Attachment 3: Work Plan

✓ Supporting Documentation

The following documents have been appended to this Attachment to provide additional information regarding the projects discussed herein:

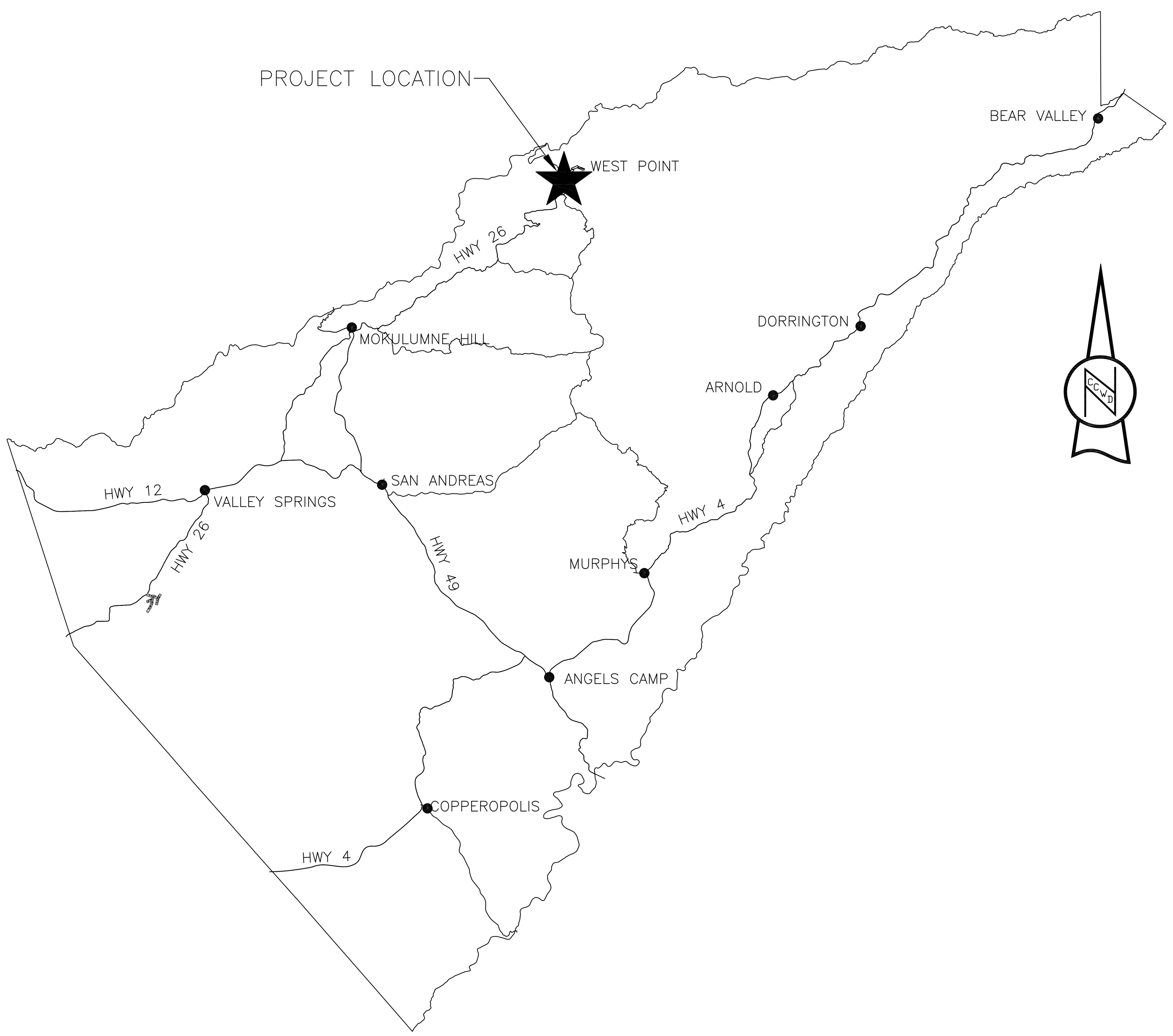
- West Point Water System Distribution System Rehabilitation Improvement Plans (Calaveras County Water District [CCWD], November 2010)
- Letter from Domenichelli and Associates, Inc. documenting West Point Water Distribution System Project Readiness (October 2006)
- Letter from U.S. Department of Agriculture (USDA) to CCWD summarizing USDA Rural Development Funding Award (December, 2010)
- Resolution 2008-24, executed by CCWD Board of Directors authorizing General Manager to execute and implement funding agreement with USDA (CCWD, March 2008)
- Letter from Domenichelli and Associates, Inc. documenting West Point/Bummerville/Wilseyville Water Distribution System Code Deficiencies (July 2005)
- Letter from Senator Feinstein and Congressman Lungren supporting CCWD's application for financial assistance under the USDA Rural Development Funding Program (May 2005)
- Preliminary Engineering Report (CCWD, May 2005)
- Camanche Regional Water Treatment Plant Plans (East Bay Municipal Utilities District [EBMUD])
- Camanche South and North Shore Water Treatment Plants Evaluation (EBMUD, May 2003)

West Point Water System Distribution System Rehabilitation Improvement Plans (Calaveras County Water District, November 2010)

