DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — No. Exp. CIVIL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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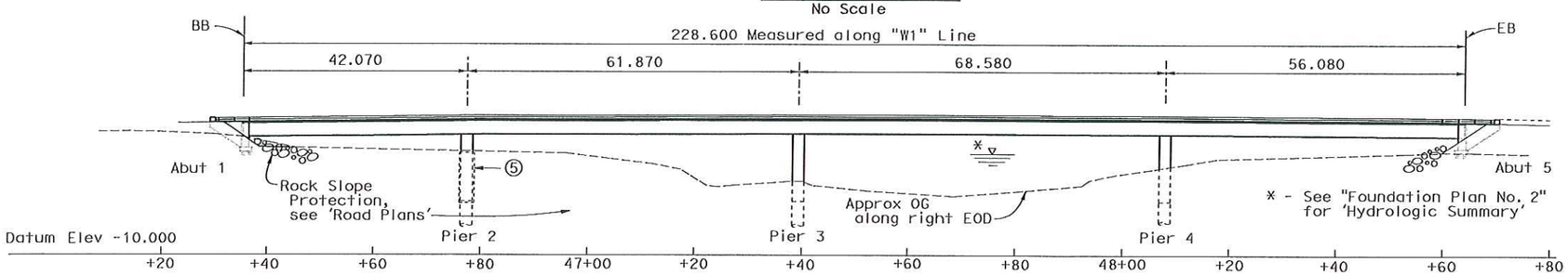
BVC 45+45.000
Elev 13.526
+1.750%

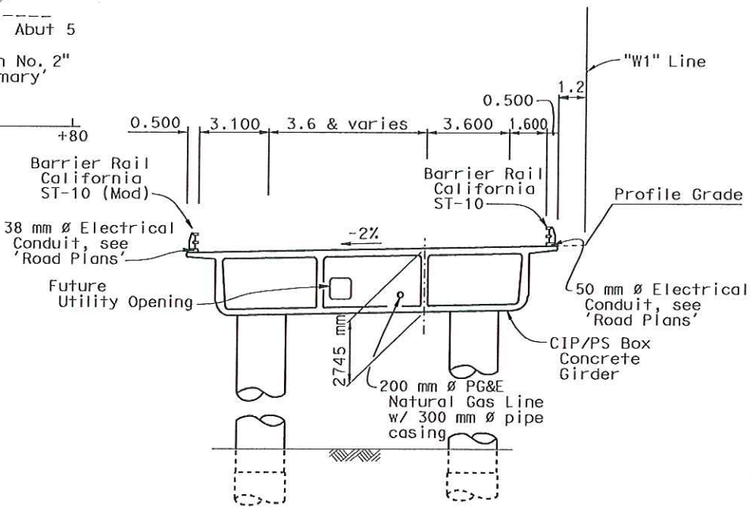
440.000 VC
RC = -0.8163/Sta

EVC 49+85.000
Elev 13.324
-1.842%

PROFILE GRADE
No Scale

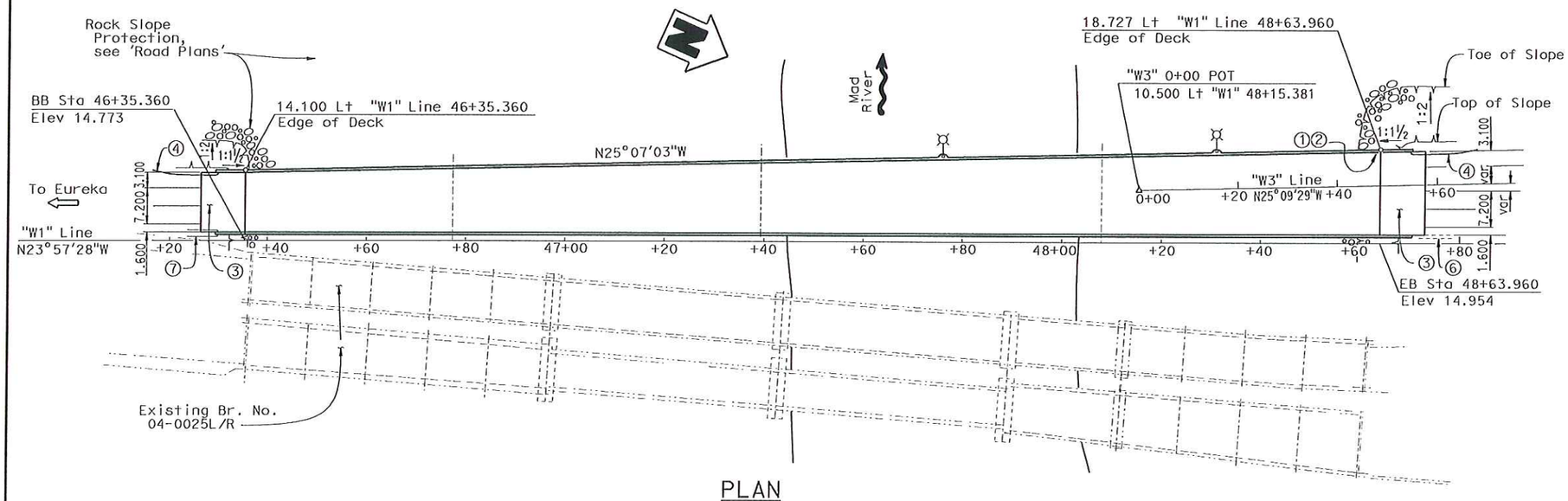


ELEVATION
1:500



TYPICAL SECTION
1:125

QUANTITIES



PLAN
1:500

For 'Pile Data Table', 'Index to Plans' and 'General Notes', see "Index to Plans" sheet

DATE PLOTTED => 08-MAY-2007 TIME PLOTTED => 14:42
USERNAME => tshen

Caltrans Metric	Joseph E Downing, DESIGN ENGINEER	DESIGN	BY	CHECKED	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD	
		DETAILS	BY	CHECKED	LAYOUT	BY	CHECKED
		QUANTITIES	BY	CHECKED	SPECIFICATIONS	BY	PLANS AND SPECS COMPARED

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 3

BRIDGE NO. 04-0025L
KILOMETER POST 144.4

MAD RIVER BRIDGE (REPLACE-LEFT)
GENERAL PLAN

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU 01256
EA 296101

FILE => 04-0025l-a-gp.dgn

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 6-18-04 | 1-20-07 | 2-20-07 | 4-1-07 | 4-25-07 | 6-18-07 | 8-31-07 | 12-17-07

SHEET 1 OF 40

STRUCTURES DESIGN GENERAL PLAN SHEET (METRIC) (REV.03-17-04)

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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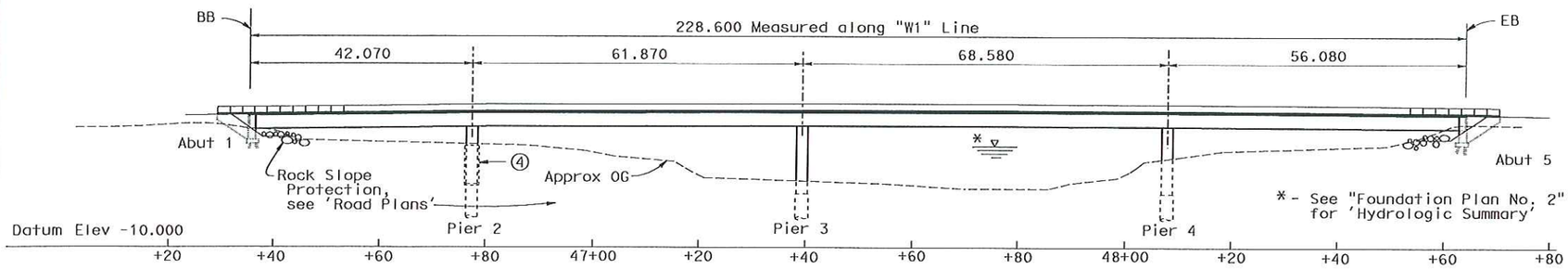
BVC 45+45.000
Elev 13.526
+1.750%

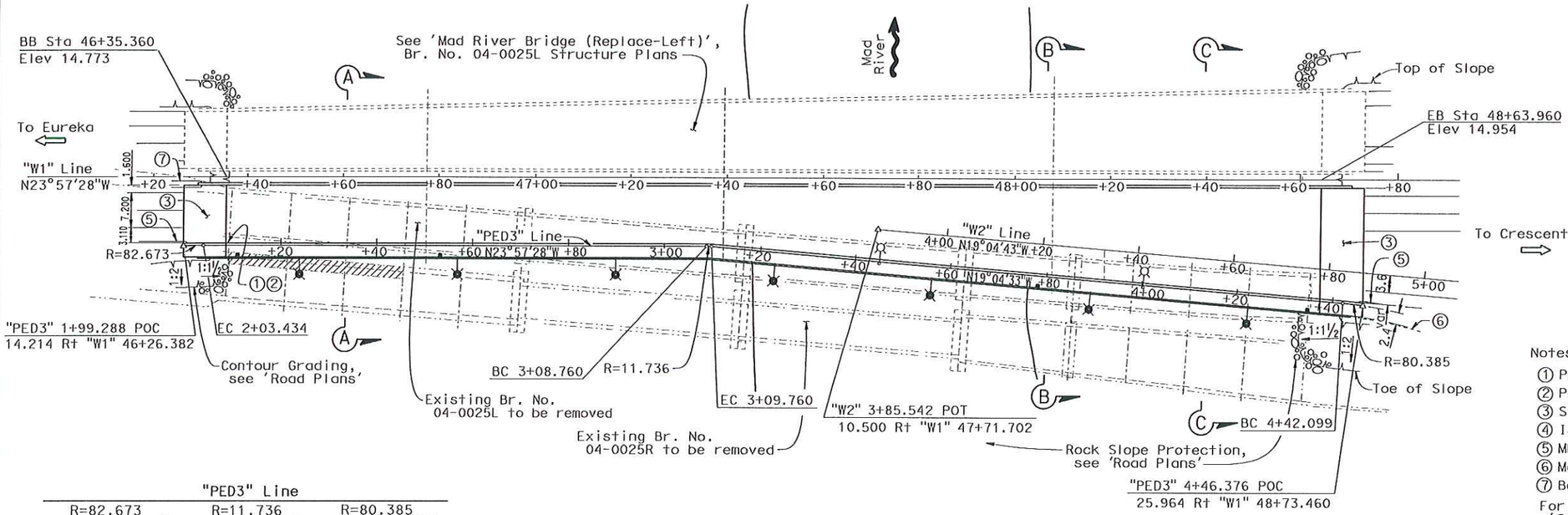
440.000 VC
RC = -0.8163/Sta

EVC 49+85.000
Elev 13.324
-1.842%

PROFILE GRADE
No Scale



ELEVATION
1:500



"PED3" Line		
R=82.673	R=11.736	R=80.385
Δ=02°52'23"	Δ=4°52'56"	Δ=03°02'55"
T=2.073	T=0.500	T=2.139
L=4.146	L=1.000	L=4.277

PLAN
1:500

Notes:
① Paint "Br. No 04-0025R"
② Paint "Mad River Bridge"
③ Structure Approach Type N(9S)
④ Isolation Casing
⑤ MBGR, see 'Road Plans'
⑥ Metal Fence, see 'Road Plans'
⑦ Bouble Thrie Beam, see 'Road Plans'
For 'Section A - A', 'Section B - B' and 'Section C - C', see "General Plan No. 2" sheet
- - - - - - - Indicates existing structure
▨ - Indicates Stage 2 Bridge Removal (Portion)
• - Indicates Deck Drain Type D-2, see "Girder Details" sheets for location
- Indicates Electrolier, see 'Road Plans'
- Indicates Pedestrian Lighting, see 'Road Plans'

For 'General Notes', 'Index to Plans' and 'Pile Data Table', see "Index to Plans" sheet

Caltrans Metric

DESIGN ENGINEER

	BY	CHECKED			
DESIGN	BY	CHECKED	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD	
DETAILS	BY	CHECKED	LAYOUT	BY	CHECKED
QUANTITIES	BY	CHECKED	SPECIFICATIONS	BY	PLANS AND SPECS COMPARED

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES
STRUCTURE DESIGN
DESIGN BRANCH 3

CU 01256
EA 296101

FILE => 04-0025r-a-gp01.dgn

BRIDGE NO. 04-0025R
KILOMETER POST 144.4

MAD RIVER BRIDGE (REPLACE-RIGHT)
GENERAL PLAN NO. 1

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 6-15-04 | 1-28-07 | 2-22-07 | 3-5-07 | 4-25-07 | | 5-4-05 | 5-3-05 | 6-24-06 | 10-17-06

SHEET 1 OF 47

STRUCTURES DESIGN GENERAL PLAN SHEET (METRIC) (REV.03-17-04)

DATE PLOTTED => 08-MAY-2007 TIME PLOTTED => 14:38

USERNAME => tshen

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101			

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

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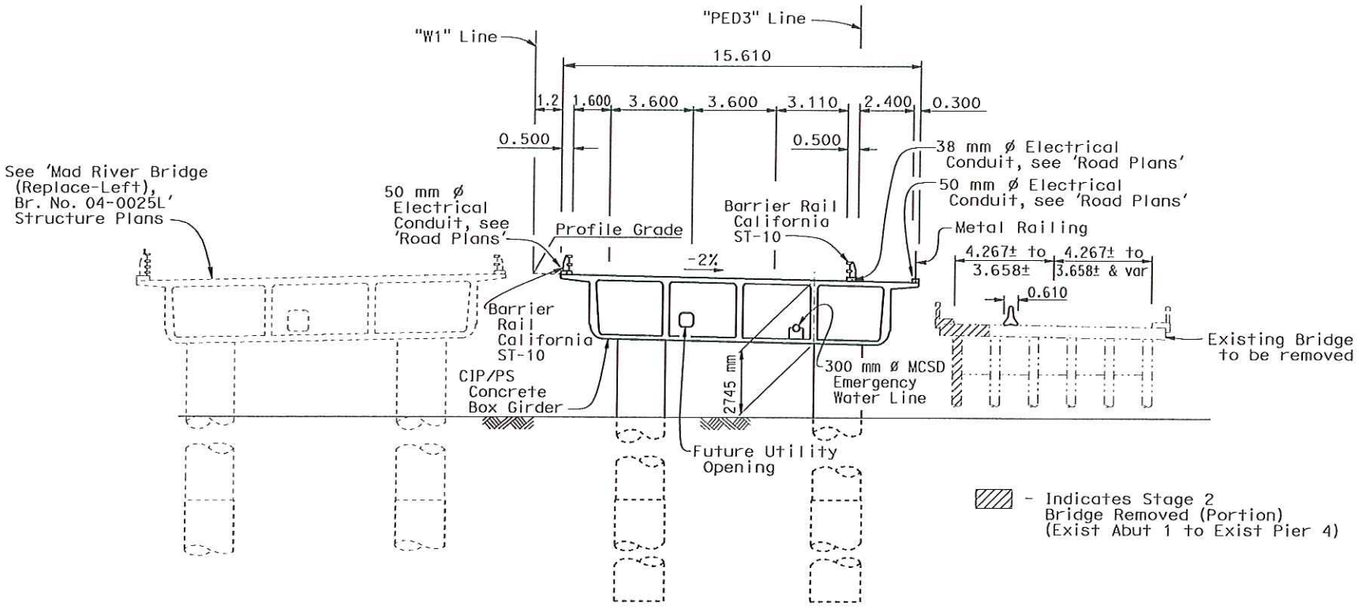
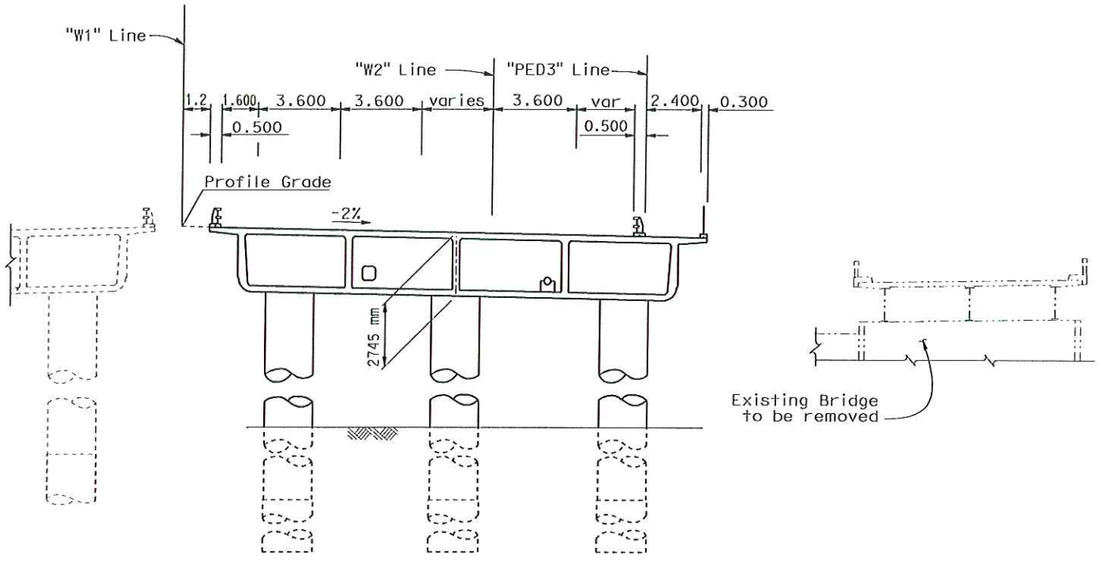
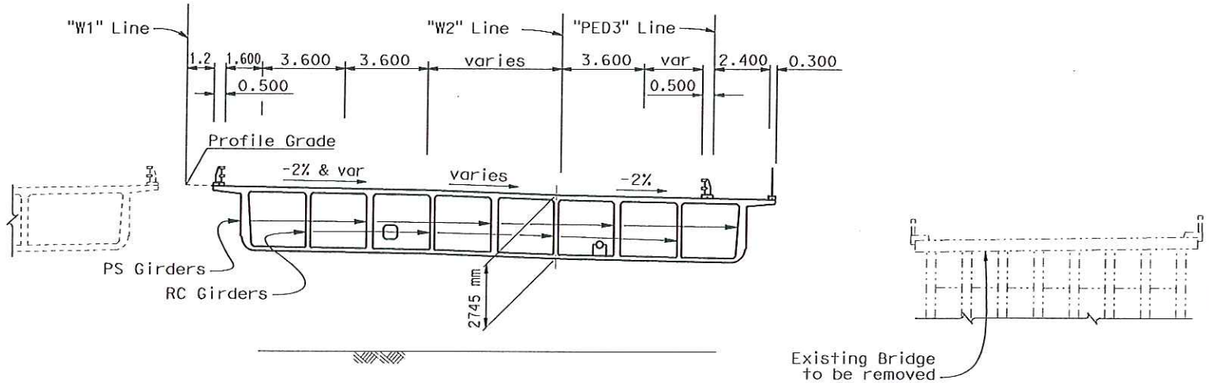


SECTION A - A
1:125



Note:
For details not shown, see 'Section A - A'

