	245.89	2484.58	2484.58	2485.05	7.21	946.98	1406.29	2375.00	.00
*	22.000	2927.46	2036.17	713.84	177.45	2485.07	.00	2485.11	6.20	747.59	1601.14	2365.00	.00
*	23.000	3129.95	1007.85	1833.37	288.72	2485.36	2485.36	2485.92	5.76	1443.49	842.91	2310.00	.00
*	24.000	3129.95	1364.55	1679.39	86.00	2486.05	2486.05	2486.52	5.65	1361.64	870.17	2250.00	.00
*	25.000	3129.95	1366.44	1763.51	.00	2486.97	2486.97	2487.56	5.67	1150.92	881.11	2044.86	.00
	26.000	3129.95	1631.36	1498.59	.00	2487.52	.00	2487.91	5.42	911.98	1118.62	2045.08	.00
*	27.000	3129.95	1110.97	2018.97	.00	2489.25	2489.25	2489.87	6.45	1021.68	1023.87	2045.55	.00
*	28.000	3129.95	343.55	1052.07	1734.33	2489.95	.00	2489.96	4.35	575.13	5106.97	6592.40	.00
	28.100	7638.00	797.98	2394.20	4445.82	2489.92	.00	2489.97	4.32	579.32	5665.98	7331.02	.00

West Branch Santa Cruz

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.000	.00	.00	.00	2463.00	2786.72	2466.70	.00	2467.04	17.69	4.69	594.71	662.55
	2.000	100.00	.00	.00	2463.50	2786.72	2466.81	.00	2467.30	26.03	5.64	493.97	546.18
	3.000	200.00	.00	.00	2464.30	2786.72	2467.29	.00	2468.06	45.52	7.05	395.31	413.05
	4.000	200.00	.00	.00	2464.70	2786.72	2468.17	.00	2469.18	60.89	8.04	346.42	357.13
	5.000	200.00	.00	.00	2464.80	2786.72	2469.31	.00	2470.07	32.74	7.02	396.99	487.04
	6.000	200.00	.00	.00	2465.00	2786.72	2469.89	.00	2470.91	45.34	8.11	343.47	413.87
*	7.000	200.00	.00	.00	2466.70	2786.72	2470.62	2470.62	2472.29	77.78	10.35	269.14	315.99
	8.000	200.00	.00	.00	2467.00	2786.72	2472.17	.00	2473.59	53.32	9.56	291.63	381.65
*	9.000	164.00	.00	.00	2467.50	2786.72	2473.09	2473.09	2475.29	73.84	11.92	233.84	324.31
*	10.000	136.00	.00	.00	2469.00	2786.72	2476.35	2476.35	2476.79	21.48	6.77	843.87	601.30
*	11.000	200.00	.00	.00	2469.60	2786.72	2477.13	2477.13	2477.67	26.42	7.80	1113.41	542.18
*	12.000	200.00	.00	.00	2470.30	2786.72	2477.84	2477.84	2478.46	31.87	8.09	974.42	493.60
*	13.000	200.00	.00	.00	2471.00	2798.72	2478.85	2478.85	2479.28	22.95	7.00	1207.04	584.25
*	14.000	112.00	.00	.00	2471.90	2862.99	2479.34	2479.34	2479.77	9.65	6.88	1521.86	921.51
*	15.000	100.00	.00	.00	2472.20	2910.11	2479.73	.00	2479.85	3.69	3.78	1683.71	1514.73
*	16.000	250.00	.00	.00	2473.10	2910.11	2480.29	2480.29	2480.80	15.03	7.31	1143.65	750.67
*	17.000	250.00	.00	.00	2474.02	2910.11	2481.46	2481.46	2481.94	14.00	7.05	1187.54	777.70
*	18.000	250.00	.00	.00	2474.92	2910.11	2482.28	2482.28	2482.75	14.22	6.90	1038.16	771.77
*	19.000	250.00	.00	.00	2475.80	2910.11	2482.72	2482.72	2483.23	15.20	7.28	1026.78	746.48
*	20.000	250.00	.00	.00	2476.67	2910.11	2483.36	.00	2483.50	6.16	4.54	1595.12	1172.58
*	21.000	197.00	.00	.00	2477.37	2910.11	2484.58	2484.58	2485.05	9.48	6.76	1224.30	945.13
*	22.000	44.00	.00	.00	2478.87	2927.46	2485.07	.00	2485.11	1.68	2.73	2694.39	2258.57
*	23.000	231.00	.00	.00	2479.60	3129.95	2485.36	2485.36	2485.92	16.12	7.66	968.81	779.68
*	24.000	231.00	.00	.00	2480.40	3129.95	2486.05	2486.05	2486.52	14.53	7.33	1013.08	821.05

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	25.000	300.00	.00	.00	2481.30	3129.95	2486.97	2486.97	2487.56	15.60	8.00	847.99	792.52
	26.000	235.00	.00	.00	2482.10	3129.95	2487.52	.00	2487.91	12.80	7.07	1124.46	874.98
*	27.000	234.00	.00	.00	2482.80	3129.95	2489.25	2489.25	2489.87	12.67	7.80	954.45	879.46
*	28.000	52.00	.00	.00	2485.60	3129.95	2489.95	.00	2489.96	2.73	.97	5076.90	1892.93
	28.100	2.00	.00	.00	2485.60	7638.00	2489.92	.00	2489.97	15.73	2.28	5406.00	1925.84

West Branch Santa Cruz

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1.000	2786.72	2466.70	.00	.00	.00	199.20	.00
	2.000	2786.72	2466.81	.00	.11	.00	167.07	100.00
	3.000	2786.72	2467.29	.00	.48	.00	145.60	200.00
	4.000	2786.72	2468.17	.00	.88	.00	129.92	200.00
	5.000	2786.72	2469.31	.00	1.14	.00	114.02	200.00
	6.000	2786.72	2469.89	.00	.59	.00	99.43	200.00
*	7.000	2786.72	2470.62	.00	.73	.00	82.00	200.00
	8.000	2786.72	2472.17	.00	1.55	.00	75.31	200.00
*	9.000	2786.72	2473.09	.00	.91	.00	53.76	164.00
*	10.000	2786.72	2476.35	.00	3.26	.00	961.83	136.00
*	11.000	2786.72	2477.13	.00	.78	.00	895.58	200.00
*	12.000	2786.72	2477.84	.00	.71	.00	777.78	200.00
*	13.000	2798.72	2478.85	.00	1.01	.00	1295.70	200.00
*	14.000	2862.99	2479.34	.00	.49	.00	1655.57	112.00
*	15.000	2910.11	2479.73	.00	.39	.00	1240.00	100.00
*	16.000	2910.11	2480.29	.00	.56	.00	1379.59	250.00
*	17.000	2910.11	2481.46	.00	1.16	.00	1245.09	250.00
*	18.000	2910.11	2482.28	.00	.83	.00	1345.70	250.00
*	19.000	2910.11	2482.72	.00	.44	.00	1168.00	250.00
*	20.000	2910.11	2483.36	.00	.63	.00	1439.95	250.00
*	21.000	2910.11	2484.58	.00	1.22	.00	1406.29	197.00
*	22.000	2927.46	2485.07	.00	.49	.00	1601.14	44.00
*	23.000	3129.95	2485.36	.00	.29	.00	842.91	231.00
*	24.000	3129.95	2486.05	.00	.68	.00	870.17	231.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	25.000	3129.95	2486.97	.00	.93	.00	881.11	300.00
	26.000	3129.95	2487.52	.00	.55	.00	1118.62	235.00
*	27.000	3129.95	2489.25	.00	1.73	.00	1023.87	234.00
*	28.000	3129.95	2489.95	.00	.70	.00	5106.97	52.00
	28.100	7638.00	2489.92	.00	-.02	.00	5665.98	2.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=     7.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     7.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     9.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     9.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     9.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    10.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    10.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    10.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    11.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    11.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    11.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    12.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    12.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    12.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    13.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    13.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    13.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    14.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    14.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    14.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=    15.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    16.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    16.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    16.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    17.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    17.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    17.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    18.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    18.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=    19.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    19.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    19.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=    20.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    21.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    21.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    21.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=    22.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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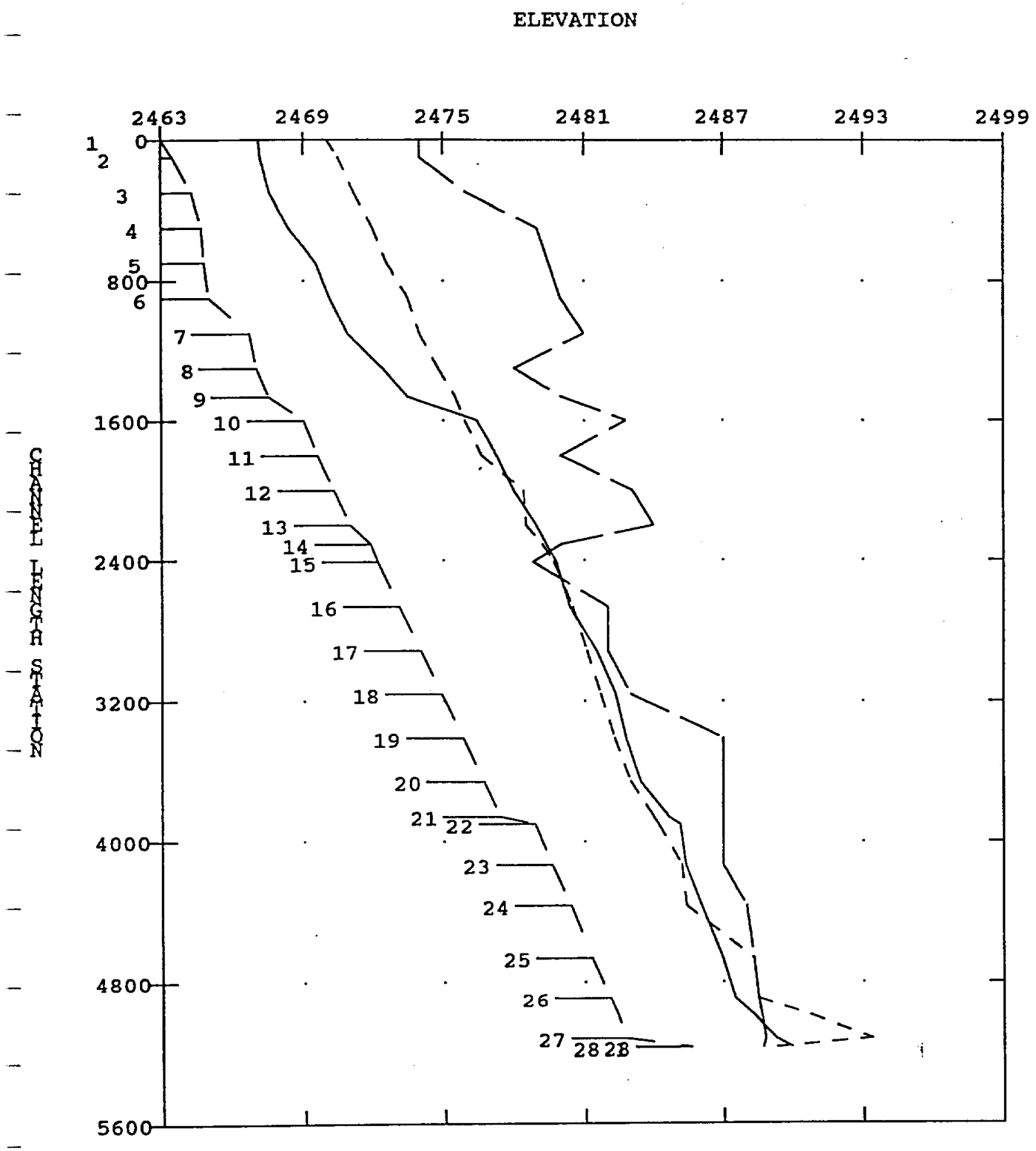
CAUTION SECNO=     23.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     23.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     23.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

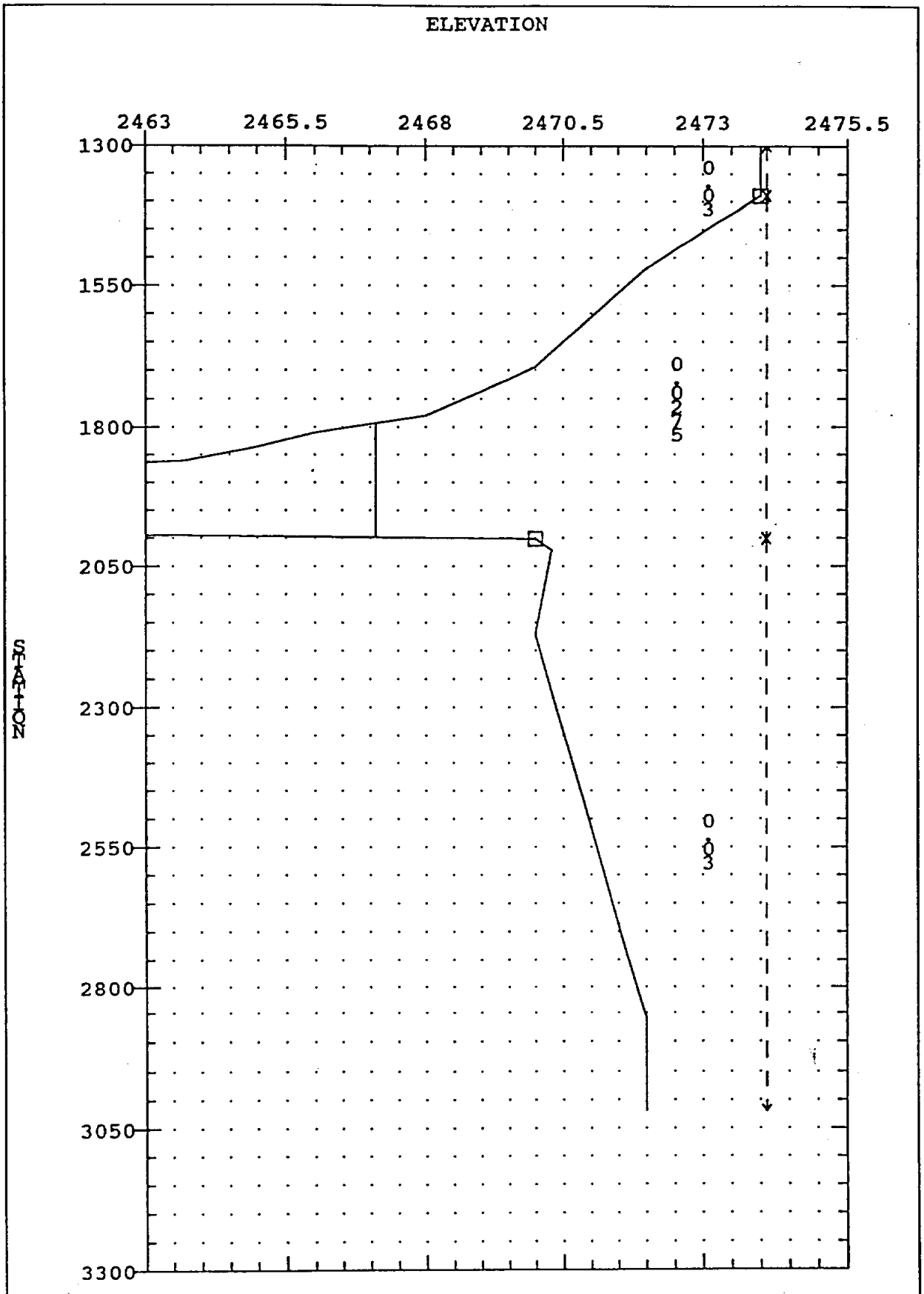
CAUTION SECNO=     24.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     24.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     24.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     25.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     25.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     25.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     27.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     27.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     27.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

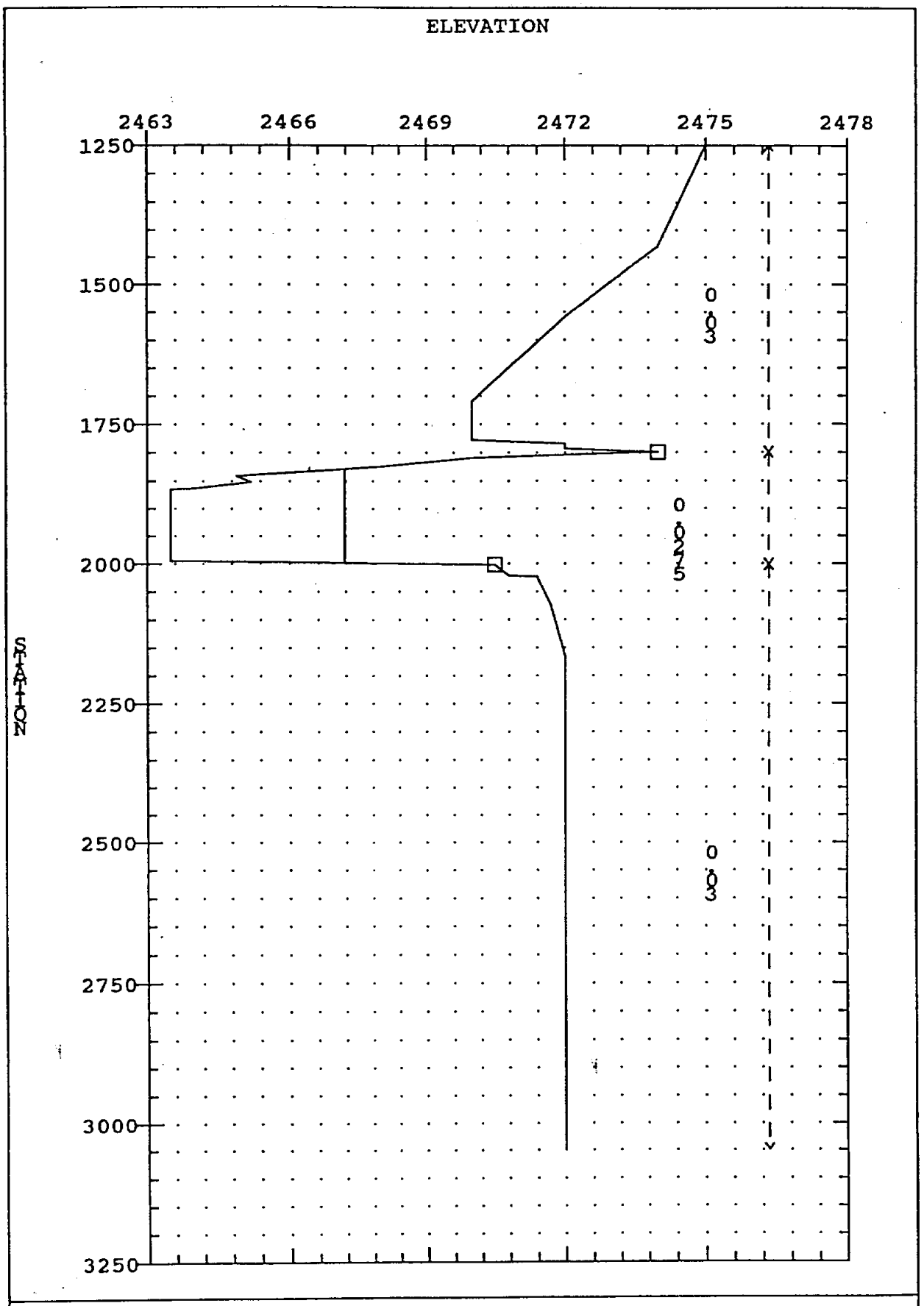
WARNING SECNO=     28.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```


ELEVATION
2463
2469
2475
2481
2487
2493
2499
CHANNEL LENGTH STATION
0
800
1600
2400
3200
4000
4800
5600
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
28