PLANS FOR CONSTRUCTION

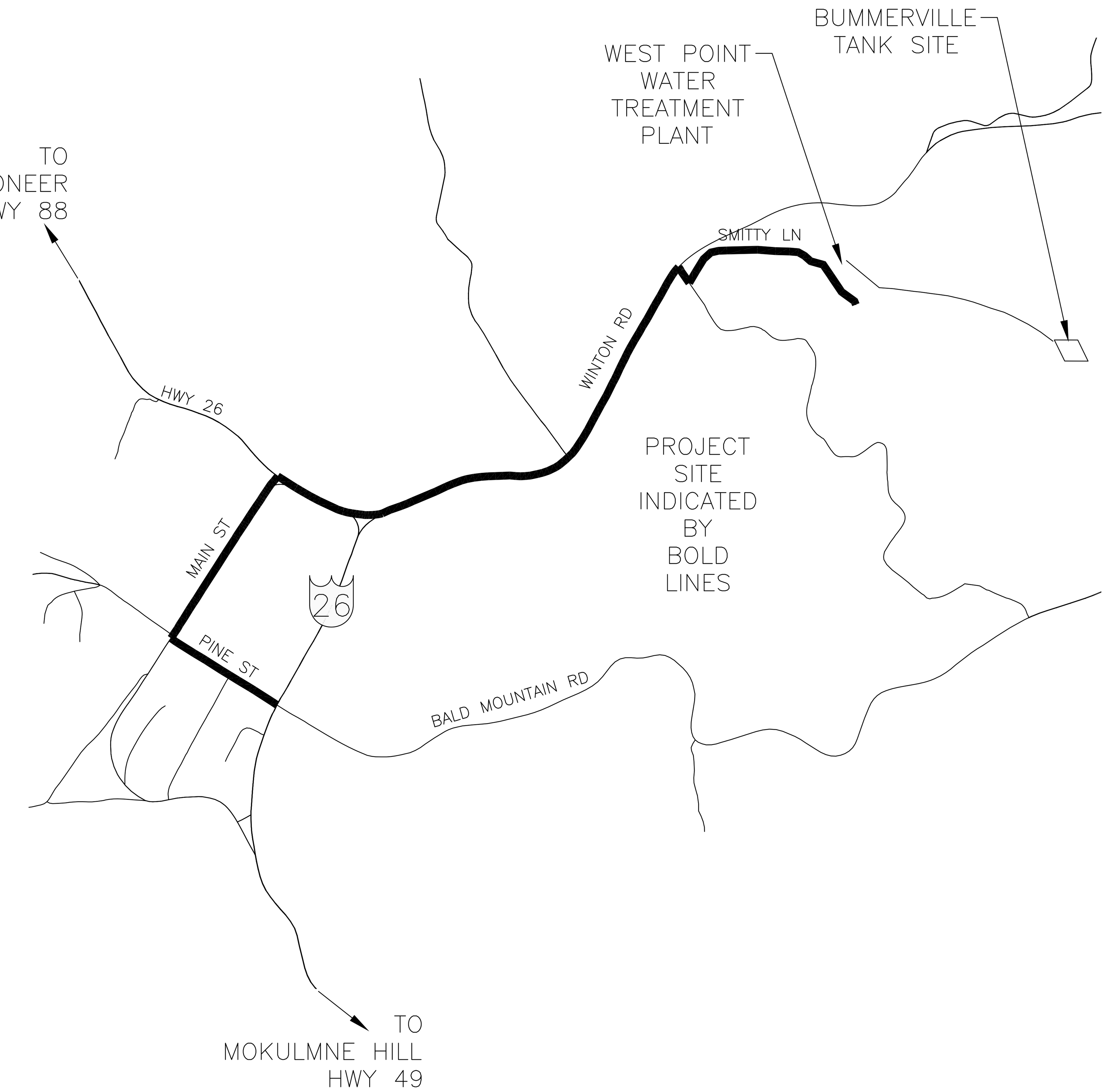
WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION IMPROVEMENT PLANS

CIP NO. -



COUNTY MAP

NTS



VICINITY MAP

NTS

DRAWING INDEX

APPROVED BY:

STEVE HUTCHINGS, DISTRICT ENGINEER, CCWD *DATE*
RCE 44336

BILL PERLEY, DIRECTOR OF UTILITIES, CCWD *DATE*

FIRE CHIEF, WEST POINT FPD *DATE*

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY

ENGINEER: S. HUTCHINGS

CHECKED: -

DRAWN BY: B. LONG

TITLE PAGE

CALAVERAS COUNTY WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010

PROJECT NO: -

SCALE: AS NOTED

FILE NAME: -

SHEET NO. 1

GENERAL NOTES

1. CONTRACTOR SHALL MARK ALL EXCAVATIONS AND CALL UNDERGROUND SERVICE ALERT (USA) NOT LESS THAN 48 HOURS BEFORE DIGGING; WHEN EXCAVATING WITHIN 3–FEET OF EXISTING UTILITIES POTHOLE AND EXPOSE UTILITIES BY HAND DIGGING OR VACUUM EXCAVATION.
2. CCWD SHALL DESIGNATE A SOURCE OF CONSTRUCTION WATER FOR THE PROJECT; THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT, LABOR, AND MATERIALS NEEDED TO TRANSPORT AND CONVEY THE WATER FOR USE IN CONSTRUCTION. IF WATER IS SUPPLIED FROM A FIRE HYDRANT IT SHALL BE DRAWN FROM A HYDRANT METER; CONTRACTOR SHALL NOT LEAVE THE HYDRANT FLOWING UNATTENDED.
3. CONTRACTOR SHALL PROVIDE DUST CONTROL AT ALL TIMES. WATER SPRAY SHALL BE APPLIED TO EXPOSED SOIL AS FREQUENTLY AS NEEDED TO CONTROL DUST AND TO THE EXTENT THAT IT DOES NOT CAUSE EROSION OR SEDIMENT TO RUNOFF INTO DROP INLETS OR DRAINAGES. AT END OF EACH DAY SOIL SPILLAGE SHALL BE REMOVED FROM PAVEMENT SURFACE EITHER MANUALLY, BY SWEEPING AND/OR BY VACUUMING; WATER SPRAY SHALL NOT BE USED TO WASH DOWN STREETS.
4. CONTRACTOR SHALL MITIGATE STORM WATER DISCHARGES FROM THE CONSTRUCTION SITE IN COMPLIANCE WITH STATE LAW AND REGULATIONS. CONTRACTOR SHALL PROVIDE LABOR AND MATERIALS NEEDED TO IMPLEMENT EFFECTIVE BEST MANAGEMENT PRACTICES (BMP) AND PERFORM WORK ACCORDING TO THE CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA) CONSTRUCTION HANDBOOK. PROVISIONS SHALL BE MADE FOR PROPER STORAGE AND DISPOSAL OF CHEMICAL WASTES AND CONTAINMENT OF PAINT AND CONCRETE WASHOUT. FOR CONSTRUCTION CAUSING 1–ACRE OR MORE SOIL DISTURBANCE THE CONTRACTOR SHALL PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND FILE A NOTICE OF INTENT (NOI) WITH STATE WATER RESOURCES CONTROL BOARD.
5. CONTRACTOR IS REQUIRED TO FURNISH AND REGULARLY MAINTAIN TEMPORARY SANITARY FACILITIES, I.E. PORTABLE TOILETS, AT THE CONSTRUCTION SITE FOR THE DURATION OF THE PROJECT.
6. AT LEAST FIVE (5)WORKING DAYS IN ADVANCE CONTRACTOR SHALL MAKE A WRITTEN REQUEST TO CCWD FOR CONSTRUCTION STAKING. CCWD WILL PROVIDE ONE (1) SET OF CONSTRUCTION STAKES AND MARKS TO ESTABLISH LINE AND GRADES. CONTRACTOR SHALL PAY THE COST FOR A SURVEYOR IF NECESSARY TO RESET STAKES DESTROYED, DAMAGED OR LOST.
7. ALL GRADING/EARTHWORK SHALL BE CONSTRUCTED TO WITHIN 0.1'± VERTICAL OF GRADES SHOWN ON PLANS AND ALL SLOPES WITHIN 0.5' ± OF HORIZONTAL LOCATIONS AS SHOWN ON THE PLANS.
8. CONTRACTOR IS CAUTIONED THAT OVERHEAD POWER LINES (PG&E) ARE PRESENT IN CLOSE PROXIMITY TO THE WORK AND A HAZARD TO KEEP AWARE OF DURING CONSTRUCTION.
9. CONTRACTOR SHALL SECURE THE SITE WHEN NOT PRESENT TO ELIMINATE SITE HAZARDS, MAINTAIN PUBLIC SAFETY AND PROTECT THE WORK, MATERIALS AND EQUIPMENT AGAINST THEFT AND VANDALISM. CONTRACTOR SHALL PROVIDE TEMPORARY SECURITY FENCING AROUND WORK AREAS AND SAFETY HAZARDS AND SHALL COVER EXCAVATION IN ROADS WITH H–20 RATED STEEL TRAFFIC PLATES WHEN EXCAVATIONS REMAIN OPEN AND ARE UNATTENDED.
10. LIMITED ON–SITE STAGING AND PARKING AREAS WILL BE DESIGNATED BY CCWD FOR CONTRACTOR'S USE. CONTRACTOR SHALL SECURE AT HIS OWN EXPENSE ADDITIONAL OFF–SITE STAGING AND PARKING AREAS AS MAY BE NEEDED. CONTRACTOR SHALL NOT STORE MATERIALS OR EQUIPMENT OR PARK VEHICLES WHERE IT VIOLATES ANY ORDINANCE, OBSTRUCTS ACCESS TO PRIVATE PROPERTY, INTERFERES WITH TRAFFIC, EMERGENCY VEHICLES, PEDESTRIANS OR OTHER PUBLIC USE OF THE RIGHT–OF–WAY. BEFORE STAGING MATERIALS, EQUIPMENT OR PARKING VEHICLES ON PRIVATE PROPERTY, CONTRACTOR SHALL PROVIDE TO CCWD COPY OF WRITTEN PERMISSION FROM THE PROPERTY OWNERS.
11. THE CONTRACTOR SHALL OBTAIN ENCROACHMENT PERMITS FOR CONSTRUCTION WITHIN COUNTY ROAD OR STATE HIGHWAYS AND SHALL COMPLY WITH ALL PERMIT CONDITIONS.
12. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL ACCORDING TO <u>MANUAL OF TEMPORARY TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES</u> (A.K.A. CALIFORNIA MUTCD, PART 6) AND SHALL PROVIDE ALL TRAFFIC CONTROL DEVICES, CONSTRUCTION SIGNS, WARNING LIGHTS, FLASHING ARROW SIGNS, DELINEATORS AND BARRICADES. FLAGGERS SHALL BE PROVIDED BY CONTRACTOR AS NEEDED TO ASSURE ORDERLY AND SAFE TRAFFIC FLOW. CONTRACTOR SHALL KEEP AT LEAST ONE TRAFFIC LANE OPEN DURING WORKING HOURS AND TWO LANES (ONE IN EACH DIRECTION) OPEN AT ALL OTHER TIMES. DRIVEWAYS AND ACCESS ROADS SHALL BE OPEN AND UNOBSTRUCTED FOR USE BY PRIVATE PROPERTY OWNERS.
13. PRIVATE AND PUBLIC PROPERTY INCLUDING BUT NOT LIMITED TO LIVESTOCK, TREES, SHRUBS, WALLS, LANDSCAPING, PAVING, ROADS, DRIVEWAYS, MAIL BOXES, POLES, FENCES, SIGNS, SURVEY MARKERS, MONUMENTS, PROPERTY CORNERS, BUILDINGS, STRUCTURES, VEHICLES, DRAINAGES, CULVERTS, CONDUITS AND UTILITIES SHALL BE PROTECTED DURING CONSTRUCTION AT NO EXTRA COST AND, IF DAMAGED OR INJURED, SHALL BE REPLACED OR RESTORED BY CONTRACTOR TO A CONDITION AS GOOD, OR BETTER, AS WHEN ENTERING UPON THE WORK. NO EXTRA PAYMENT WILL BE MADE TO CONTRACTOR.
14. FOR TRENCHES AND EXCAVATION FIVE (5) FEET AND GREATER IN DEPTH INTO WHICH WORKERS ENTER THE CONTRACTOR SHALL SUBMIT PLANS USING STANDARD METHODS AND PROVIDE SHEETING, SHORING AND BRACING IN ACCORDANCE WITH CALIFORNIA LABOR CODE AND DEPARTMENT OF INDUSTRIAL RELATIONS CONSTRUCTION SAFETY ORDERS AND PERMIT REQUIREMENTS. SAFETY PLAN SHALL MEET MINIMUM REQUIREMENTS OF THE CONSTRUCTION SAFETY ORDERS SECTIONS 1539 –1543.
15. CCWD WILL RETAIN A QUALIFIED LAB TO COLLECT CONCRETE CYLINDERS, CHECK CONCRETE SLUMP AND PERFORM BACKFILL COMPACTION TESTS. CONTRACTOR SHALL NOTIFY CCWD AT LEAST THREE (3) WORKING DAYS BEFORE FINAL DATE AND TIME OF CONCRETE (OR BACKFILL) PLACEMENT. CONTRACTOR SHALL TEMPORARILY HALT HEAVY EQUIPMENT TO ALLOW PERSONNEL SAFE ACCESS TO PERFORM TESTS.
16. AT LEAST TWO WEEKS IN ADVANCE, THE CONTRACTOR SHALL SUBMIT A DETAILED PLAN, PROCEDURE AND SCHEDULE FOR MAKING EACH SHUTDOWN. THE CONTRACTOR SHALL CAREFULLY PREPARE FOR EACH SHUTDOWN, VERIFYING THAT ALL NECESSARY MATERIALS AND EQUIPMENT ARE READILY AVAILABLE AT THE JOB SITE AND FITTINGS HAVE BEEN PRE–ASSEMBLED TO THE EXTENT POSSIBLE, CLEANED AND SWABBED WITH A CHLORINE SOLUTION FOR DISINFECTION. THE CONTRACTOR SHALL NOT OPEN/CLOSE EXISTING SYSTEM VALVES UNLESS UNDER THE DIRECT SUPERVISION OF A CCWD REPRESENTATIVE PRESENT AT THE JOB SITE.

DRAWING INDEX

SHEET#	TITLE
1	COVER SHEET
2	GENERAL NOTES & ABBREVIATIONS
3	PLAN & PROFILE DOWNTOWN STA 0+00 - 16+00
4	PLAN & PROFILE DOWNTOWN STA 16+00 - 32+00
5	PLAN & PROFILE DOWNTOWN STA 32+00 - 48+00
6	PLAN & PROFILE DOWNTOWN STA 48+00 - 58+00
7	PLAN & PROFILE DOWNTOWN STA 58+00 - 64+93 END
8	PLAN & PROFILE BUMMERVILLE TANK FEED LINE STA 29+36 - 36+79 END
9	BUMMERVILLE TANK SITE PLAN

GENERAL LEGEND

Symbol	Description
	CENTER LINE
36"CMP	CULVERT
15'	EASEMENT LINE
—X—X—	FENCE
—G—	GAS LINE
—E—	POWER LINE AND POLE ABOVE GROUND
—E—	POWER LINE UNDERGROUND
—PL—	PROPERTY LINE
RW	RIGHT OF WAY LINE
	ROADWAY
6"ABS S MHSD	SEWER LINE BY OTHERS
—T—	TELEPHONE LINE
6"AC W CPUD	WATER LINE BY OTHERS