SECTION B - B
1:125



Note:
For details not shown, see 'Section A - A'

SECTION C - C
1:125

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

Caltrans Metric	DESIGN ENGINEER	DESIGN	BY	CHECKED	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD		STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES STRUCTURE DESIGN	BRIDGE NO. 04-0025R	MAD RIVER BRIDGE (REPLACE-RIGHT)
		DETAILS	BY	CHECKED	LAYOUT	BY	CHECKED		DESIGN BRANCH 3	KILOMETER POST 144.4	GENERAL PLAN NO. 2
		QUANTITIES	BY	CHECKED	SPECIFICATIONS	BY	PLANS AND SPECS COMPARED		CU 01256 EA 296101	DISREGARD PRINTS BEARING EARLIER REVISION DATES →	SHEET 2 OF 47

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

FILE => 04-0025r-a-gp02.dgn

STRUCTURES DESIGN GENERAL PLAN SHEET (METRIC) (REV.03-17-04)

DATE PLOTTED => 08-MAY-2007 TIME PLOTTED => 14:40 USERNAME => tshen

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

COUNTY R/W FROM "W1" 43+71 TO "W1"44+56

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101,200	KP143.8/145.0 KP 0.4/0.9		

REGISTERED CIVIL ENGINEER 00-00-00

ERIC Y. WONG No. C62040 Exp. 9-30-07 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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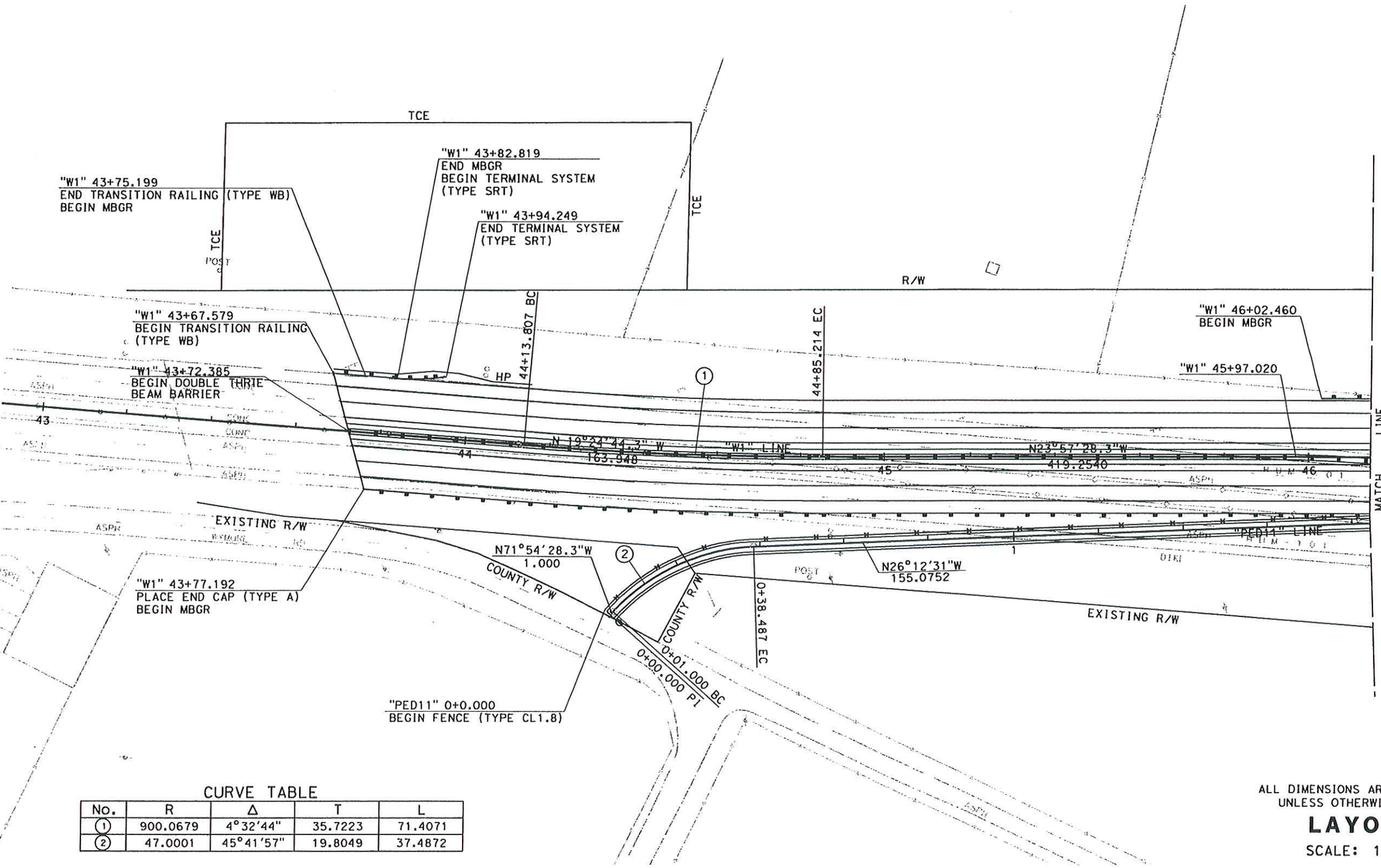


CURVE TABLE

No.	R	Δ	T	L
①	900.0679	4°32'44"	35.7223	71.4071
②	47.0001	45°41'57"	19.8049	37.4872

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LAYOUT

SCALE: 1:500

L-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
NORTH REGION
OFFICE OF DESIGN, WEST
DESIGN BRANCH 81

PROJECT ENGINEER: ERIC Y. WONG

CALCULATED/ DESIGNED BY | CHECKED BY

DATE | REVISED BY | DATE REVISED

...\01-296101\129610ea001.dgn s132428 10:02:47 AM 2/20/2007

LAST REVISION DATE PLOTTED => 2/20/2007

RELATIVE BORDER SCALE 0 20 40 60 80

USERNAME => s132428

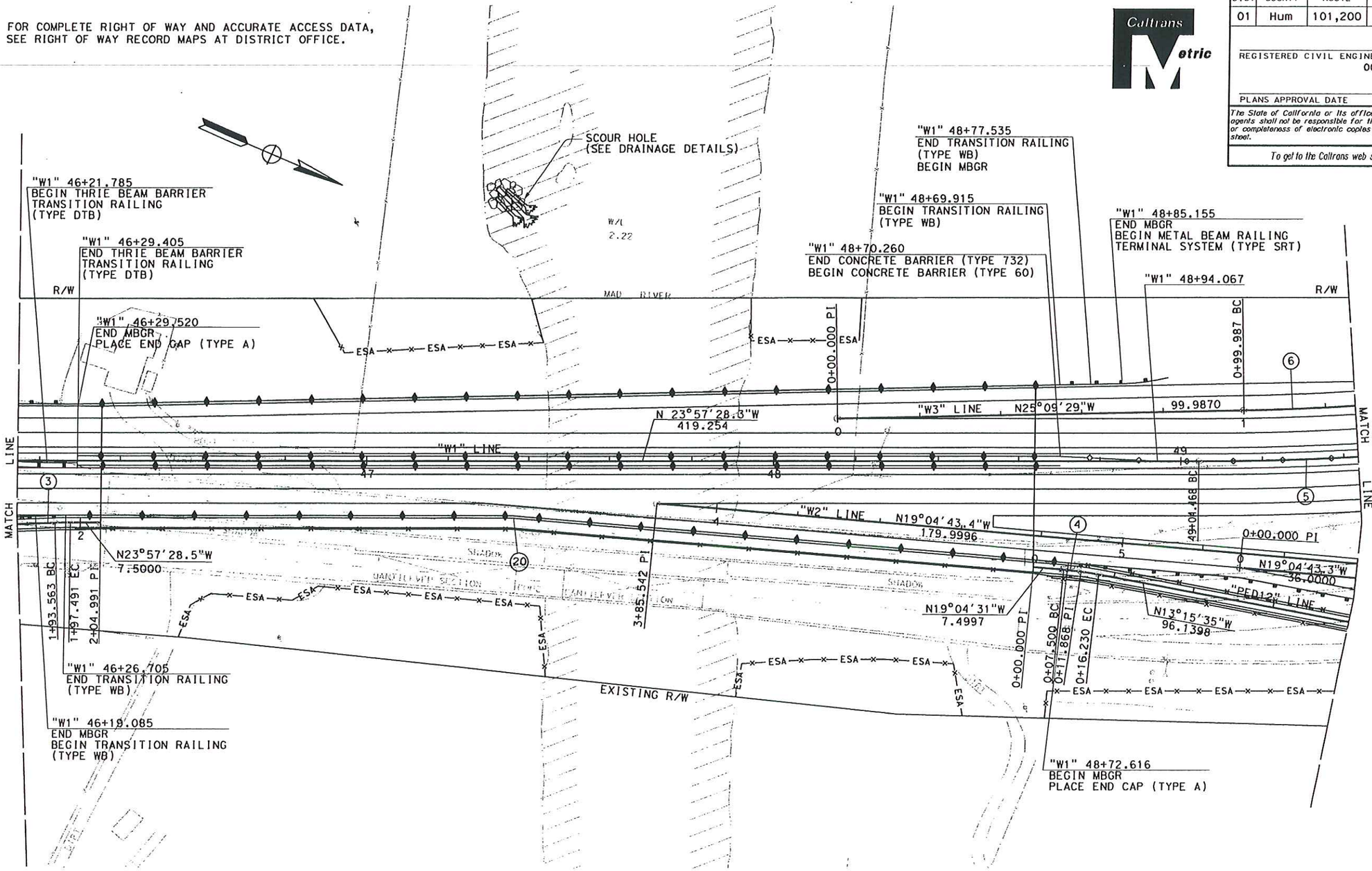
CU 03251 | EA 296101

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101,200	KP143.8/145.0 KP 0.4/0.9		

REGISTERED CIVIL ENGINEER
00-00-00
PLANS APPROVAL DATE

ERIC Y. WONG No. C62040 Exp. 9-30-07 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA



CURVE TABLE

No.	R	Δ	T	L
③	100.0031	2°15'2"	1.9644	3.9282
④	85.9999	5°48'58"	4.3686	8.7297
⑤	640.0798	34°19'48"	197.7097	383.5182
⑥	579.1198	4°56'48"	25.0155	49.9999
⑳	11.736	85°6'29"	0.5000	1.0000

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

LAYOUT

SCALE: 1:500

L-2

DATE	REVISED BY	DATE REVISED
	CALCULATED/ DESIGNED BY	CHECKED BY

PROJECT ENGINEER
ERIC Y. WONG

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
NORTH REGION
OFFICE OF DESIGN, WEST
DESIGN BRANCH 81

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10:02:49 AM 2/20/2007 s132428

RELATIVE BORDER SCALE 0 20 40 60 80

USERNAME => s132428

CU 03251 | EA 296101

LAST REVISION DATE PLOTTED => 2/20/2007

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101,200	KP143.8/145.0 KP 0.4/0.9		

REGISTERED CIVIL ENGINEER
00-00-00

ERIC Y. WONG
No. C62040
Exp. 9-30-07
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

PLANS APPROVAL DATE

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Caltrans
NORTH REGION
OFFICE OF DESIGN, WEST
DESIGN BRANCH 81

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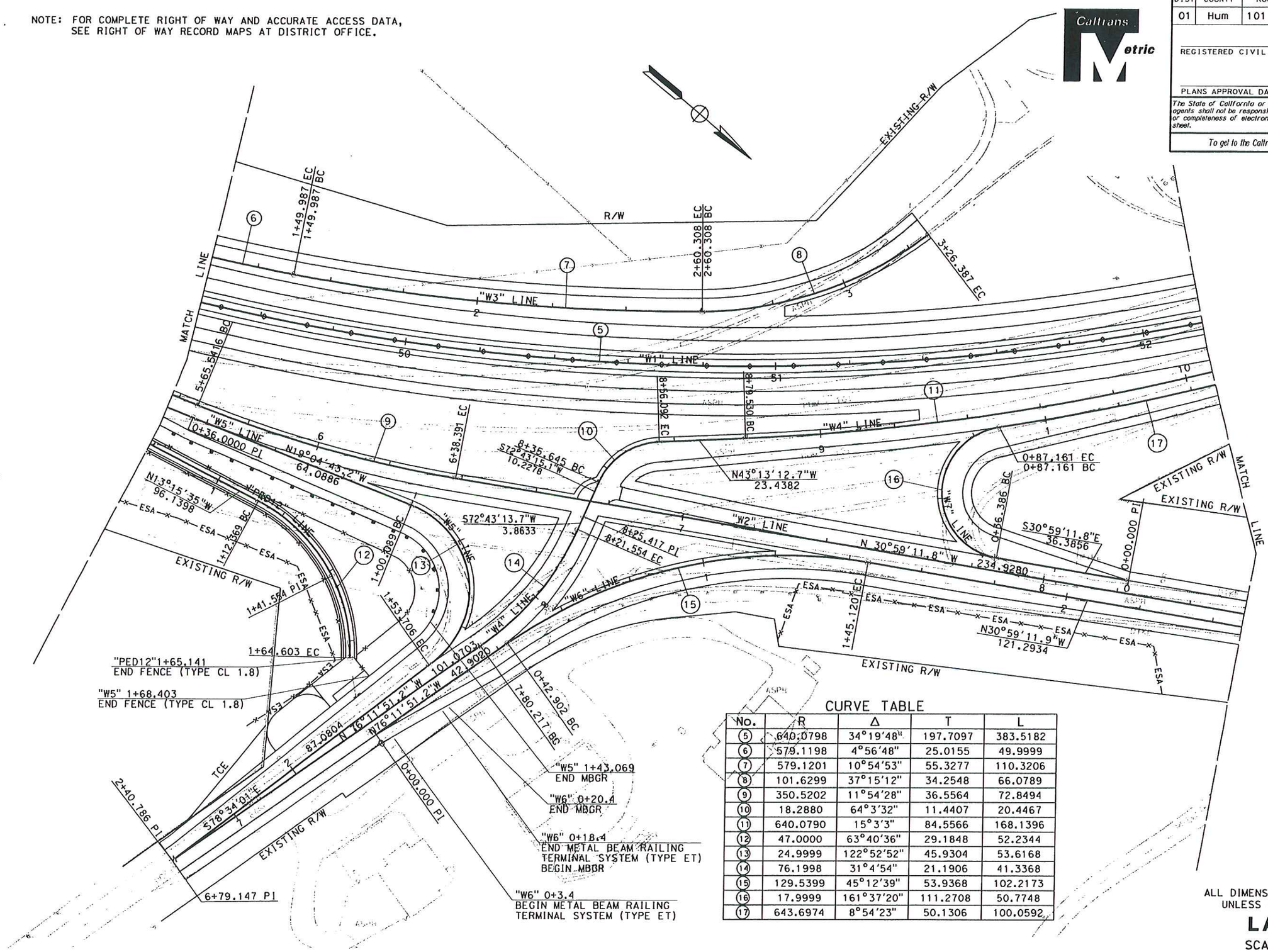

CURVE TABLE

No.	R	Δ	T	L
(5)	640.0798	34°19'48"	197.7097	383.5182
(6)	579.1198	4°56'48"	25.0155	49.9999
(7)	579.1201	10°54'53"	55.3277	110.3206
(8)	101.6299	37°15'12"	34.2548	66.0789
(9)	350.5202	11°54'28"	36.5564	72.8494
(10)	18.2880	64°3'32"	11.4407	20.4467
(11)	640.0790	15°3'3"	84.5566	168.1396
(12)	47.0000	63°40'36"	29.1848	52.2344
(13)	24.9999	122°52'52"	45.9304	53.6168
(14)	76.1998	31°4'54"	21.1906	41.3368
(15)	129.5399	45°12'39"	53.9368	102.2173
(16)	17.9999	161°37'20"	111.2708	50.7748
(17)	643.6974	8°54'23"	50.1306	100.0592

ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

LAYOUT

SCALE: 1:500

L-3

RELATIVE BORDER SCALE 0 20 40 60 80

USERNAME => s132428
DGN FILE => ...\01-296101\129610ec003.dgn

CU 03251 | EA 296101

LAST REVISION DATE PLOTTED => 2/20/2007

NOTE: FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
01	Hum	101,200	KP143.8/145.0 KP 0.4/0.9	19	

REGISTERED CIVIL ENGINEER
00-00-00

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EXISTING R/W
ASPH
DECK
DIKE
SEE SHEET L-3
10+47.670 EC
52+87.986 EC
"W1" 54+13
END CONCRETE
BARRIER (TYPE 60)
"W1" LINE
N 58°17'16.4" W
241.468
53
54
55
55+29.454 PI
"W4" LINE
N 58°16'15.3" W
89.290
"W7" LINE
N 58°16'15.3" W
44.331?
ESA
1+87.220 EC
2+31.551 PI
11+36.960 PI
TANK
PIPE
8+73.319 BC
2+66.413 BC
"W2" LINE
"W6" LINE
9+64.932 EC
3+58.568 EC
5
11
17
18
19

CURVE TABLE

No.	R	Δ	T	L
(5)	640.0798	34°19'48"	197.7097	383.5182
(11)	640.0790	15°3'3"	84.5566	168.1396
(17)	643.6974	8°54'23"	50.1306	100.0592
(18)	609.5990	8°36'38"	45.8931	91.6134
(19)	613.2003	8°36'38"	46.1641	92.1544

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

SCALE: 1:500

LAYOUT L-4

DATE	REVISED BY	DATE REVISED

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Caltrans
NORTH REGION
OFFICE OF DESIGN, WEST
DESIGN BRANCH S1

10:02:53 AM 2/20/2007 s132428 ...\01-296101\1296101ea004.dgn

RELATIVE BORDER SCALE 0 20 40 60 80

USERNAME => s132428

CU 03251 EA 296101

LAST REVISION DATE PLOTTED => 2/20/2007

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Hum	101,200	143.6/145.5 0.5/0.9		

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GLENN G. HURLBURT No. 68303 Exp. 9/30/07 CIVIL STATE OF CALIFORNIA