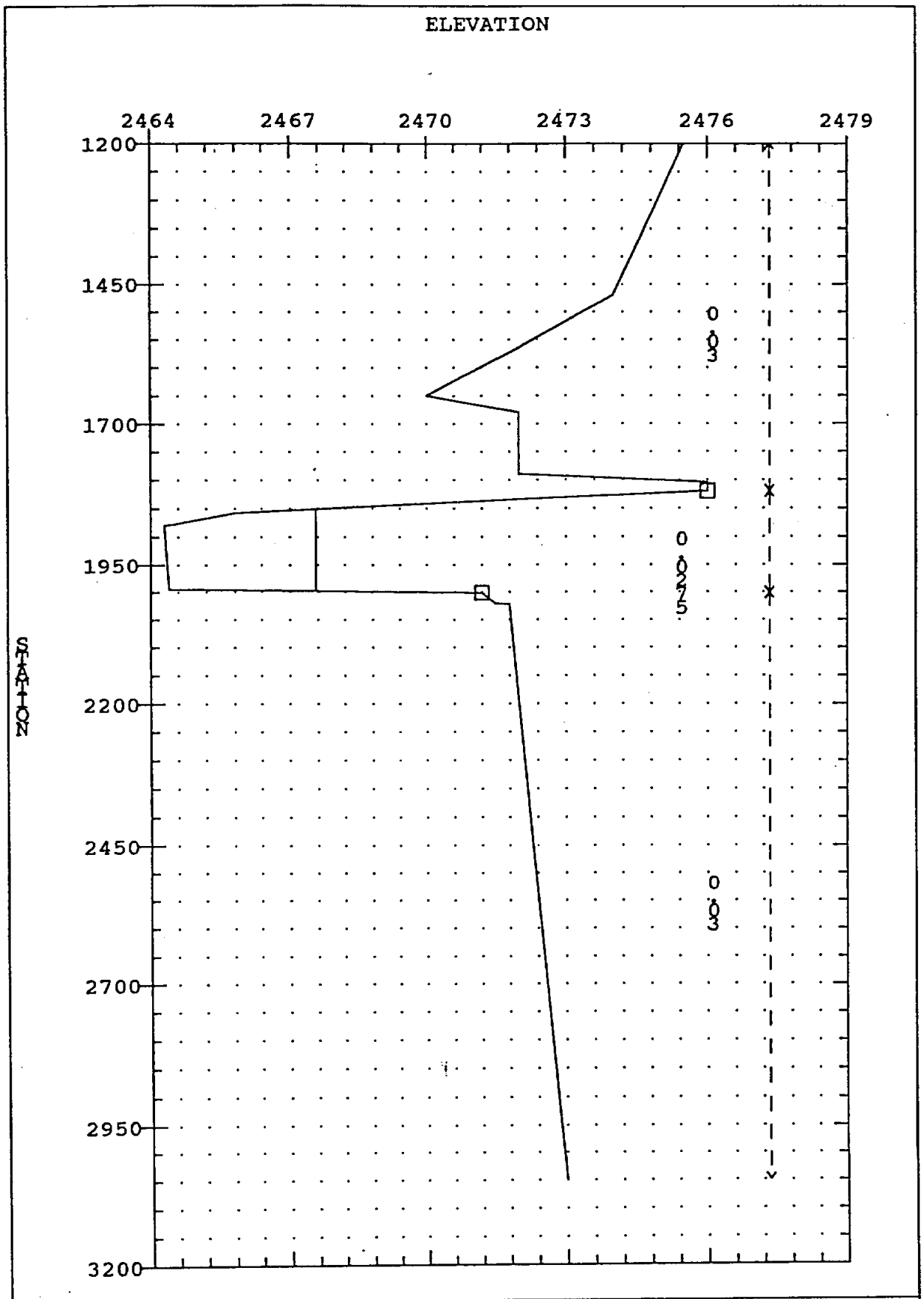
SECTION : 1

West Branch Santa Cruz River



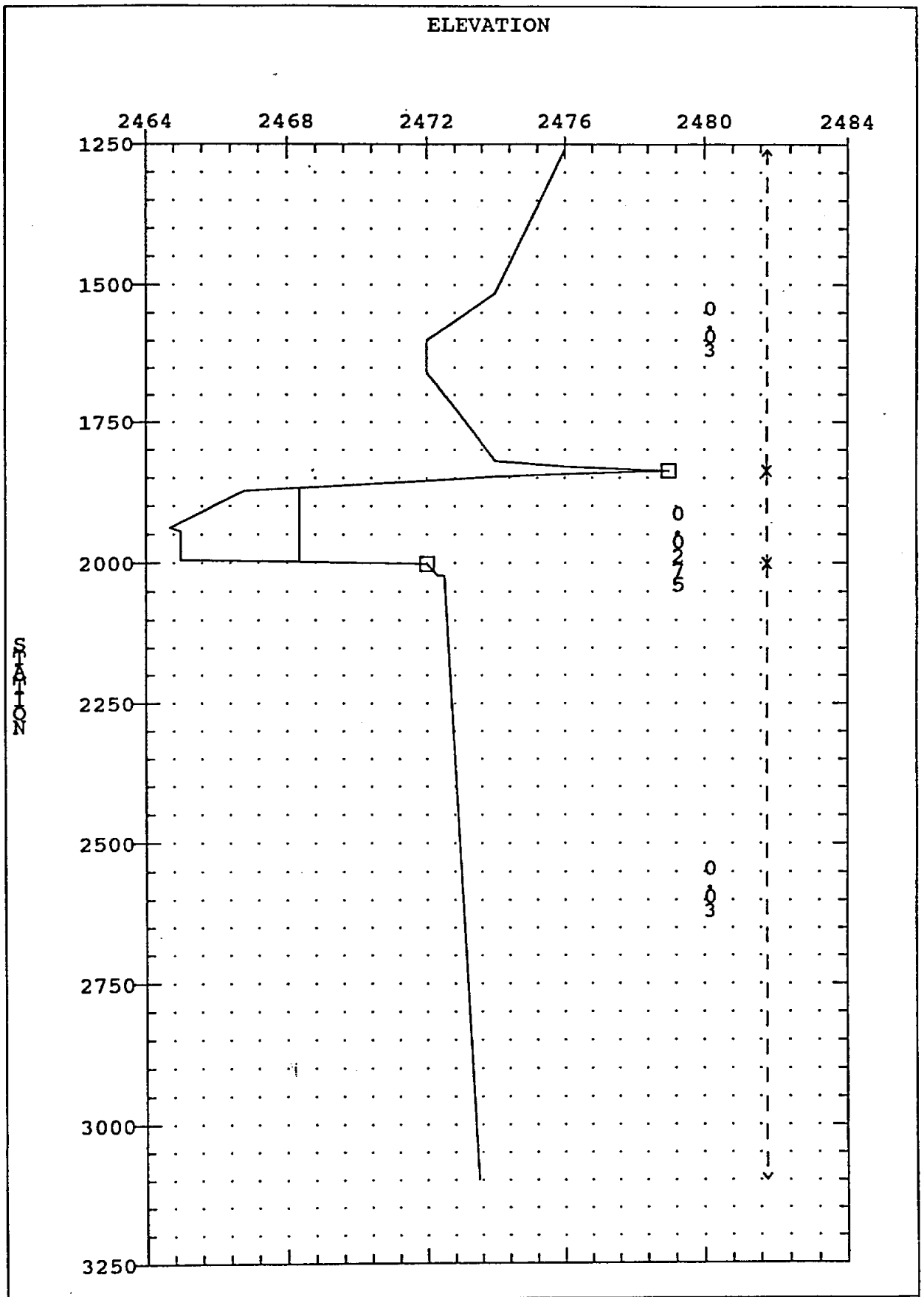
SECTION : 2

West Branch Santa Cruz River



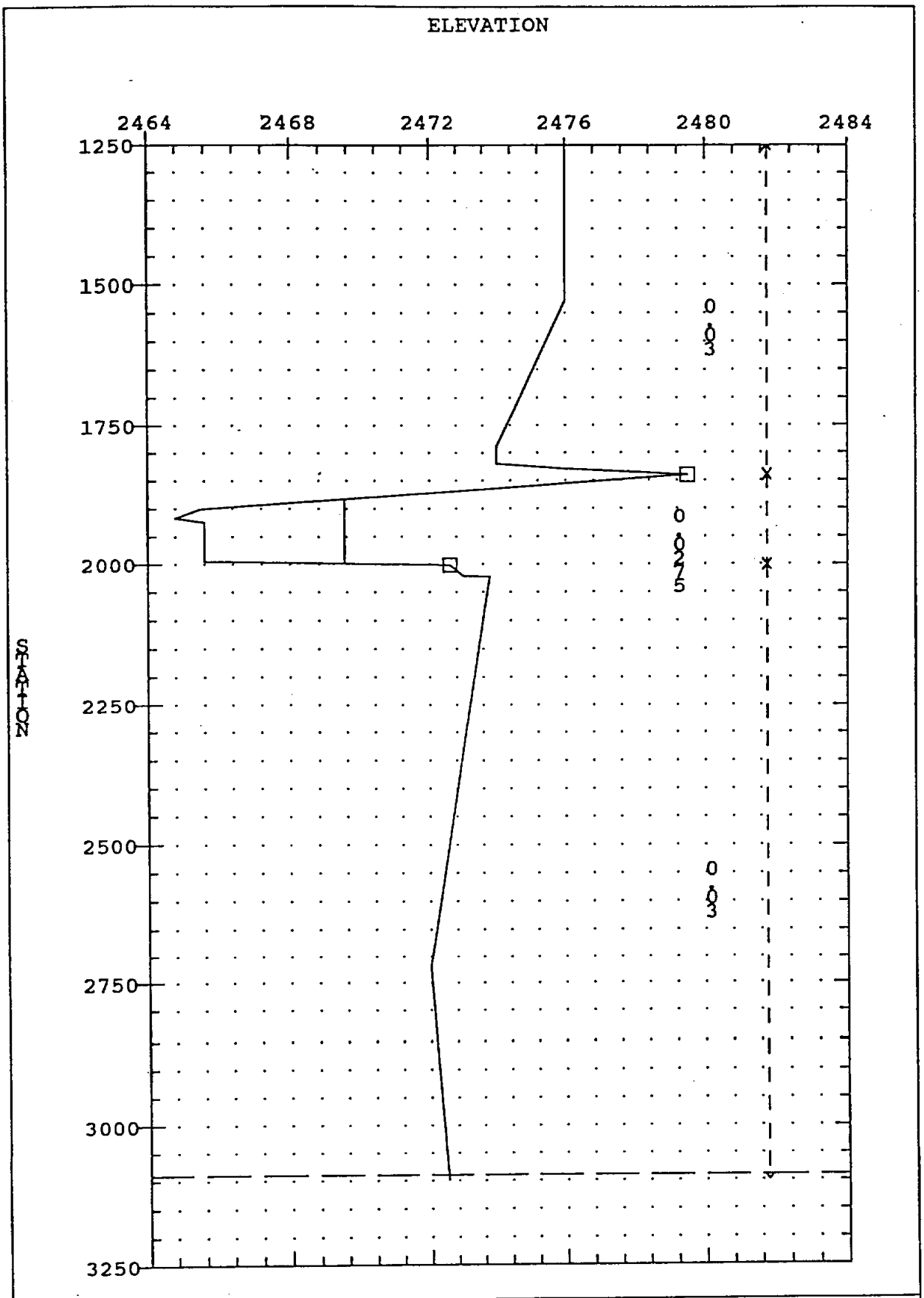
SECTION : 3

West Branch Santa Cruz River



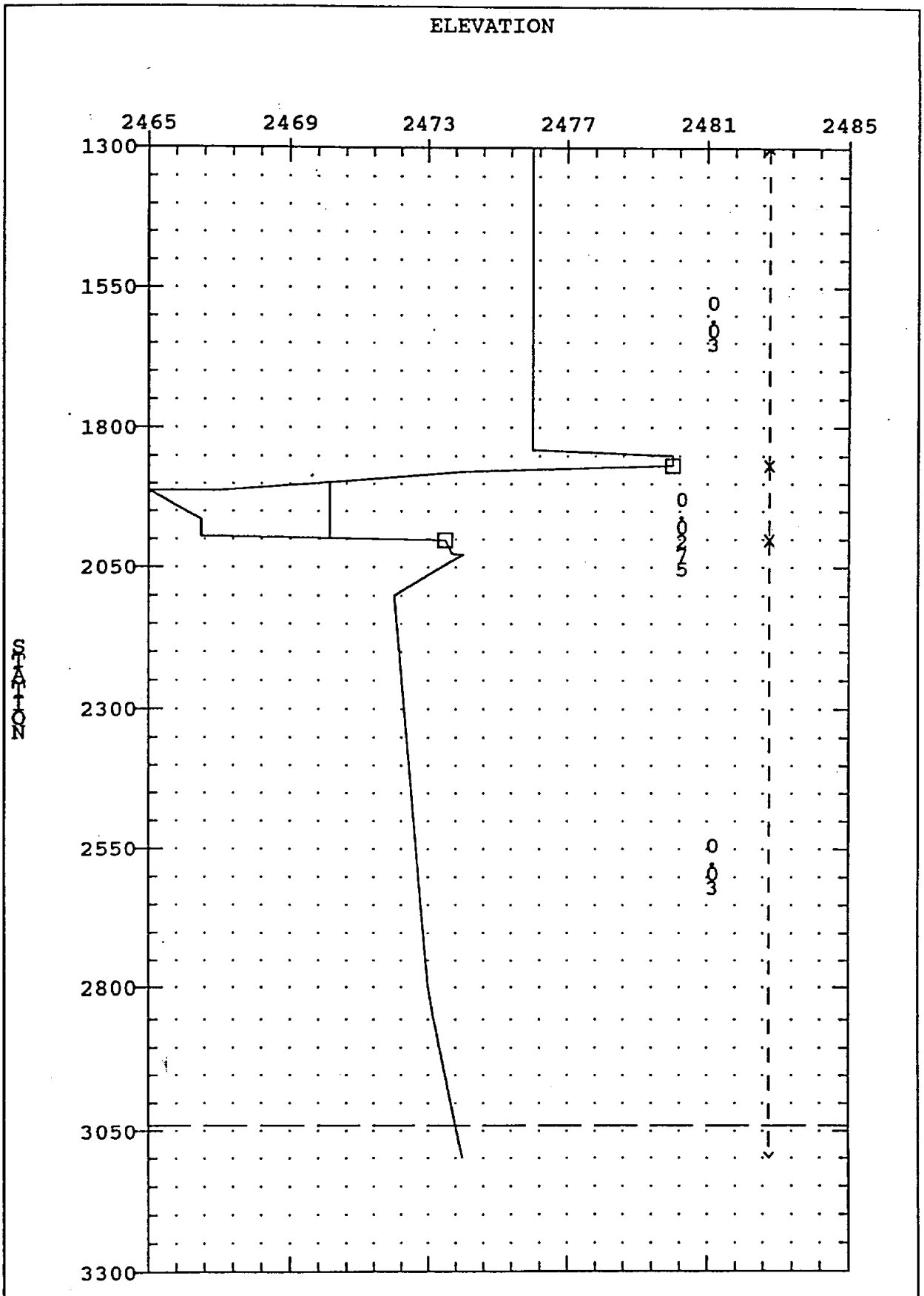
SECTION : 4

West Branch Santa Cruz River



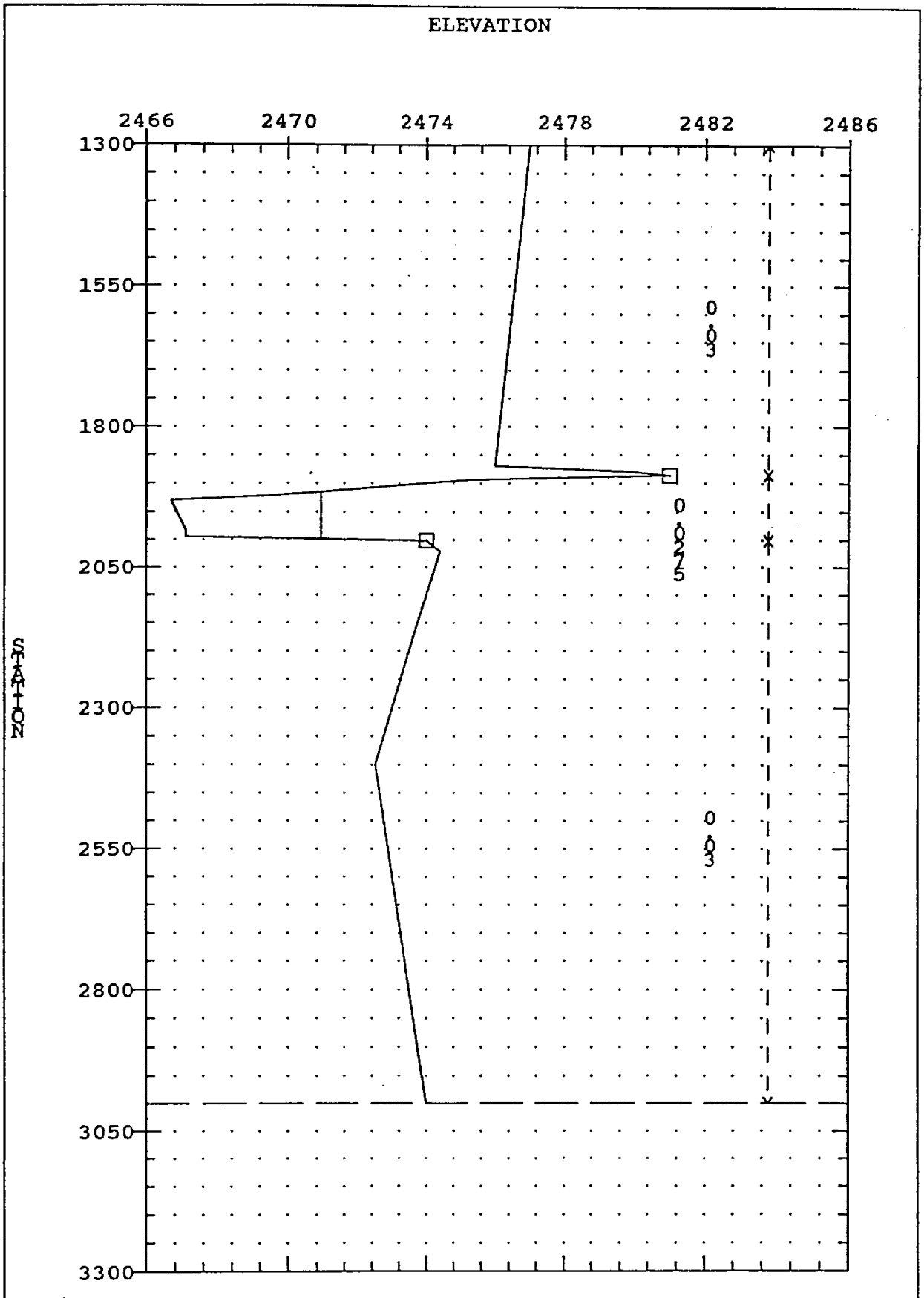
SECTION : 5

West Branch Santa Cruz River



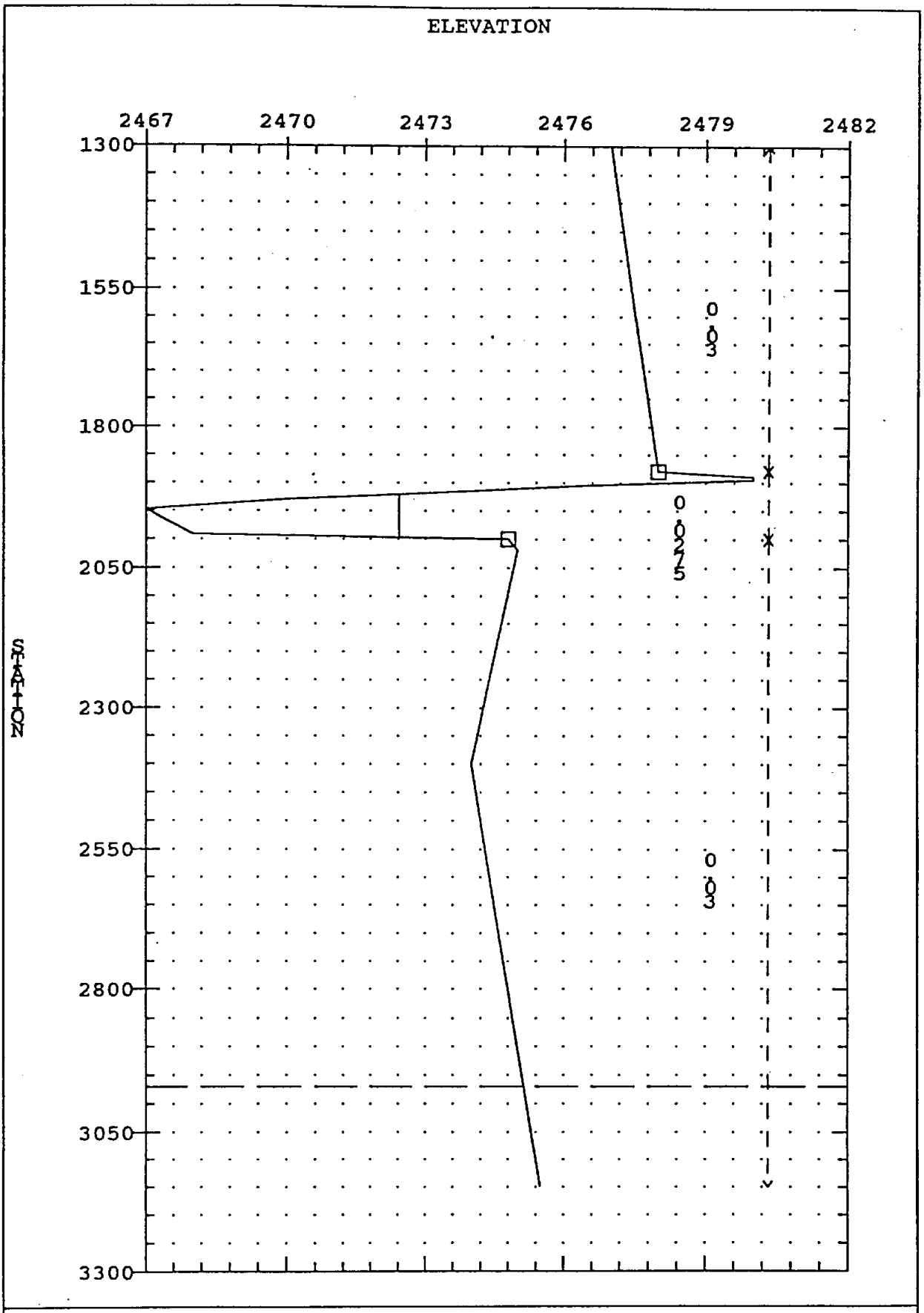
SECTION : 6

West Branch Santa Cruz River



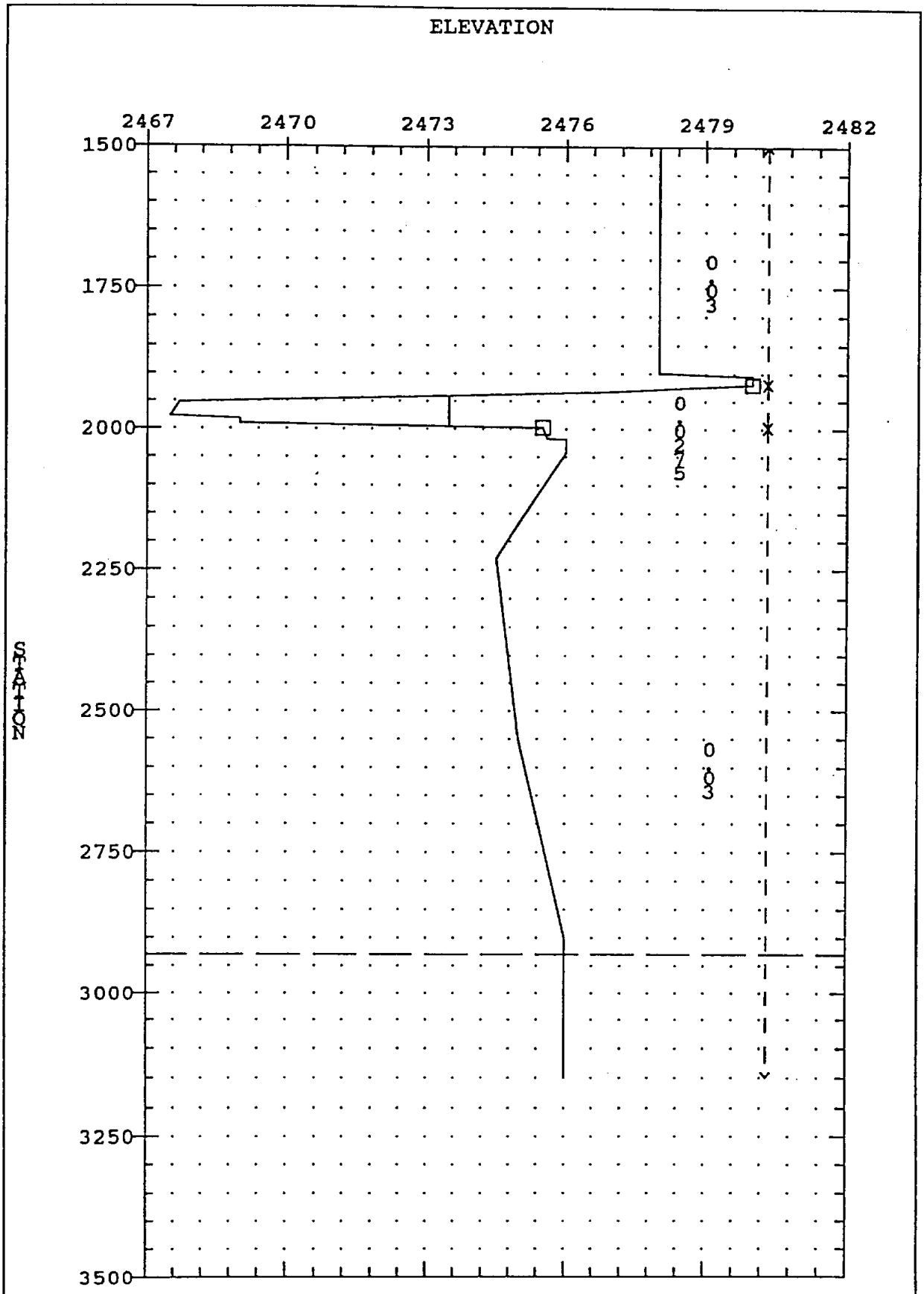
SECTION : 7

West Branch Santa Cruz River



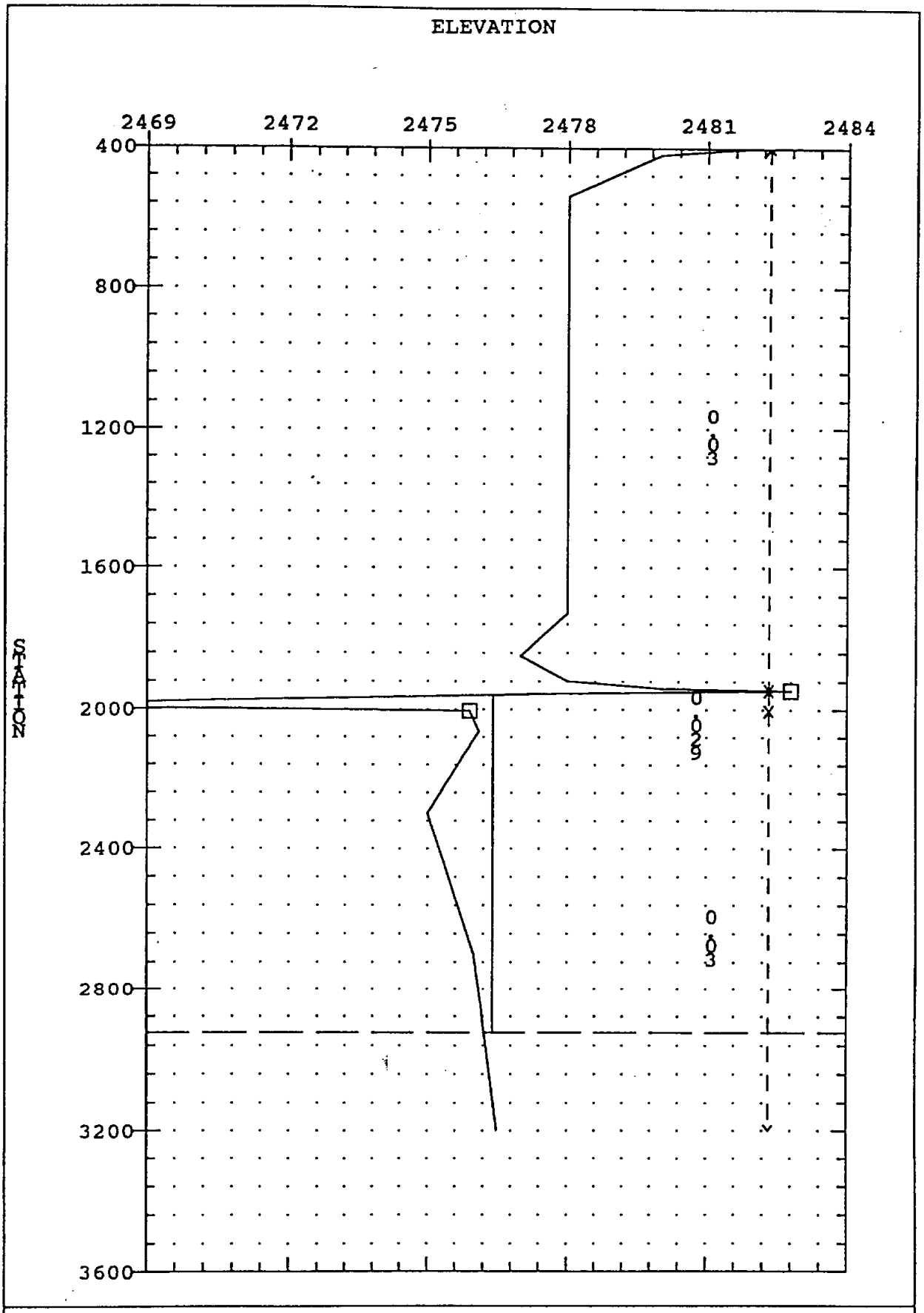
SECTION : 8

West Branch Santa Cruz River



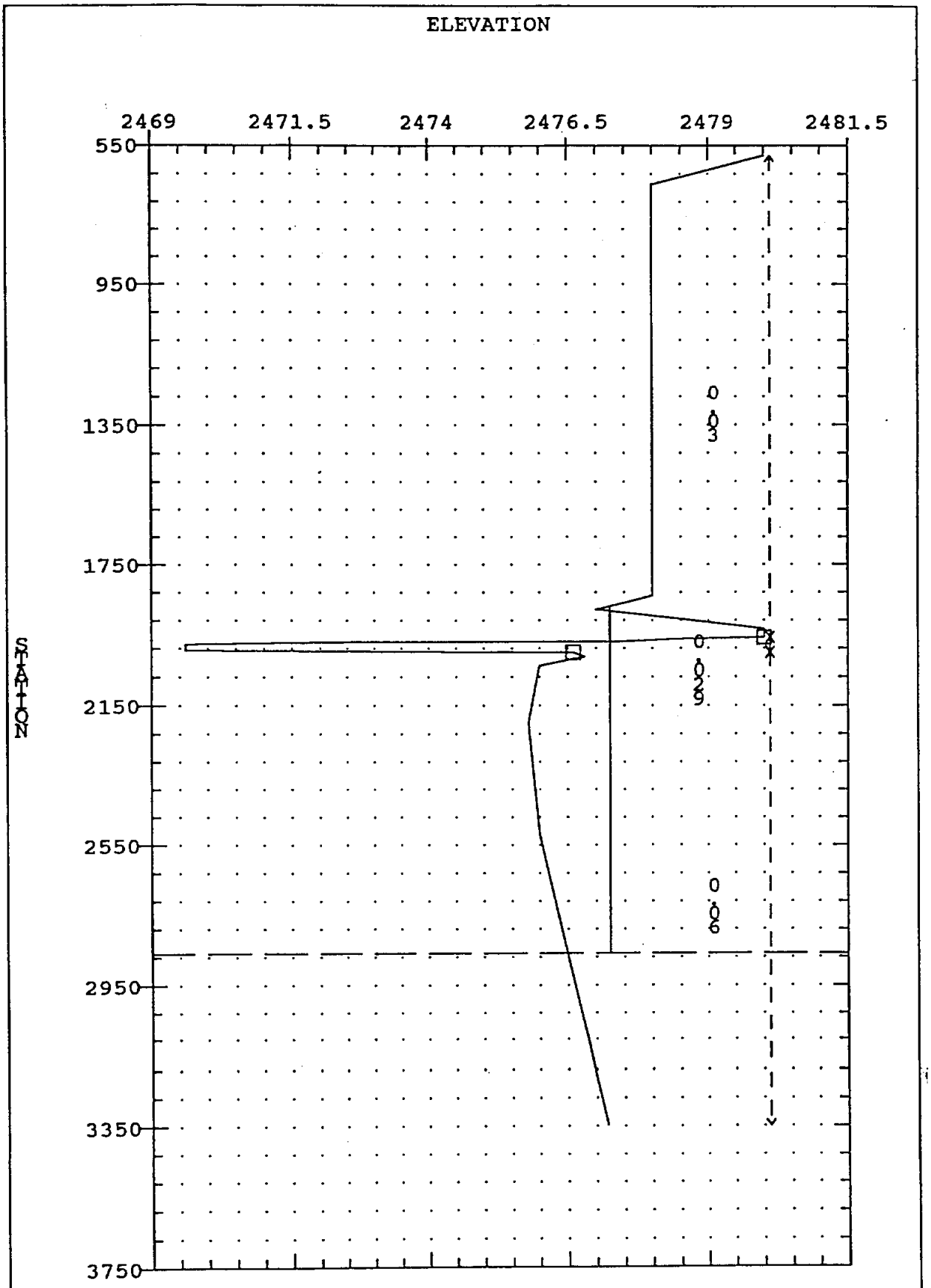
SECTION : 9

West Branch Santa Cruz River



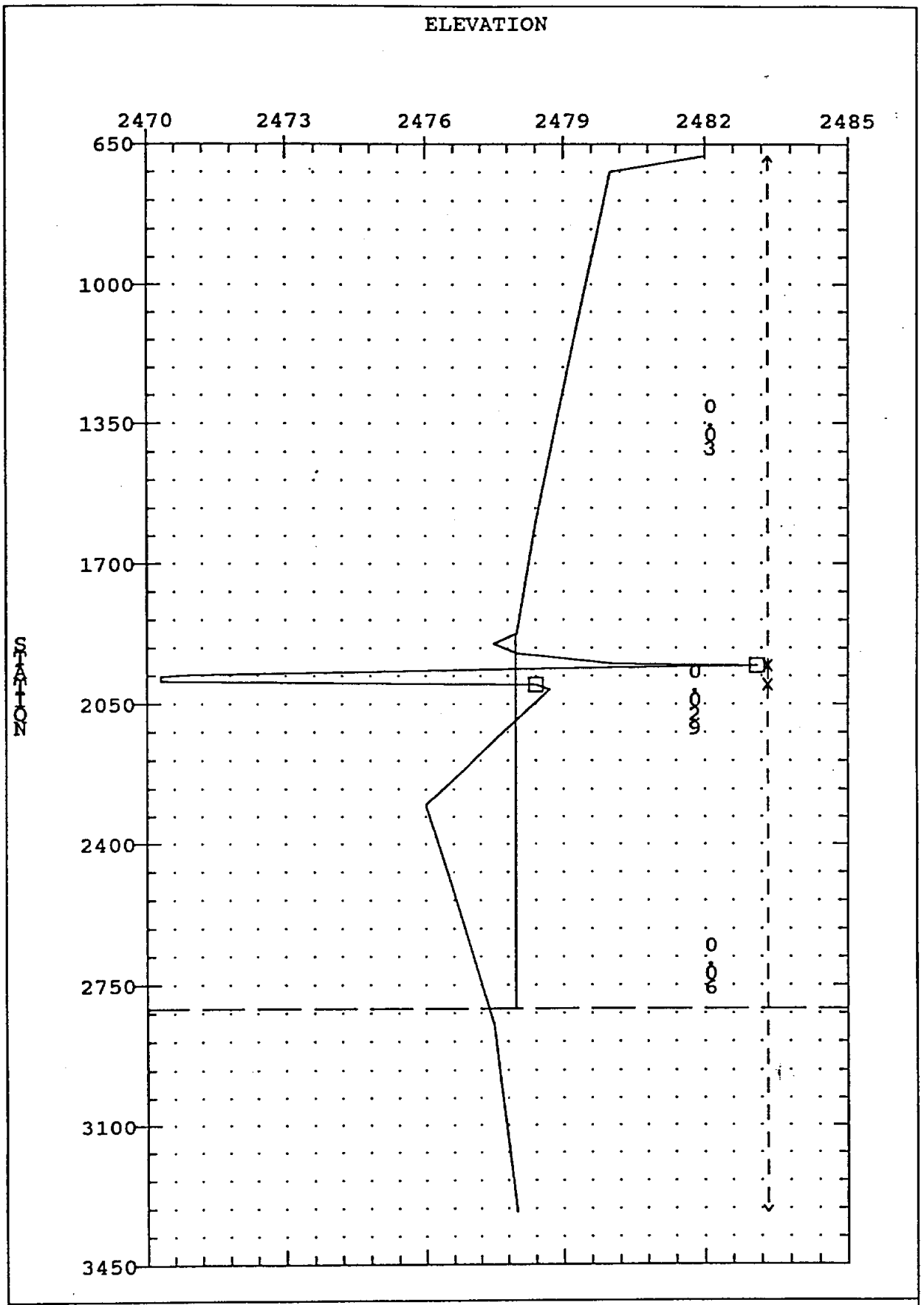
SECTION : 10

West Branch Santa Cruz River



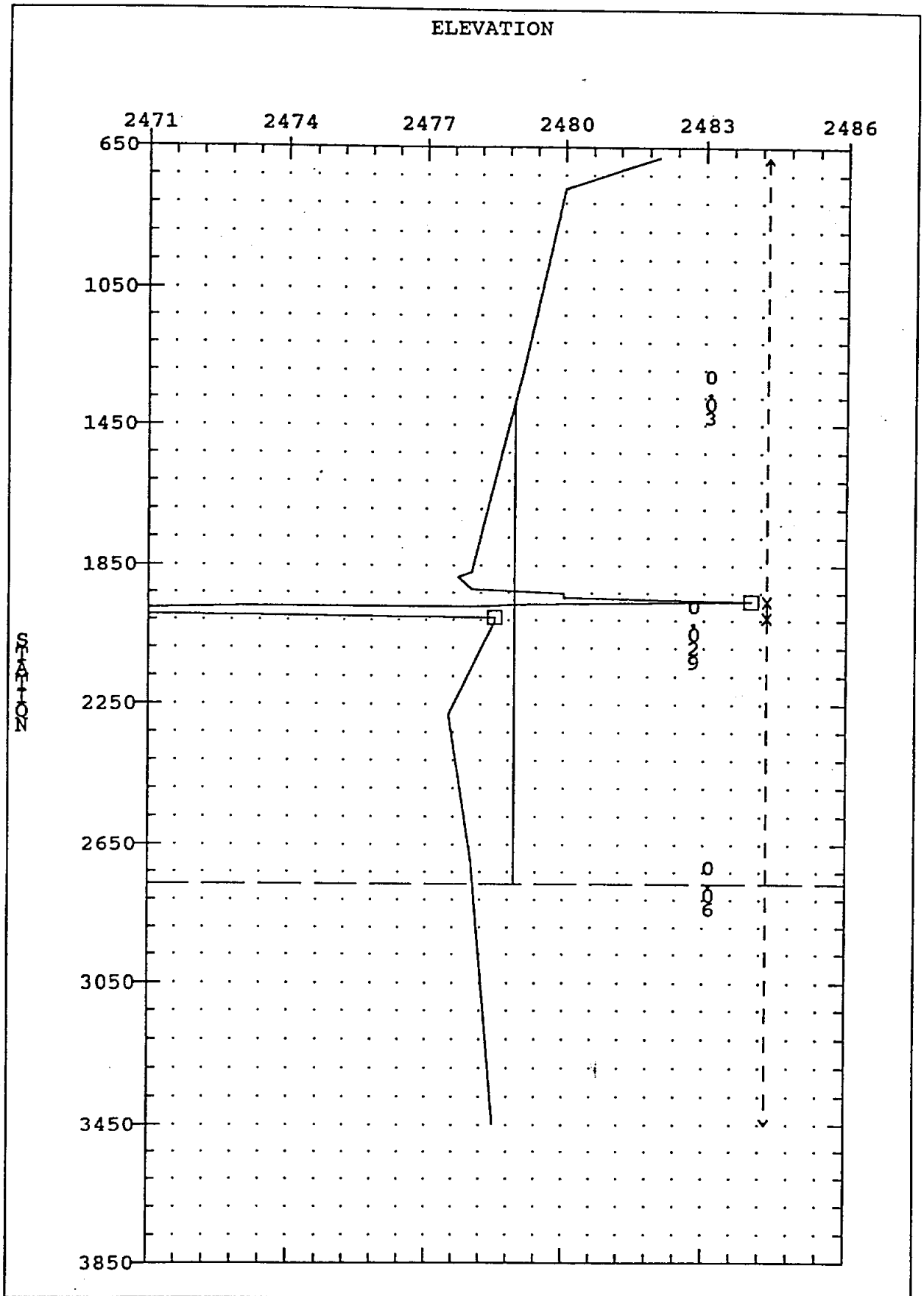
SECTION : 11

West Branch Santa Cruz River



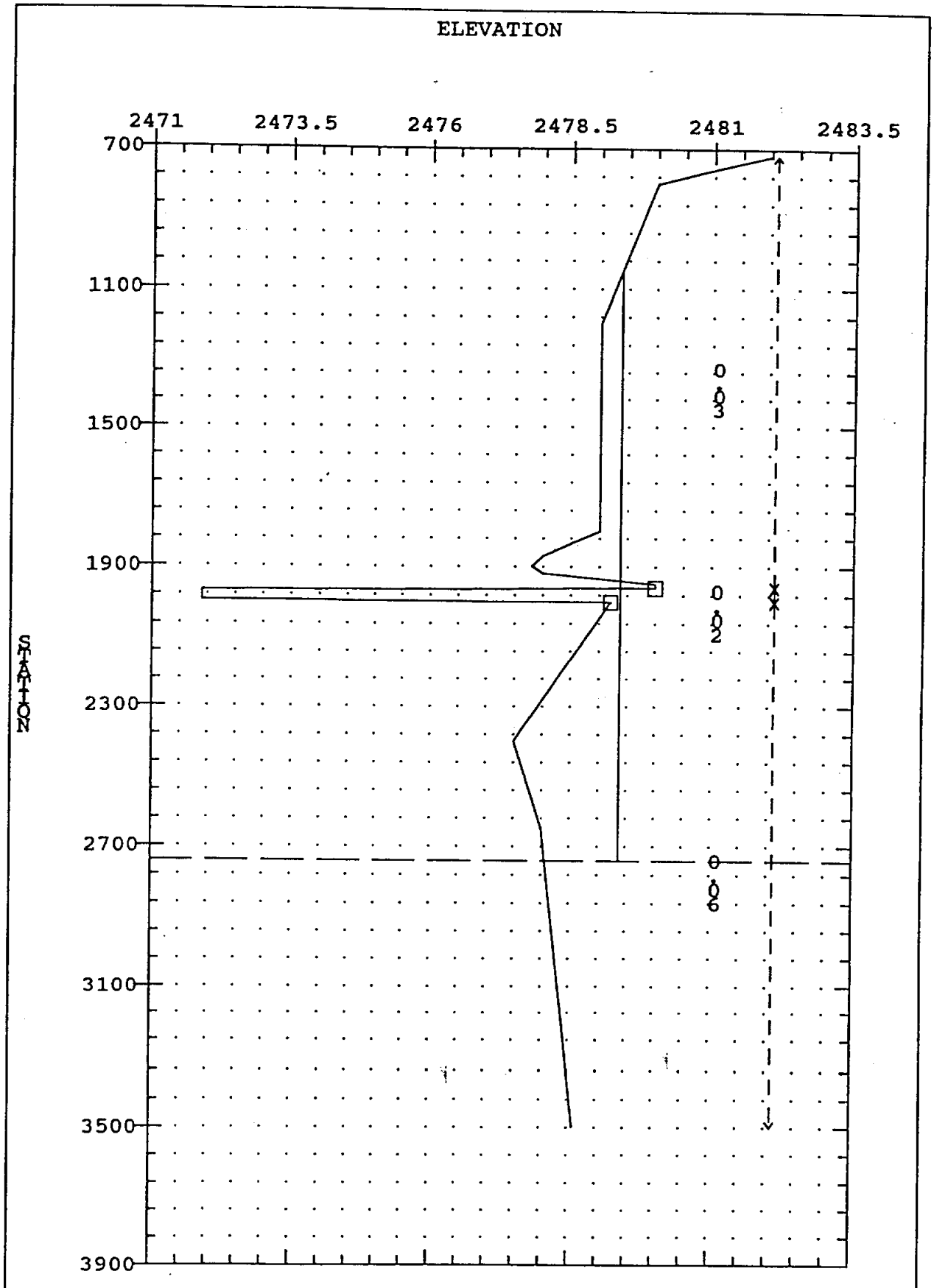
SECTION : 12

West Branch Santa Cruz River



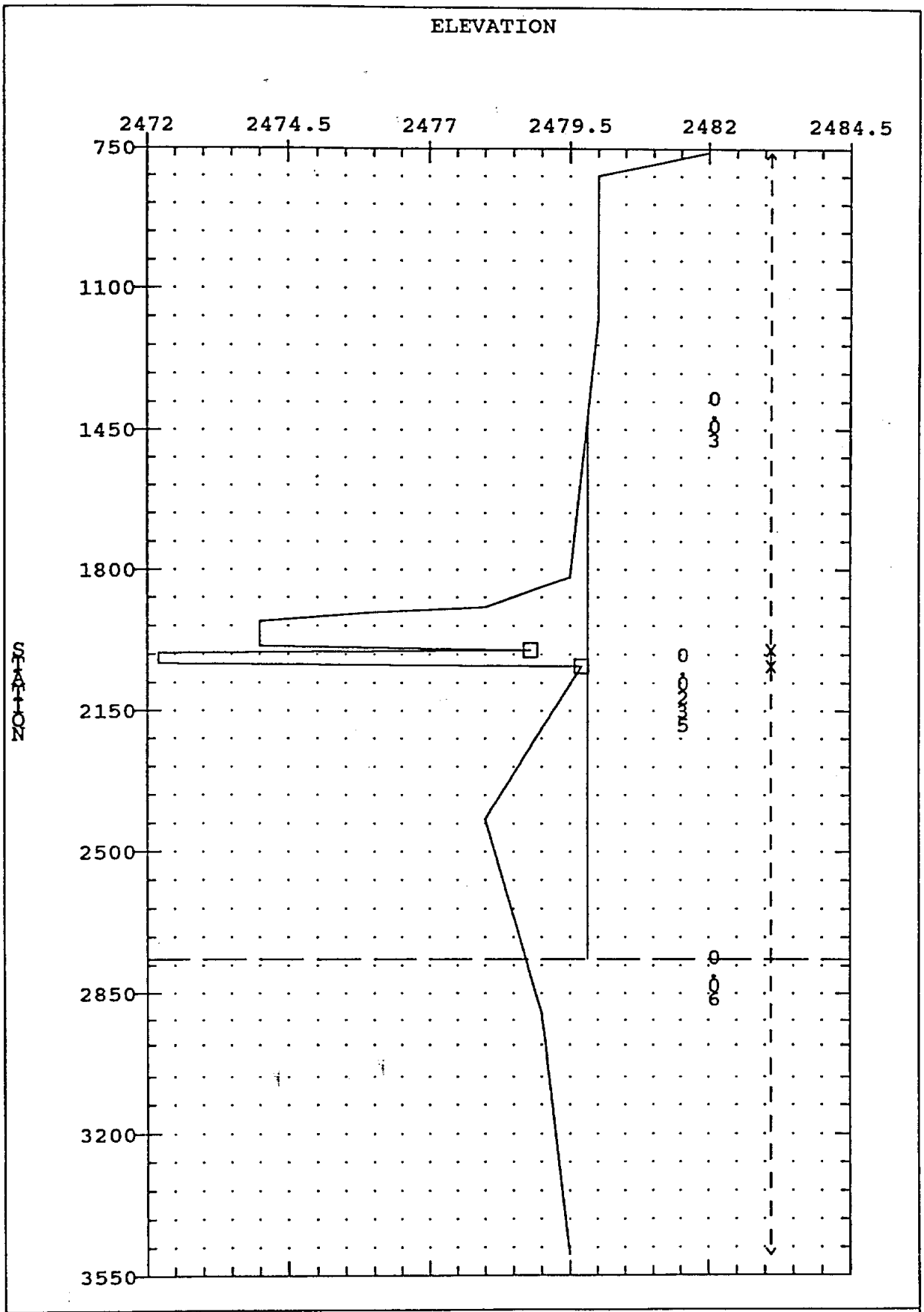
SECTION : 13

West Branch Santa Cruz River



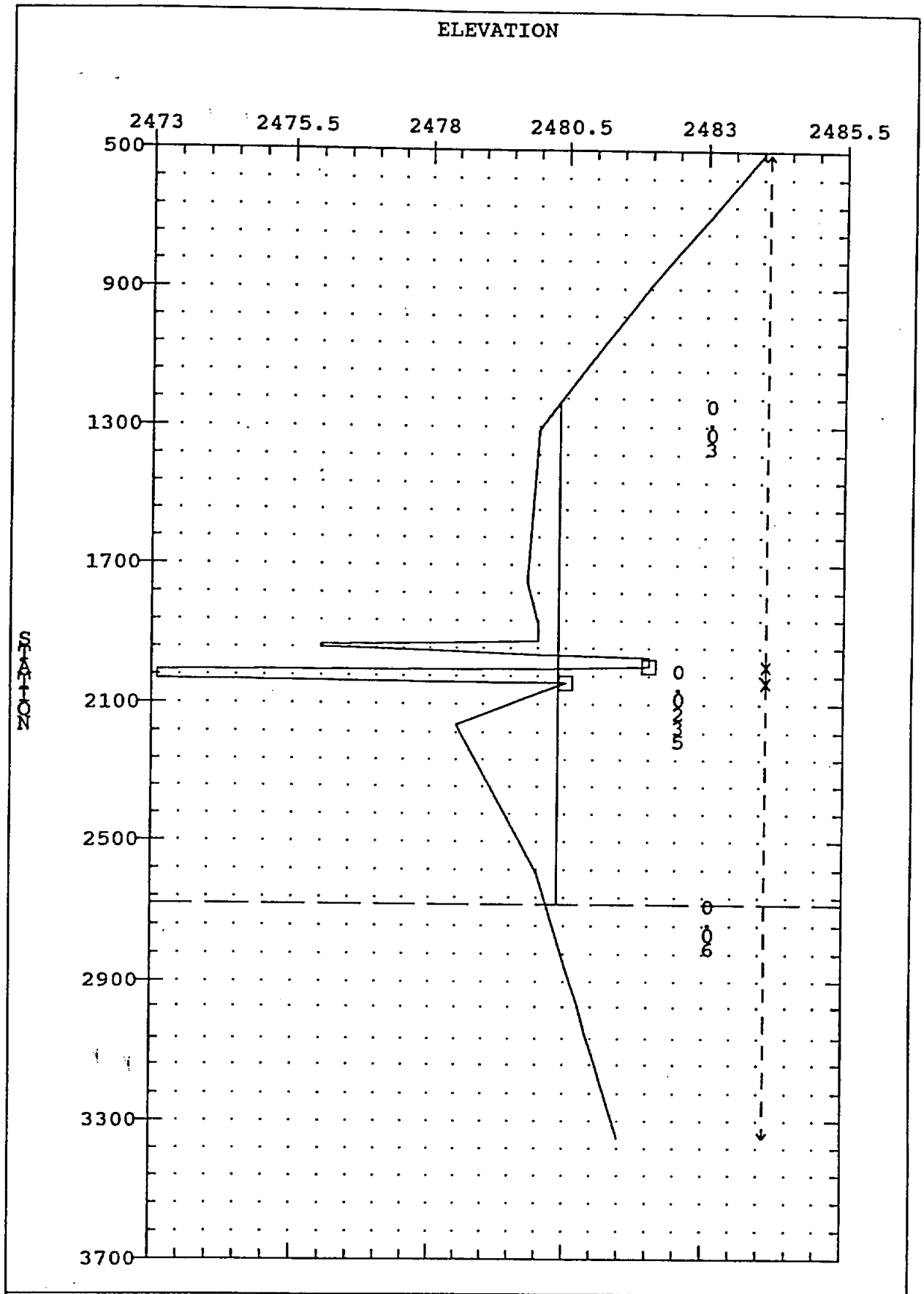
SECTION : 14

West Branch Santa Cruz River



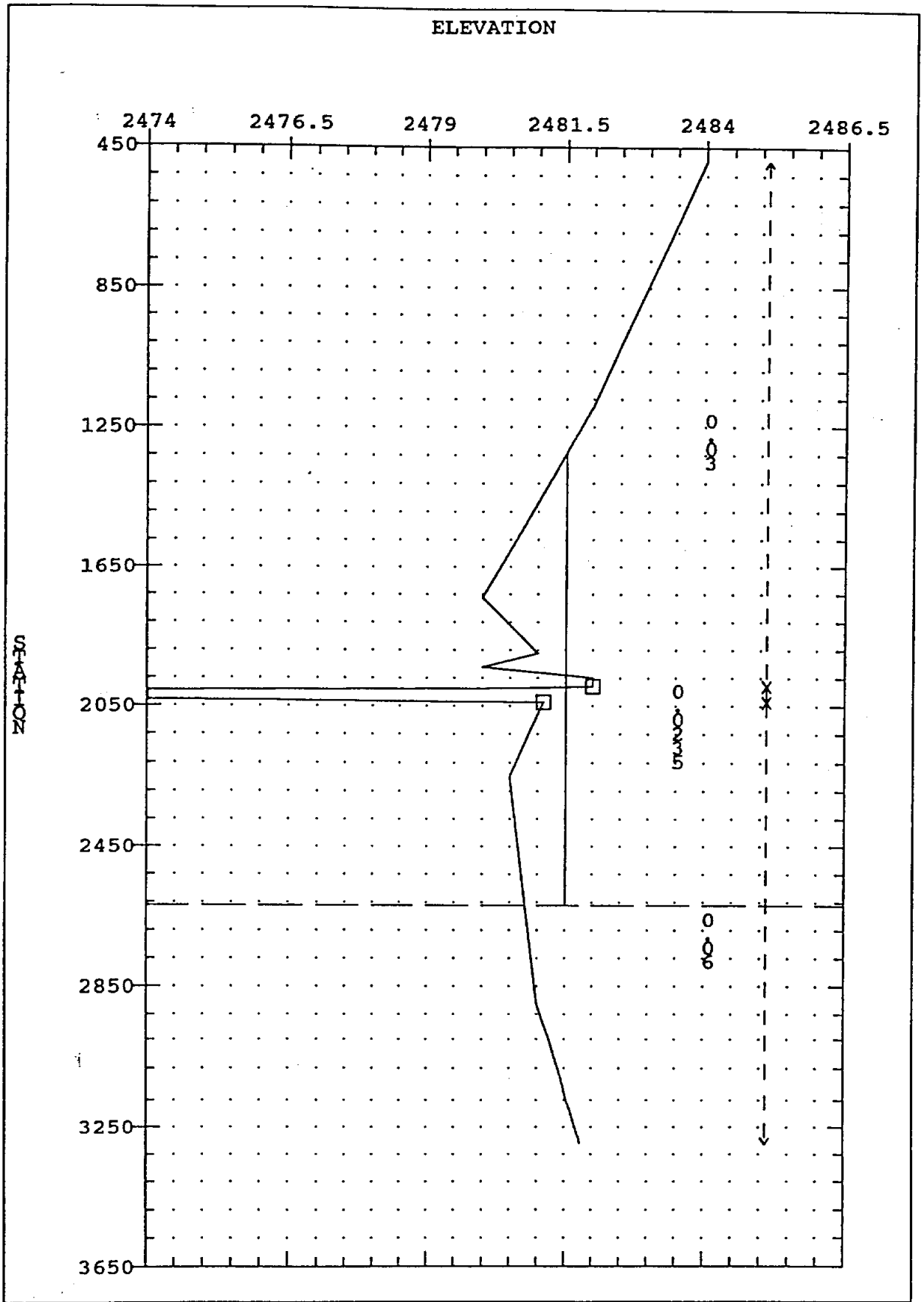
SECTION : 15

West Branch Santa Cruz River



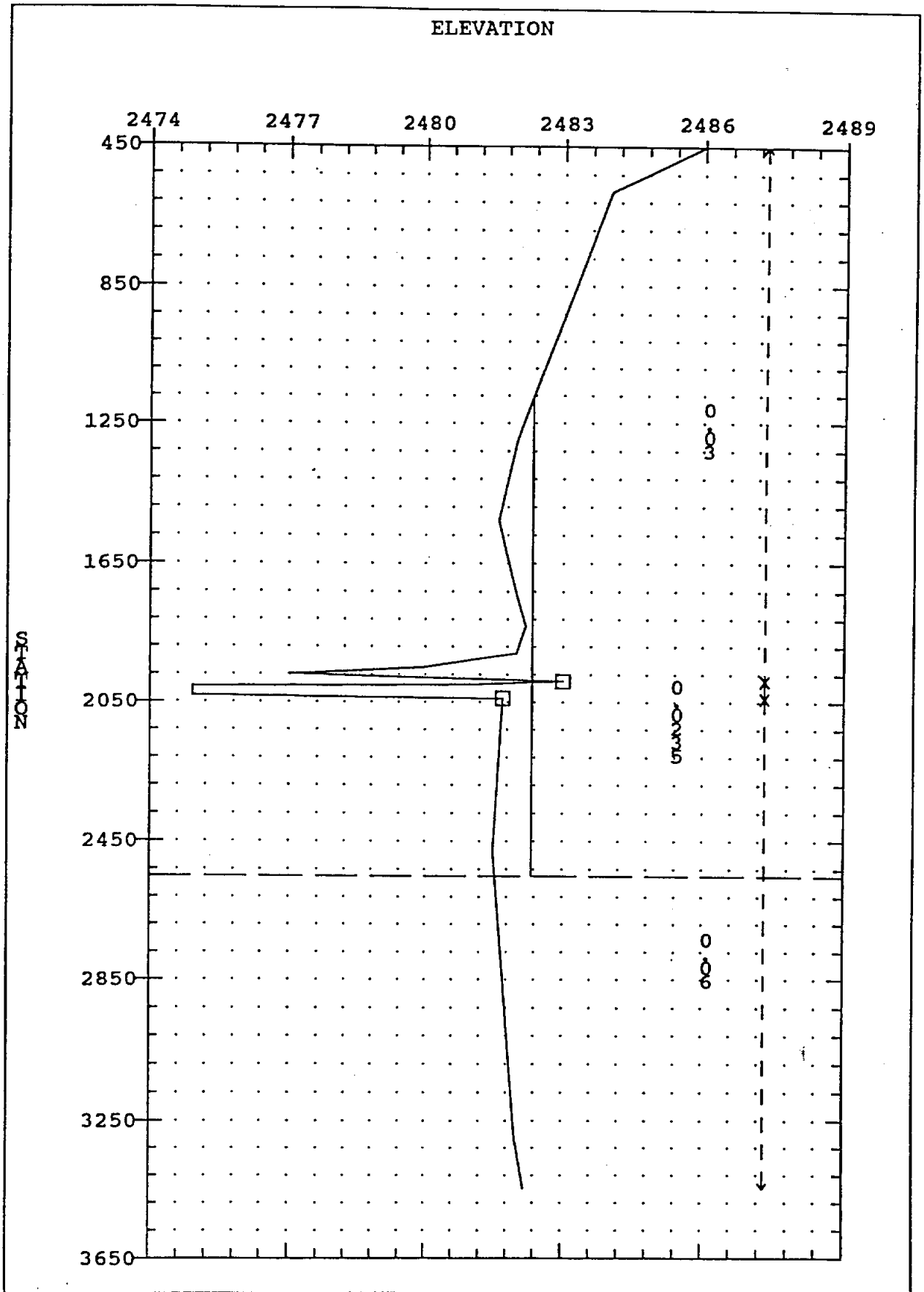
SECTION : 16

West Branch Santa Cruz River



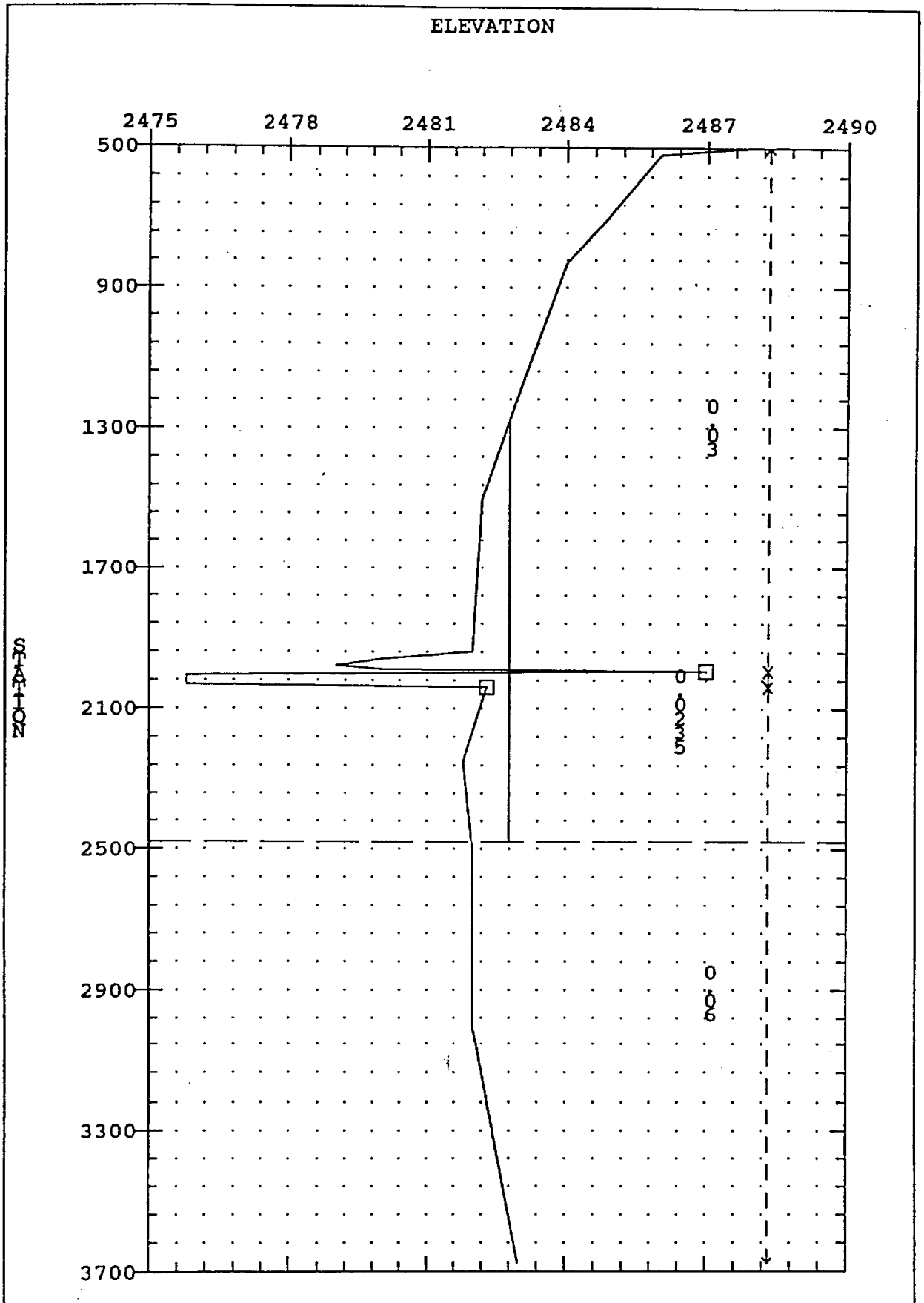
SECTION : 17

West Branch Santa Cruz River



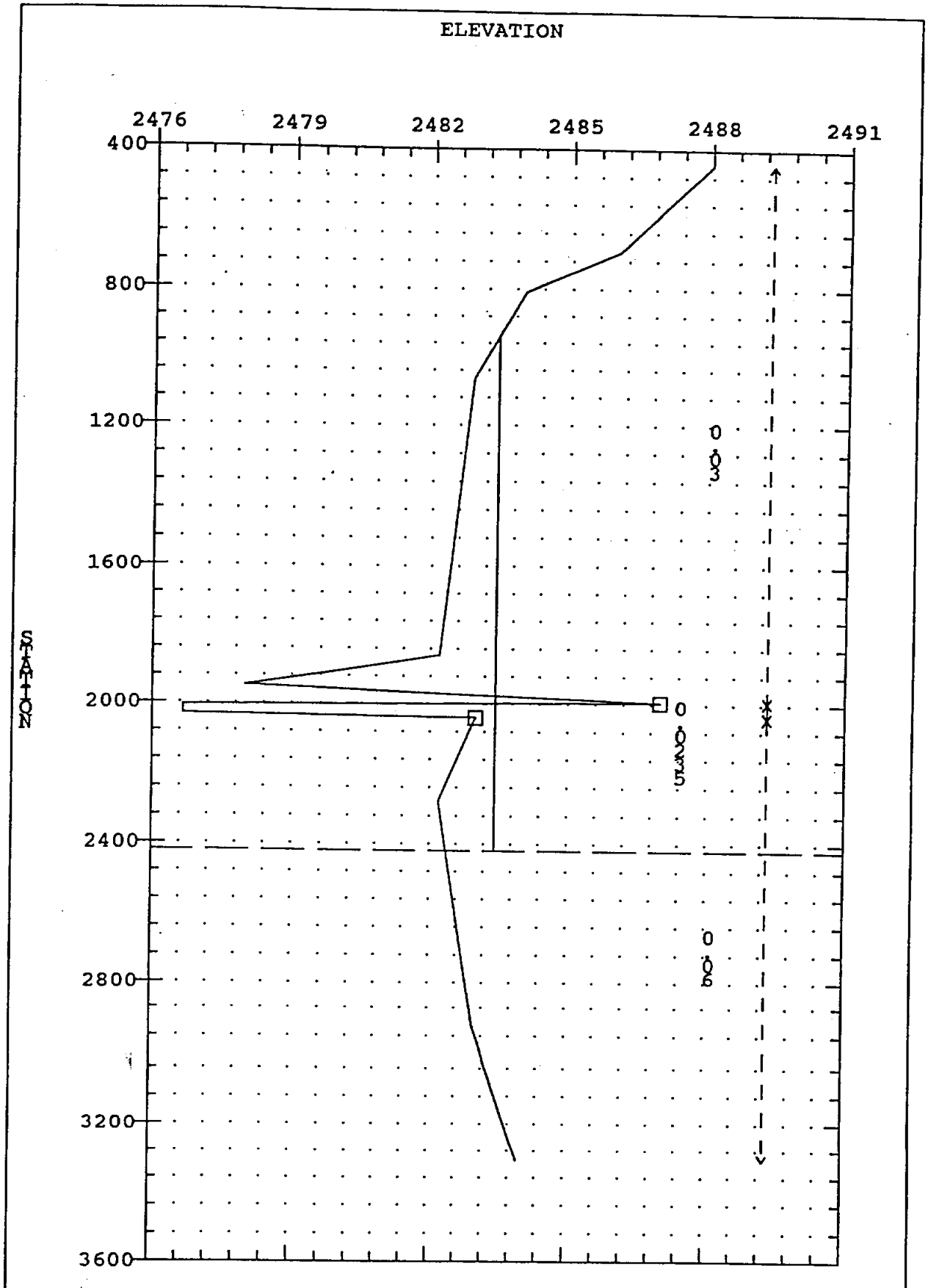
SECTION : 18

West Branch Santa Cruz River



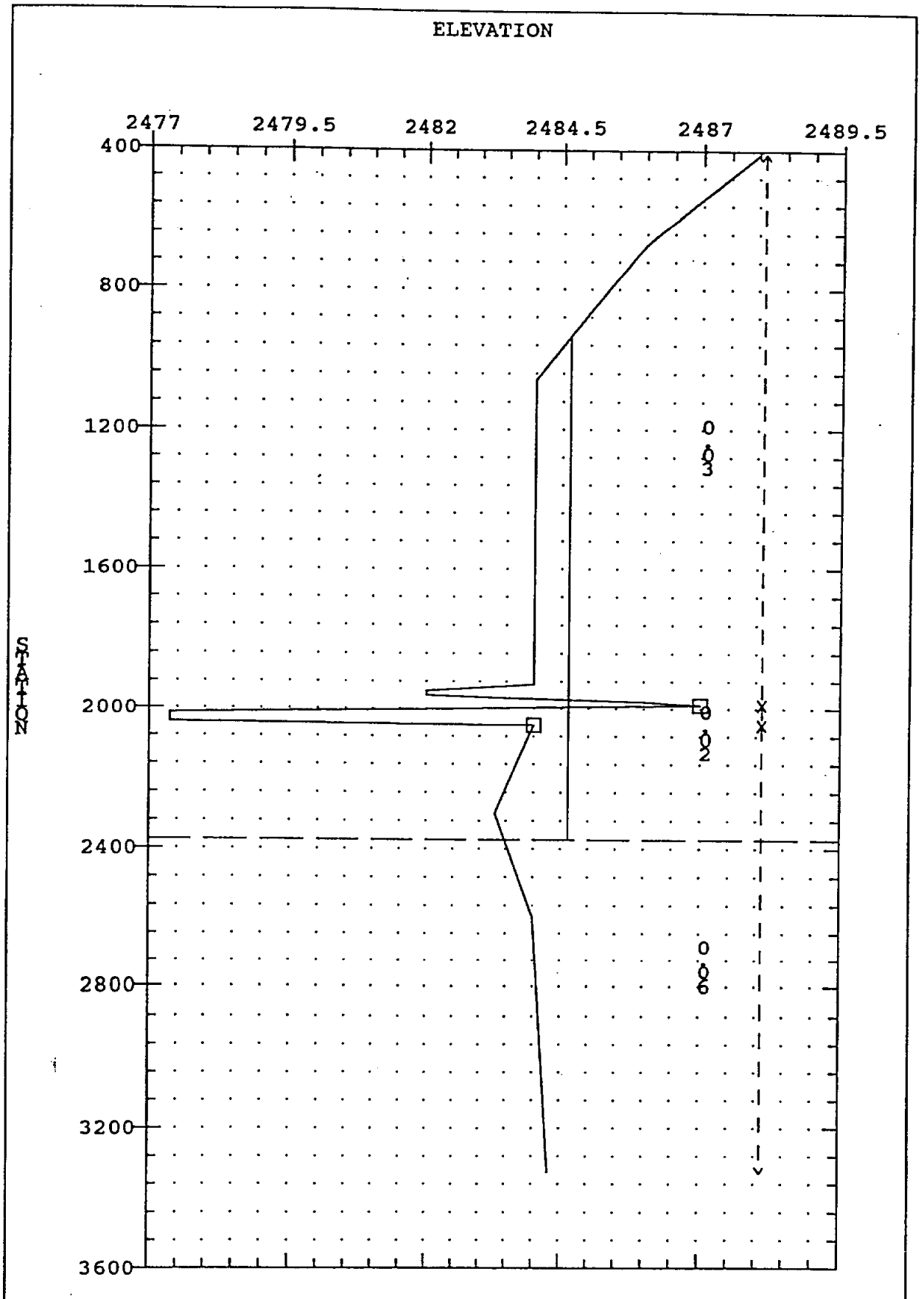
SECTION : 19

West Branch Santa Cruz River



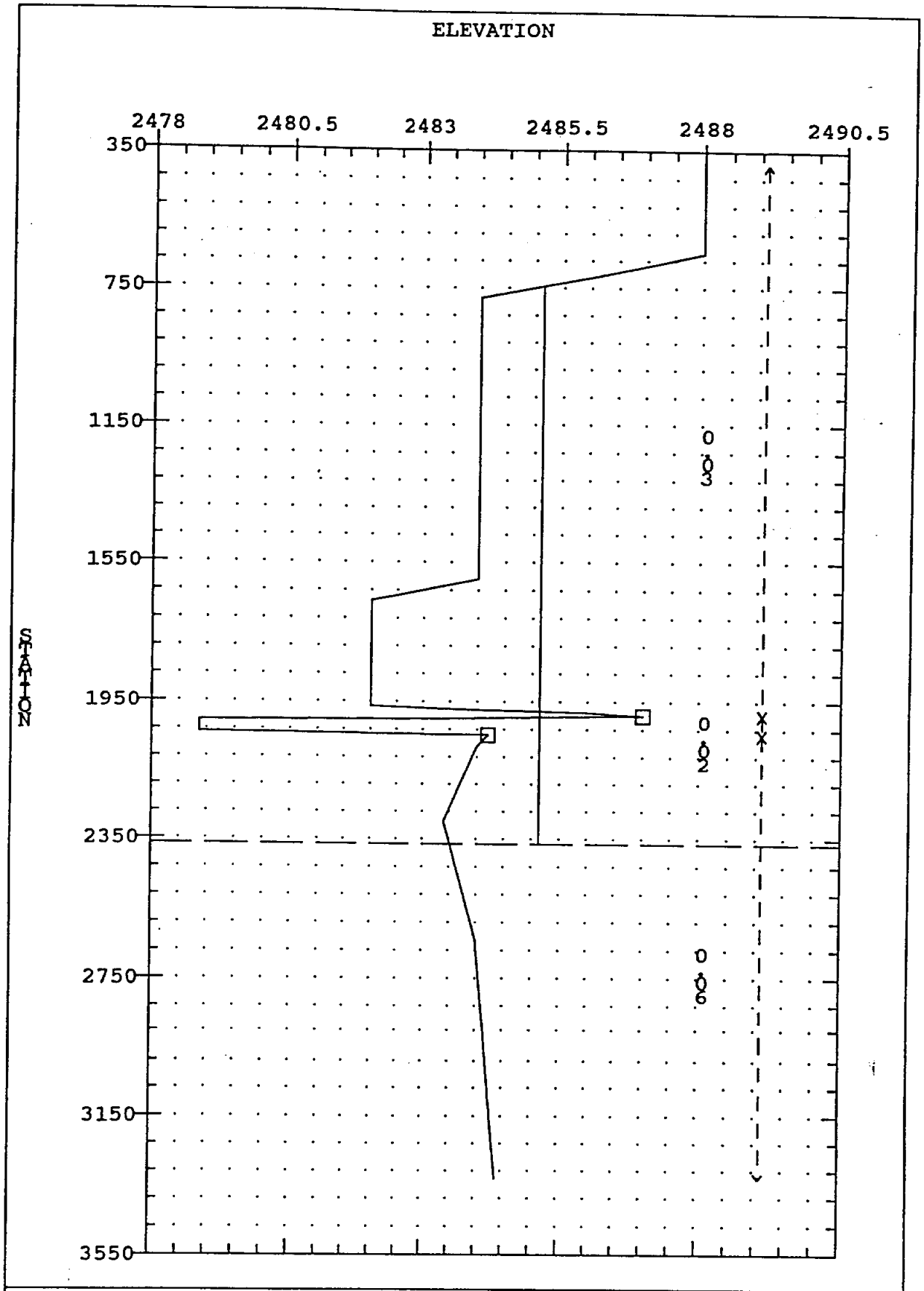
SECTION : 20

West Branch Santa Cruz River



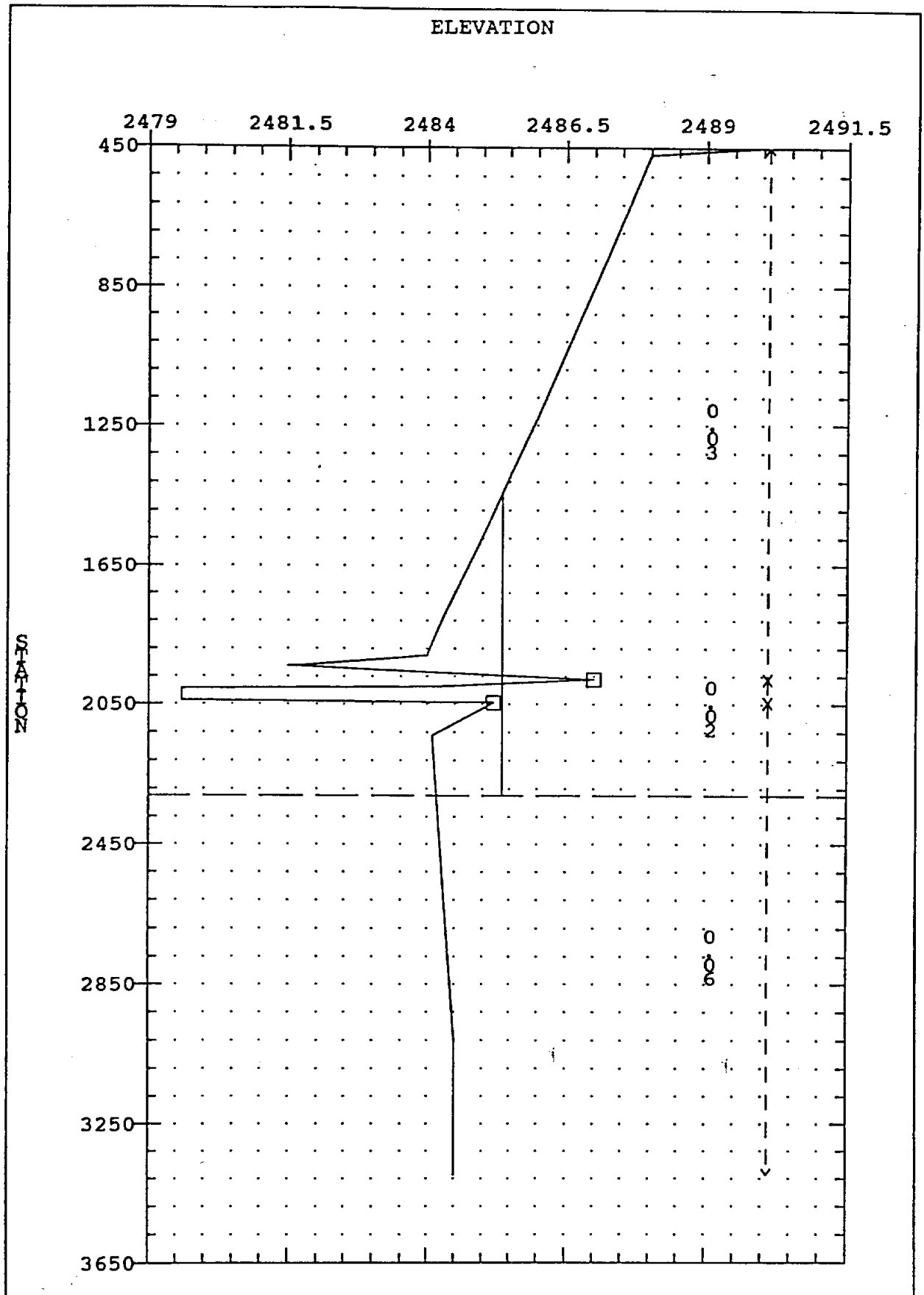
SECTION : 21

West Branch Santa Cruz River