WATER LEGEND

Symbol	Description
W	SERVED ON ANOTHER SHEET ARROW TOWARDS LOCATION
6" W	EXISTING WATER LINE
	EXISTING WATER SYMBOLS
6" W	WATER LINE
	GATE VALVE
	CHECK VALVE
	FIRE HYDRANT
	DOUBLE SERVICE
	SINGLE SERVICE
AVV	AIR/VAC VALVE
	END CAP
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE RELIEF VALVE
PS	PUMPING STATION
GAL	STORAGE TANK
	SAMPLE STATION
	REDUCER

ABBREVIATIONS

AB	AGGREGATE BASE CLASS II, 3/4" MAX.
AC	ASPHALT CONCRETE TYPE 'B', 1/2" MAX, MED. GRADING
ACP	ASBESTOS CEMENT PIPE
AVV	AIR VAC VALVE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BV	BALL VALVE
CO	CLEANOUT
COR	CORNER
DE	DRAINAGE EASEMENT
DI	DRAIN INLET
DW	DRIVEWAY
EL	ELEVATION
EP	EDGE OF PAVEMENT
FH	FIRE HYDRANT
FLG	FLANGE
GSP	GALVANIZED STEEL PIPE
LP	LOT PIN
MH	MANHOLE
MJ	MECHANICAL JOINT
NRS	NON–RISING STEM
P.E.	POLYETHYLENE
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE RELIEF VALVE
PS	PUMP STATION
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE PIPE
SL	SEWER LATERAL
SS	STAINLESS STEEL/SANITARY SEWER
SSE	SEWER SERVICE EASEMENT
WLE	WATER LINE EASEMENT
O.C.	ON CENTER
E.W.	EACH WAY
DIP	DUCTILE IRON PIPE
GV	GATE VALVE
BFV	BUTTERFLY VALVE
CV	CHECK VALVE
O.D.	OUTSIDE DIAMETER
I.D.	INSIDE DIAMETER
DIA./ø	DIAMETER
FCA	FLANGE COUPLING ADAPTER
CU	COPPER
ARV	AIR RELEASE VALVE
CAV	COMBINATION AIR VALVE
F.F	FINISHED FLOOR
T.O.W.	TOP OF WALL
B.O.F.	BOTTOM OF FOOTING

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

GENERAL NOTES
&
ABBREVIATIONS

CALAVERAS COUNTY WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754–3543 FAX: (209) 754–1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 2

PLAN

SCALE: 1" = 50' HORIZ.

PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY

ENGINEER: S. HUTCHINGS

CHECKED: -

DRAWN BY: B. LONG

STATION 0+00 - 16+00

CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT:

WEST POINT WATER SYSTEM
DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010

PROJECT NO: -

SCALE: AS NOTED

FILE NAME: -

SHEET NO. 3

PLAN

SCALE: 1" = 50' HORIZ.

PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY

ENGINEER: S. HUTCHINGS

CHECKED: -

DRAWN BY: B. LONG

STATION 16+00 - 32+00

CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010

PROJECT NO: -

SCALE: AS NOTED

FILE NAME: -

SHEET NO. 4

PLAN

SCALE: 1" = 50' HORIZ.

PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY

ENGINEER: S. HUTCHINGS

CHECKED: -

DRAWN BY: B. LONG

STATION 32+00 - 48+00

CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

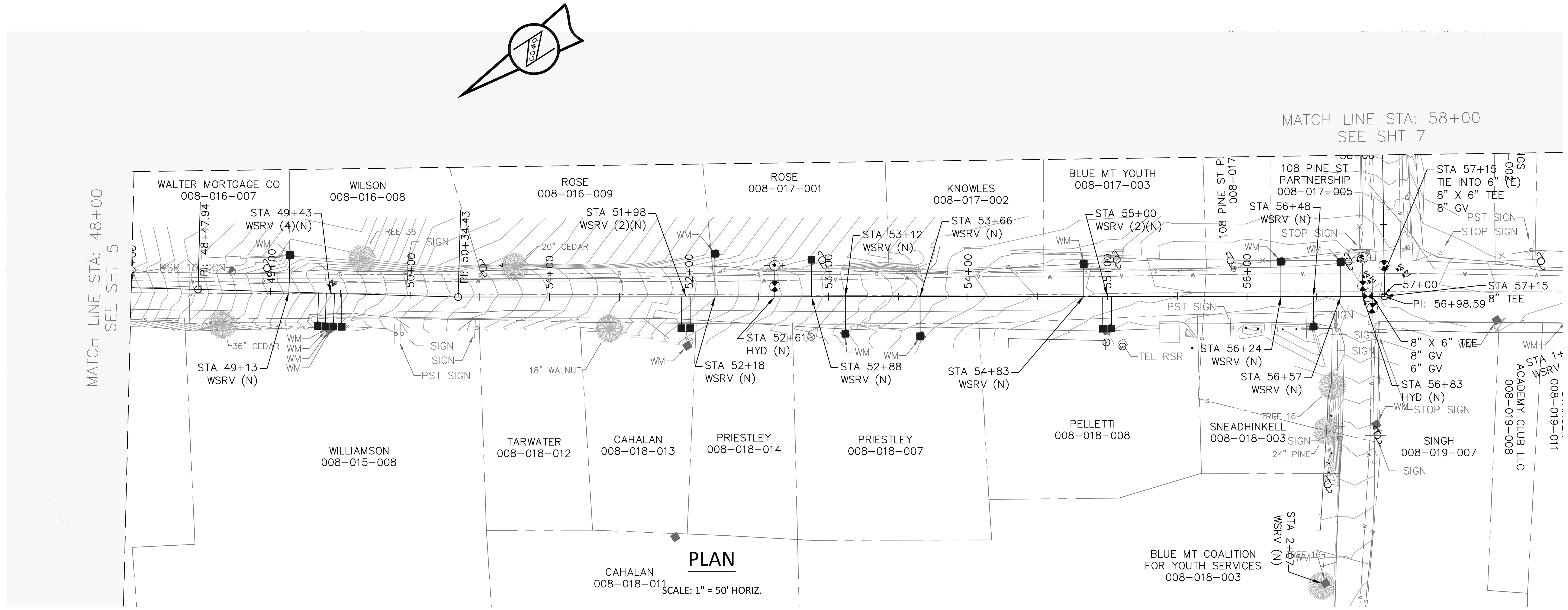
DATE: NOVEMBER 5, 2010

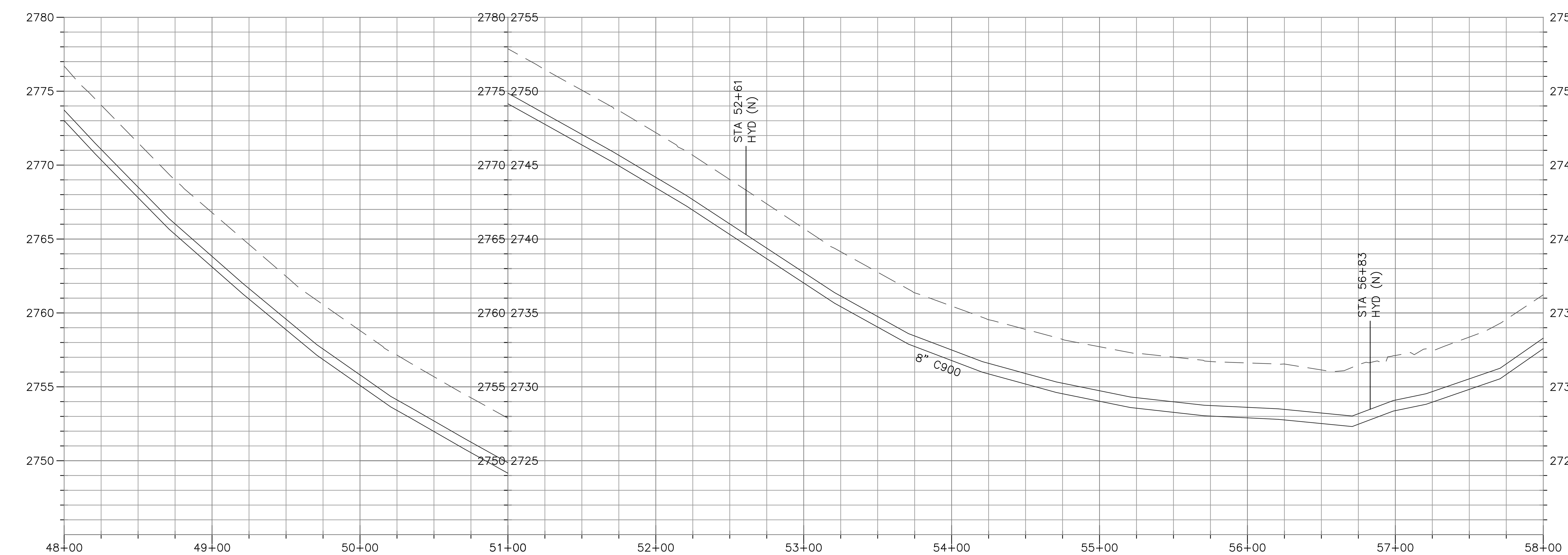
PROJECT NO: -

SCALE: AS NOTED

FILE NAME: -

SHEET NO. 5





PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

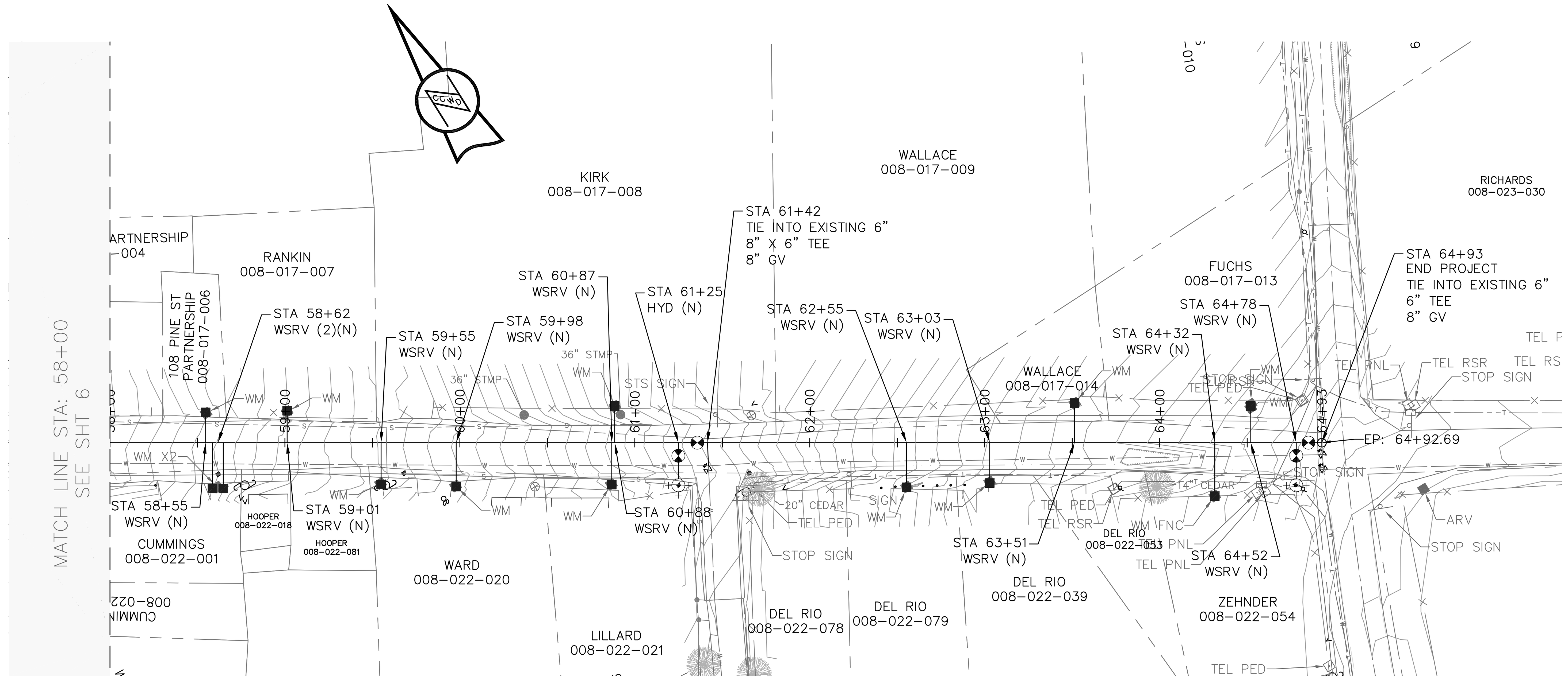
REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