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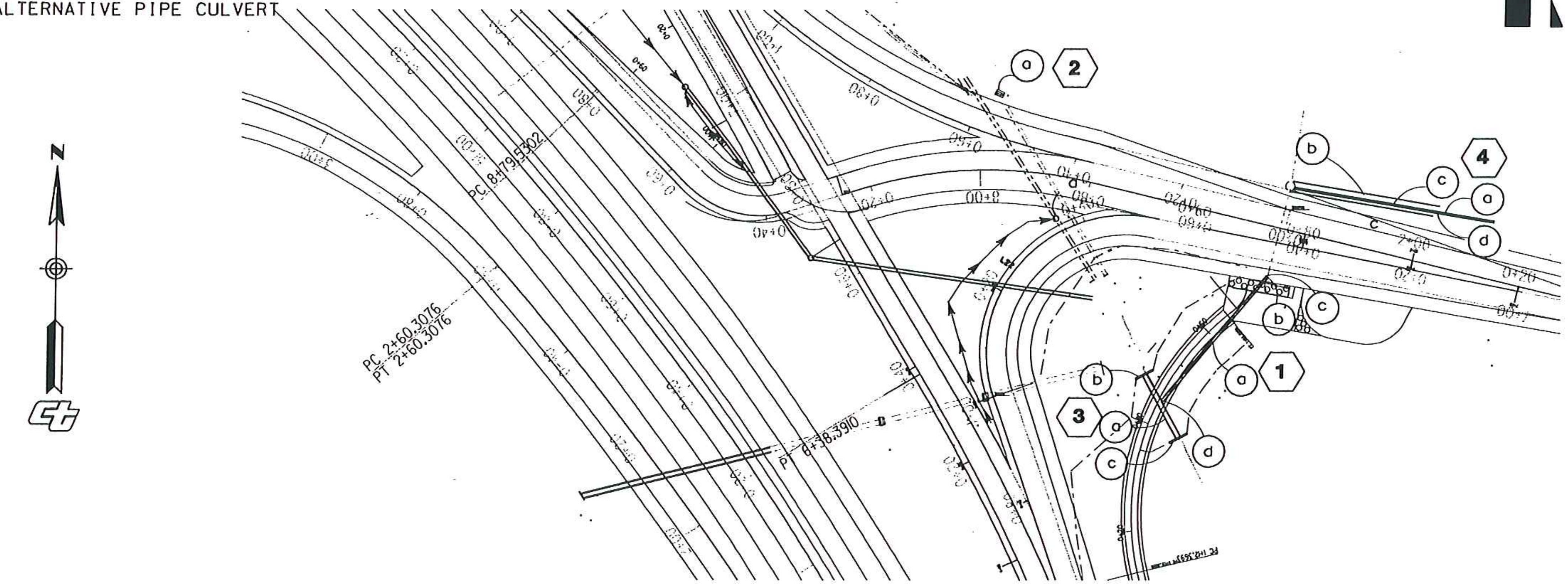
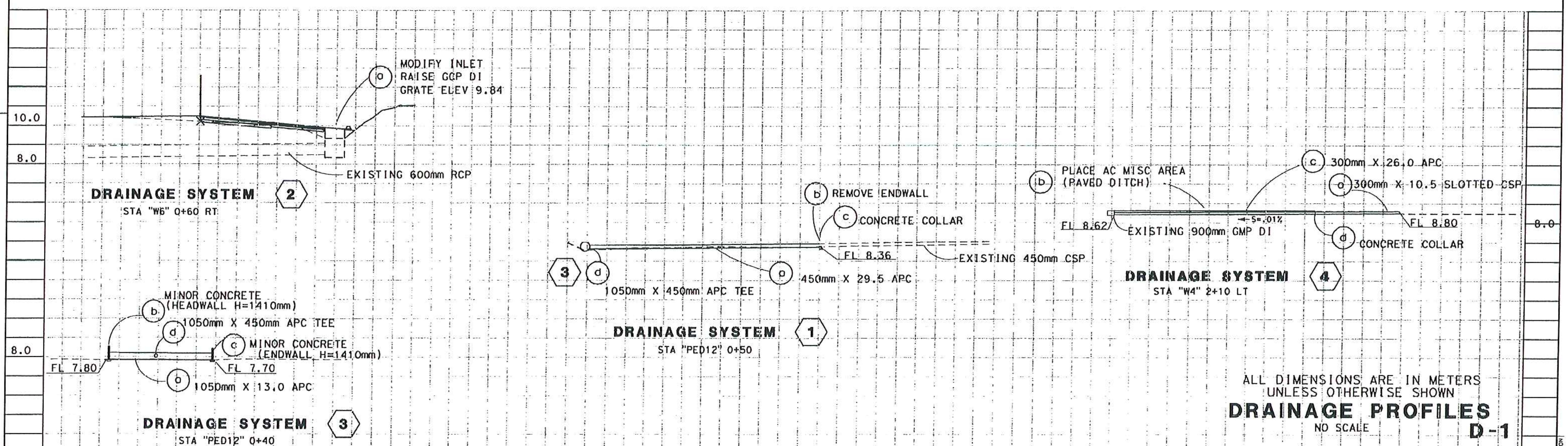
Caltrans Metric

NOTE: THIS PLAN ACCURATE FOR DRANAGE WORK ONLY

ABREVIATIONS
- AFES = ALTERNATIVE FLARED END SECTION
- APC = ALTERNATIVE PIPE CULVERT





ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE PROFILES

NO SCALE

D-1

Station	
m³ Exc	
m³ Emb	

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

PROJECT ENGINEER: ERIC Y. WONG

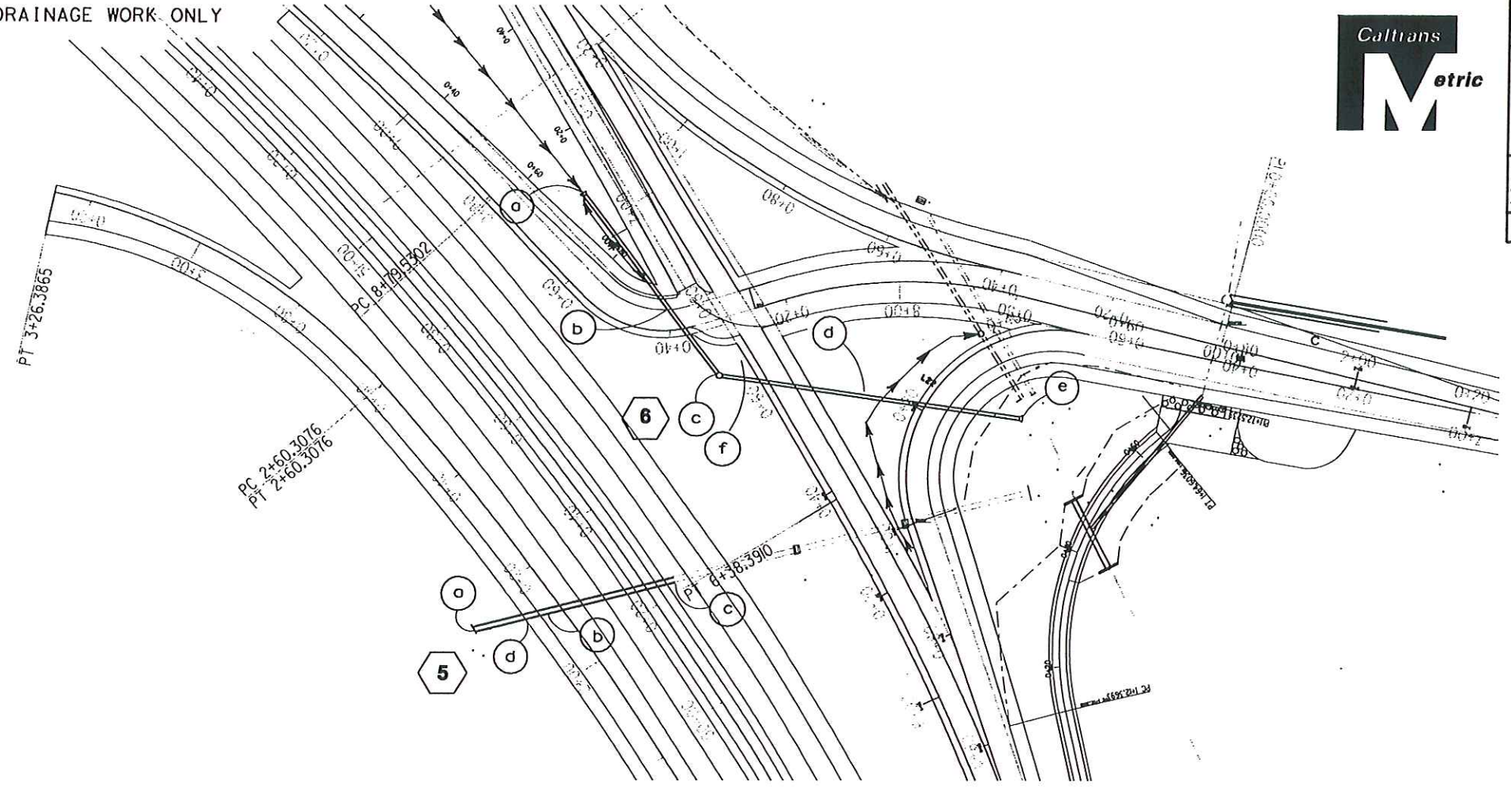
CALCULATED/DESIGNED BY | CHECKED BY

DATE | REVISED BY | DATE REVISED

RELATIVE BORDER SCALE 0 20 40 60 80

LAST REVISION

NOTE: THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Hum	101,200	143.6/145.5 0.5/0.9		

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
GLENN G. HURLBURT
No. 68303
Exp. 9/30/07
CIVIL
STATE OF CALIFORNIA

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ERIC Y. WONG

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

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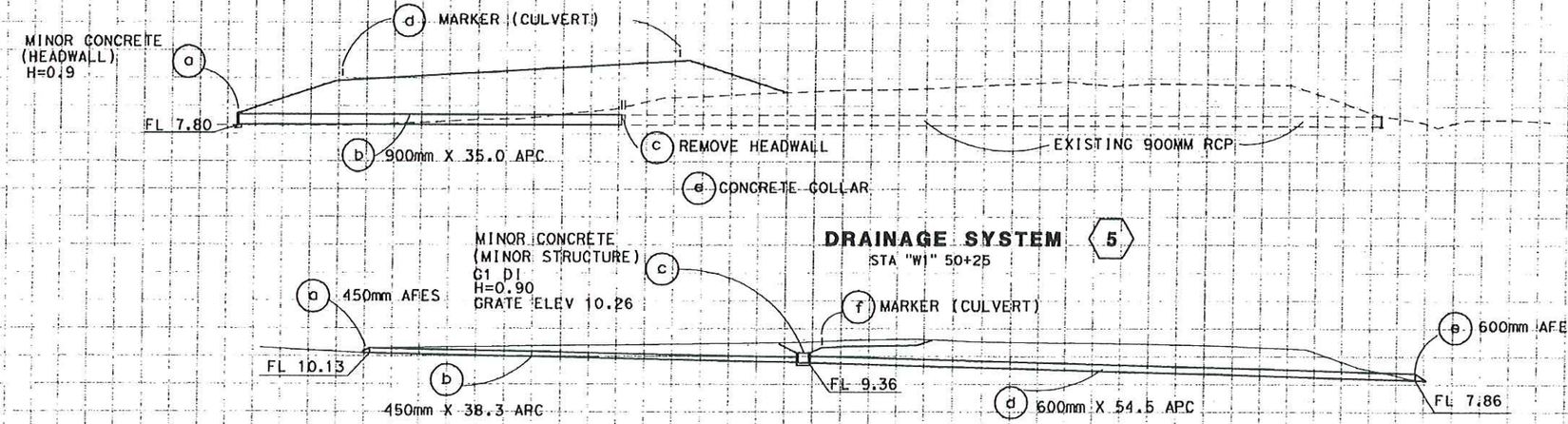
Station

m³ Exc / Emb

10.0



ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

DRAINAGE PROFILES

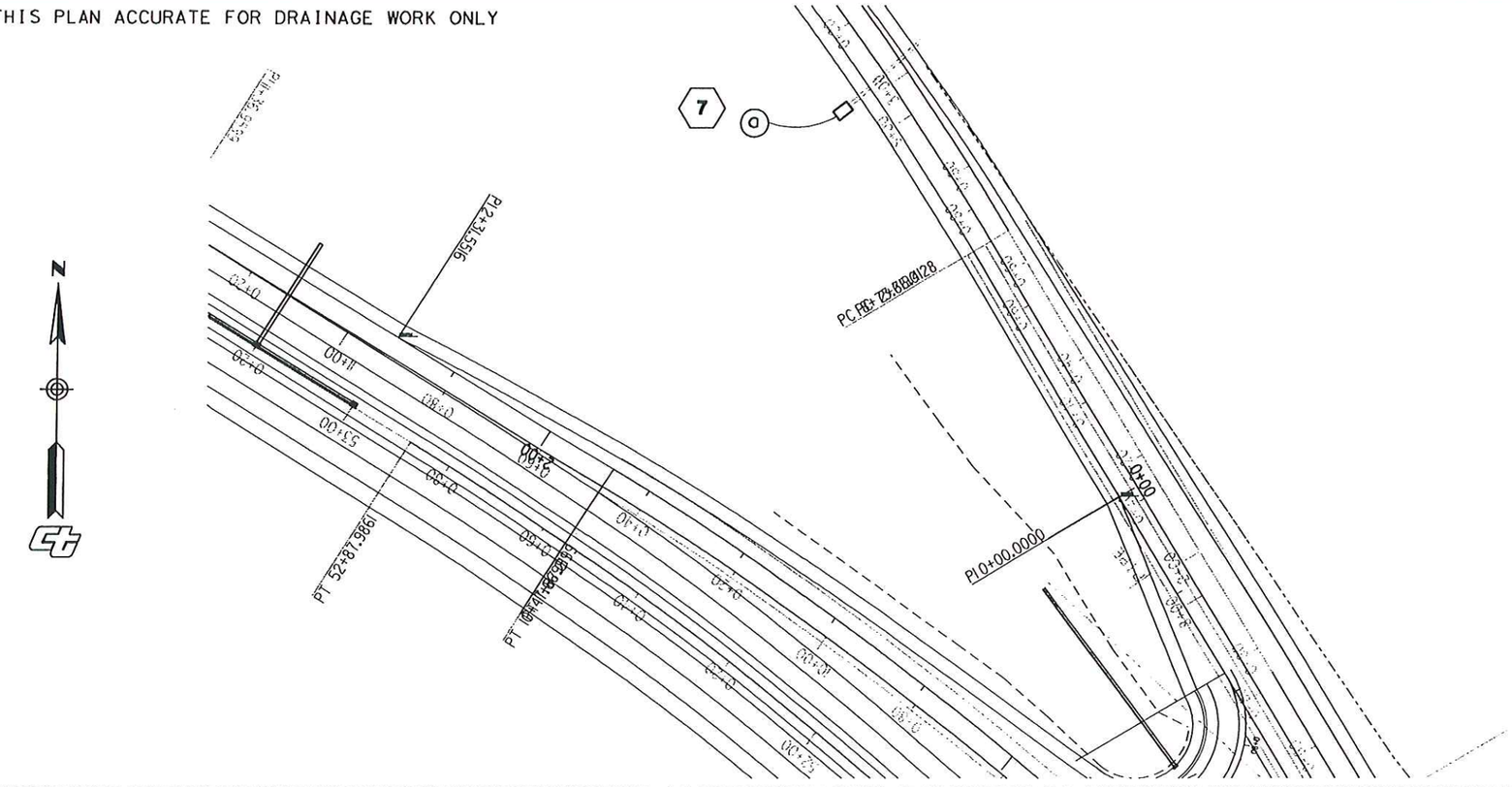
NO SCALE

D-2

RELATIVE BORDER SCALE 0 20 40 60 80

LAST REVISION

NOTE: THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Hum	101,200	143.6/145.5 0.5/0.9		

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
GLENN G. HURLBURT
No. 68303
Exp. 9/30/07
CIVIL
STATE OF CALIFORNIA

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DATE	REVISED BY	DATE REVISED

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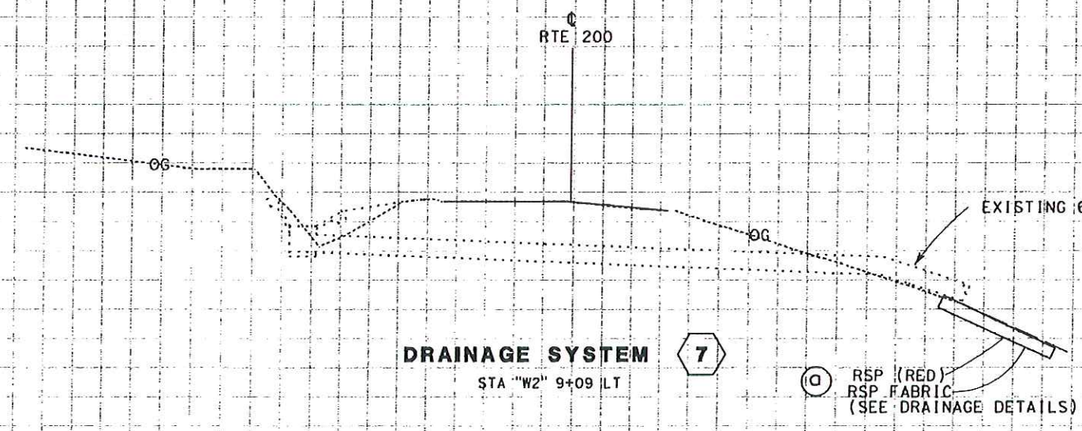
PROJECT ENGINEER
ERIC Y. WONG

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans



DRAINAGE SYSTEM 7
STA "W2" 9+09 LT

Q

ALL DIMENSIONS ARE IN METERS
UNLESS OTHERWISE SHOWN

DRAINAGE PROFILES

NO SCALE

D-3

Station		
m^3	Exc	
	Emb	

RELATIVE BORDER SCALE 0 20 40 60 80

LAST REVISION

p:\dist01\01-296101\1296101d003.dgn

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	Hum	101,200	143.6/145.5 0.5/0.9		