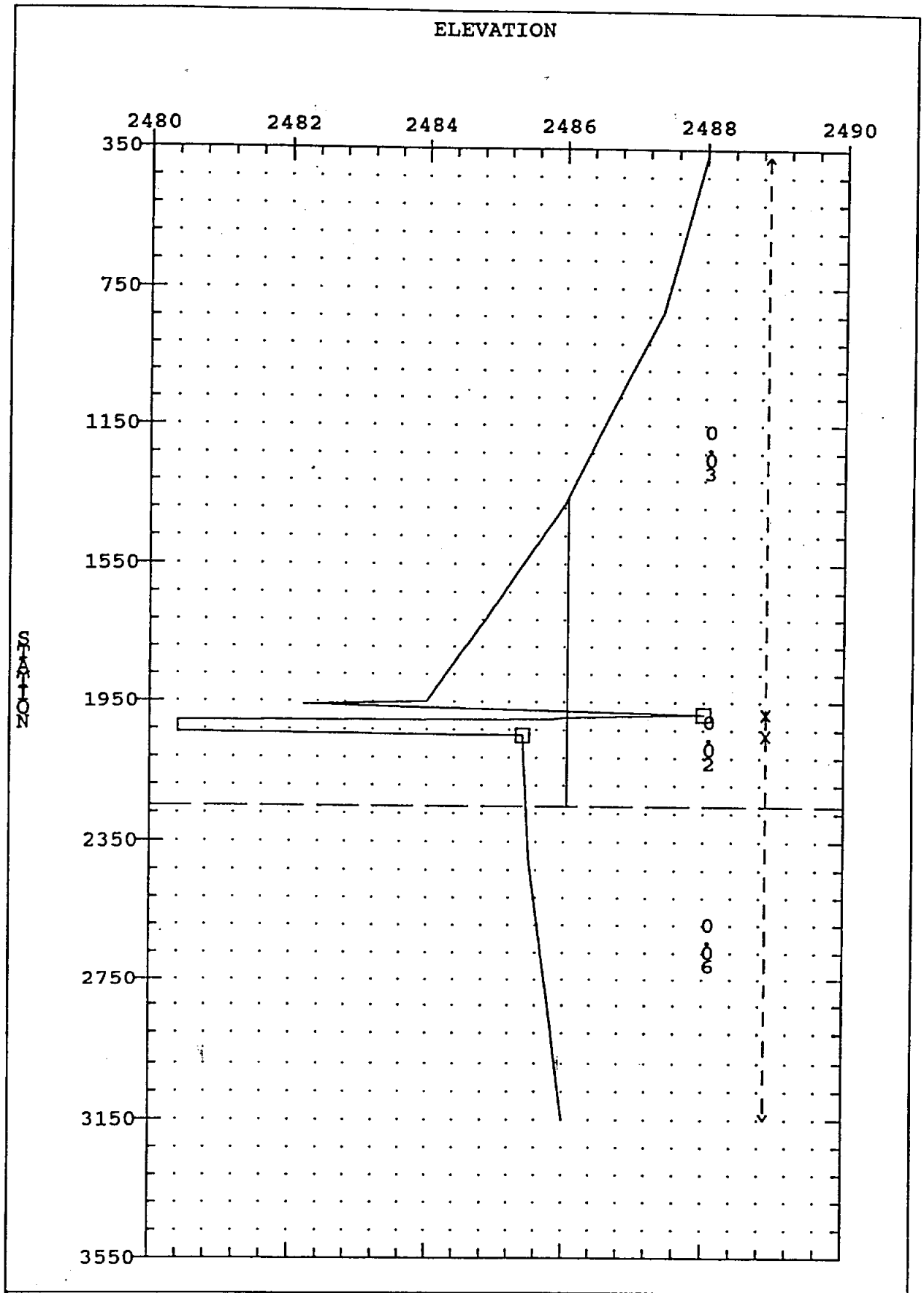
SECTION : 22

West Branch Santa Cruz River



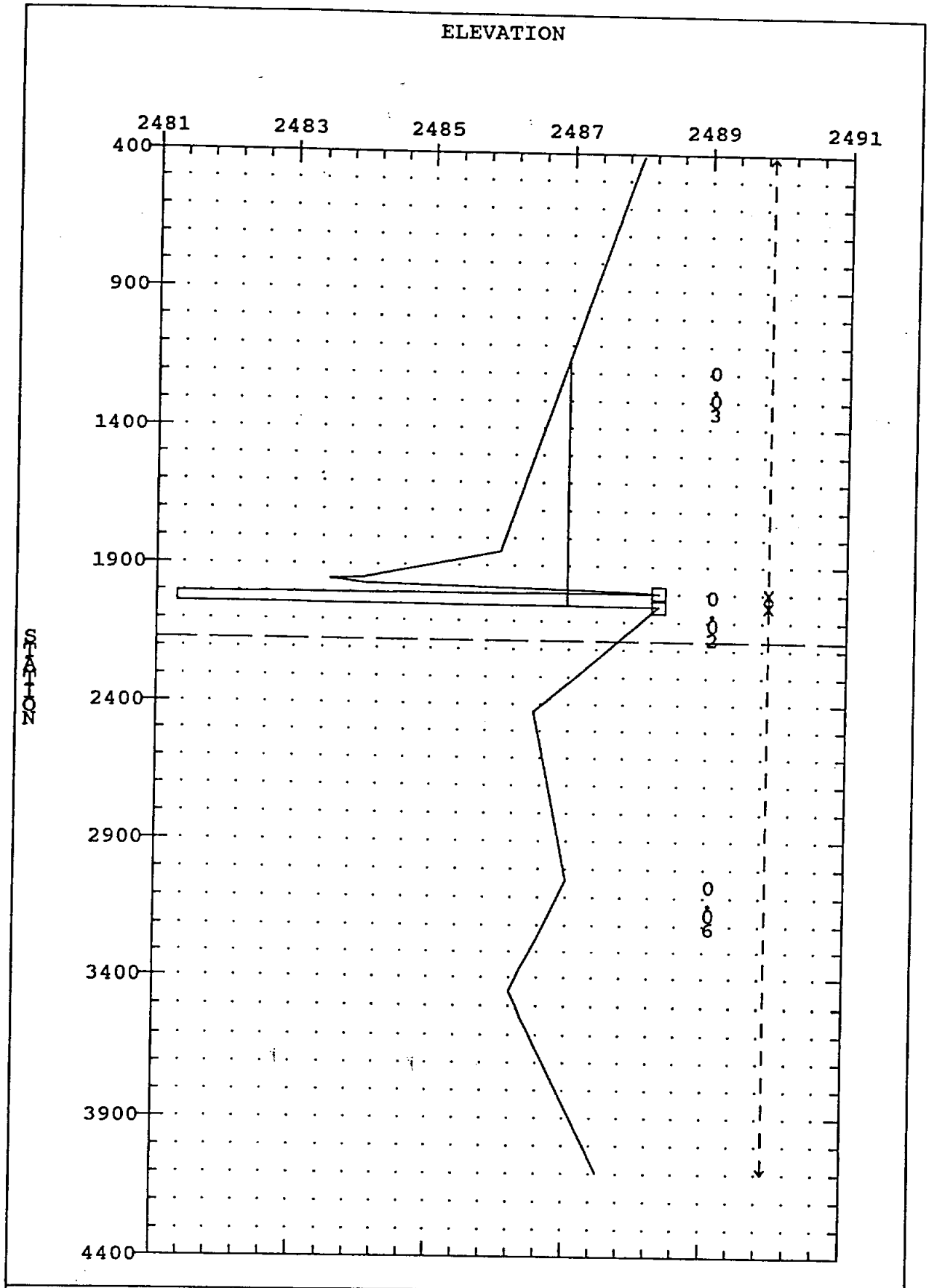
SECTION : 23

West Branch Santa Cruz River



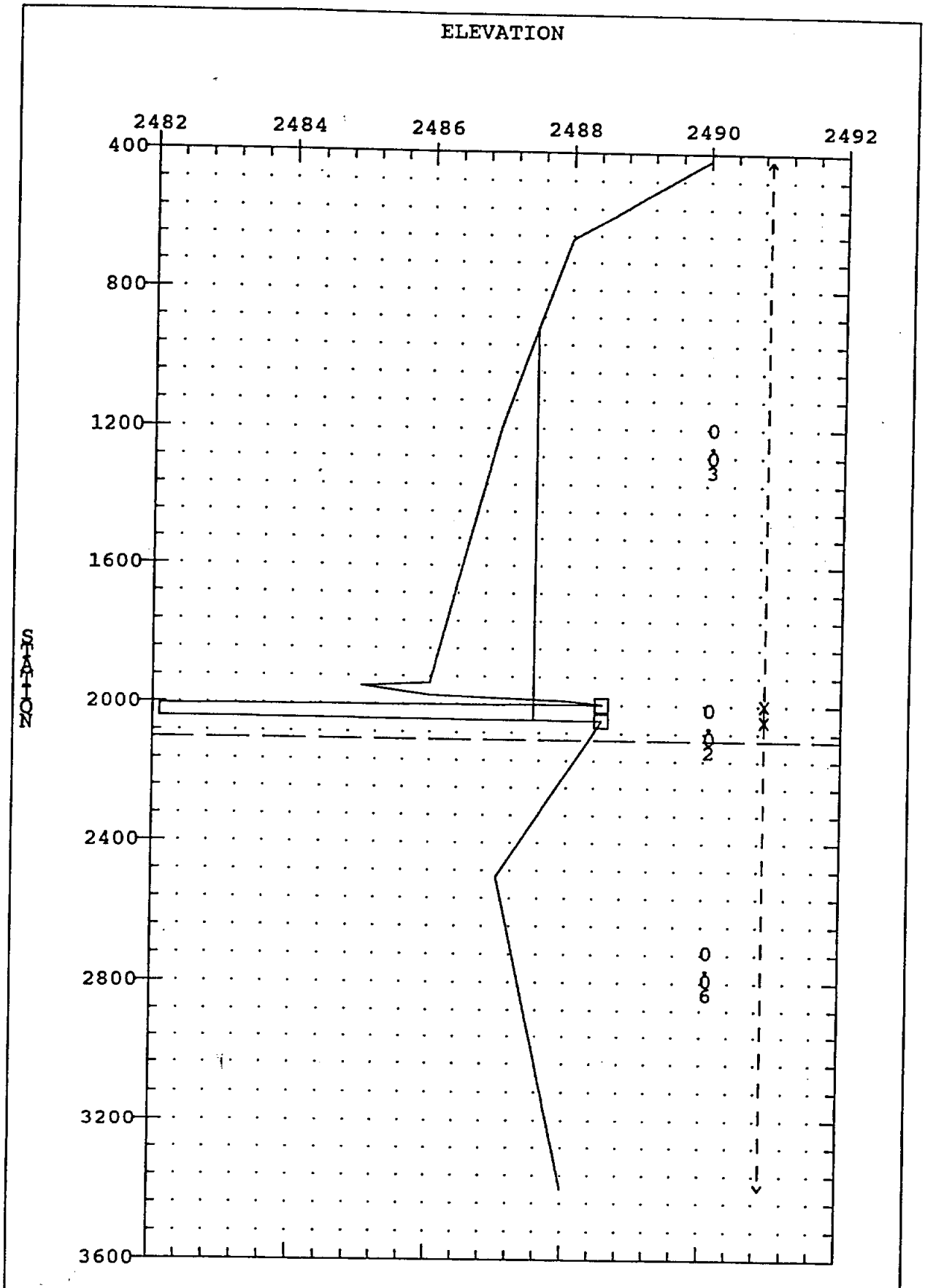
SECTION : 24

West Branch Santa Cruz River



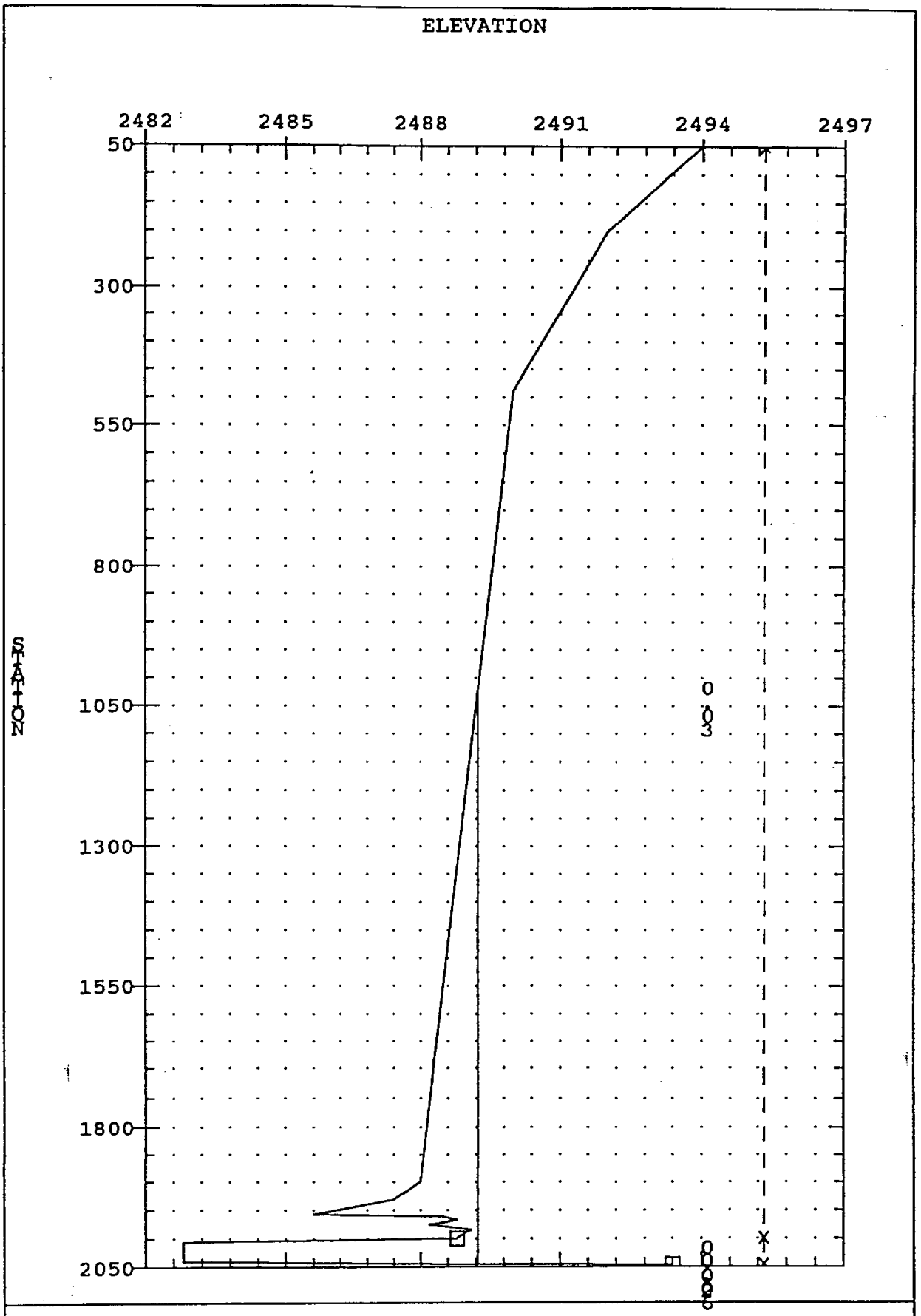
SECTION : 25

West Branch Santa Cruz River



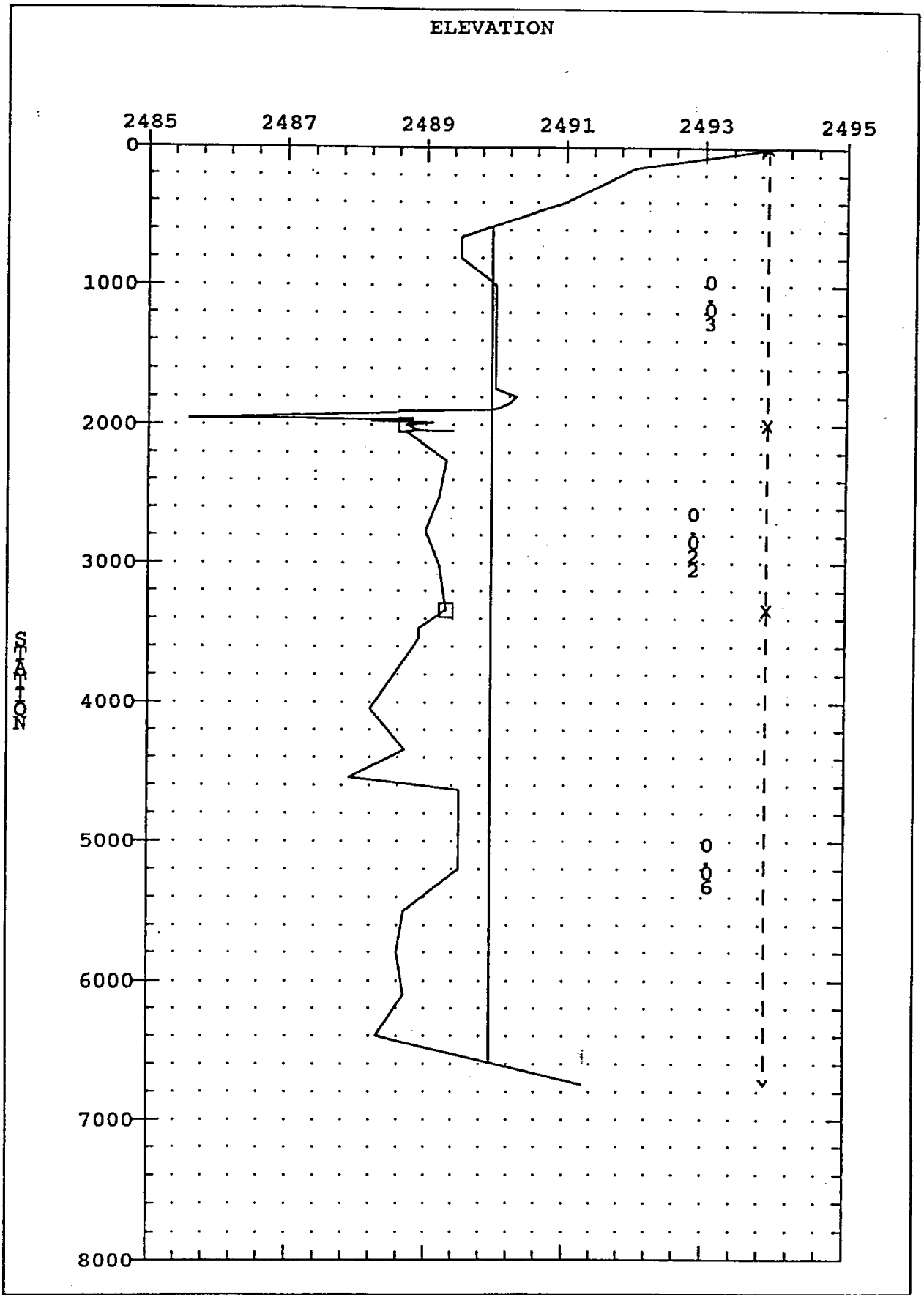
SECTION : 26

West Branch Santa Cruz River



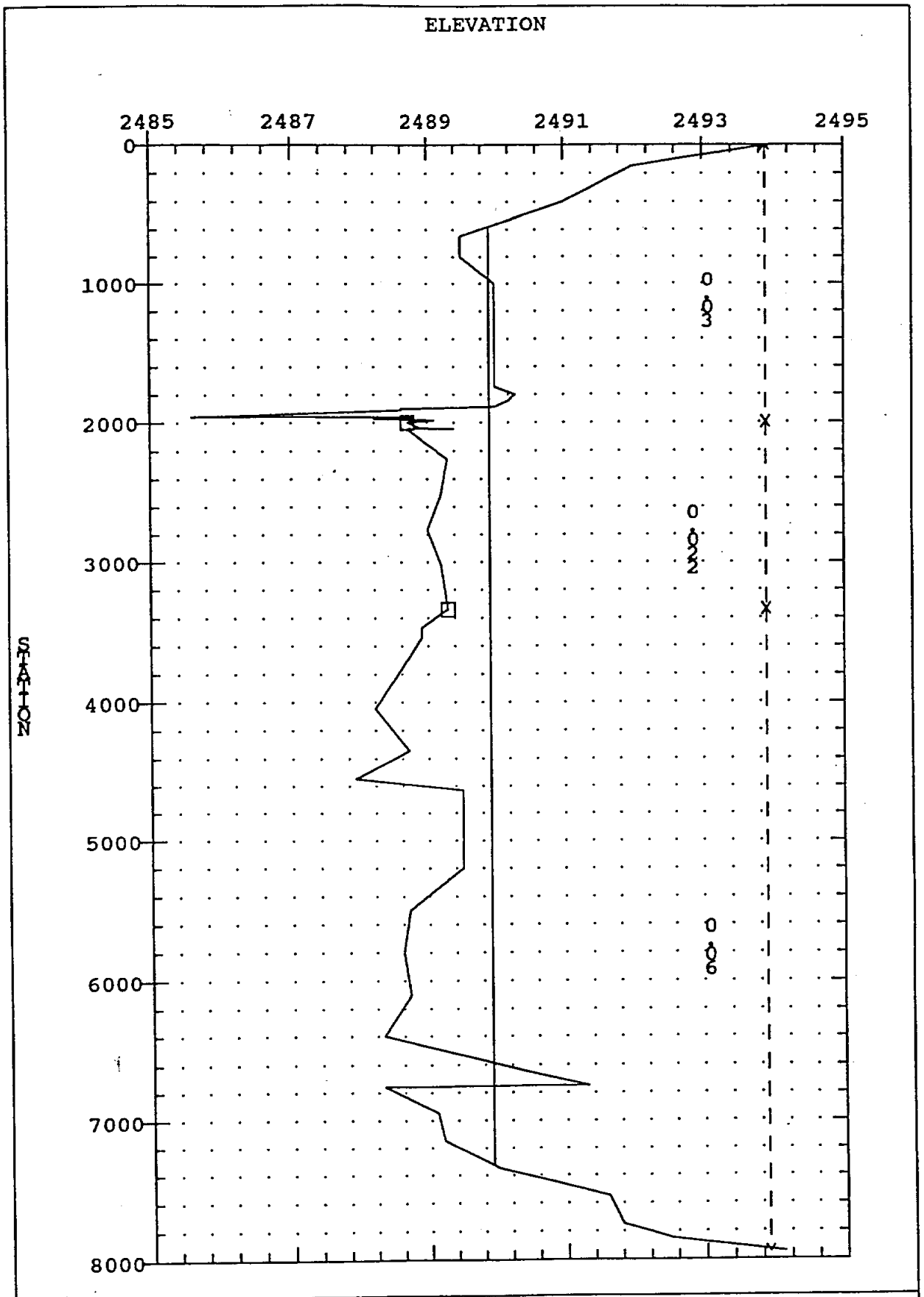
SECTION : 27

West Branch Santa Cruz River



SECTION : 28

West Branch Santa Cruz River



SECTION : 28.1

West Branch Santa Cruz River

Appendix D

HEC-2 Input And Output Files For The South Channel Of The Los Reales Improvement District

```
SF Splitflow Analysis of the South Channel
TW Splitflow #9 to #10, Weir flow across Los Reales Rd. on No.Side of So.Channel
WS     7       9      10      -1     2.6
WC     0  2493.1       1  2489.8     530  2489.4     730  2489.7    1080  2492.5
WC  1280  2492.5    1450  2492.5
EE
T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3      South Channel
J1     0       2       0       0      -1       0       0       0    2472
J2     1       0      -1       0       0       0       0       0       0
J3    38      43      13      14      15       1       2       3       8      53
J3     4      54      61             150
NC  .025    .025    .025     0.1     0.3
QT     3    3250    3300    3350

*  Note that 3 flood discharges were used in this multi-profile run.  These
*  discharges were used to develop the stage-discharge curve for use in the
*  HEC-2 model of the West Branch (see TC cards in HEC-2 file WEST.H2I), as well
*  as to predict water-surface elevations within and along the South Channel.
*  In addition, the water-surface elevation given in field J1.9 is equal to the