STATION 48+00 - 58+00

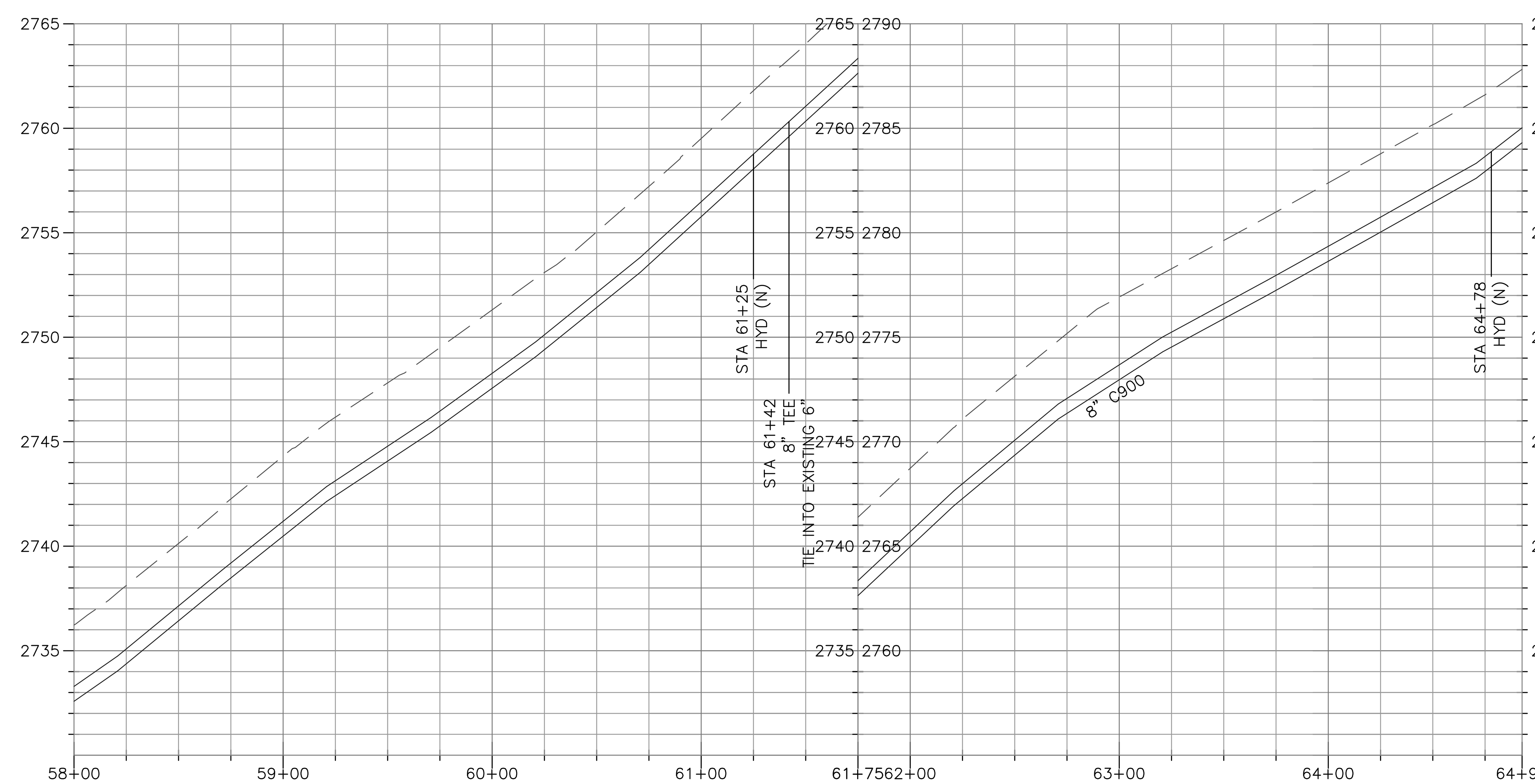
CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION
DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 6



PLAN

SCALE: 1" = 50' HORIZ.



PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

STATION 58+00 - 64+93 END

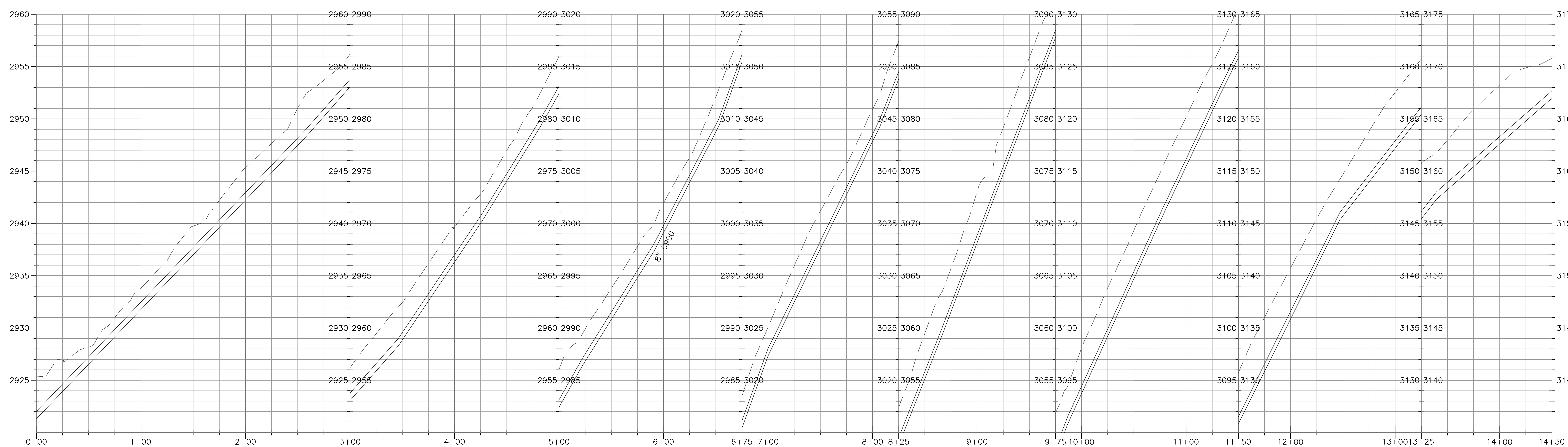
CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT:
WEST POINT WATER SYSTEM
DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 7

PLAN

SCALE: 1" = 50' HORIZ.



PROFILE

SCALE: 1" = 50' HORIZ.
SCALE: 1" = 25' VERT.

REV:	DESCRIPTION:	DATE:

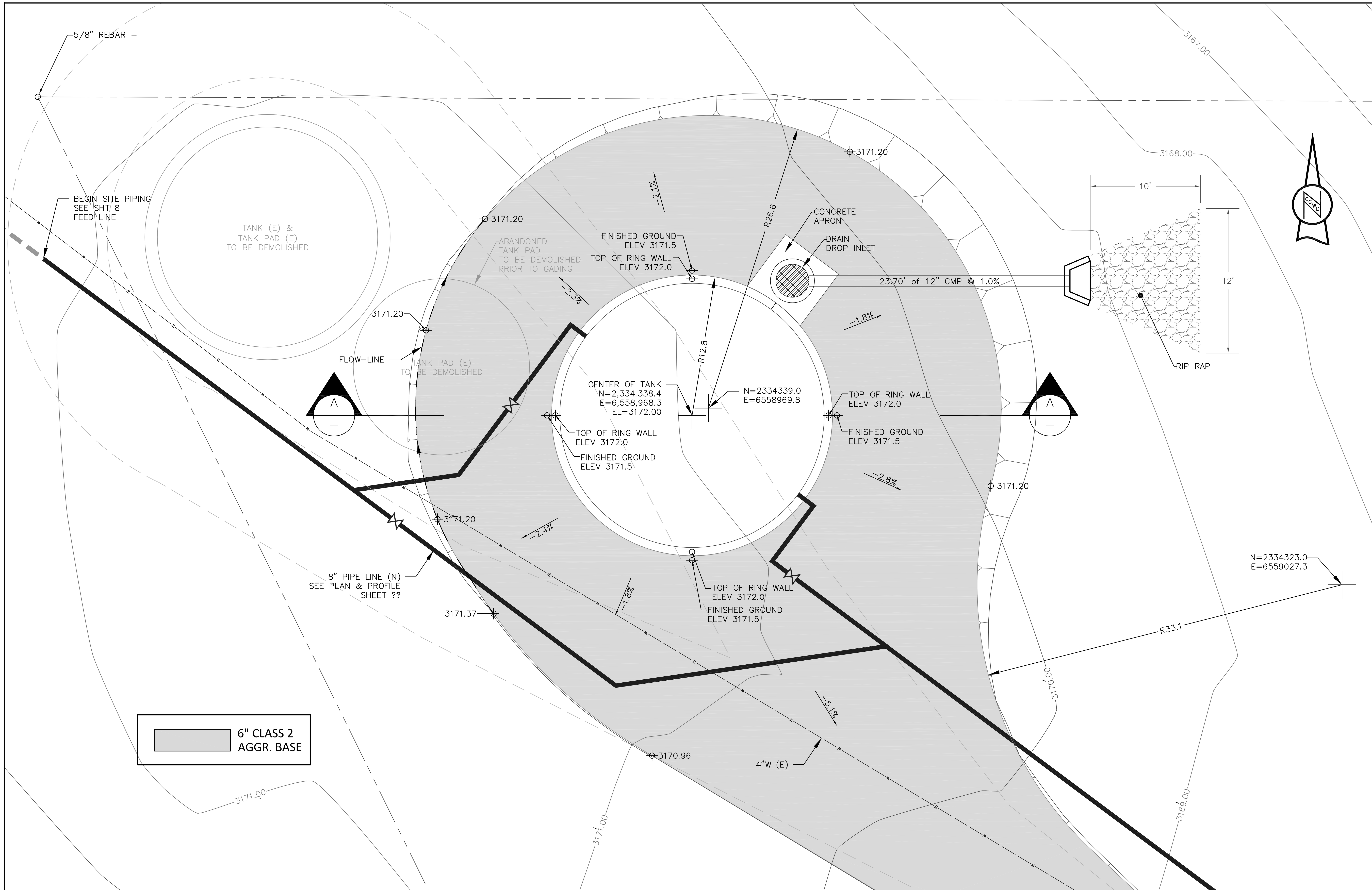
PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

BUMMERVILLE TANK FEED LINE

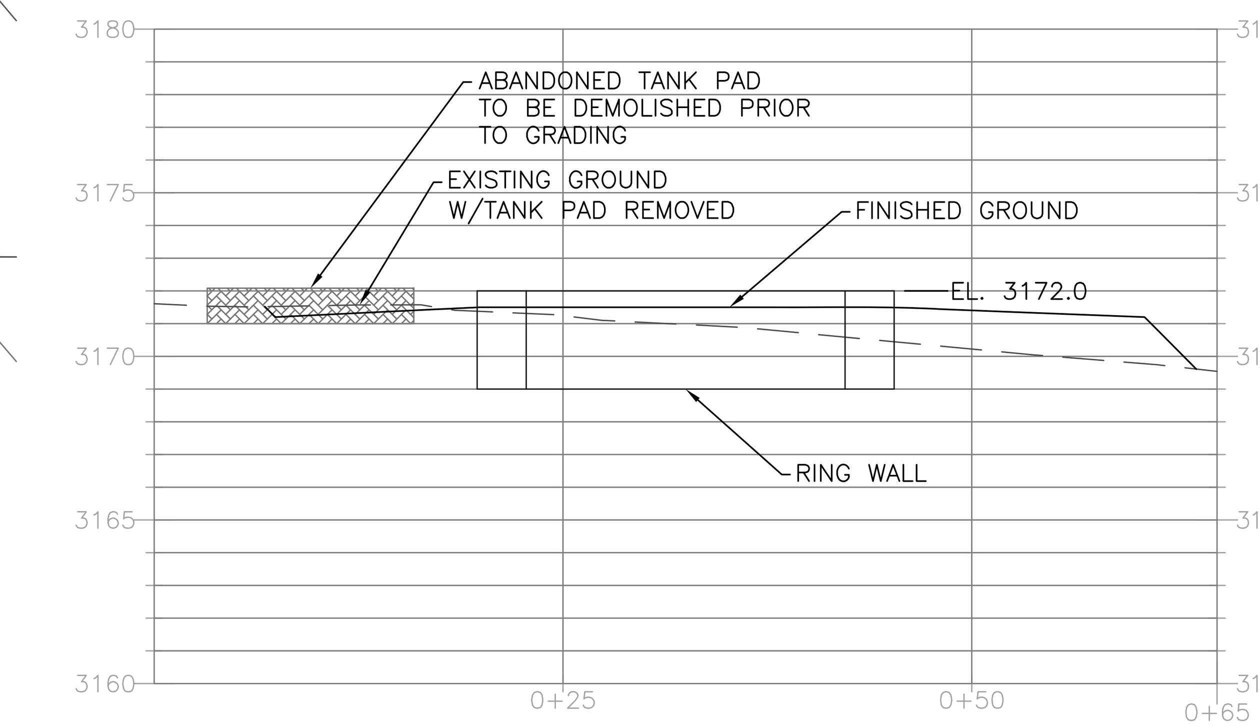
CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

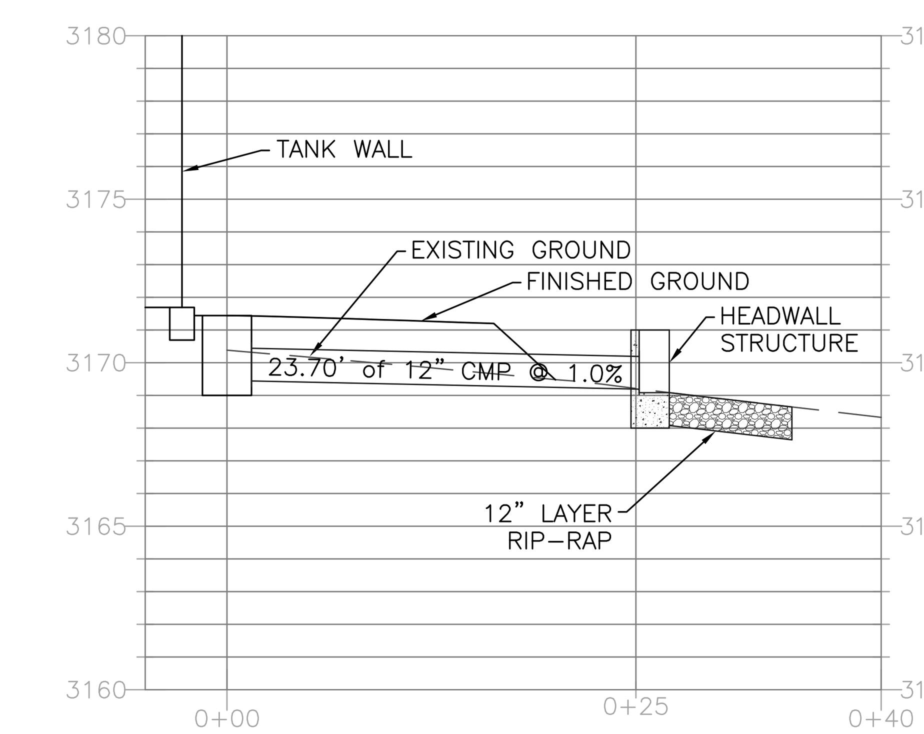
DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 8