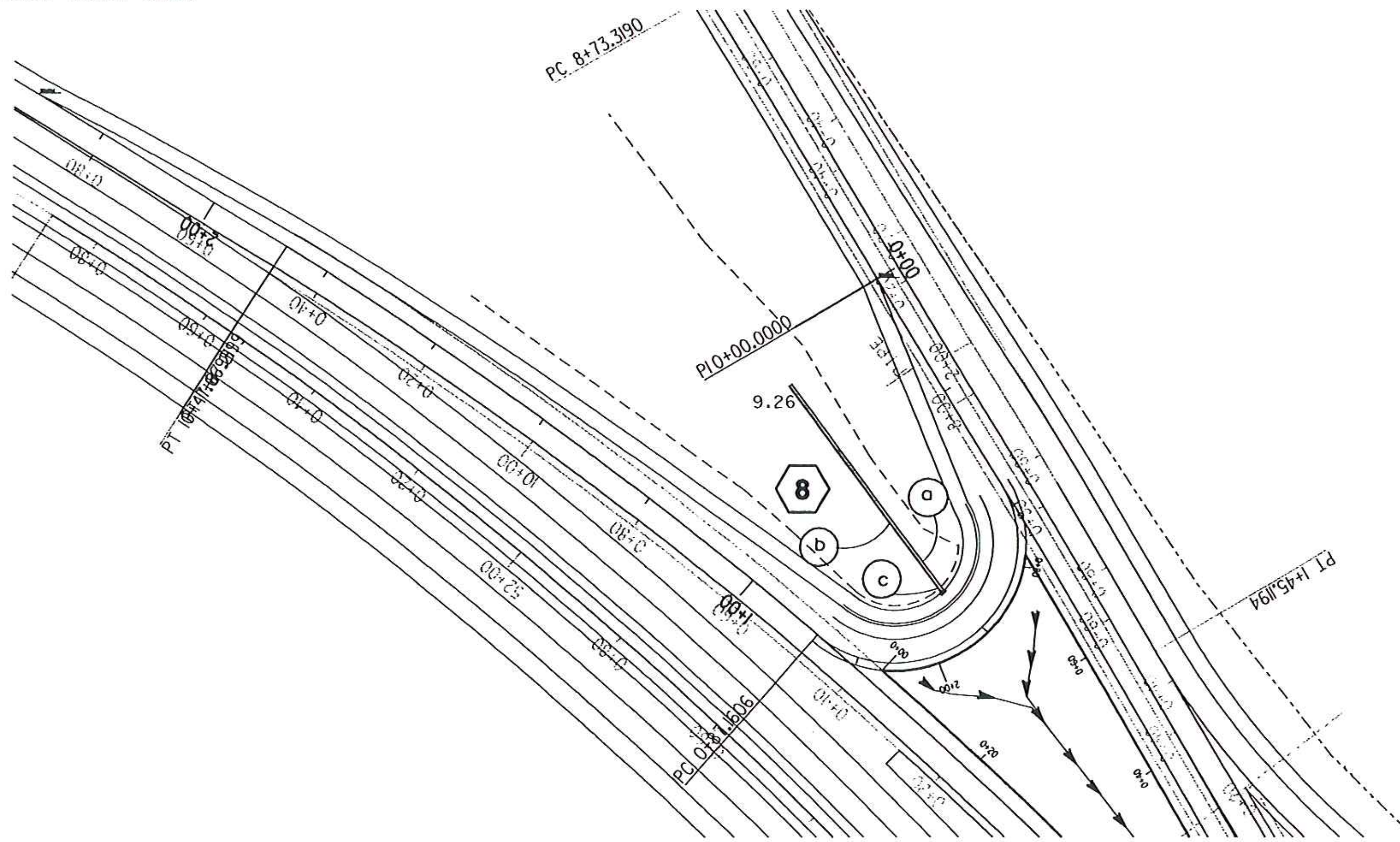
REGISTERED CIVIL ENGINEER

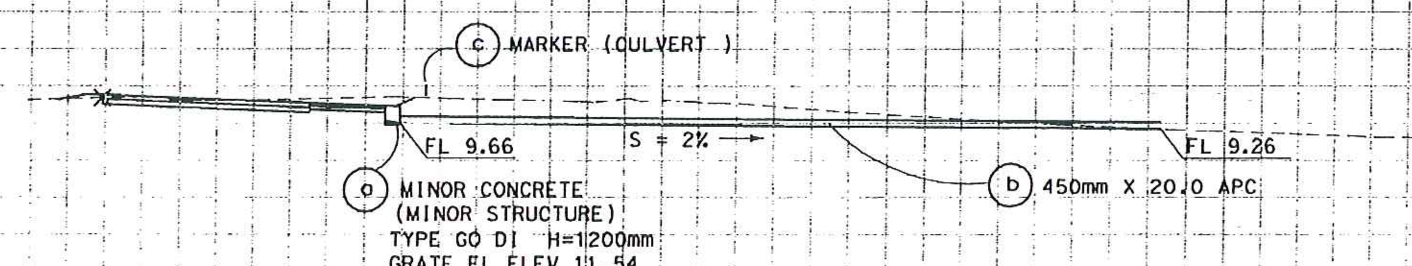
PLANS APPROVAL DATE

GLENN G. HURLBURT No. 68303 Exp. 9/30/07 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

Caltrans Metric

NOTE: THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY





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DRAINAGE PLAN AND PROFILE

NO SCALE

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STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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PROJECT ENGINEER: ERIC Y. WONG

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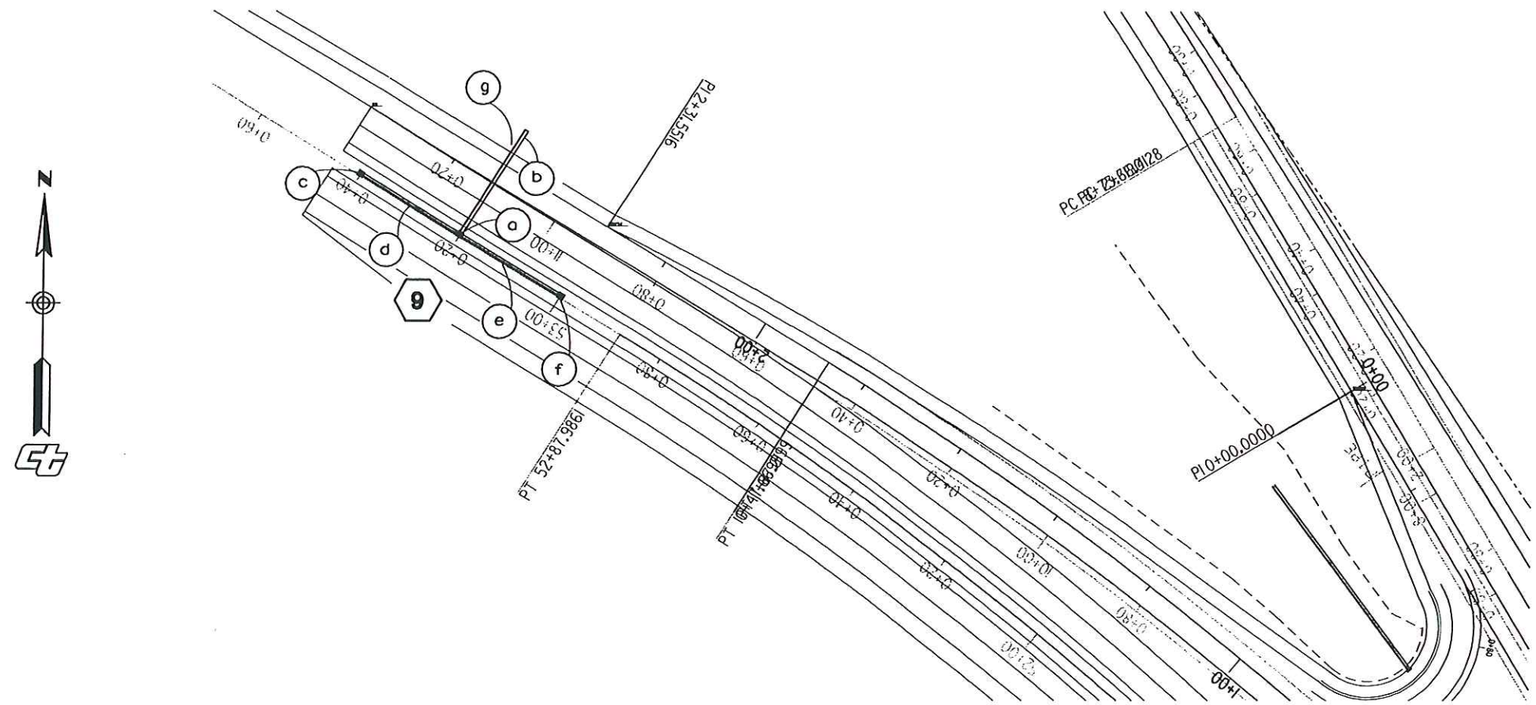

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REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — GLENN G. HURLBURT — No. 68303 — Exp. 9/30/07 — CIVIL — STATE OF CALIFORNIA

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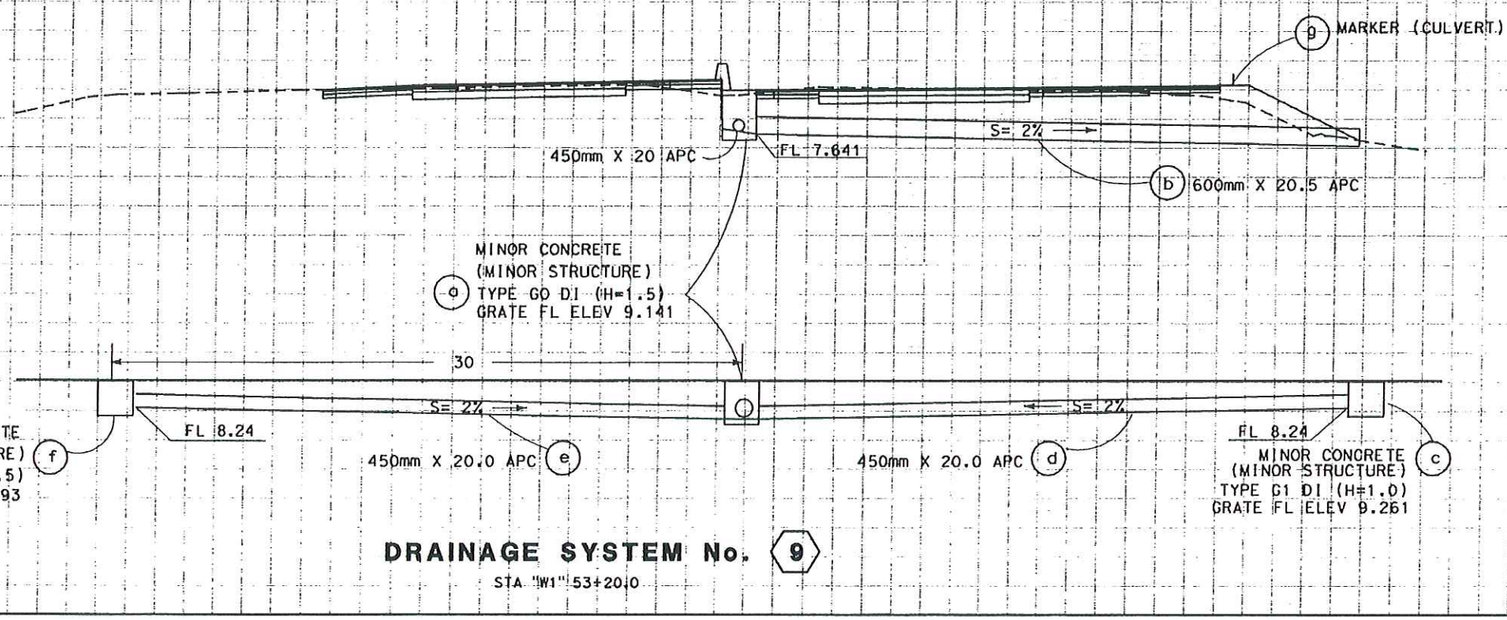

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ERIC Y. WONG

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Caltrans Metric

REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER GLENN G. HURLBURT No. 68303 Exp. 9/30/07 CIVIL STATE OF CALIFORNIA

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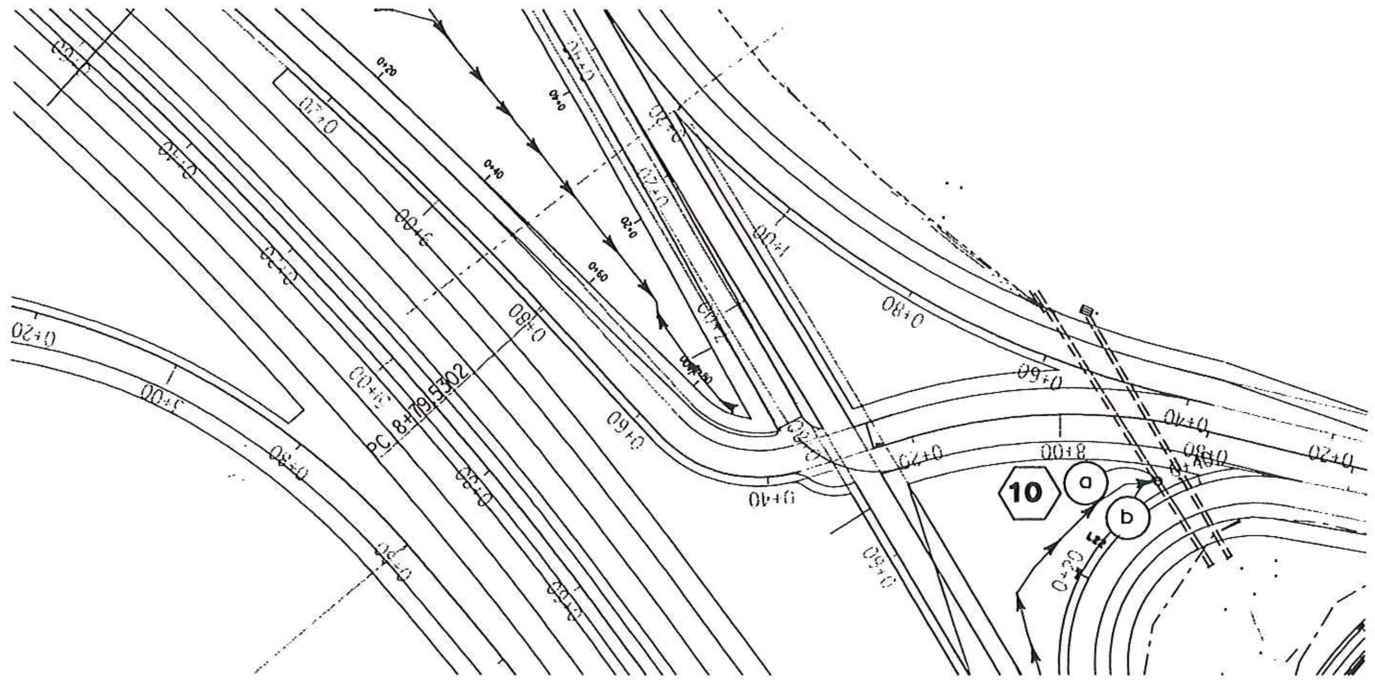

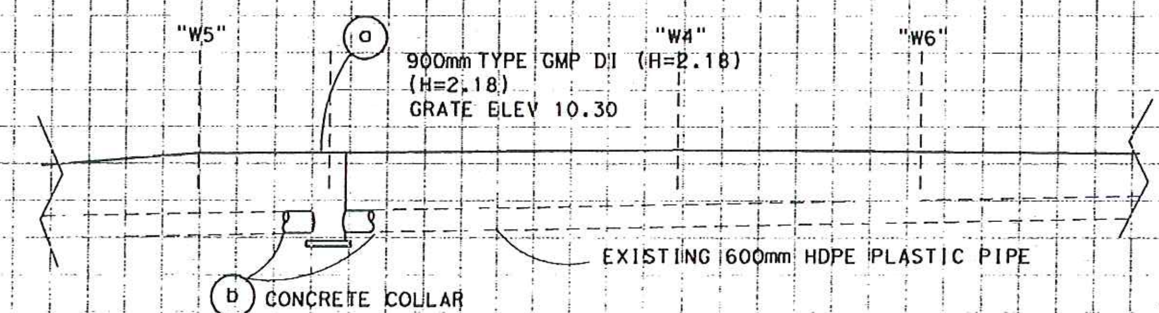

DRAINAGE SYSTEM (10)

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ESS IMPACTS IN THE RIVER CHANNEL FOR THE DURATION
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TEMP CUT AND FILL
FOR SOUTH WEST ACCESS RAMP
FILL 295 YD³
CUT 102 YD³
6146 FT²

WATER BLADDER
(SEE NOTE 1)

Temp Access Road

TEMP CUT AND FILL
FOR SOUTH EAST ACCESS RAMP
FILL 380 YD³
CUT 37 YD³
7675 FT²

LEGEND:

TEMPORARY ACCESS RAMP
105 mm AC (Type A) and 140 mm AB (Class 2)

TEMPORARY PATH FOOTPRINT 310 mm AB class 2)

RECEIVED
NOV 09 2007
CALIFORNIA
COASTAL COMMISSION

CONSTRUCTION ACCESS

Mad River Bridges Replacement
West Alternative
PM 89.1/90.4 01-HUM-101
EA 01-296101
SCALE 1:2000 Exhibit Y

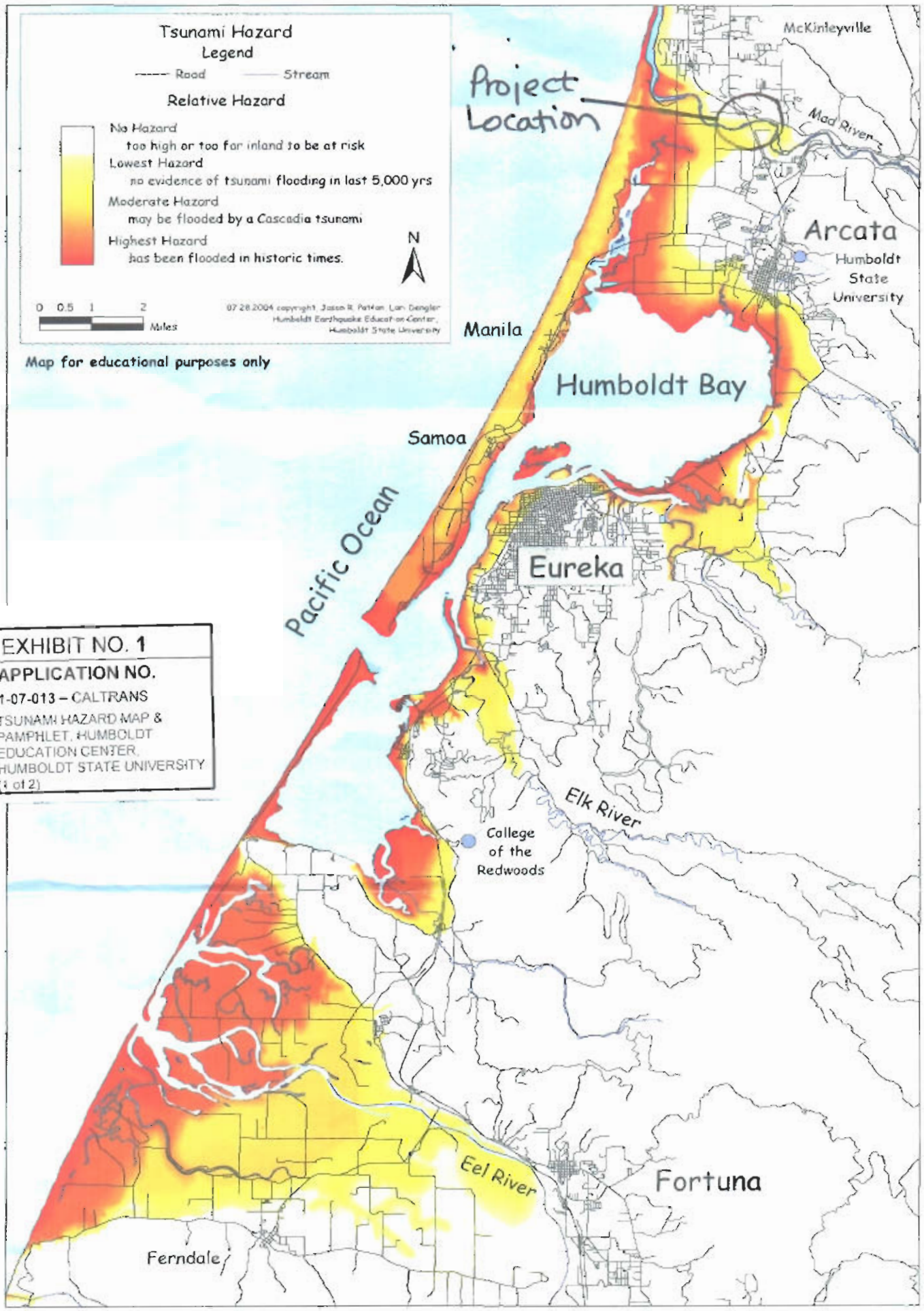


EXHIBIT NO. 1
APPLICATION NO.
1-07-013 – CALTRANS
TSUNAMI HAZARD MAP & PAMPHLET, HUMBOLDT EDUCATION CENTER, HUMBOLDT STATE UNIVERSITY
(1 of 2)

HUMBOLDT COUNTY'S TSUNAMI RISK

A tsunami is a series of waves or surges most commonly caused by an earthquake beneath the sea floor. Tsunamis can cause great loss of life and property damage where they come ashore.