*  10-year water-surface elevation within the Santa Cruz River at the channel outlet.

*  Cross Section #62+50 from Sheet 12 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1     1       4       0     128       0       0       0
GR2486.6       0  2468.9      57  2468.9      73  2486.4     128

*  Cross Section #60+00 from Sheet 12 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1     2       4       0     112     250     250     250
GR2487.4       0  2471.8      48  2471.8      64  2487.6     112

*  Cross Section #57+00 from Sheet 11 of 15 of Los Reales Improvement District
*  Job No. 85-074
NC  .024    .024    .024     0.1     0.3
X1     3       6       0    86.9     300     300     300       0    2400
GR 87.78       0   75.20    27.1   75.20    56.0   88.19    66.5   91.31    75.9
GR 91.31    86.9

*  Cross Section #54+00 from Sheet 11 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1     4       6       0    86.9     300     300     300       0    2400
GR 87.95       0   75.67    27.1   75.67    56.0   88.15    66.5   91.51    75.9
GR 91.51    86.9

*  Cross Section #51+00 from Sheet 11 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1     5       6       0    86.9     300     300     300       0    2400
GR 88.11       0   76.64    27.1   76.64    56.0   88.35    66.5   91.59    75.9
GR 91.59    86.9

*  Cross Section #48+00 from Sheet 10 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1     6       6       0    86.9     300     300     300       0    2400
GR 87.47       0   77.44    27.1   77.44    56.0   88.30    66.5    92.2    75.9
GR  92.2    86.9

*  Cross Section #45+00 from Sheet 10 of 15 of Los Reales Improvement District
*  Job No. 85-074
```

```
X1      7       6       0    86.9     300     300     300       0    2400