- The first wave is almost never the largest
- Successive waves may be spaced ten or more minutes apart and continue arriving for many hours

You may find out that a tsunami is coming in two ways:

Natural Warning

For a large, nearby earthquake or submarine landslide, there will be no time to issue an official warning. **Strong ground shaking, a sudden change in sea level, ocean withdrawal, or a loud roar from the ocean are all Nature's warning that a tsunami may be approaching.** If you observe any of these natural warning signs, immediately move to higher ground or inland. Stay away from low areas until told by an official source that the danger has passed.

Official Warning

You may be notified that a Tsunami Warning has been issued by: TV and radio stations (through the Emergency Alert System), door-to-door contact by law enforcement, on NOAA weather radios, or in some cases by outdoor siren. Move away from the beach and seek more information without using a phone. Tune into a local radio or television station for more information. Follow the directions of local authorities which may include evacuating low lying coastal areas.

Both Natural and Official warnings are equally important. Respond to whatever you hear or observe first!

Prepared by: Humboldt Earthquake Education Center, Humboldt State University for educational purposes only. ©August 2007

WHAT AREAS ARE AT RISK?

Beach areas along the coast and low lying areas close to the coast and bay are at greatest risk. In some areas, tsunami hazard zone signs have been posted. Check the map on the reverse side for more information. **If you are in a white area, DO NOT EVACUATE! YOU ARE SAFE WHERE YOU ARE.**

WHAT IF I AM OUTSIDE THE MAP AREA?

Go to an area 100 feet above sea level or 2 miles inland, away from the coast. If you cannot get this high or far, go as high as possible. Every foot inland or upwards can make a difference.

HOW DO I KNOW IF AN EARTHQUAKE IS BIG ENOUGH TO CAUSE A TSUNAMI?

If you are on the beach and feel an earthquake, no matter how small, immediately move inland or to high ground.

COUNT how long the earthquake lasts. If you count 20 seconds or more of very strong ground shaking, **and you are located in a red or orange zone on the map, evacuate to a WHITE OR YELLOW AREA as soon as it is safe to do so.** In all other areas, **STAY WHERE YOU ARE.**

GO ON FOOT. Roads and bridges may be damaged by the strong ground shaking. If your only evacuation route is blocked by downed power lines, carefully cross without touching the lines.

If evacuation is impossible, go to the upper floor of a sturdy building or climb a tree — this should only be used as a last resort.

FOR FURTHER INFORMATION

Humboldt County Office of Emergency Services,
826 4th Street, Eureka, CA 95501
Phone (707) 268-2500

Humboldt Earthquake Education Center
Geology Dept., Humboldt State University
Arcata, CA 95521;
Phone (707) 826-6019
Earthquake Hot Line (707) 826-6020
http://www.humboldt.edu/~geodept/earthquakes/eqk_info.html

Humboldt County American Red Cross
406 11th St., Eureka, CA 95501
Phone (707) 443-4521

NOAA, National Weather Service
300 Startare Drive, Eureka, CA 95501;
Phone (707) 443-6484
http://www.weather.gov/eureka

TSUNAMI!

HOW TO SURVIVE THIS HAZARD IN HUMBOLDT COUNTY

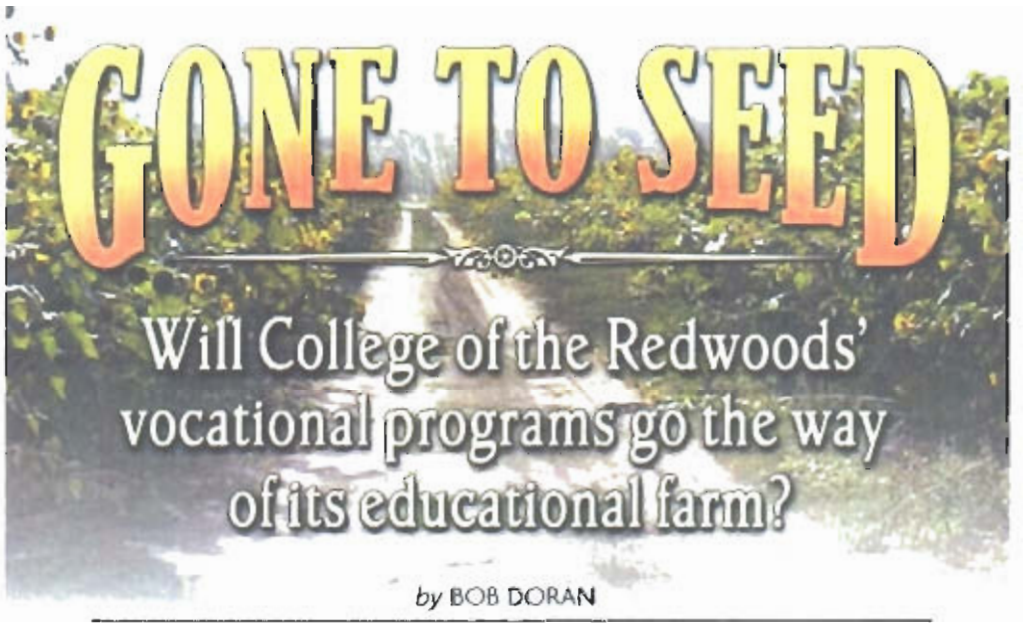
- **Protect yourself during strong ground shaking**
  Drop, cover and hold
- **Move to higher ground or inland immediately, as soon as it is safe to do so**
  A tsunami may be coming

DO NOT WAIT FOR AN OFFICIAL WARNING

- **Stay away from the coast**
  Waves may continue to arrive for hours
- **Do not leave high ground before an official "all clear"**
  Listen to your radio for instructions

NORTH COAST JOURNAL WEEKLY

October 12, 2006



On the cover: College of the Redwoods' Shively farm. Photo by Pierre Gaude.

Along the Eel River into Shively on a fall morning, golden sunlight shines through the rows of sunflowers lining the road into a farm. A battered Ford truck rolls between the rows carrying Tiffany Wildharber and her son, Tory. They've come to gather produce to sell at the College of the Redwoods later that day. Tiffany's farming partner Fallon Orr is already there, gathering blooms in a plot dedicated to cut flowers, deadheading blooms past their prime as she goes.

Tory and Tiffany set straight to work. The 18-year-old grabs a tub from the back of the truck and heads off to the corn patch while his mom harvests some brilliantly yellow crookneck squash. She stops to point out rows of chard, zucchini and carrots, thriving tomato plants, potatoes ready to dig.

Even an untrained eye can see that the soil is good here -- the lush crops confirm it -- but amid the bounty you can also see the unfulfilled potential. Then there's the long row of broccoli gone to seed. A line of cucumber plants ready for picking is littered with overgrown cukes rotting between the rows. "We put in way too much and couldn't keep up," says Tiffany. "It's kind of a shame. A lot has gone to waste."

It's a learning experience for the women. This is the College of the Redwoods' Sustainable Organic Agriculture Farm, and the two of them make up most of the enrollment in a CR Agricultural Enterprise class that uses the farm as a laboratory. It's a Wednesday, so the day's activities include selling at the produce stand they set up in the school's quad two days a week. On Sundays and Mondays they assemble boxes of vegetables for a couple of dozen households that have signed up for a Community Supported Agriculture (CSA) program, each paying $400 to get organic produce throughout the growing season.

Left: Bounty from the CR Farm. Photo by Bob Doran.

On the other side of a dirt road are more fields with winter squash, pumpkins and alfalfa that are maintained by farm manager Franz Rulofson and students from another CR class, a lab on sustainable agriculture. Rulofson and his family live across a redwood-lined creek spanned by a plank bridge. The area known as the upper field holds a small barn and a few outbuildings where donated farm machines wait for operators. A new greenhouse and the beginnings of an apple orchard suggest recent activity. Rusting antique equipment left over from the previous owner show that this place has a long history as a working farm.

A long history, but an uncertain future. As the bolted broccolis and the rest of the rotting produce testify, the CR administration's enthusiasm for

the farm -- never high to begin with -- has been waning still further in recent years. Acting CR President Jeff Bobbitt, who took over the helm of the school when former president Casey Crabill left for a job in New Jersey earlier in the year, has inherited a school in decline as is case with Humboldt State University, enrollment at CR is falling. Classes are being cut; programs are being scaled back.

Here in Shively, with the bounty of harvest season springing forth from the soil, the value of the educational farm is plain. In fact, though, with all that wasted produce going back to the earth the farm could be taken as a bellwether of the College of the Redwoods and its changing purpose. Is it still a place where people can learn a trade where they can get their hands dirty? Or is that part of the college's mission due for pruning?

College of the Redwoods' acquisition of the 38-acre Shively farm is a story unto itself. In 1995, the property was bequeathed to the college from an eccentric old Italian farmer, John Bianchi, who by all accounts was not the nicest man around. Basically a bachelor farmer, he had no family. He'd brought back a wife when he served overseas during WWII, but she left after the 1964 flood and he lived alone for the rest of his life.

He had no know connection to the college and apparently left the land to the school in his will to spite a neighbor who had his eye on it. To make sure the neighbors did not get his land, he was very specific: He mandated that CR must use the property for agricultural education. If the college did not want it, it would go to the Save the Redwoods League to be planted with redwoods and turned into a park.

According to retired CR agriculture instructor Bert Walker, when Bianchi died and it came time to receive the bequest, "There were a lot of fits and jerks" on the part of the college. "The college president then, [Cedric] Samson, wanted to sell it, but there was a clause in the will saying it could not be sold, rented, leased etc. to any

of the neighbors. He didn't trust them, particularly one he called `the greedy neighbor.'"

Right: Excess produce composting at the CR Farm. Photo by Pierre Gaude.

There was originally some discussion about whether or not the school should take the gift. Shively is a long way from the main campus and there was uncertainty about how the farm would be integrated into the curriculum. Samson came up with a plan of sorts: The college could accept the bequest and sell the farm, then use the money to support the agriculture program, thus fulfilling the intent of the will. The probate court did not agree. A protracted legal battle ensued.

That battle was still being fought when Jeff Bobbitt joined the CR administration in spring of 1997. Cedric Sampson was still college president, but he left the following year, and after a 12-month search Casey Crabill was hired to take his place. (When Crabill left CR earlier this year to take a position at another college, Bobbitt left his position as vice president of academic affairs to take over as CR's acting president.)

One of Crabill's first actions was to resolve the legal fight over the Shively farm. "When Casey came in, our only desire about the farm was to get the issue settled," Bobbitt recalled in a recent conversation. "That was one of the first things we worked on, trying to get a positive resolution to any lingering questions about the farm. Casey put the word out to the whole community asking for [input]." An advisory committee was established, and it offered recommendations. In February 2000, the CR board of trustees finally chose a plan put forward by Bert Walker and John Wrigley, both full-time agriculture teachers at the time -- to use the Shively farm as a working component of the college's agricultural program.

Walker was excited at the prospect. "I'm a farm boy, and I'd lived down there -- the climate's good, the soil is spectacular -- so I thought it would be a great opportunity," he said recently. "There were all sorts of things the farm could do."

As Bobbitt recalled, the farm needed a lot work. "The college invested significant time and energy and money in bringing the infrastructure up to speed," he said.

Franz Rulofson was hired as farm manager in 2001 and brought his family to live on the farm in Bianchi's old house. He noted that his first task was to clear the overgrown property. While the ag teachers, Walker and Wrigley, had come up with the proposal, once the farm was established they were not allowed to offer much further input. Under the administration's version of their plan, all Walker was allowed to do was take classes to the farm for field trips.

"[Bobbitt] separated the agricultural instruction program from the farm very firmly in a memo," said Walker. "The instruction on campus was a plant science horticulture program, mainly. I was not permitted to serve on the farm advisory committee or to have any say in the management or operation of the farm."

Farm management was solely Rulofson's responsibility. He also became overseer for the agricultural enterprise program, supervising the students and acting as liaison for CSA customers, something he does to this day along with teaching labs for the sustainable ag class.

In addition to the produce stand on campus and work for the CSA, Fallon Orr and Tiffany Wildharber sold flowers and vegetables at the farmer's markets in Garberville and Ferndale this summer. It brought in some additional income, but their main reason for being there was to serve as ambassadors for CR's sustainable agriculture program. They also ran a booth at the Organic Planet Festival, an event in Eureka celebrating all things organic, again as an outreach mission.

Wildharber and Orr are believers in the CR ag program. When they were at the farm that morning, they spoke with what bordered on evangelic fervor about the what they'd learned. It was clear that they were frustrated: They were running the farm garden pretty much on their own, and felt that the college was not giving adequate support to the farm, or to the ag department in general.

A few weeks later, at their vegetable stand near the CR bookstore, they were still feeling positive about the program, but no less frustrated. They offered numerous ideas for improvement, from bringing in new students to strengthening the ag curriculum.

Left: Tiffany Wildharber and Fallon Orr serve as ag ambassadors at the Organic Planet Festival. Photo by Bob Doran.

With a touch of southern drawl, Orr described the agriculture department's potential for recruitment from a personal perspective. "I moved here from Tennessee for the ag program," she said. `I thought, wow, I can live by the ocean and the redwoods and learn about farming, and the farm's organic. It just seemed like a good thing to do, and here I am."

This is Wildharber's second year for enterprise ag. She explained that the way the class is set up, the participants get to keep half the money they take in -- the rest goes to support the farm -- but it does not amount to a whole lot. Her first year she took home $3,000 for untold hours of labor, her own and her teenage sons'.

"It's kind of nutty for me to do it again considering the time commitment, but I'd even do it again if they'd pay me better," she said.

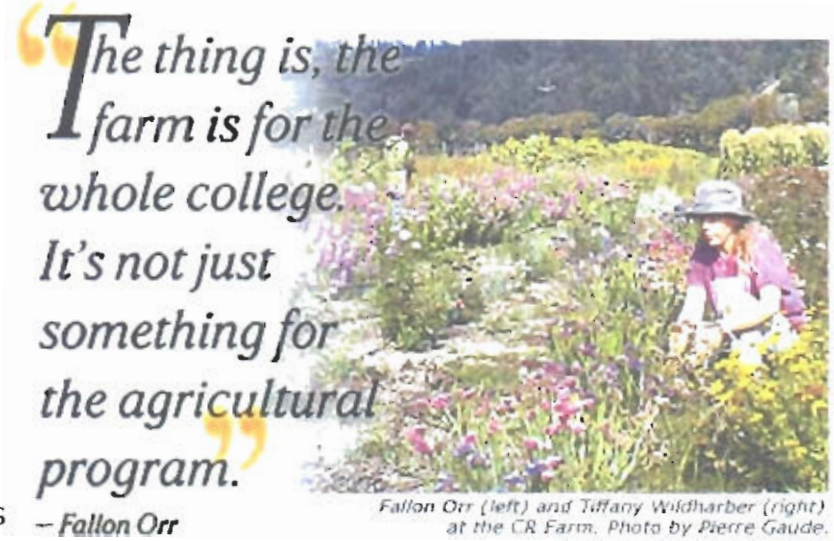
She'd also like to see the college offer more academic credit for the enterprise class. "It's a year-long commitment and we spend a lot of time on it, but all of our work only earns us two units," she said. "That's something they should change."

How much time do they spend? "A lot," said Orr with exaggerated emphasis, and both women laughed. "We work four days a week, about eight hours a day," said Wildharber, and Orr added, "And that doesn't include the driving. I travel 300 miles a week."

The gasoline bills have been particularly brutal this season, and the money comes out of their end; the college does not reimburse for travel. As summer wore on they stopped going to the Garberville Farmer's

Market, then Ferndale. Sales at those markets barely paid their gas expenses.

"What we need is a vehicle to transport us from the school to the farm back to market, to deliver to the market," said Orr.



Fallon Orr (left) and Tiffany Wildharber (right) at the CR Farm. Photo by Pierre Gaude.

But time, money and credits are not their primary worries. Last spring Wildharber met with Bobbitt, then CR's vice president of academic affairs, to express her concern for the future of the ag program in general, and in particular the fact that since Bert Walker retired in 2004, his position had not been filled.

"They've parceled his classes out to three part-time faculty," she recalled telling Bobbitt. "There's no one to provide continuity. Everyone's wondering what's going to happen to the program."

She was not reassured by Bobbitt's response. She recalled: "He said he'd seen this before, not necessarily with the ag program. But when any program looses an instructor, students worry about their program. He told me a couple of times, `You probably care about this more than I do.'"

She left the meeting feeling that the administrator did not really recognize the importance of the college ag program. "He asked me what I wanted to do with my ag degree," she recalled. "I said I'd like to farm. He said, `If you just want to farm, you don't need a degree do you?'

"You know when you're taking those classes you only need to get the degree, accounting and things like that, you wonder about that. It just made me mad that he said that." (Walker disagrees with the idea that farmers don't need education -- he said that studies have shown that about 64 percent of California's farmers have college degrees.)

Orr and Wildharber concede that the farm program could use more

participants. That's why they've been serving as ambassadors. "I think what the program needs is marketing," said Wildharber. "I'm in a marketing class, using it as a project. Fallon is using it in her business class, looking at that angle."

CR's public relations department did actually put some energy into creating a marketing campaign a couple of years ago. There are brochures pitching the CSA and laminated signs to be used with the produce stand. They even produced a video about the farm. What effect it all had is hard to gauge.

Wildharber thinks more needs to be done. "I have this dream, that the whole college takes a semester to support the farm: get a construction class to help build a bathroom, a wiring class to help with the electric part, a marketing class to get the word out so we get more students," she said.

"The thing is, the farm is for the whole college," added Orr. "It's not just something for the agricultural program." Their vision of an interdisciplinary approach to the farm is not new. When CR took over the farm in 2000, a press release described it as a "laboratory setting for agriculture production courses in addition to a variety of forestry and natural resources classes," adding, "The farm would also involve CR students taking classes in construction technology, small engine and diesel repair and welding technology to upgrade farm equipment and other property. Geology, biology, environmental science and art students may use the setting for field-work."

This interdisciplinary vision of the farm is echoed in a recent report by the Community College Statewide Agriculture Advisory Committee, a panel of experts invited by the college to analyze their agriculture program and the farm and make recommendations. The committee submitted a report in June, and it begins by describing the setting of the college and the farm as a unique resource -- "an asset that should enable you to grow specialized programs in agriculture and forestry that cannot be duplicated."

It goes on to lay out advice in bullet points, advice that pretty much

coincides with what the students have requested:

> No. 1: The school should fill the full time agriculture instructor position left by retired faculty ASAP, and should add a forestry/natural resources instructor to provide "proper leadership."
>
> No. 2: The school should take immediate steps to address logistics of getting students to the school farm lab.

The report also suggests an outreach program for recruitment and a niche-marketing promotion of the college based on the theme of "sustainability," along with improving counsel services for "all vocational technical programs." Further recommendations include combining the agriculture and forestry/natural resources programs into a single department and that the "school farm should be recognized as part of the agriculture department."

Bobbitt has read the report and distributed copies among the faculty and the ag community in general. (Despite the fact that the report is public record, he declined our request for a copy. It wasn't hard to find one, though.)

Bobbitt offered no solid plans for implementing the committee's recommendations. As to the farm, in his analysis the key problem is "location, location, location." "I wish we had a bigger, critical mass for the agriculture program and for the farm," he said. "But my firm belief is that 90 percent plus of the [farm's] problem is location and transportation.'

Could the college provide transportation to the farm? "We haven't found a way to do that yet," he said.

As to filling the full-time ag position, he said it was not his decision, deferring to the faculty's academic senate, which is currently in the midst of the annual hiring process. Choices for new hires will be made at the senate's upcoming meeting on Friday, Oct. 20. The full-time ag position is one of 13 under consideration.

But when it comes to filling new positions, Bobbitt says the college has to take into account limits on its resources and make allocations accordingly. "Like many of the California community colleges, we've been

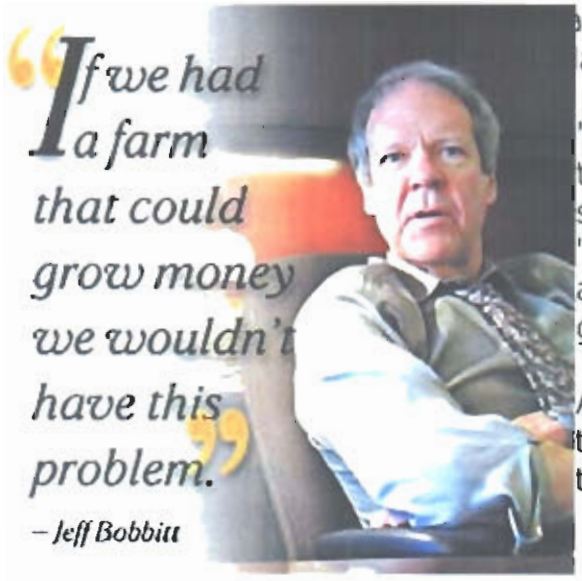
in a state of enrollment decline," he noted. "So we have a number of programs that used to have higher enrollments than they do now."

The bottom line: "Every academic decision has some financial component to it."

Not long after 1974, when Bert Walker began teaching at CR, the vocational programs were going full-bore. "There were 27 instructors in what was called `the vocational technical division,'" he said recently. "Today that same subject matter is down to 7 or 8 full-time positions. That includes auto and diesel -- electronics is gone -- woodworking, welding, agriculture, forestry. Each time someone retired, they simply did not replace them. That ratcheted all those programs down."

The end result is a shift in the college's core mission away from vocational training programs toward a program of general education aimed at students who will continue their education elsewhere.

"I don't think that the community had that in mind at all when they established the college," said Walker. "It was sold as a vocational college, and with Measure Q, they emphasized that in their advertising." (The ballot language for the $40 million regional bond measure bond passed in 2004 stated the money was "to finance specified improvements to school l job and vocational training asses.")



"It sounds like Dr. Bobbitt's mission is to prepare people to go on to do something else," Walker continued. "The college has definitely moved away from the vocational areas into general ed."

After spending three decades teaching agriculture, Walker fears for the future of his old department, but

he's just as worried about what seems to be a redirection of the school's resources. "We had so many instructors in the vocational ed area, and now most are gone," he said. "Not every student who goes to College of the Redwoods is going further. Not everyone who wants to be a diesel mechanic, a farmer, an electronics technician or a forester needs to get a bachelor's degree; they want enough technical skills to enter their field."

Left: Jeff Bobbitt. Photo by Bob Doran.

In his defense, Bobbitt contended that the departments that prep kids for a four-year university are there, in part, to support the vocational programs. "Every college uses big enrollment in popular general education areas to support courses that have to be smaller in more specialized occupational areas ... small programs that are expensive to maintain," Bobbitt said. "Agriculture with the farm is one of ours. It's not the only one. But the way colleges support that is by large enrollments in courses and program that are not expensive to maintain. The worst-case scenario is that enrollments in the small programs decline while the rest of the college is in general decline. That's what's been happening the last few years."

As a result, tough decisions must be made. Bobbitt's hope is that no program suffers. "In any school if the enrollment continues to decline it becomes harder and harder to support every program," he said. "But as long as we maintain our base enrollment funding, our goal would be to maintain all of the occupational programs the students need."

When we spoke with Bobbitt a few weeks ago, figures for current enrollment were not finalized. Now they are, and it doesn't look good. The trend has continued downward, both in headcount (the total number of students) and FTE (full-time equivalent). This year's CR class is 11 percent smaller than last year's. Fewer students means less money coming in, which presumably translates as fewer new hires for full-time positions.

Walker is especially worried that the agriculture position will not be filled and there will be no one to speak out in support of ag classes in general. He ties it back to the farm. "I believe that killing the agriculture classes is a way to get rid of the farm," he said. He said that the farm had always been a "political hot potato," one that could pull down the whole ag program. But that would only be the case if the farm were defined narrowly, he said.

"The farm is not the agricultural program," he insisted, "it is an instructional site that's available for any discipline at College of the Redwoods. I don't think they've explored all of their options." Walker suggested that the farm could be used for more "passive enterprises." "It doesn't have to be a vegetable farm or a hay farm," he said. "There's the potential to raise more timber or Christmas trees; there's an apple orchard on it, and as time goes on it should generate some small revenue."

What does Bobbitt imagine CR will do with the farm, in the long run? Nothing's certain yet, but he doesn't rule out the possibility that the college could eventually let it go, handing it off to John Bianchi's back-up organization -- the Save the Redwoods League. It might just be too expensive for CR to maintain.

"If we had a farm that could grow money," Bobbitt said, "we wouldn't have this problem."

An open house at the College of the Redwoods' Sustainable Organic Agriculture Farm is scheduled for this Sunday, Oct. 15, 2006, from 11 a.m.-3 p.m., with tours of the property, live music, u-pick produce and flowers. You can find the farm by taking the Pepperwood exit off Hwy. 101 to Ave. of the Giants. Shively Rd. is clearly marked. Follow it down the river bar and up the hill until you see twins rows of sunflowers.

TOP

NORTH COAST JOURNAL
WEEKLY

Aug. 5, 2004

IN THE Garden

Open house in Shively

by AMY STEWART

AUGUST GARDEN CHECKLIST

FOR THE LAST FEW YEARS, COLLEGE OF THE REDWOODS HAS gradually been improving and expanding its sustainable agriculture farm in Shively. Farmer John Bianchi left the property to the college in his will when he died in 1995. The 38-acre farm was overgrown with blackberry bramble, the fences needed repair, and the irrigation system needed serious upgrades. The college staff worked steadily on, and in 2001, Franz Rulofson was hired to manage the farm and oversee the educational programs for students. Now the public is invited to an open house to tour the farm and have a look at all they've accomplished.

[Photo courtesy of College of the Redwoods]

"We planted our first crop in 2002," he told me, "and we're now in our third season. We grow vegetables, we have a small orchard, and we're growing a crop of hay. We got our organic certification last year."

Three of CR's agricultural programs are centered around the Shively farm. There's an Enterprise Projects class that takes three seasons to complete, because students develop a business plan, plant a crop from seed, and see it through to harvest and sale. (And to think I spent my college career sitting in linguistics and poli sci classes.) They offer an independent field study course in which students develop an individual study plan focused on, say, equipment operation or orchard management, and then there's also a sustainable agricultural lab, in which students get to experience every aspect of operating

a farm at once -- pruning, irrigation, equipment repair, and, with any luck, harvest. There are plans in the works for a sustainable livestock class as well.

The produce from the Shively farm travels to restaurant owners, wholesalers in the Bay Area, and it's sold on the CR campus near the bookstore every Thursday during harvest season. They also operate a CSA (Community Supported Agriculture) program, in which customers purchase a share of the farm's production and get a box of produce every week. Shares run $375 for the season, and if you'd like to get in this year, you can -- they'll pro-rate the price for the remainder of the harvest. (If you've never participated in a CSA, I highly recommend it. It's a real joy to be so connected to the farm that grows your food, and you'll learn a million new ways to enjoy fresh, seasonal produce.)

The open house takes place on Saturday, Aug. 7, from noon to 4 p.m. Take the Shively Road exit off 101 about three miles south of Scotia, and follow the signs to the farm. It's about a 30-minute drive once you get off the highway. There will be tours, a walk through their young demonstration orchard that is planted with more than 50 varieties of apple trees, and they'll have produce and other goodies for sale. To find out more, give Franz a call at 722-4640.

-- -- --

I've had a couple more questions about the use of wood chips in the garden. I just hauled 10 cubic feet of the stuff around my own garden, so while it's on my mind, I'll just remind you that wood, bark, and sawdust have all kinds of uses in the garden, but as they decompose, they take up nitrogen from the soil. Piling shredded bark or wood chips around your plants may look neat, but you could be robbing your plants of nutrients. (In fact, there is nothing that irritates me more than the sight of a planting strip around a gas station or a dentist's office that has two or three plants stuck in the ground and a bunch of shredded bark piled around. Talk about a band-aid solution.)

If you must use wood chips around plants, let them age in a pile first so that decomposition process can get underway before you use them. Consider adding a nitrogen source like blood meal to them while they age. And be sure that any plants that are surrounded by a wood product get a regular dose of fertilizer -- a liquid fish emulsion fertilizer, for example, would work well to correct the nitrogen imbalance.

Apart from this issue, wood chips make a great material for paths -- that's how I use them -- because they suppress weeds and last through several seasons. They are also easy to obtain around here as a sawmill by-product, and when you have a tree trimmed, the tree trimmers will often chip your branches on site and leave them for you. Some gardeners have even been known to chase a tree trimmer's truck down the street to beg for chips. Is that taking it too far? I'll let you be the judge of that.

New Stony Creek Bridge Opens in District 3

By Shelly Chernicki
District 3 Public Information Officer

After two-and-a-half years of seasonal work, the new Stony Creek Bridge construction is complete. The new bridge, located on State Highway 32 in Glenn County, was built to replace the old bridge which had been subject to ongoing channel degradation and scour since 1980, exposing some of the old bridge pier pilings.

Work on this $9.2 million project began on March 17, 2003 and was completed September 15. The flood season halts work from October 1 through April 30 each year. The foundations (cast-in-steel shell piles) were completed the first year. The superstructure and realignment of the roadway were completed the second year, and the removal of the old bridge was accomplished this year.

The recently completed, Stony Creek Bridge on State Highway 32 in Glenn County. (Photo by David Clark)

This photo of the old Stony Creek Bridge shows degradation of pier pilings due to years of scour. (Photo by David Clark)

The contractor, MCM Construction, helped finance the design and construction of the largest pile-driving impact hammer ever made in the United States just for use at Stony Creek. The Stony Creek piles are some of the largest, if not the largest, land-based cast-in-steel shell piles in the world!

Resident Engineers for the project were Kyle Ingvoldsen, Abel Huerta, and Jody Allen. The project was finished one month early and met its budget.

EXHIBIT NO. 3
APPLICATION NO.
1-07-013 - CALTRANS
IMPACT-HAMMER INSTALLATION OF HEAVY STEEL SHELL PILES AT CALTRANS' STONY CREEK BRIDGE, HIGHWAY 32, GLENN COUNTY (1 of 9)

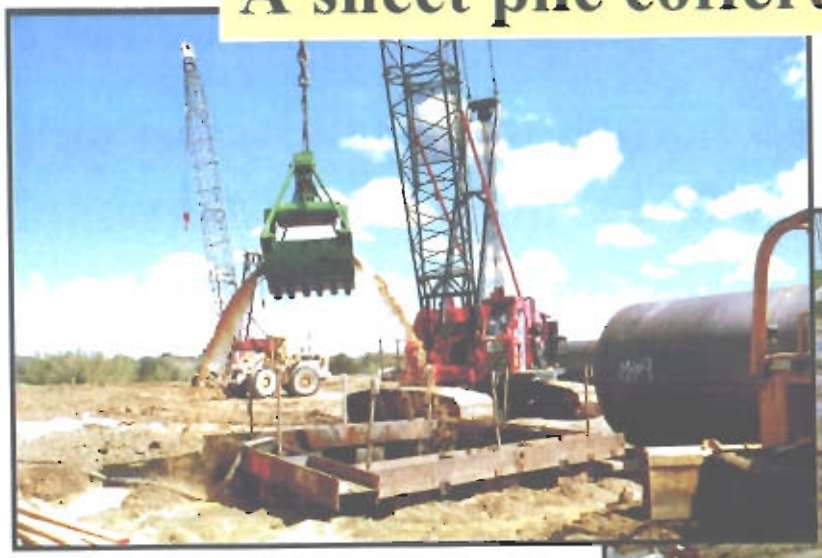
MCM Construction uses a specially built pile-driving hammer to drive the first of seven large diameter piles at the Stony Creek Bridge project. The large hammer weighs more than 250,000 lb.

Three pieces
240,500 lb.

Caltrans


LINK

A sheet pile cofferdam was excavated...



Pile isolation was specified down to the pile cutoff elevation for the load test. This was accomplished with the sheet pile cofferdam.

The hammer also had to be placed on top of the pile one piece at a time.

This was a "critical lift" using two cranes and a spreader bar.

MCM CONSTRUCTION, INC.
GENERAL ENGINEERING CONTRACTORS

Caltrans

APE successfully tests 750,000 foot-pound hydraulic impact hammer for delivery to MCM

…By creating the the largest hydraulic impact hammer ever built in the United States!

So how does *that* get to Stony Creek??

849

9999

DEPARTMENT OF TRANSPORTATION
DIVISION OF ENGINEERING SERVICES
MATERIALS ENGINEERING AND TESTING SERVICES
5900 FOLSOM BOULEVARD
SACRAMENTO, CA 95819-4612
PHONE (916) 227-7108
FAX (916) 227-7075
TTY (916) 653-4086

Flex your power!
Be energy efficient!

October 25, 2005

Sakai Takayuki
Giken America
3686 Carson St. Unit 332
Torrance, CA 90503

Dear Mr. Takayuki:

The California Department of Transportation (Department) has reviewed the following procedure:

Product	Tracking Number
Silent Piler	04-12-001

The review committee has determined that this procedure would be covered within Section 49-1.03 of the Standard Specifications. Therefore, it can be considered for use on Caltrans projects as defined in Section 49-1.03.

If you have any questions regarding the new product review process, please contact me at
(916) 227-7108 or my assistant, G. M. Amthor, at (916) 227-7027.

Sincerely,

RON REESE
Office of Testing and Technology Services

c : Dan Adams

EXHIBIT NO. 4
APPLICATION NO.
1-07-013 - CALTRANS
CALTRANS AUTHORIZATION OF "SILENT PILER" HYDRAULIC FILE INSTALLATION SYSTEM

Submitted to:

Richard Horsfield
Environment Agency
Sussex Area Office
Saxon House
Little High Street
Worthing
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BN11 1DH

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Submitted by:

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Measurements of underwater noise in the River Ouse during piling for a flood alleviation scheme in the Malling Brook cell

Report Reference: 625R0108

by

Dr. J. R. Nedwell, Mr T Macneish, Mr J W Langworthy,

Mr D Howell, and Mr R Workman.

08/03/05

Approved for release: .....

Contents

1 Introduction

1.1 Aims of the measurements

During 2004 piling was undertaken along the margin of the River Ouse as part of a project commissioned by the Environment Agency Southern for a flood alleviation scheme in the Malling Brook cell. The sheet piling was performed on their behalf by Fussey Piling Ltd.

The project was unusual in that the piling was performed using a hydraulic piling system, in which piles are forced in by hydraulic jacks located on adjacent piles. In principle, it was thought that this approach might be quieter than other piling methods such as impact piling.

Impact piling at or near the banks of a river has the potential to generate high levels of noise and there has been consequently concern over the possible effects this noise may have on fish migration [1], [2], [3]. Hydraulic piling has been identified as a method that might be considerably quieter than impact piling; and it was thought unlikely that the hydraulic piling at the Malling Brook cell would have significant effects on the local fish population. However, there is no information on waterborne noise from hydraulic piling and hence it was thought to be a useful opportunity to collect data. The EA therefore agreed to contract Subacoustech Ltd. to take measurements of the underwater noise created during the piling. This report documents the measurements that were taken and the results that were obtained.

1.2 Piling methods

Traditionally, impact piling is the method most used for driving piles. In this method, a large weight is dropped onto the top of the pile, driving it into the ground. However, high levels of airborne noise from impact piling can cause annoyance to local communities and hence over recent years many attempts have been made to reduce the airborne noise by developing alternative piling techniques and equipment. These alternative techniques include hydraulic, vibratory and bored piling.

Hydraulic piling is a method used to install and extract steel sheet piles with the use of static-load hydraulic power. The static piling method can be simplified into four stages of operation.

1. The hydraulic piling machine is initially attached to a reaction stand loaded with stacked sheet piles, in order to obtain a reaction force to drive the first piles as shown in the photograph of Fig 1.
2. The installed piles are then used as the resistance, thus driving the next sheet pile while adjusting the position of the machine to keep it level with the use of a tilting device as shown in Fig 2.
3. The machine moves by elevating its travel carriage while supporting itself on the last installed pile, and the travel carriage then slides forward.
4. The travel carriage lowers itself and drops onto the installed sheet piles and continues its hydraulic installation process.

2 The measurements

2.1 Location of pile driving and measurement locations

The construction of the flood alleviation scheme was located along the bank of the River Ouse. The hydraulic piling technique was exclusively used along the east bank of the river; the work area being located predominately within the Malling Recreation Ground and the Tesco Supermarket car park on the Eastern bank of the river.

Measurements were taken of the noise and ground vibration resulting from the hydraulic piling equipment and support machinery. Each sheet pile was six metres in length and half a tonne in weight; Figure 3 illustrates the proposed flood embankment's position on the Malling Brook site.

The piling machine with support equipment can be seen in the centre of the photomontage in Fig 4. The position of the boat shows the location of the hydrophone in the river with respect to the piling operation.

Piling was not conducted on a continuous basis at the site due to the practicalities of the operation, with interruptions from the supply and positioning of new piles, by the piles striking subterranean debris which had to be removed and by other problems including the unwanted rotation of piles. Consequently, the driving of piles occurred intermittently and in total only for approximately 20% of the time. A total of 100 sets of measurements were taken each comprising 30 seconds of continuously recorded data.

2.2 Instrumentation

Underwater noise measurements were taken using a Brüel & Kjær Type 8106 hydrophone, serial number 2256725, connected to a Subacoustech 68SP0101 signal conditioning amplifier and anti-aliasing filter. Ground vibration measurements were taken with a Brüel & Kjær Type 4340 accelerometer, serial number 520025, connected to a Brüel & Kjær Type 2635 charge amplifier. Airborne sound levels were recorded using a Cirrus Sound Level Meter (SLM) Type 601.