GR 87.99        0   78.16    27.1   78.16    56.0   88.50    66.5   92.03    75.9
GR 92.03    86.9

*  Cross Section #42+00 from sheet 10 of 15 of Los Reales Improvement District
*  Job No. 85-074
X1      8       6       0    86.9     300     300     300       0    2400
GR 88.28        0   78.70    27.1   78.70    56.0   88.71    66.5   92.55    75.9
GR 92.55    86.9

*  Cross Section #39+20 from sheet  9 of 15 of Los Reales Improvement District
*  Job No. 85-074
NC  .022    .022    .022     0.1     0.3
X1      9       4       0      67     280     280     280       0    2400
GR  88.0        0    79.4      28    79.4      57    89.0      67

*  Cross Section runs along south top of bank protection between sta.
*  #24+70 and #39+20 from sheets 8 & 9 of 15 of Los Reales Improvement District
*  Job No. 85-074

X1     10       7       0     730    1450     720    1085       0    2400
GR  93.1        0    89.8       1    88.6     530    88.9     730    88.0    1130
GR  89.3     1310    92.5    1450

EJ

T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3      South Channel
J1    0       3       0       0      -1       0       0       0    2472
J2    2       0      -1       0       0       0       0       0       0

T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3      South Channel
J1    0       4       0       0      -1       0       0       0    2472
J2    3       0      -1       0       0       0       0       0       0

ER
```

```
*********************************************
*  HEC-2 WATER SURFACE PROFILES             *
*                                           *
*  Version   4.6.2;  May 1991               *
*                                           *
*  RUN DATE    03OCT94    TIME    15:32:21  *
*********************************************
```

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

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

THIS RUN EXECUTED 03OCT94 15:32:21

```
************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************
```

SPLIT FLOW BEING PERFORMED

SF Splitflow Analysis of the South Channel

```
TW Splitflow #9 to #10, Weir flow across Los Reales Rd. on No.Side of So.Channel
WS     7       9      10      -1     2.6
WC     0  2493.1       1  2489.8     530  2489.4     730  2489.7    1080  2492.5
WC  1280  2492.5    1450  2492.5
```

```
T1      Los Reales Improvement District, Letter of Map Revision
T2      Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3      South Channel

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0       -1        0        0        0      2472

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1        0        0        0        0        0        0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38       43       13       14       15        1        2        3        8       53
      4       54       61               150

NC   .025     .025     .025     0.1      0.3
QT      3     3250     3300     3350

   Note that 3 flood discharges were used in this multi-profile run.  These
   discharges were used to develop the stage-discharge curve for use in the
   HEC-2 model of the West Branch (see TC cards in HEC-2 file WEST.H2I), as well
   as to predict water-surface elevations within and along the South Channel.
   In addition, the water-surface elevation given in field J1.9 is equal to the
   10-year water-surface elevation within the Santa Cruz River at the channel ou

   Cross Section #62+50 from Sheet 12 of 15 of Los Reales Improvement District
   Job No. 85-074
X1       1        4        0      128        0        0        0
GR  2486.6        0   2468.9       57   2468.9       73   2486.4      128

   Cross Section #60+00 from Sheet 12 of 15 of Los Reales Improvement District
   Job No. 85-074

X1       2        4        0      112      250      250      250
GR  2487.4        0   2471.8       48   2471.8       64   2487.6      112

   Cross Section #57+00 from Sheet 11 of 15 of Los Reales Improvement District
   Job No. 85-074

NC   .024     .024     .024     0.1      0.3
X1       3        6        0     86.9      300      300      300        0     2400
GR   87.78        0    75.20     27.1    75.20     56.0    88.19     66.5    91.31     75.9
GR   91.31     86.9

   Cross Section #54+00 from Sheet 11 of 15 of Los Reales Improvement District
   Job No. 85-074
```

```
X1      4       6       0      86.9     300     300     300       0    2400
GR  87.95       0   75.67      27.1   75.67    56.0   88.15    66.5   91.51    75.9
GR  91.51    86.9
```

Cross Section #51+00 from Sheet 11 of 15 of Los Reales Improvement District
Job No. 85-074

```
X1      5       6       0      86.9     300     300     300       0    2400
GR  88.11       0   76.64      27.1   76.64    56.0   88.35    66.5   91.59    75.9
GR  91.59    86.9
```

Cross Section #48+00 from Sheet 10 of 15 of Los Reales Improvement District
Job No. 85-074

```
X1      6       6       0      86.9     300     300     300       0    2400
GR  87.47       0   77.44      27.1   77.44    56.0   88.30    66.5    92.2    75.9
GR   92.2    86.9
```

Cross Section #45+00 from Sheet 10 of 15 of Los Reales Improvement District
Job No. 85-074

```
X1      7       6       0      86.9     300     300     300       0    2400
GR  87.99       0   78.16      27.1   78.16    56.0   88.50    66.5   92.03    75.9
GR  92.03    86.9
```

Cross Section #42+00 from sheet 10 of 15 of Los Reales Improvement District
Job No. 85-074

```
X1      8       6       0      86.9     300     300     300       0    2400
GR  88.28       0   78.70      27.1   78.70    56.0   88.71    66.5   92.55    75.9
GR  92.55    86.9
```

Cross Section #39+20 from sheet 9 of 15 of Los Reales Improvement District
Job No. 85-074

```
NC    .022    .022    .022       0.1     0.3
X1      9       4       0        67     280     280     280       0    2400
GR   88.0       0    79.4        28    79.4      57    89.0      67
```

Cross Section runs along south top of bank protection between sta.
#24+70 and #39+20 from sheets 8 & 9 of 15 of Los Reales Improvement District
Job No. 85-074

```
X1     10       7       0       730    1450     720    1085       0    2400
GR   93.1       0    89.8         1    88.6     530    88.9     730    88.0    1130
GR   89.3    1310    92.5      1450
```

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

*PROF 1

CCHV= .100 CEHV= .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED

1.000	7.03	2475.93	2475.93	2472.00	2478.18	2.26	.00	.00	2486.60
3250.0	.0	3250.0	.0	.0	269.7	.0	.0	.0	2486.40
.00	.00	12.05	.00	.000	.025	.000	.000	2468.90	34.36
.005899	0.	0.	0.	0	16	0	.00	60.73	95.09

*SECNO 2.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2.000	7.12	2478.92	2478.92	.00	2481.19	2.27	1.46	.00	2487.40
3250.0	.0	3250.0	.0	.0	269.0	.0	1.5	.3	2487.60
.01	.00	12.08	.00	.000	.025	.000	.000	2471.80	26.09
.005818	250.	250.	250.	20	5	0	.00	59.54	85.63

CCHV= .100 CEHV= .300
*SECNO 3.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3.000	6.48	2481.68	2481.68	.00	2484.32	2.63	1.70	.11	2487.78
3250.0	.0	3250.0	.0	.0	249.7	.0	3.3	.7	2491.31
.01	.00	13.02	.00	.000	.024	.000	.000	2475.20	13.13
.005544	300.	300.	300.	20	11	0	.00	48.11	61.24

*SECNO 4.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.61

4.000	8.42	2484.09	.00	.00	2485.42	1.33	.97	.13	2487.95
3250.0	.0	3250.0	.0	.0	351.3	.0	5.4	1.1	2491.51
.02	.00	9.25	.00	.000	.024	.000	.000	2475.67	8.52
.002130	300.	300.	300.	4	0	0	.00	54.56	63.08

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

*SECNO 5.000
    5.000     8.06   2484.70       .00       .00   2486.13      1.43       .68       .03   2488.11
   3250.0       .0    3250.0       .0        .0     338.7        .0       7.8       1.4   2491.59
      .03      .00      9.59       .00      .000      .024      .000      .000   2476.64      8.06
  .002410     300.      300.      300.         3         0         0       .00     55.17     63.23

*SECNO 6.000
    6.000     8.08   2485.52       .00       .00   2486.84      1.31       .70       .01   2487.47
   3250.0       .0    3250.0       .0        .0.    353.3        .0      10.2       1.8   2492.20
      .04      .00      9.20       .00      .000      .024      .000      .000   2477.44      5.27
  .002234     300.      300.      300.         2         0         0       .00     58.55     63.81

*SECNO 7.000
    7.000     8.04   2486.20       .00       .00   2487.51      1.31       .67       .00   2487.99
   3250.0       .0    3250.0       .0        .0     354.4        .0      12.6       2.2   2492.03
      .05      .00      9.17       .00      .000      .024      .000      .000   2478.16      4.93
  .002237     300.      300.      300.         2         0         0       .00     59.24     64.17

*SECNO 8.000
    8.000     8.26   2486.96       .00       .00   2488.15      1.19       .63       .01   2488.28
   3250.0       .0    3250.0       .0        .0     371.2        .0      15.1       2.7   2492.55
      .06      .00      8.76       .00      .000      .024      .000      .000   2478.70      3.73
  .001986     300.      300.      300.         2         0         0       .00     60.94     64.67

CCHV=     .100 CEHV=     .300
*SECNO 9.000
    9.000     8.11   2487.51       .00       .00   2488.66      1.16       .51       .00   2488.00
   3250.0       .0    3250.0       .0        .0     376.4        .0      17.5       3.1   2489.00
      .07      .00      8.63       .00      .000      .022      .000      .000   2479.40      1.60
  .001679     280.      280.      280.         2         0         0       .00     63.85     65.45