The output signals from the instrumentation were fed to an analogue-to-digital converter card that was inserted in a PCMCIA slot in a laptop computer. The computer was running a data acquisition and analysis program written using the National Instruments LabVIEW application.

2.3 Measurement procedure

Several methods of instrumentation were considered for the underwater noise measurements. The most commonly used method of deploying a hydrophone is hanging from a boat, but while initially this approach appeared beneficial, it was dismissed because of the difficulty of ensuring that the position of the boat remained constant during the relatively long period of the measurement. Consequently, the boat was only used to situate the hydrophone in the centre of the river and a large anchor weight, which sank to the riverbed, was attached to the hydrophone cage to ensure that the hydrophone maintained a constant position. A buoy was then attached to the top of the cage in order that the hydrophone maintained a constant distance of 1 metre above the river bed.

Underwater noise measurements were taken in the centre of the river adjacent to the piling operation, as illustrated in Fig 5. The hydrophone was positioned at a fixed distance of 31 metres from the piling machine during all of the underwater measurements. Ground vibration,

and airborne noise levels in dB(A) re 20 μPa were also recorded during piling. These measurements were taken at distances of 1m, 3m, 10m and 30m from the piling machine.

The underwater measurements were taken with the hydrophone positioned approximately mid depth in the river. Measurements were taken both during piling and whilst there was no piling or support machinery running, so as to provide background noise measurements.

Ground vibration measurements were taken with the accelerometer attached to a 5kg weight in order that the small device became effectively coupled with the ground.

The airborne sound pressure levels were recorded at the same location as the vibration measurements; data was recorded directly from the Cirrus SLM.

3 Analysis of measurements and results

3.1 Background noise

Background noise in rivers results from contributions of noise from natural processes, such as flow noise and rain, and also from anthropogenic sources such as boat traffic or distant landborne traffic. Measurements were taken to ascertain the usual level of noise in the environment and to provide a baseline against which measurements of the hydraulic piling could be compared. The background noise in the Ouse at Lewes was found to be of relatively low level because flow in the river is slow and in addition there is minimal boat or local heavy vehicular traffic.

Background noise measurements were taken before and after each measurement of piling because in general ambient noise does not remain constant throughout the day. Each measurement was thirty seconds in length and recorded with a bandwidth of 150 kHz. Frequencies below 20 Hz were dominated by hydrodynamic noise caused by flow past the hydrophone. This type of noise is not true propagating sound and thus the measurements have been filtered to remove frequencies below 20 Hz and thus to prevent the measurements from appearing unrealistically high. The mean long-term underwater background noise level in the river was calculated to be 98.3 dB re 1 μPa .

3.2 Noise produced by piling and support equipment

The piling and support equipment that was used during the piling process consisted of a crane, a hydraulic power pack, a jack hammer and a digger. The crane was used to lift and position the sheet piles into the hydraulic piling machine and remained predominately stationary whilst performing its role. The hydraulic power pack was used to power the piling machine, this unit is shown in the centre of Figure 4 as the large rectangular grey unit. The digger was used intermittently through out the day to clear earth and debris so that the piling machine and crane could move unimpeded along the designated piling line, the digger was also used to remove large under ground obstructions such as rocks and concrete. If the underground obstruction was suitably small, the jack hammer shown in Figure 6 was used break up the obstacle.

The machinery noise produced by the support equipment measured using a hydrophone in the river was initially analysed in terms of its spectrum. The Power Spectral Density (PSD) of the underwater noise from the digger working on the river bank in dB re 1 $\mu Pa^2/Hz$ as a function of the frequency is illustrated in figure 7; the figure also indicates the ambient noise level from measurements taken in the river. Figure 8 illustrates similar quantities for the jack hammer being used to clear obstructions.

It may be seen that in both cases the noise level of noise in the river is elevated over the normal background levels. In the case of the digger, there was a small increase in level of about 20 dB in the frequency range from 10 Hz to 100 Hz, and a smaller elevation at frequencies up to 800 Hz. In the case of the jackhammer, there is a tonal component to the spectrum arising from the repetitive noise; the increase in level is similar to that caused by the digger, and is about 20 dB in the frequency range from 10 Hz to 100 Hz. In general, the noise probably peaks at a slightly higher frequency than for the digger.

Figure 9 indicates a similar plot, but in this case for the operation of the hydraulic piling machinery. It may be seen that there was an increase in the level of noise in the frequency

range from 10 Hz to 1 kHz, of about 10 – 15 dB or so; the spectrum of the noise in this case extends to slightly higher frequencies of perhaps 2 kHz or above.

Table 1 indicates the Sound Pressure Level in dB re 1 µPa. Both the long-term average level, and the peak level occuring in one-second segments, are illustrated in the figure. The results are shown for both the individual noise sources, and for various combinations that occurred during the day.

It may be seen that the tabulated values indicate that the noise varies in level significantly, since the average level and the 1 second peak level are considerably different. However in general the noise with the plant operating is typically 10-20 dB above background.

	RMS Pressure Level (dB re 1 µPa)	Peak 1/10 second RMS average (dB re 1 µPa)
Background noise	98.3	107.6
Hydraulic pile driving	113.1	126.7
Digger moving along river bank	114.4	120.7
Digger removing concrete & piling noise	114.3	123.4
Digger removing concrete & welding noise	113.3	119.4
Digger removing concrete & piling & welding noise	108.4	120.7
Jack hammer being used to clear obstructions	110.8	114.5

Table 1 Average sound pressure levels recorded in the river

In summary, the underwater noise created by the hydraulic piling, the use of a jack hammer, by digger movements and by combinations of these was typically of the order of 10-20 dB above background.

3.3 Airborne noise.

The significance of airborne noise was found by recording the noise levels at approximately logarithmically increasing distances from the hydraulic power unit. The results are shown in Table 2. The mean background dB(A) level in air was measured to be 60 dB re 20 µPa.

Distance from power unit (m)	1	3	10	30
Sound pressure level (dB(A))	87.9	82.4	72.3	60

Table 2 The airborne noise in dB(A) re 20 µPa at various distances from the hydraulic power unit

It may be seen that the levels decrease with distance from the unit, such that at 30 metres the airborne noise level is similar to the background noise level.

Table 3 shows the sound pressure level in air at various distances from the hydraulic piling machine. It may be noted that the piling machine cannot operate without the hydraulic power

unit, therefore the piling noise measurements included the noise produced by the hydraulic power unit.

Distance from piling machine (m)	1	3	10	30
Sound pressure level (dB re 20 uPa)	76.8	74.8	73.8	60

Table 3 The airborne noise in dB(A) re 20 μPa at various distances from the hydraulic piling

It may be seen that similarly to the preceding case, the levels decrease with distance from the unit, such that at 30 metres the airborne noise level is similar to the background noise level. Subacoustech staff at the site commented that the equipment was extremely quiet in operation.

3.4 Ground borne vibration.

The ground vibration produced by the process of hydraulic piling is displayed as peak acceleration values in Table 4.

Figures 10 and 11 indicate typical time histories of the acceleration, for distances of one and three metres from source (Fig 11 to 12). It may be seen that the vibration is charecterised by some machinery noise, and the occasional spike, perhaps as the pile penetrates past obstructions such as stones.

Distance from piling machine (m)	**1**	**3**	**10**	**30**	**33**
Ground vibration (Peak ms^{-2})	7	0.2	0.05	0.1	0.04

Table 4 Acceleration levels from hydraulic piling machine at various distances

It was found that the ground acceleration was in general rather low and fell to close to ambient levels at ranges of greater than three meters from the piling source.

4 dBht analysis and the potential for effects of hydraulic piling on fish

4.1 A brief description of the dB_{ht}.

The dB_{ht}(*Species*), which is a measure of sound which may be related to environmental effect, was used to investigate the potential for effects of the hydraulic piling on three species of fish.

A brief description of the concept of a perception scale may be helpful. The human ear, for instance, is most sensitive to sound at frequencies of the order of 1 to 4 kHz, and hence these frequencies are of greatest importance in determining the physical and psychological effects of sound for humans. At lower or higher frequencies the ear is much less sensitive, and humans are hence more tolerant of these frequencies. To reflect the importance of this effect a scale of sound, the dB(A), has been developed, which allows for the frequency response of the human ear. Measurements of sound level in dB(A) thus relate well to the degree of both physical and behavioral effects of sound on humans. This approach has also been extended to underwater human exposure to sound (where hearing ability differs greatly from that in air), yielding the dB(UW), which allows the effects of sound on submerged humans to be estimated.

In the dB_{ht}(*Species*), a similar approach is used to arrive at a number for the level of a given sound which is indicative of how much that species will be affected by that sound. A frequency dependent filter is used to weight the sound; the suffix 'ht' relates to the fact that the sound is weighted by the hearing threshold of the species of interest. The level expressed in this scale is therefore different for each species and corresponds to the likely perception of the sound by the species. The benefit of this approach is that it enables a single number (the dB_{ht}(*Species*)) to describe the effects of the sound on that species.

It may be noted that the effective noise levels of sources measured in dB_{ht}(*Species*) are usually much lower than the unweighted levels, both because the sound will contain frequency components that the species cannot detect, and also because most aquatic animals have high thresholds of perception of (are insensitive to) sound.

4.2 The levels of underwater noise from hydraulic piling in dB_{ht}(*species*) units.

The level of underwater noise calculated in dB_{ht}(*Species*) for salmon (dB_{ht} (*Salmo salar*)), bream (dB_{ht}(*Abramis brama*)) and trout (dB_{ht}(*Salmo trutta*)) are displayed in Table 5. The levels were calculated for these species primarily because they were species for which reliable audiograms were available. There is no indication that these species are necessarily present; they have instead been chosen as representative species.

It may be seen that nearly all of the levels are below $0dB_{ht}$, that is, the majority of the noise measurements are below the hearing threshold of the species. It may therefore be concluded that not only would no reaction to the sound be expected (it is thought that levels of 90 dB_{ht} or more are required to cause strong avoidance reaction), but also that the fish would not be able to hear the noise.

In the case of the brown trout *Salmo trutta*, which has particularly insensitive hearing, all of the dB_{ht} levels are below 0 dB_{ht}, and thus it would be unable to sense the noise. The results indicate that the salmon is the most sensitive to noise, with a maximum perceived level of 13 dB_{ht} (*Salmo salar*), and the bream is intermediate. In all cases the levels are near to the species' thresholds, and it is very unlikely that any adverse effect of the noise would occur.

Description of noise source	Salmon dB_{ht}	Salmon dB_{ht} peak 1 sec	Brown Trout dB_{ht}	Trout dB_{ht} peak 1 sec	Bream dB_{ht}	Bream dB_{ht} peak 1 sec
Background noise	-7.7	-2.4	-23.8	-19.1	-15.6	-8.3
Hydraulic pile driving	-1.5	7.1	-14.7	-5.6	-10.2	-1.22
Digger & piling	-1.6	4.9	-14.8	-9.1	-11.2	-4.1
Digger & welding	-2.1	1.45	-15.6	-12.6	-12.4	-8.0
Digger & piling & welding	-4.3	1.6	-18.6	-12.2	-14.0	-6.5
Jack hammer	9.7	13.0	-8.0	-5.0	5.1	7.6

Table 5 dB_{ht}(*Species*) levels for noise measurements in the river

5 Conclusions

In summary, measurements of waterborne noise, ground vibration and airborne noise have been taken during hydraulic piling operations to construct the flood alleviation scheme in the Malling Brook cell. The underwater noise levels in the river were recorded during use of a hydraulic power unit, the use of a digger, the operation of a jackhammer, during hydraulic piling, and for combinations of these noise sources.

It was found that:

1) The waterborne noise in the river during the piling operation was not greatly above the background level, which was on average 98.3 dB re 1μPa. The underwater noise created by the hydraulic piling, the use of a jack hammer, by digger movements and by combinations of these was typically of the order of 10-20 dB above background.

2) The airborne noise produced by the hydraulic piling fell to background at distances of 30 metres and more, and the ground vibration fell to background at distances of 3 metres and more.

3) dB_{ht}(*Species*) levels of the underwater noise were calculated for salmon (dB_{ht} (*Salmo salar*)), bream (dB_{ht}(*Abramis brama*)) and trout (dB_{ht}(*Salmo trutta*)). In all cases the levels were near to or below 0 dB_{ht} (i.e. below the species' thresholds), and it was thought very unlikely that any adverse effect of the noise would occur.

6 Figures

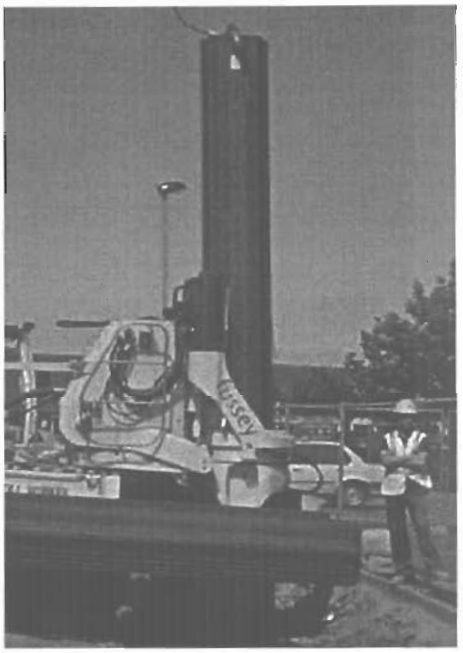


Figure 1. The hydraulic piling machine using stacked sheet piles to obtain a reaction force

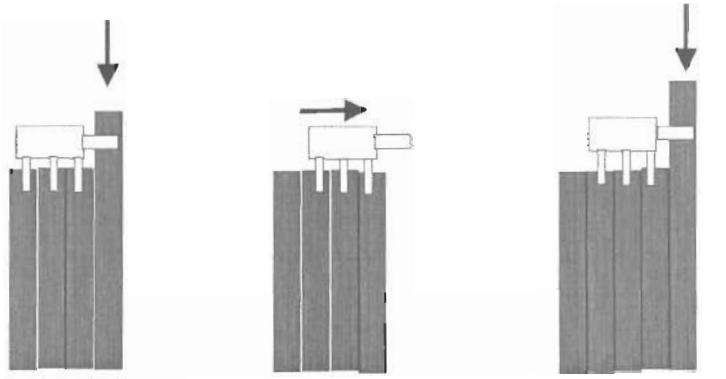


Figure 2. A sketch to illustrate the principle of hydraulic piling machine

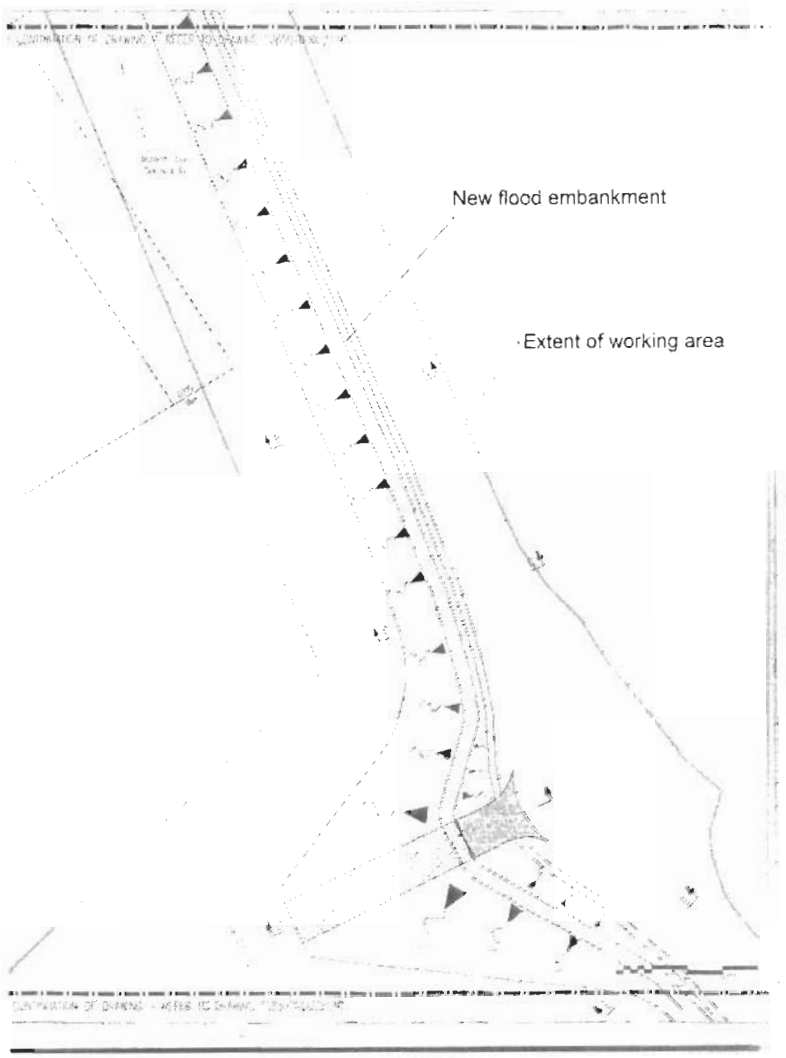


Figure 3. A map of the Malling Brook cell indicating where the piling operation was carried out.

Figure 4. A photo montage of the piling operation (on right) and hydrophone deployment (on left).

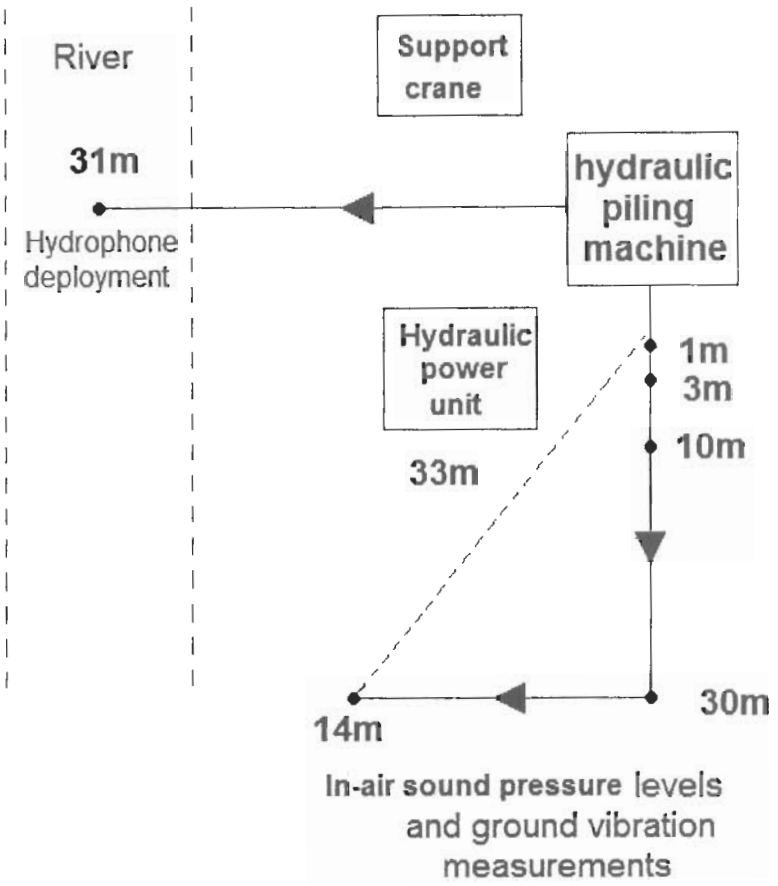


Figure 5. The position of the recording equipment in relation to the piling.