*SECNO 10.000

3301 HV CHANGED MORE THAN HVINS

   10.000     1.90   2489.90       .00       .00   2489.99       .09      1.22       .11   2493.10
   3250.0       .0    1116.4    2133.6        .0     600.2     812.8      36.4      17.9   2488.90
      .18      .00      1.86      2.62      .000      .022      .022      .000   2488.00       .97
  .000983    1450.     1085.      720.         6         0         0       .00   1335.27   1336.24
```

TW Splitflow #9 to #10, Weir flow across Los Reales Rd. on No.Side of So.Channel

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	.00	.00	.00	2	2487.507	2489.900	9.000	10.000

T1 Los Reales Improvement District, Letter of Map Revision
T2 Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3 South Channel

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	-1	0	0	0	2472	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1	0	0	0	0	0	0	

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


*PROF 2


CCHV=     .100 CEHV=     .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED
    1.000      7.09   2475.99   2475.99   2472.00   2478.25      2.27       .00       .00   2486.60
   3300.0        .0    3300.0       .0       .0     273.2        .0        .0        .0   2486.40
      .00       .00     12.08       .00      .000      .025      .000      .000   2468.90     34.18
  .005873        0.        0.        0.         0        16         0       .00     61.10     95.27


*SECNO 2.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    2.000      7.17   2478.97   2478.97       .00   2481.26      2.28      1.46       .01   2487.40
   3300.0        .0    3300.0       .0        .0     272.1        .0       1.6        .3   2487.60
      .01       .00     12.13       .00      .000      .025      .000      .000   2471.80     25.93
  .005811      250.      250.      250.        20         5         0       .00     59.87     85.79


CCHV=     .100 CEHV=     .300
*SECNO 3.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    3.000      6.54   2481.74   2481.74       .00   2484.40      2.65      1.70       .11   2487.78
   3300.0        .0    3300.0       .0        .0     252.6        .0       3.4        .7   2491.31
      .01       .00     13.07       .00      .000      .024      .000      .000   2475.20     13.00
  .005532      300.      300.      300.        20        11         0       .00     48.29     61.29


*SECNO 4.000

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

    4.000      8.49   2484.16       .00       .00   2485.50      1.34       .97       .13   2487.95
   3300.0        .0    3300.0       .0        .0     355.0        .0       5.5       1.1   2491.51
      .02       .00      9.30       .00      .000      .024      .000      .000   2475.67      8.37
  .002132      300.      300.      300.         4         0         0       .00     54.76     63.14
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 5.000
   5.000     8.13   2484.77       .00       .00   2486.21      1.44       .68       .03   2488.11
  3300.0       .0    3300.0       .0        .0     342.5        .0       7.9       1.5   2491.59
     .03      .00      9.63      .00      .000      .024      .000      .000   2476.64      7.90
 .002408     300.      300.     300.         3         0         0       .00     55.39     63.29

*SECNO 6.000
   6.000     8.15   2485.59       .00       .00   2486.92      1.32       .69       .01   2487.47
  3300.0       .0    3300.0       .0        .0     357.5        .0      10.3       1.8   2492.20
     .04      .00      9.23      .00      .000      .024      .000      .000   2477.44      5.07
 .002230     300.      300.     300.         2         0         0       .00     58.81     63.88

*SECNO 7.000
   7.000     8.11   2486.27       .00       .00   2487.59      1.32       .67       .00   2487.99
  3300.0       .0    3300.0       .0        .0     358.5        .0      12.7       2.3   2492.03
     .05      .00      9.21      .00      .000      .024      .000      .000   2478.16      4.74
 .002233     300.      300.     300.         2         0         0       .00     59.50     64.24

*SECNO 8.000
   8.000     8.33   2487.03       .00       .00   2488.23      1.20       .63       .01   2488.28
  3300.0       .0    3300.0       .0        .0     375.4        .0      15.3       2.7   2492.55
     .06      .00      8.79      .00      .000      .024      .000      .000   2478.70      3.53
 .001984     300.      300.     300.         2         0         0       .00     61.21     64.74

CCHV=     .100 CEHV=     .300
*SECNO 9.000
   9.000     8.18   2487.58       .00       .00   2488.74      1.17       .51       .00   2488.00
  3300.0       .0    3300.0       .0        .0     380.7        .0      17.7       3.1   2489.00
     .07      .00      8.67      .00      .000      .022      .000      .000   2479.40      1.38
 .001677     280.      280.     280.         2         0         0       .00     64.13     65.52

*SECNO 10.000

3301 HV CHANGED MORE THAN HVINS

  10.000     1.93   2489.93       .00       .00   2490.02       .09      1.17       .11   2493.10
  3300.0       .0    1153.9    2146.1        .0     625.5     833.9      37.1      18.0   2488.90
     .18      .00      1.84      2.57      .000      .022      .022      .000   2488.00       .96
 .000915    1450.     1085.     720.         6         0         0       .00   1336.80   1337.76
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TW Splitflow #9 to #10, Weir flow across Los Reales Rd. on No.Side of So.Channel

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	.00	.00	.00	2	2487.575	2489.935	9.000	10.000

T1 Los Reales Improvement District, Letter of Map Revision
T2 Arroyo Job #PDOT01.1, HEC2 File: South.H2I
T3 South Channel

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	4	0	0	-1	0	0	0	2472	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	3	0	-1	0	0	0	0	0	0	

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

*PROF 3


CCHV=     .100 CEHV=     .300
*SECNO 1.000
3720 CRITICAL DEPTH ASSUMED
    1.000      7.14  2476.04  2476.04  2472.00  2478.32      2.28       .00       .00  2486.60
   3350.0        .0    3350.0       .0       .0     276.6        .0        .0        .0  2486.40
      .00       .00     12.11       .00      .000      .025      .000      .000   2468.90     34.00
  .005855        0.        0.        0.        0        16         0       .00     61.45     95.45


*SECNO 2.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    2.000      7.23  2479.03  2479.03       .00  2481.33      2.30      1.46       .01  2487.40
   3350.0        .0    3350.0       .0       .0     275.3        .0       1.6        .3  2487.60
      .01       .00     12.17       .00      .000      .025      .000      .000   2471.80     25.76
  .005802      250.      250.      250.       20         5         0       .00     60.19     85.96


CCHV=     .100 CEHV=     .300
*SECNO 3.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    3.000      6.60  2481.80  2481.80       .00  2484.47      2.67      1.70       .11  2487.78
   3350.0        .0    3350.0       .0       .0     255.3        .0       3.4        .7  2491.31
      .01       .00     13.12       .00      .000      .024      .000      .000   2475.20     12.88
  .005528      300.      300.      300.       20        11         0       .00     48.46     61.34


*SECNO 4.000

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

    4.000      8.56  2484.23       .00       .00  2485.58      1.35       .97       .13  2487.95
   3350.0        .0    3350.0       .0       .0     358.7        .0       5.5       1.1  2491.51
      .02       .00      9.34       .00      .000      .024      .000      .000   2475.67      8.22
  .002134      300.      300.      300.        4         0         0       .00     54.97     63.20
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 5.000
    5.000     8.20   2484.84       .00       .00   2486.29      1.45       .68       .03   2488.11
   3350.0       .0    3350.0       .0        .0     346.3        .0       8.0       1.5   2491.59
      .03      .00      9.67       .00      .000      .024      .000      .000   2476.64      7.74
  .002406     300.      300.      300.         3         0         0       .00     55.61     63.35

*SECNO 6.000
    6.000     8.22   2485.66       .00       .00   2487.00      1.33       .69       .01   2487.47
   3350.0       .0    3350.0       .0        .0     361.6        .0      10.4       1.9   2492.20
      .04      .00      9.26       .00      .000      .024      .000      .000   2477.44      4.88
  .002225     300.      300.      300.         2         0         0       .00     59.06     63.95

*SECNO 7.000
    7.000     8.18   2486.34       .00       .00   2487.66      1.33       .67       .00   2487.99
   3350.0       .0    3350.0       .0        .0     362.5        .0      12.9       2.3   2492.03
      .05      .00      9.24       .00      .000      .024      .000      .000   2478.16      4.55
  .002231     300.      300.      300.         2         0         0       .00     59.75     64.30

*SECNO 8.000
    8.000     8.40   2487.10       .00       .00   2488.31      1.21       .63       .01   2488.28
   3350.0       .0    3350.0       .0        .0     379.5        .0      15.4       2.7   2492.55
      .06      .00      8.83       .00      .000      .024      .000      .000   2478.70      3.34
  .001984     300.      300.      300.         2         0         0       .00     61.47     64.81

CCHV=     .100 CEHV=     .300
*SECNO 9.000
    9.000     8.25   2487.65       .00       .00   2488.82      1.17       .51       .00   2488.00
   3350.0       .0    3350.0       .0        .0     385.3        .0      17.9       3.1   2489.00
      .07      .00      8.70       .00      .000      .022      .000      .000   2479.40      1.15
  .001673     280.      280.      280.         2         0         0       .00     64.44     65.59

*SECNO 10.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.40
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
10.000	1.97	2489.97	.00	.00	2490.05	.08	1.12	.11	2493.10
3350.0	.0	1191.2	2158.8	.0	651.1	855.3	37.9	18.0	2488.90
.18	.00	1.83	2.52	.000	.022	.022	.000	2488.00	.95
.000853	1450.	1085.	720.	6	0	0	.00	1338.35	1339.30

TW Splitflow #9 to #10, Weir flow across Los Reales Rd. on No.Side of So.Channel

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	.00	.00	.00	2	2487.645	2489.970	9.000	10.000

THIS RUN EXECUTED 03OCT94 15:34:10

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

South Channel

SUMMARY PRINTOUT

	SECNO	Q	QLOB	QCH	QROB	CWSEL	CRIWS	EG	DEPTH	SSTA	TOPWID	ENDST	DIFEG
*	1.000	3250.00	.00	3250.00	.00	2475.93	2475.93	2478.18	7.03	34.36	60.73	95.09	.00
*	1.000	3300.00	.00	3300.00	.00	2475.99	2475.99	2478.25	7.09	34.18	61.10	95.27	.07
*	1.000	3350.00	.00	3350.00	.00	2476.04	2476.04	2478.32	7.14	34.00	61.45	95.45	.14
*	2.000	3250.00	.00	3250.00	.00	2478.92	2478.92	2481.19	7.12	26.09	59.54	85.63	.00
*	2.000	3300.00	.00	3300.00	.00	2478.97	2478.97	2481.26	7.17	25.93	59.87	85.79	.07
*	2.000	3350.00	.00	3350.00	.00	2479.03	2479.03	2481.33	7.23	25.76	60.19	85.96	.14
*	3.000	3250.00	.00	3250.00	.00	2481.68	2481.68	2484.32	6.48	13.13	48.11	61.24	.00
*	3.000	3300.00	.00	3300.00	.00	2481.74	2481.74	2484.40	6.54	13.00	48.29	61.29	.08
*	3.000	3350.00	.00	3350.00	.00	2481.80	2481.80	2484.47	6.60	12.88	48.46	61.34	.16
*	4.000	3250.00	.00	3250.00	.00	2484.09	.00	2485.42	8.42	8.52	54.56	63.08	.00
*	4.000	3300.00	.00	3300.00	.00	2484.16	.00	2485.50	8.49	8.37	54.76	63.14	.08
*	4.000	3350.00	.00	3350.00	.00	2484.23	.00	2485.58	8.56	8.22	54.97	63.20	.16
	5.000	3250.00	.00	3250.00	.00	2484.70	.00	2486.13	8.06	8.06	55.17	63.23	.00
	5.000	3300.00	.00	3300.00	.00	2484.77	.00	2486.21	8.13	7.90	55.39	63.29	.08
	5.000	3350.00	.00	3350.00	.00	2484.84	.00	2486.29	8.20	7.74	55.61	63.35	.16
	6.000	3250.00	.00	3250.00	.00	2485.52	.00	2486.84	8.08	5.27	58.55	63.81	.00
	6.000	3300.00	.00	3300.00	.00	2485.59	.00	2486.92	8.15	5.07	58.81	63.88	.08
	6.000	3350.00	.00	3350.00	.00	2485.66	.00	2487.00	8.22	4.88	59.06	63.95	.16
	7.000	3250.00	.00	3250.00	.00	2486.20	.00	2487.51	8.04	4.93	59.24	64.17	.00
	7.000	3300.00	.00	3300.00	.00	2486.27	.00	2487.59	8.11	4.74	59.50	64.24	.08
	7.000	3350.00	.00	3350.00	.00	2486.34	.00	2487.66	8.18	4.55	59.75	64.30	.16
	8.000	3250.00	.00	3250.00	.00	2486.96	.00	2488.15	8.26	3.73	60.94	64.67	.00
	8.000	3300.00	.00	3300.00	.00	2487.03	.00	2488.23	8.33	3.53	61.21	64.74	.08
	8.000	3350.00	.00	3350.00	.00	2487.10	.00	2488.31	8.40	3.34	61.47	64.81	.16

SECNO	Q	QLOB	QCH	QROB	CWSEL	CRIWS	EG	DEPTH	SSTA	TOPWID	ENDST	DIFEG
9.000	3250.00	.00	3250.00	.00	2487.51	.00	2488.66	8.11	1.60	63.85	65.45	.00
9.000	3300.00	.00	3300.00	.00	2487.58	.00	2488.74	8.18	1.38	64.13	65.52	.08
9.000	3350.00	.00	3350.00	.00	2487.65	.00	2488.82	8.25	1.15	64.44	65.59	.15
10.000	3250.00	.00	1116.35	2133.65	2489.90	.00	2489.99	1.90	.97	1335.27	1336.24	.00
10.000	3300.00	.00	1153.94	2146.06	2489.93	.00	2490.02	1.93	.96	1336.80	1337.76	.03
* 10.000	3350.00	.00	1191.23	2158.77	2489.97	.00	2490.05	1.97	.95	1338.35	1339.30	.06

South Channel

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	1.000	.00	.00	.00	2468.90	3250.00	2475.93	2475.93	2478.18	58.99	12.05	269.69	423.15
*	1.000	.00	.00	.00	2468.90	3300.00	2475.99	2475.99	2478.25	58.73	12.08	273.20	430.61
*	1.000	.00	.00	.00	2468.90	3350.00	2476.04	2476.04	2478.32	58.55	12.11	276.56	437.80
*	2.000	250.00	.00	.00	2471.80	3250.00	2478.92	2478.92	2481.19	58.18	12.08	268.95	426.10
*	2.000	250.00	.00	.00	2471.80	3300.00	2478.97	2478.97	2481.26	58.11	12.13	272.12	432.89
*	2.000	250.00	.00	.00	2471.80	3350.00	2479.03	2479.03	2481.33	58.02	12.17	275.32	439.82
*	3.000	300.00	.00	.00	2475.20	3250.00	2481.68	2481.68	2484.32	55.44	13.02	249.69	436.48
*	3.000	300.00	.00	.00	2475.20	3300.00	2481.74	2481.74	2484.40	55.32	13.07	252.58	443.69
*	3.000	300.00	.00	.00	2475.20	3350.00	2481.80	2481.80	2484.47	55.28	13.12	255.33	450.59
*	4.000	300.00	.00	.00	2475.67	3250.00	2484.09	.00	2485.42	21.30	9.25	351.27	704.21
*	4.000	300.00	.00	.00	2475.67	3300.00	2484.16	.00	2485.50	21.32	9.30	354.96	714.62
*	4.000	300.00	.00	.00	2475.67	3350.00	2484.23	.00	2485.58	21.34	9.34	358.69	725.14
	5.000	300.00	.00	.00	2476.64	3250.00	2484.70	.00	2486.13	24.10	9.59	338.72	662.05
	5.000	300.00	.00	.00	2476.64	3300.00	2484.77	.00	2486.21	24.08	9.63	342.52	672.46
	5.000	300.00	.00	.00	2476.64	3350.00	2484.84	.00	2486.29	24.06	9.67	346.34	682.99
	6.000	300.00	.00	.00	2477.44	3250.00	2485.52	.00	2486.84	22.34	9.20	353.35	687.60
	6.000	300.00	.00	.00	2477.44	3300.00	2485.59	.00	2486.92	22.30	9.23	357.49	698.87
	6.000	300.00	.00	.00	2477.44	3350.00	2485.66	.00	2487.00	22.25	9.26	361.63	710.19
	7.000	300.00	.00	.00	2478.16	3250.00	2486.20	.00	2487.51	22.37	9.17	354.37	687.17
	7.000	300.00	.00	.00	2478.16	3300.00	2486.27	.00	2487.59	22.33	9.21	358.50	698.36
	7.000	300.00	.00	.00	2478.16	3350.00	2486.34	.00	2487.66	22.31	9.24	362.49	709.22
	8.000	300.00	.00	.00	2478.70	3250.00	2486.96	.00	2488.15	19.86	8.76	371.16	729.26
	8.000	300.00	.00	.00	2478.70	3300.00	2487.03	.00	2488.23	19.84	8.79	375.38	740.82
	8.000	300.00	.00	.00	2478.70	3350.00	2487.10	.00	2488.31	19.84	8.83	379.49	752.10
	9.000	280.00	.00	.00	2479.40	3250.00	2487.51	.00	2488.66	16.79	8.63	376.43	793.18
	9.000	280.00	.00	.00	2479.40	3300.00	2487.58	.00	2488.74	16.77	8.67	380.73	805.76
	9.000	280.00	.00	.00	2479.40	3350.00	2487.65	.00	2488.82	16.73	8.70	385.26	819.11
	10.000	1085.00	.00	.00	2488.00	3250.00	2489.90	.00	2489.99	9.83	1.86	1413.02	1036.65
	10.000	1085.00	.00	.00	2488.00	3300.00	2489.93	.00	2490.02	9.15	1.84	1459.34	1090.75
*	10.000	1085.00	.00	.00	2488.00	3350.00	2489.97	.00	2490.05	8.53	1.83	1506.36	1146.82

South Channel

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	1.000	3250.00	2475.93	.00	.00	3.93	60.73	.00
*	1.000	3300.00	2475.99	.06	.00	3.99	61.10	.00
*	1.000	3350.00	2476.04	.05	.00	4.04	61.45	.00
*	2.000	3250.00	2478.92	.00	2.99	.00	59.54	250.00
*	2.000	3300.00	2478.97	.05	2.99	.00	59.87	250.00
*	2.000	3350.00	2479.03	.05	2.99	.00	60.19	250.00
*	3.000	3250.00	2481.68	.00	2.76	.00	48.11	300.00
*	3.000	3300.00	2481.74	.06	2.77	.00	48.29	300.00
*	3.000	3350.00	2481.80	.06	2.77	.00	48.46	300.00
*	4.000	3250.00	2484.09	.00	2.41	.00	54.56	300.00
*	4.000	3300.00	2484.16	.07	2.41	.00	54.76	300.00
*	4.000	3350.00	2484.23	.07	2.42	.00	54.97	300.00
	5.000	3250.00	2484.70	.00	.61	.00	55.17	300.00
	5.000	3300.00	2484.77	.07	.61	.00	55.39	300.00
	5.000	3350.00	2484.84	.07	.61	.00	55.61	300.00
	6.000	3250.00	2485.52	.00	.82	.00	58.55	300.00
	6.000	3300.00	2485.59	.07	.82	.00	58.81	300.00
	6.000	3350.00	2485.66	.07	.83	.00	59.06	300.00
	7.000	3250.00	2486.20	.00	.68	.00	59.24	300.00
	7.000	3300.00	2486.27	.07	.68	.00	59.50	300.00
	7.000	3350.00	2486.34	.07	.68	.00	59.75	300.00
	8.000	3250.00	2486.96	.00	.76	.00	60.94	300.00
	8.000	3300.00	2487.03	.07	.76	.00	61.21	300.00
	8.000	3350.00	2487.10	.07	.76	.00	61.47	300.00
	9.000	3250.00	2487.51	.00	.55	.00	63.85	280.00
	9.000	3300.00	2487.58	.07	.55	.00	64.13	280.00
	9.000	3350.00	2487.65	.07	.55	.00	64.44	280.00
	10.000	3250.00	2489.90	.00	2.39	.00	1335.27	1085.00
	10.000	3300.00	2489.93	.03	2.36	.00	1336.80	1085.00
*	10.000	3350.00	2489.97	.04	2.32	.00	1338.35	1085.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      1.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.000  PROFILE=  3  CRITICAL DEPTH ASSUMED

CAUTION SECNO=      2.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      2.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.000  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.000  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      2.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.000  PROFILE=  3  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.000  PROFILE=  3  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=      3.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3.000  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.000  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.000  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3.000  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.000  PROFILE=  3  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.000  PROFILE=  3  20 TRIALS ATTEMPTED TO BALANCE WSEL

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WARNING SECNO=      4.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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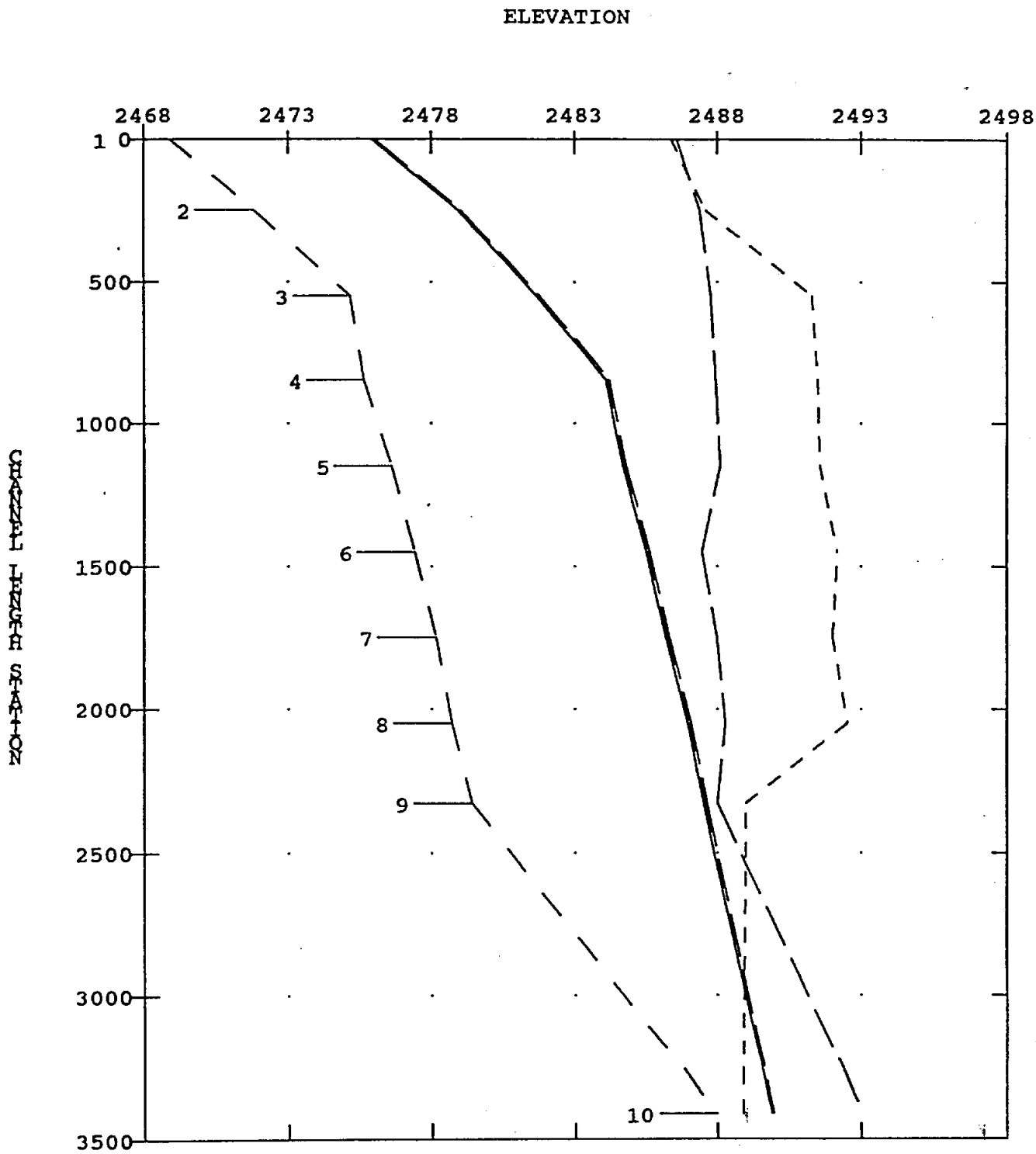
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2493
2498
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9
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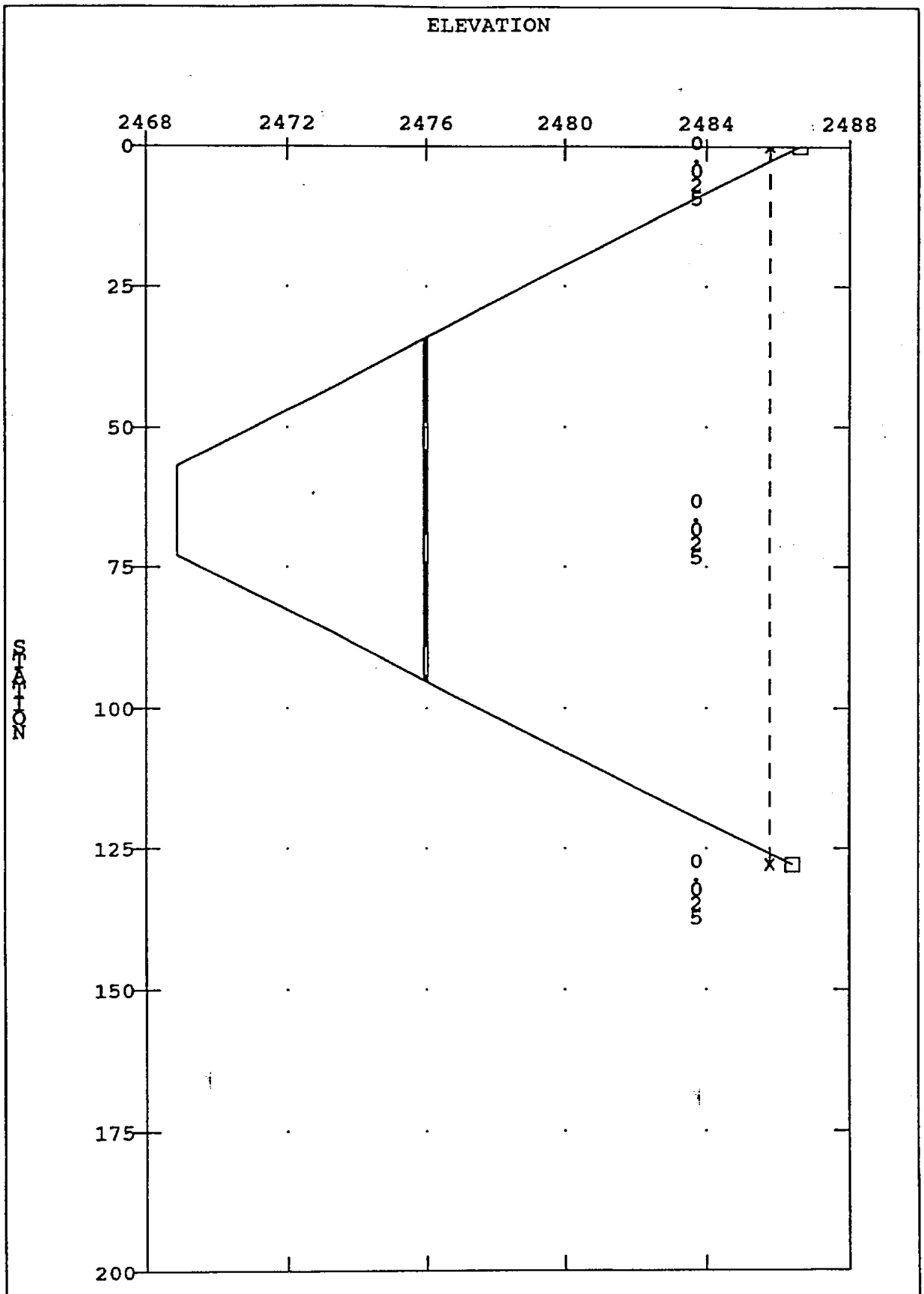
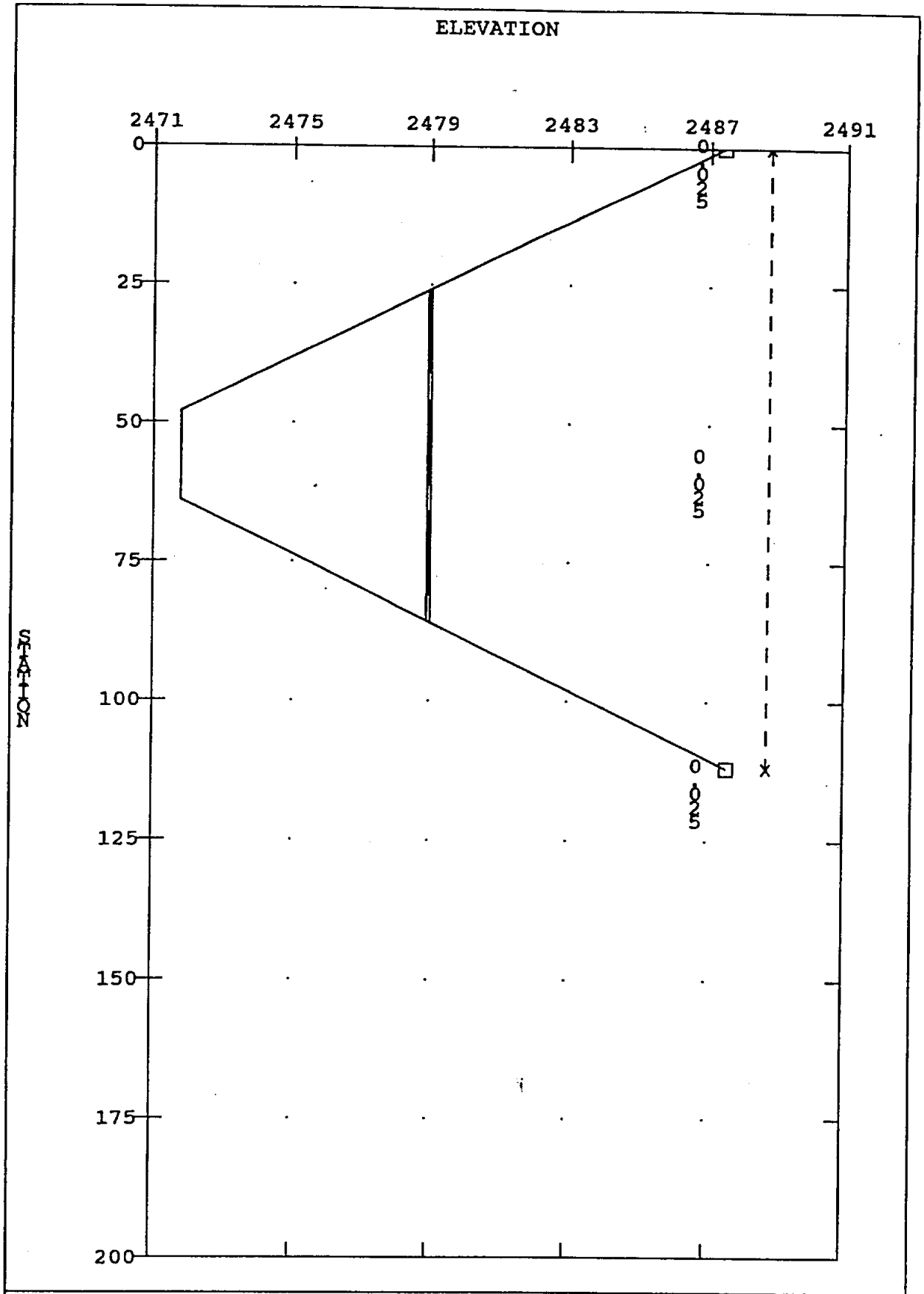


SECTION : 1

South Channel



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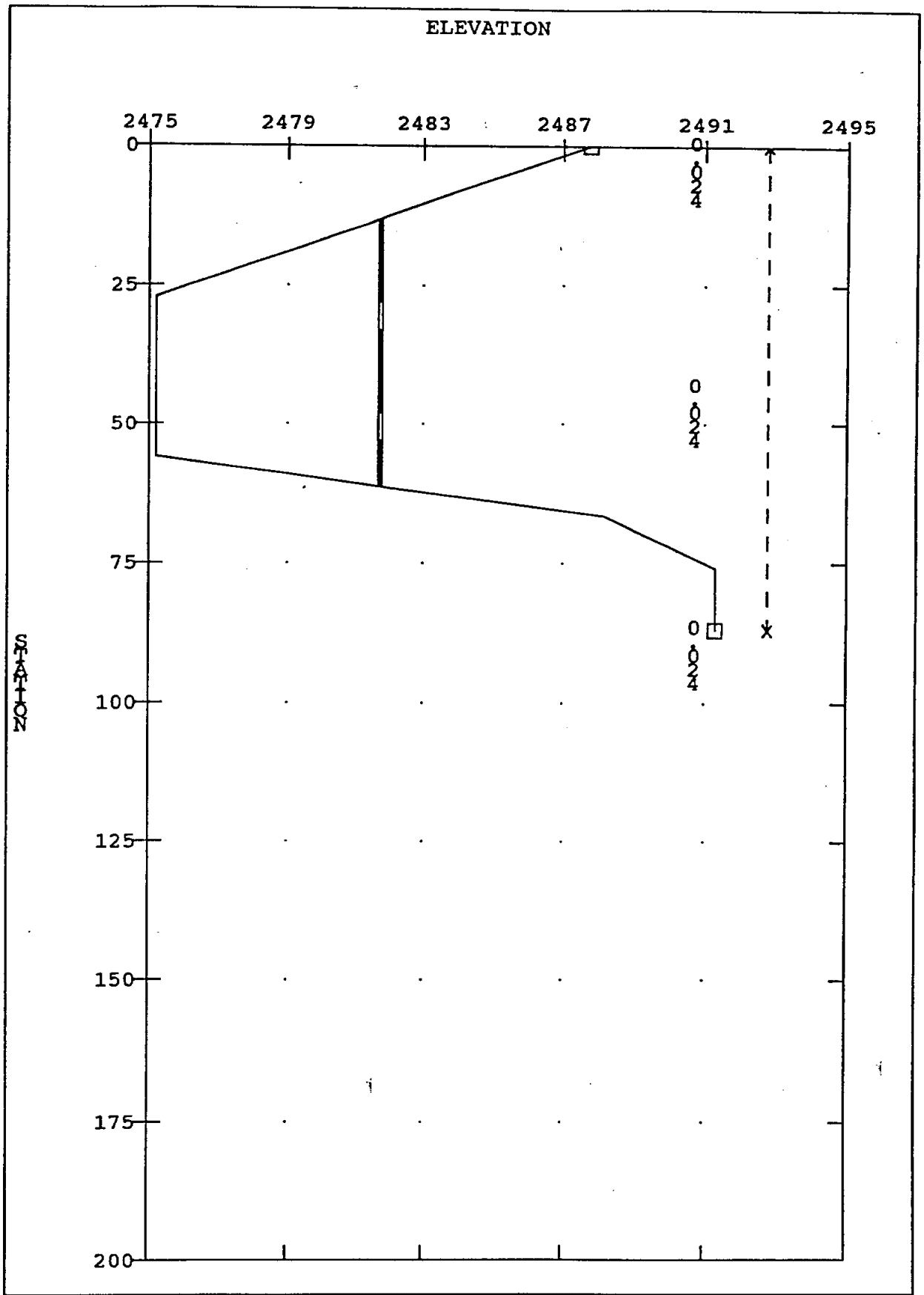
South Channel



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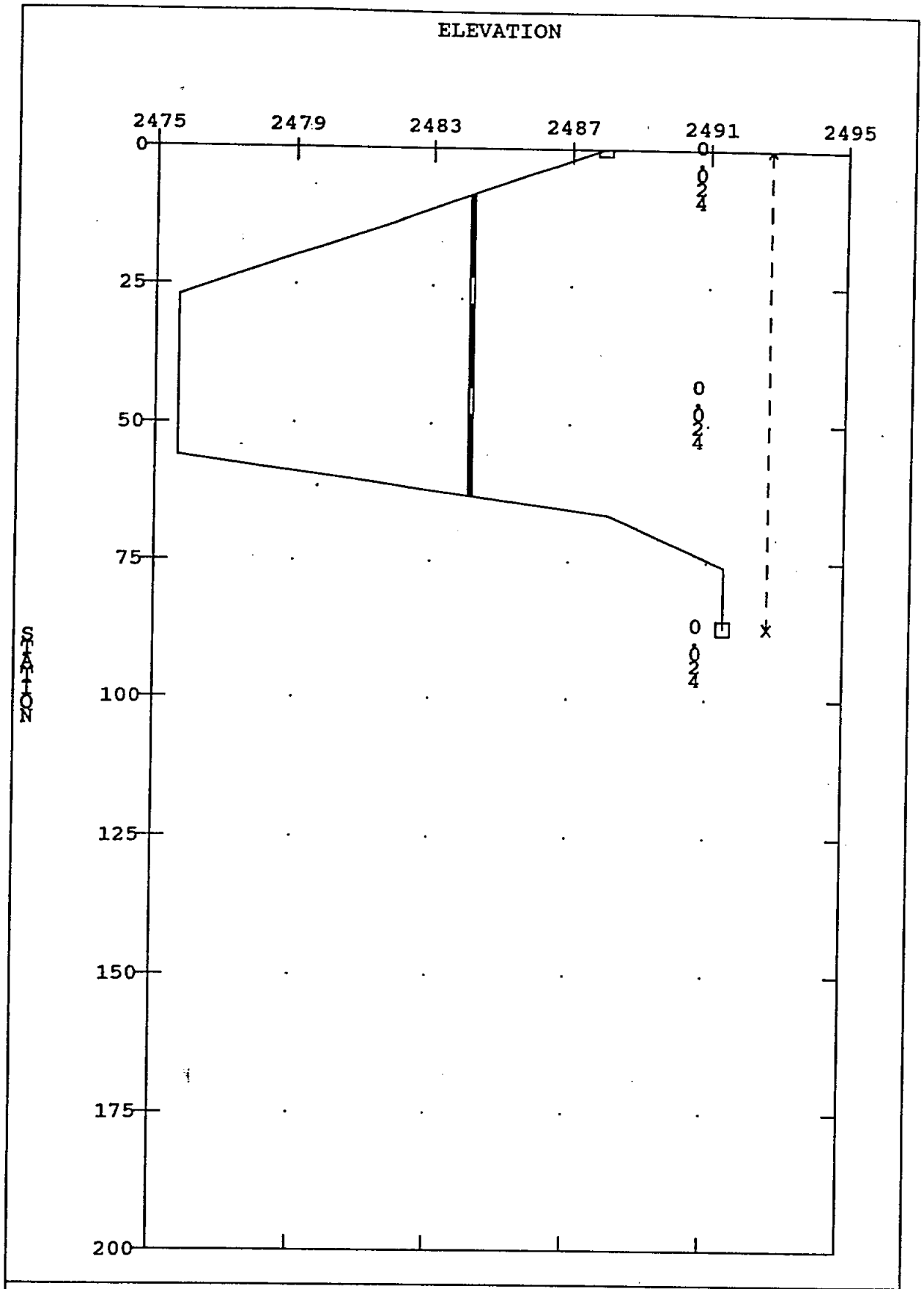
South Channel



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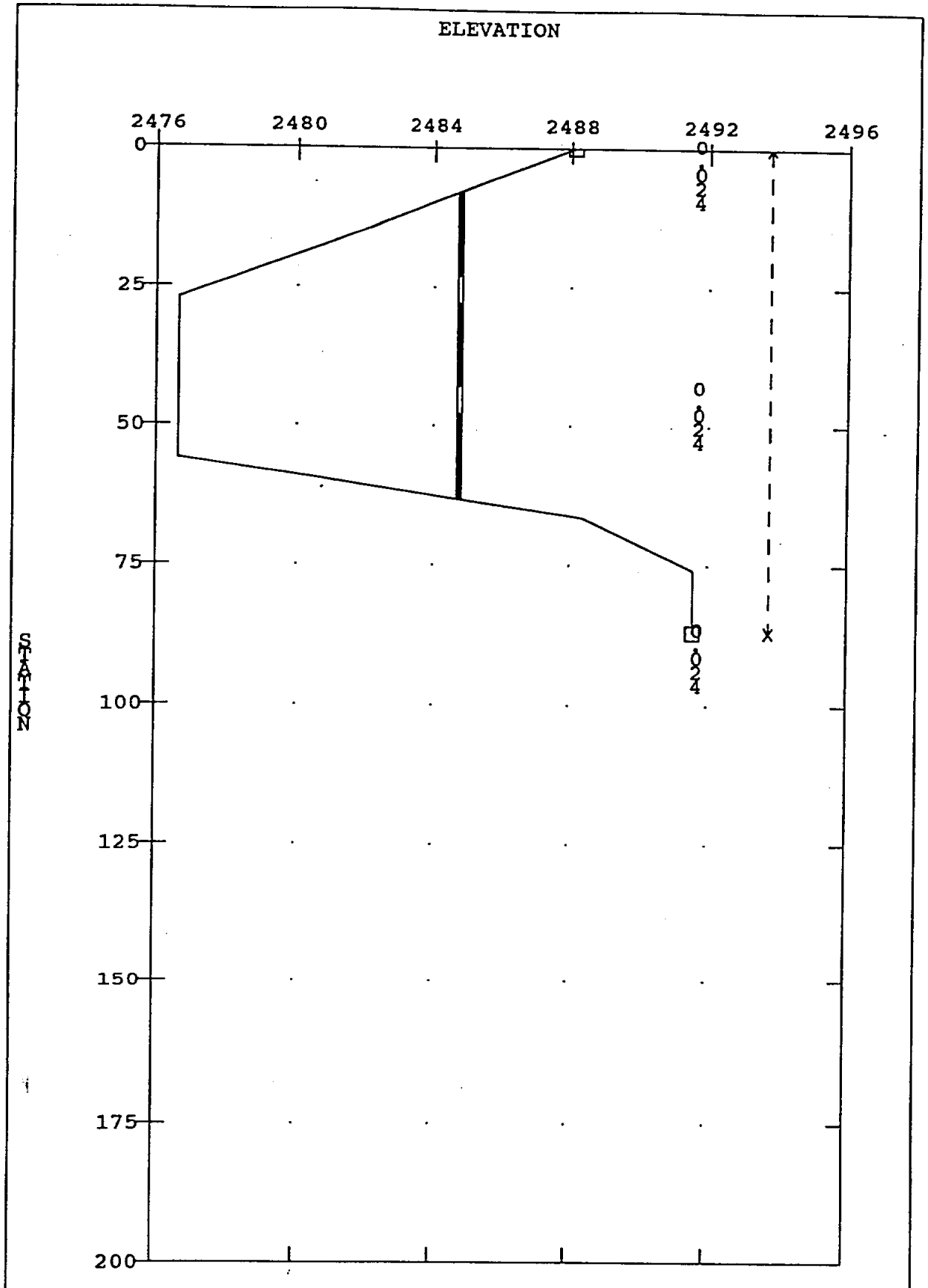
South Channel



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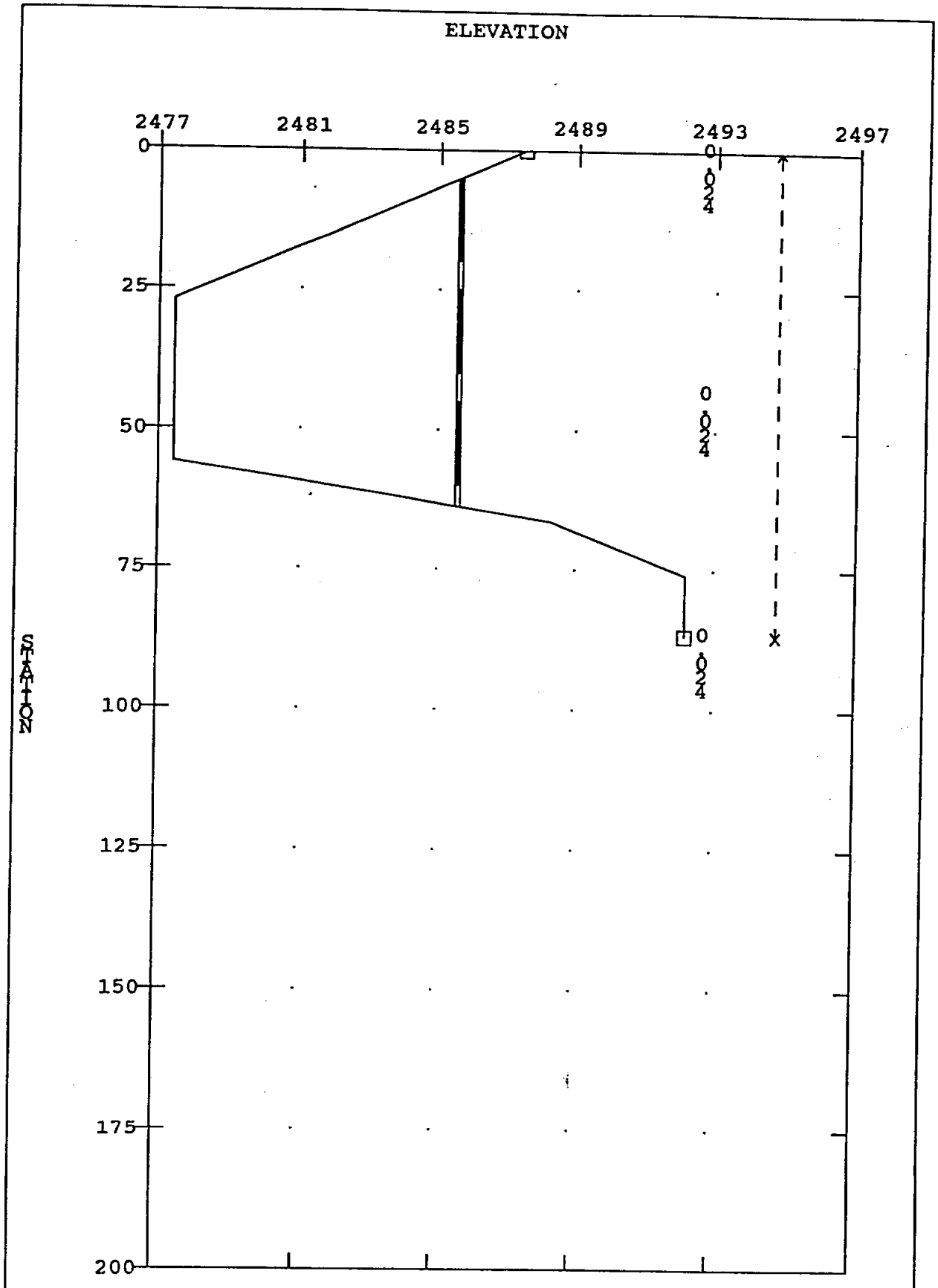
South Channel



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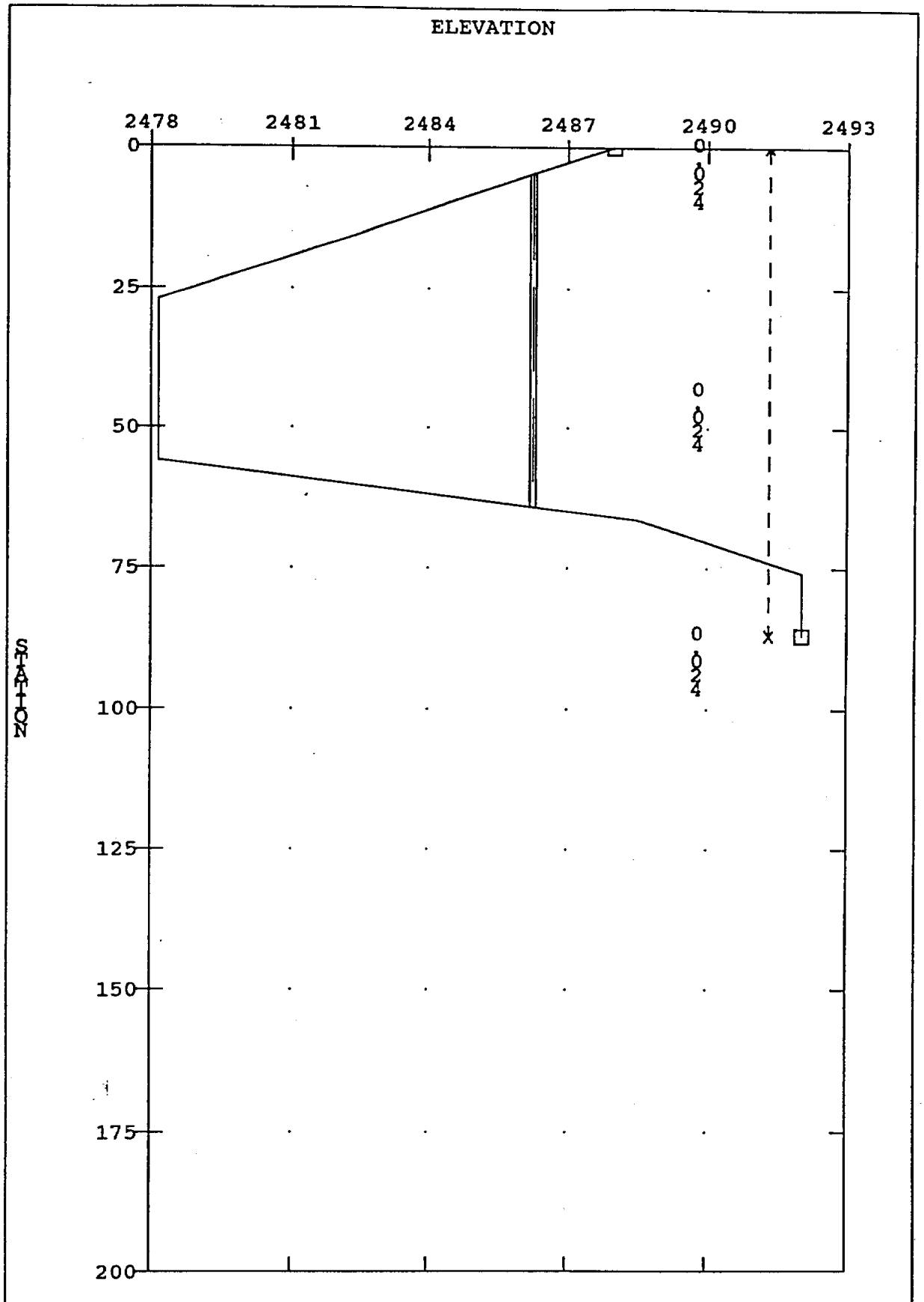
South Channel



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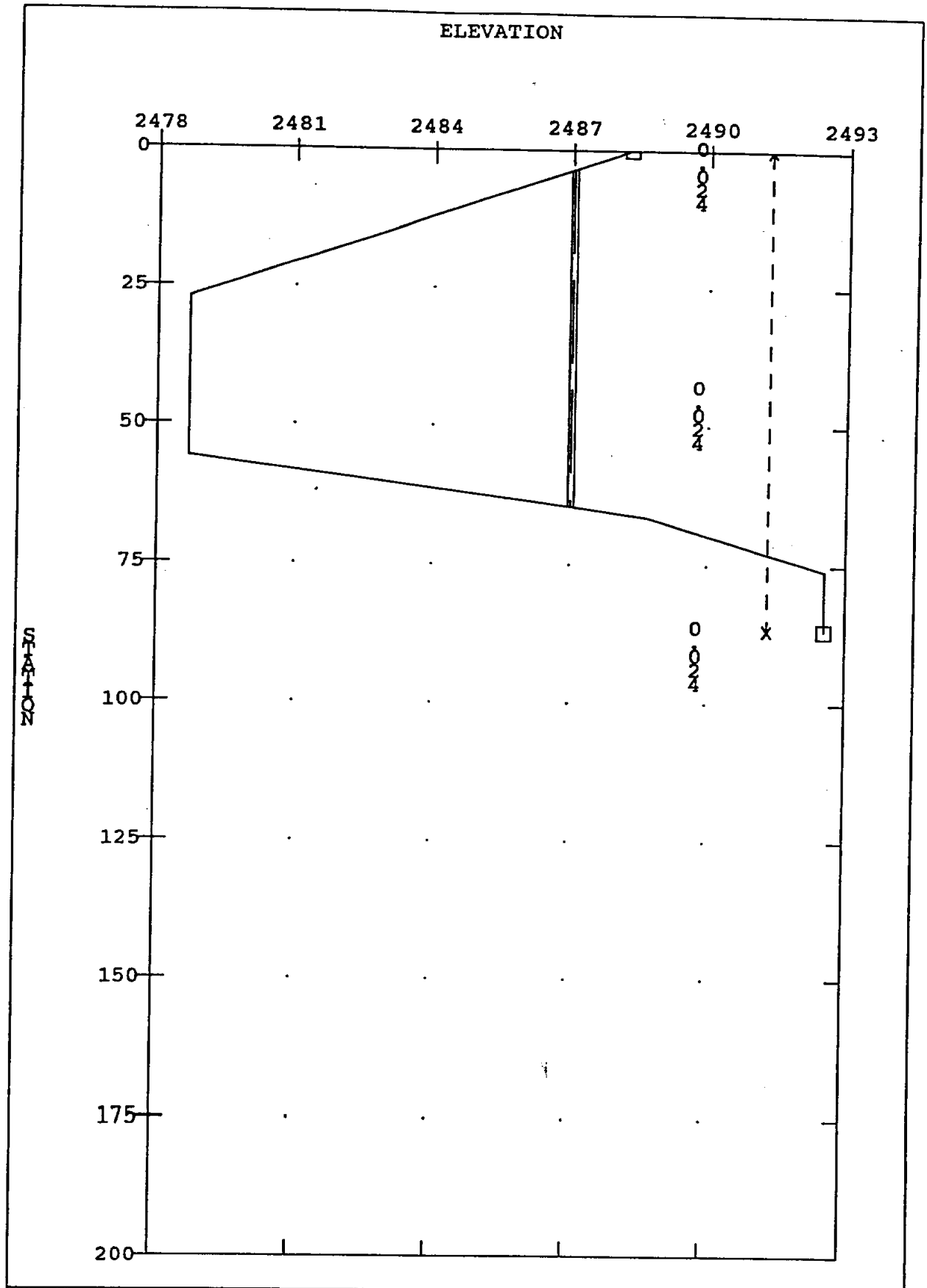
South Channel



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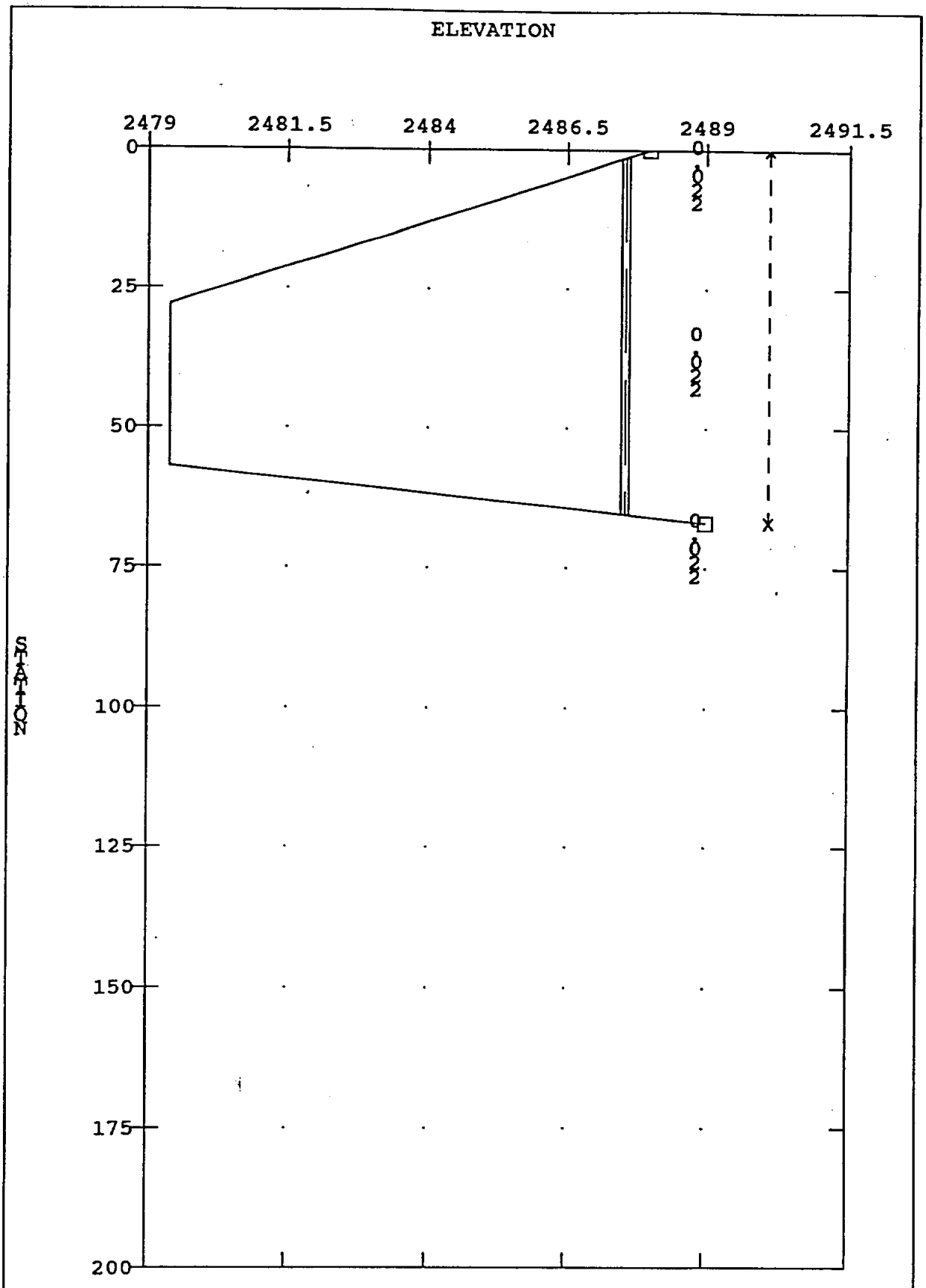
South Channel



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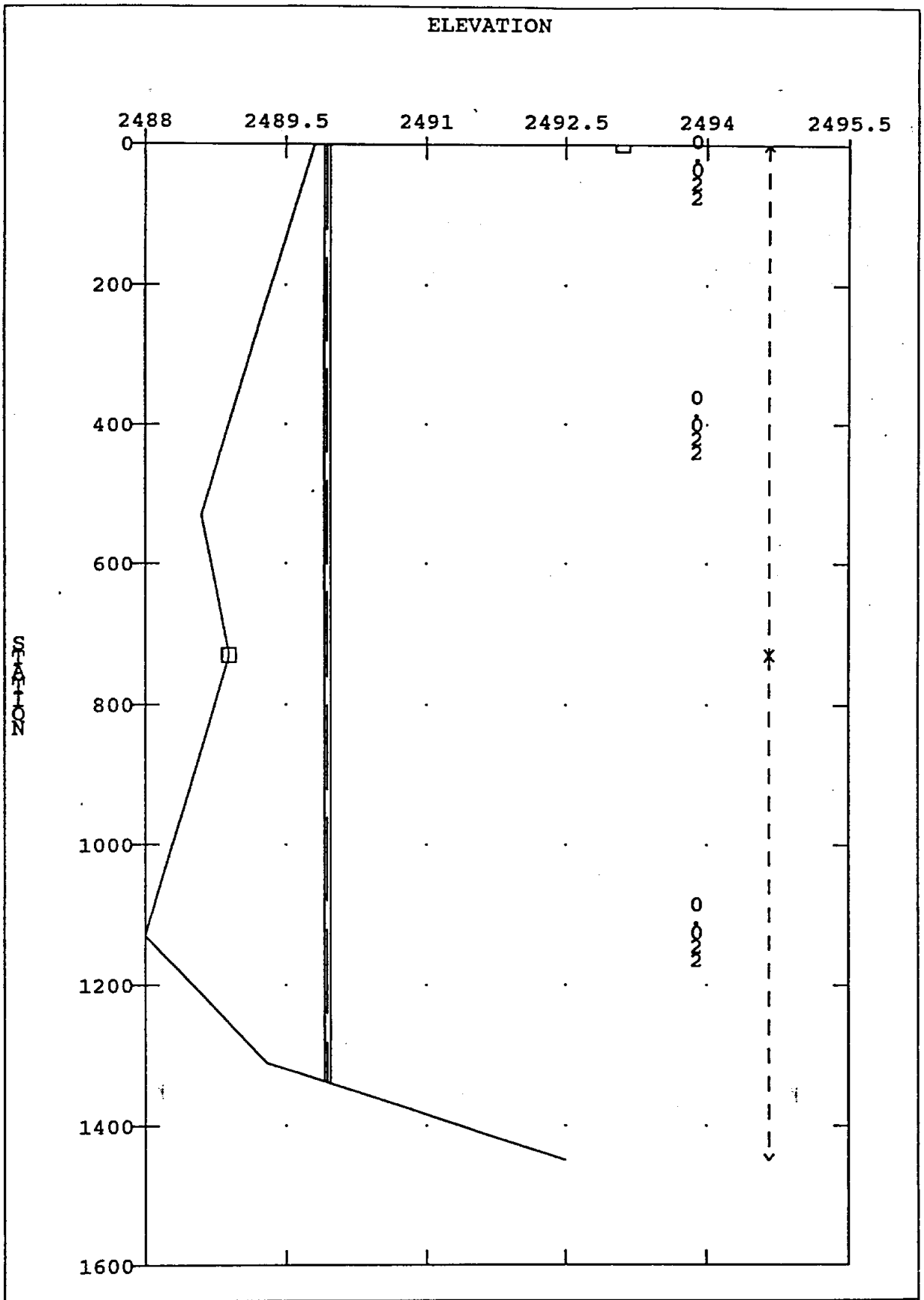
South Channel



SECTION : 10

South Channel

Appendix 4

Midvale Park Master Drainage Report: study boundaries, West Branch Channel typical cross sections

Dooley-Jones & Associates, Inc.

CONSULTING ENGINEERS / PLANNERS

MIDVALE PARK
MASTER DRAINAGE REPORT

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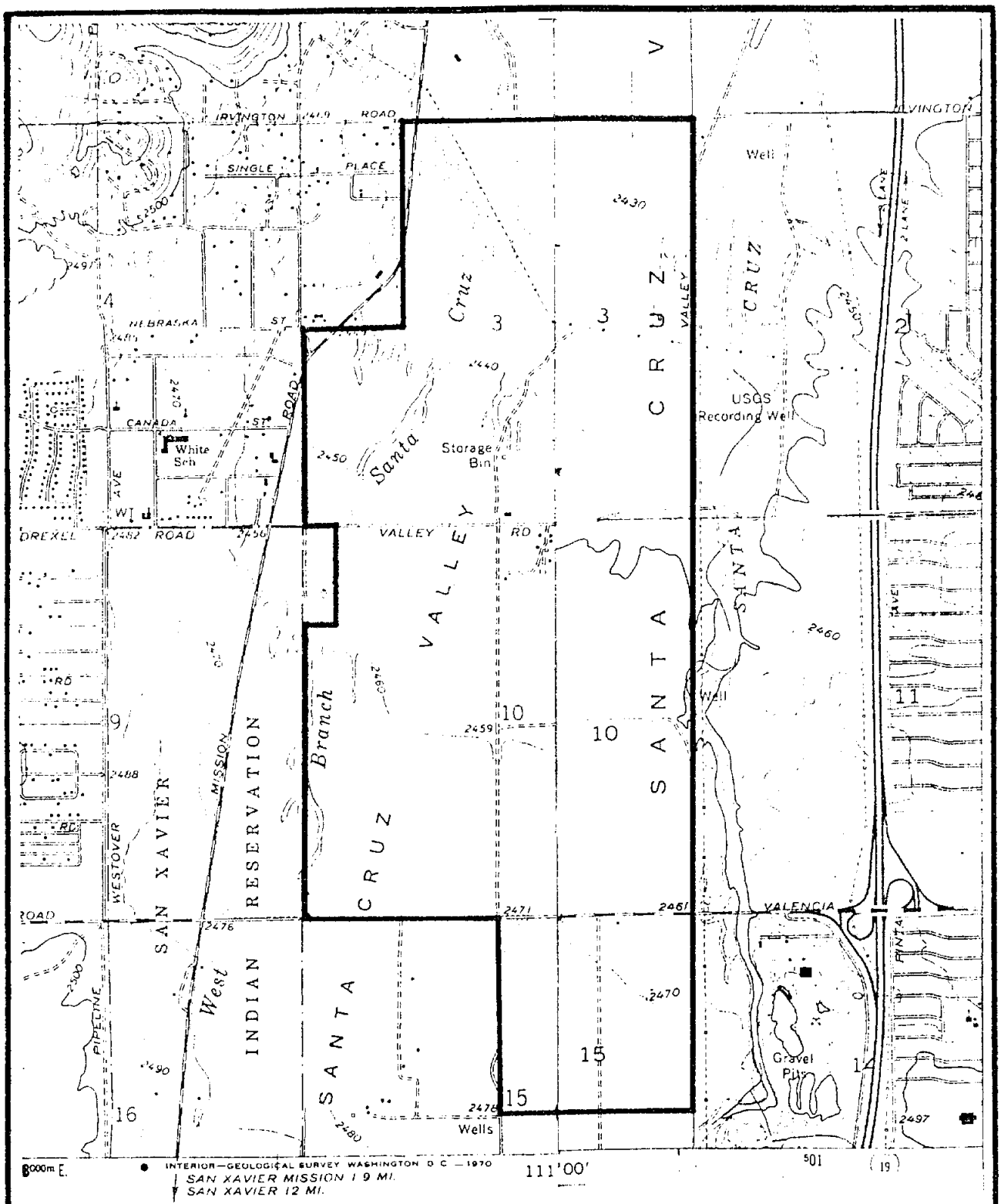
Doo
1

Property of:
Pima County
Flood Control District Library
740-6350

AUG 1983
FLOOD
PLAIN
MANAGEMENT

...55 EAST TOOLE AVENUE • P.O. BOX 1830, TUCSON, ARIZONA 85702 • (602) 624-2391



MIDVALE PARK

SCALE: 1" - 2000'

LOCATION PLAN

FIGURE 1