Figure 6. The jack hammer being used to clear a piling obstruction.

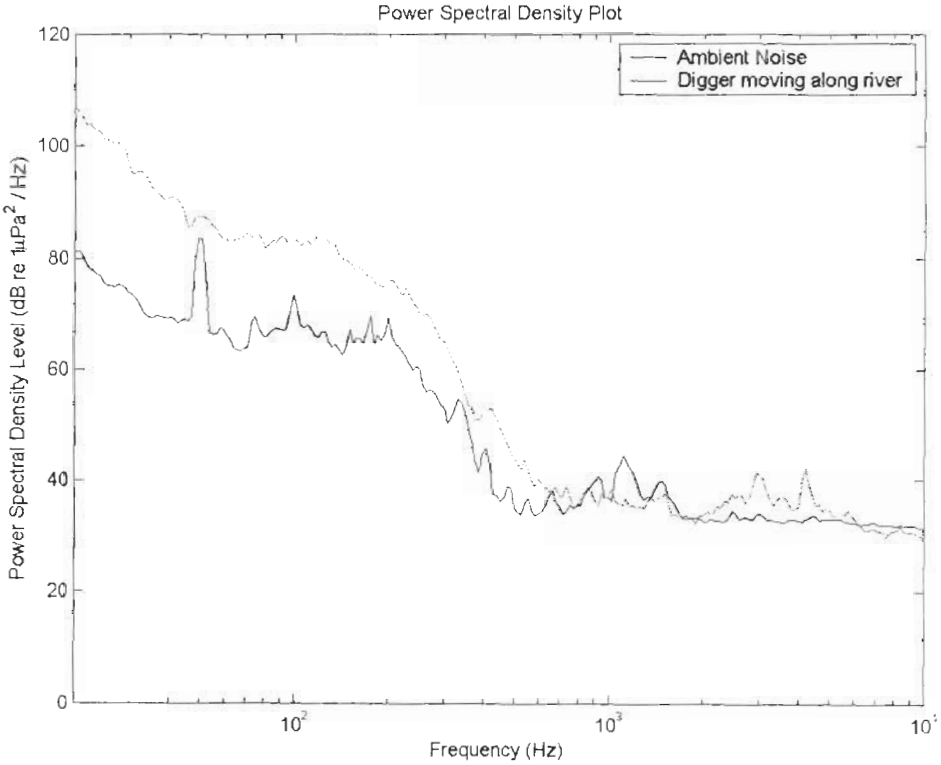


Figure 7. The PSD of the underwater noise from the Digger removing obstructions

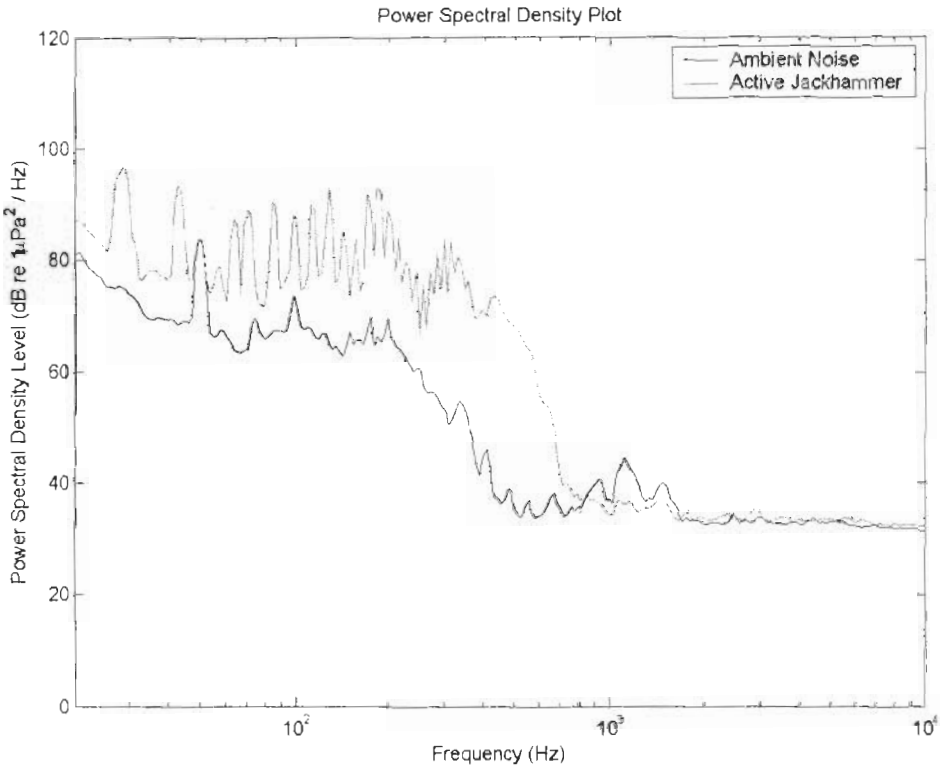


Figure 8. The PSD of the underwater noise from a jackhammer being operated

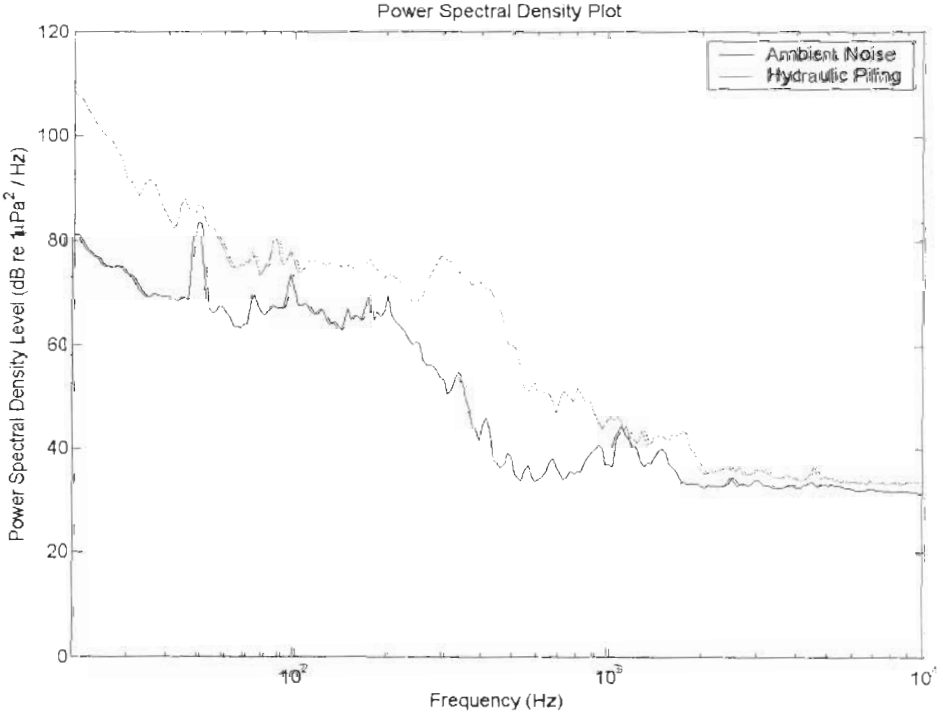


Figure 9. The PSD of the hydraulic piling

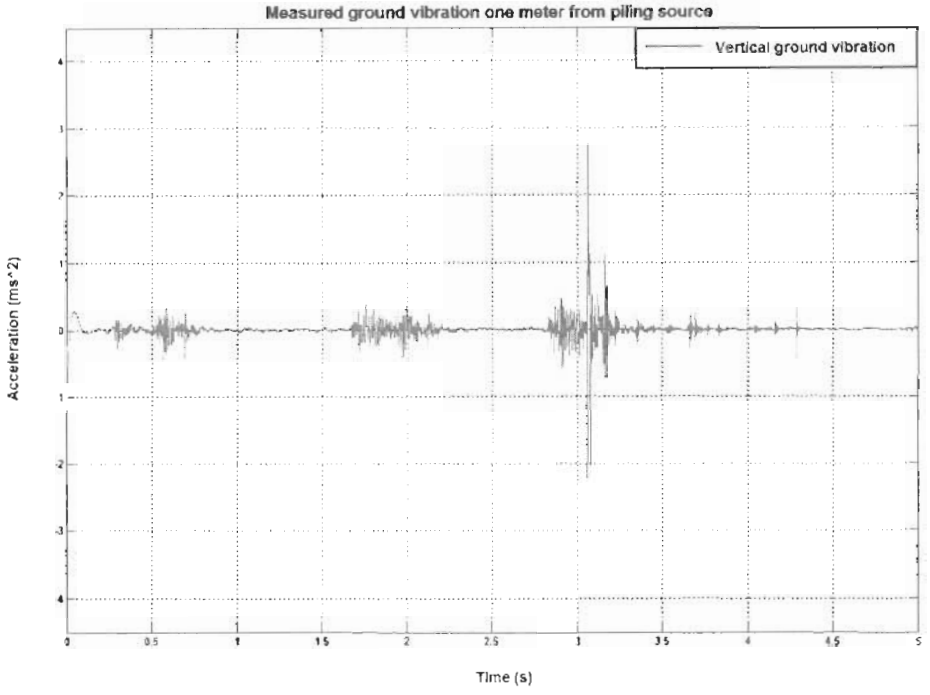
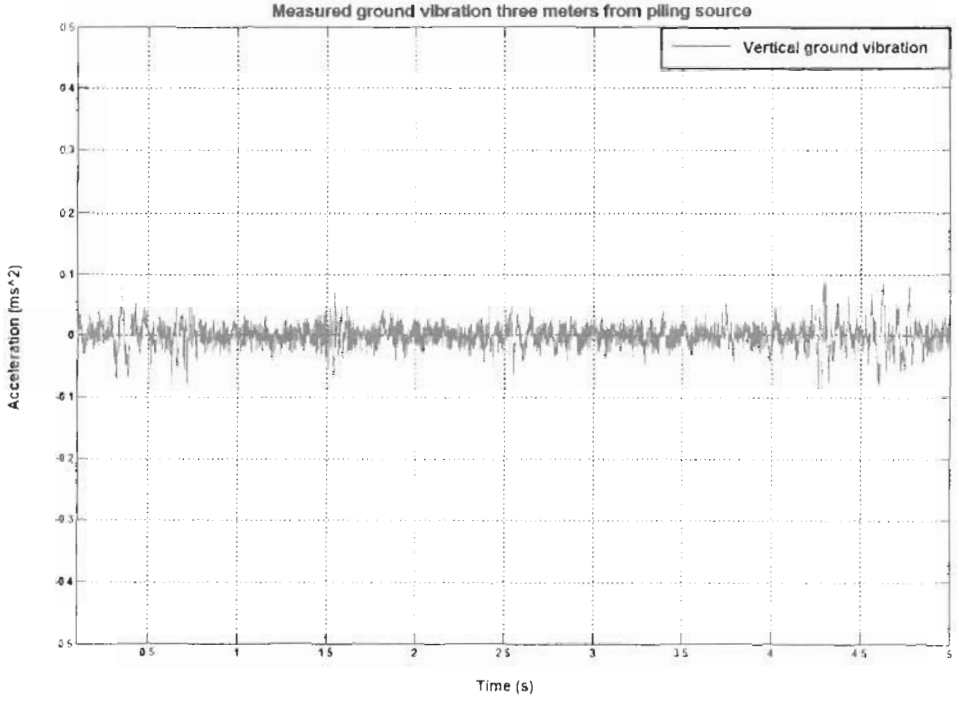


Figure 10. The time history of the ground vibration one metre from the hydraulic piling machine



7 **Figure 11. The time history of the ground vibration three metres from the hydraulic piling machine**

8 References

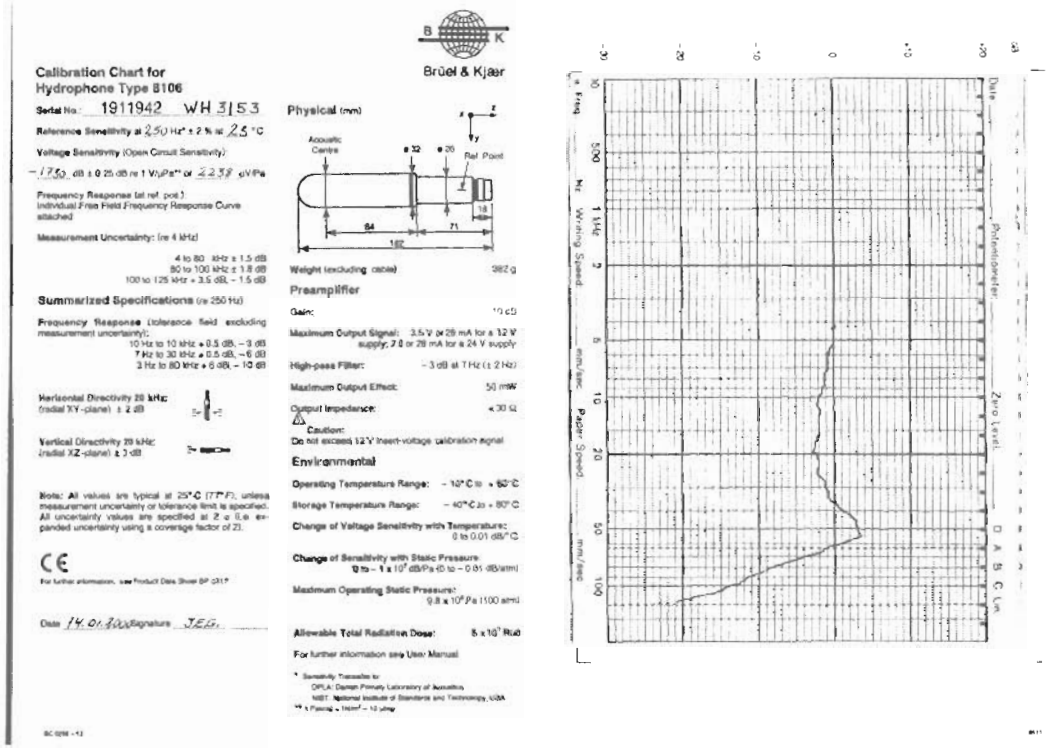
[1] Nedwell, J R, Turnpenny, A W H and Edwards, B. *Piling on the River Arun; implications for salmon migration.* Proceedings of the American Fisheries Society 132nd Annual Meeting, 18-22 August 2002, Hyatt Regency Hotel, Baltimore, USA.

[2] Nedwell, J.R, Turnpenny, A.W.H, Lovell, J, Langworthy, J. W., Howell, D. M. & Edwards, B. *The effects of underwater noise from coastal piling on salmon (Salmo salar) and brown trout (Salmo trutta).* Subacoustech report to the Environment Agency, reference 576R0113. Dec. 2003. Subacoustech Ltd, Chase Mill, Winchester Road, Bishop's Waltham, Hampshire SO32 1AH, United Kingdom.

[3] Nedwell, J. R., Langworthy J and Howell, D. *Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise.* Subacoustech report to COWRIE (Collaborative Offshore Wind Research into the Environment), Report No. 544 R 0424, May 2003.

Appendix A – Calibration Certificates

The calibration of the Bruel and Kjaer Type 8106 hydrophone used.



Calibration Chart for
Hydrophone Type 8106

Serial No.: 1911942 WH 3153

Reference Sensitivity at 250 Hz* ± 2 % re: 25 °C

Voltage Sensitivity (Open Circuit Sensitivity):

−175.0 dB ± 0.25 dB re 1 V/µPa** or 2.238 µV/Pa

Frequency Response (at ref. pos.)
Individual Free Field Frequency Response Curve attached

Measurement Uncertainty: (re 4 kHz)

4 to 80 kHz ± 1.5 dB
80 to 100 kHz ± 1.8 dB
100 to 125 kHz + 3.5 dB, − 1.5 dB

Summarized Specifications (re 250 Hz)

Frequency Response (tolerance field excluding measurement uncertainty):
10 Hz to 10 kHz + 0.5 dB, − 3 dB
7 Hz to 30 kHz + 0.5 dB, − 6 dB
3 Hz to 80 kHz + 5 dB, − 10 dB

Horizontal Directivity 20 kHz:
(radial XY-plane) ± 2 dB

Vertical Directivity 20 kHz:
(radial XZ-plane) ± 3 dB

Note: All values are typical at 25°C (77°F), unless measurement uncertainty or tolerance limit is specified. All uncertainty values are specified at 2 σ (i.e. expanded uncertainty using a coverage factor of 2).

CE

For further information, see Product Data Sheet BP 0317

Date 14.01.2000 Signature JEH.

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Brüel & Kjær

Physical (mm)

Weight (excluding cable): 382 g

Preamplifier

Gain: 10 dB

Maximum Output Signal: 3.5 V (≥ 28 mA for a 12 V supply; 7.0 or 28 mA for a 24 V supply)

High-pass Filter: − 3 dB at 7 Hz (± 2 Hz)

Maximum Output Effect: 50 mW

Output Impedance: < 30 Ω

Caution:
Do not exceed 12 V insert-voltage calibration signal

Environmental

Operating Temperature Range: − 10°C to + 60°C

Storage Temperature Range: − 40°C to + 80°C

Change of Voltage Sensitivity with Temperature:
0 to 0.01 dB/°C

Change of Sensitivity with Static Pressure:
0 to − 1 x 10^{-3} dB/Pa (0 to − 0.01 dB/atm)

Maximum Operating Static Pressure:
9.8 x 10^{6} Pa (100 atm)

Allowable Total Radiation Dose: 5 x 10^{7} Rad

For further information see User Manual

* Sensitivity Traceable to:
DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

** 1 Pascal = 1 N/m² = 10 µbar

Appendix B - Record of changes

1. This is a controlled document.
2. Additional copies should be obtained through the Subacoustech Librarian.
3. If copied locally, each document must be marked "Uncontrolled Copy".
4. Amendment shall be by whole document replacement.
5. Proposals for change to this document should be forwarded to Subacoustech.

Issue	Date	Details of changes
625R0101	20-08-04	Document created by TM
625R0102	09-09-04	Document reviewed by JWL
625R0103	29-09-04	Document reviewed by JRN
625R0104	07-10-04	Issue in draft
625R0105	03-01-05	Addition of extra species to analysis by JL
625R0106	10-01-05	Recalculation of dBht using FIR method by DH
625R0107	14-02-05	Document reviewed by JRN
625R0108	08-03-05	Re-issue in draft for approval

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3. Contract number & period covered	625; period to October 2002
4. Sponsor's name & location	Richard Horsfield, Environment Agency
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6b. Pagination	20pp
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7b. Translation / Conference details	N/A
7c. Title classification	N/A
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10b. Abstract classification	N/A