PLAN VIEW
SCALE: 1" = 5'



SECTION A-A
HORZ. SCALE: 1" = 10'
VERT. SCALE: 1"= 5'



DRAIN LINE
HORZ. SCALE: 1" = 10'
VERT. SCALE: 1"= 5'

GENERAL NOTES:

1. CONTRACTOR SHALL DEMOLISH AND REMOVE EXISTING REDWOOD TANK AND EXISTING CONCRETE TANK PADS. CONTRACTOR SHALL MAINTAIN WATER SERVICE FROM EXISTING REDWOOD TANK UNTIL AFTER THE NEW TANK IS COMPLETED, TESTED, DISINFECTED AND READY FOR SERVICE.
2. CONTRACTOR SHALL PROVIDE TO FINISH ROAD SURFACE AROUND PERIMETER OF TANK (AS SHOWN) A 6-INCH LAYER OF CLASS 2 AGGR. BASE COMPACTED TO 95% RELATIVE COMPACTION PER ASTM METHOD D1557.
3. ROCK SLOPE PROTECTION (RIP RAP) SHALL BE NO.3 GRADING FOR METHOD 'B' PLACEMENT IN ACCORDANCE WITH SECTION 72 OF THE STATE STANDARD SPECIFICATIONS. AREAS TO HAVE RIP RAP SHALL BE EXCAVATED TO REQUIRED DEPTH AND LINED WITH FILTER FABRIC BEFORE PLACING RIP RAP.
4. EXCAVATION FOR TANK RINGWALL FOOTING SHALL BE FOUNDED ON A LEVEL, FIRM, STABLE SUBGRADE WITH UNIFORM PROPERTIES. EXCAVATION SHELL BE KEPT DRY, CLEAN, AND FREE OF ROOTS, DEBRIS, MUD AND OTHER UNSUITABLE CONDITIONS. THE SUBGRADE SHALL BE UNIFORM AROUND THE TANK PERIMETER AND HAVE A RELATIVE DENSITY OF 98% TO 100% PER ASTM D1557. TWO WEEKS IN ADVANCE THE CONTRACTOR SHELL SCHEDULE DATE AND TIME FOR GEOTECHNICAL ENGINEER (RETAINED BE DISTRICT) TO INSPECT THE FOUNDATION EXCAVATION. CONTRACTOR SHALL NOT CONTINUE WITH PLACEMENT OF REBAR, FORMWORK, OR CONCRETE UNTIL SUBGRADE CONDITION IS ACCEPTABLE TO DISTRICT.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

BUMMERVILLE TANK
SITE PLAN

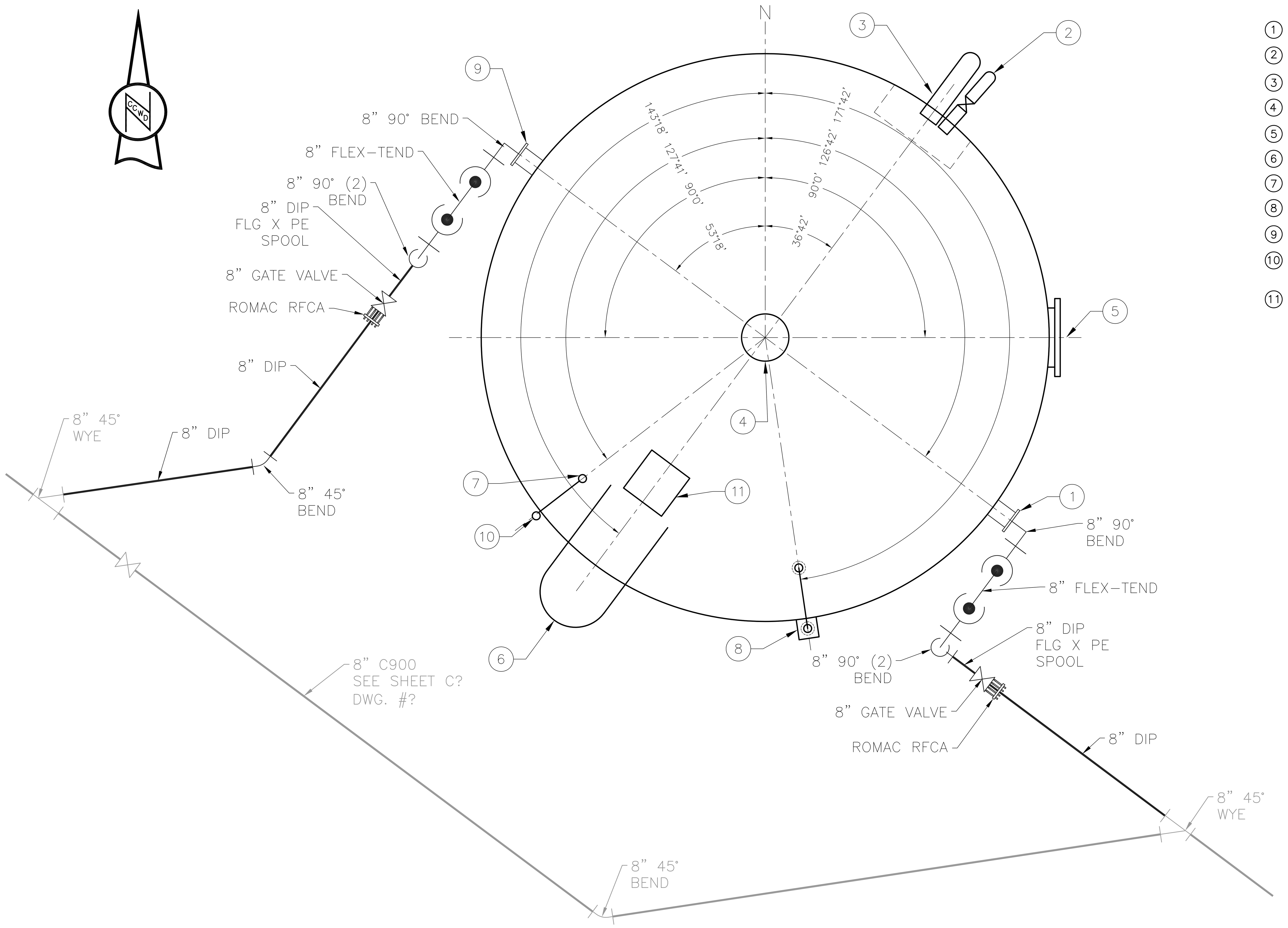
CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM
DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 9

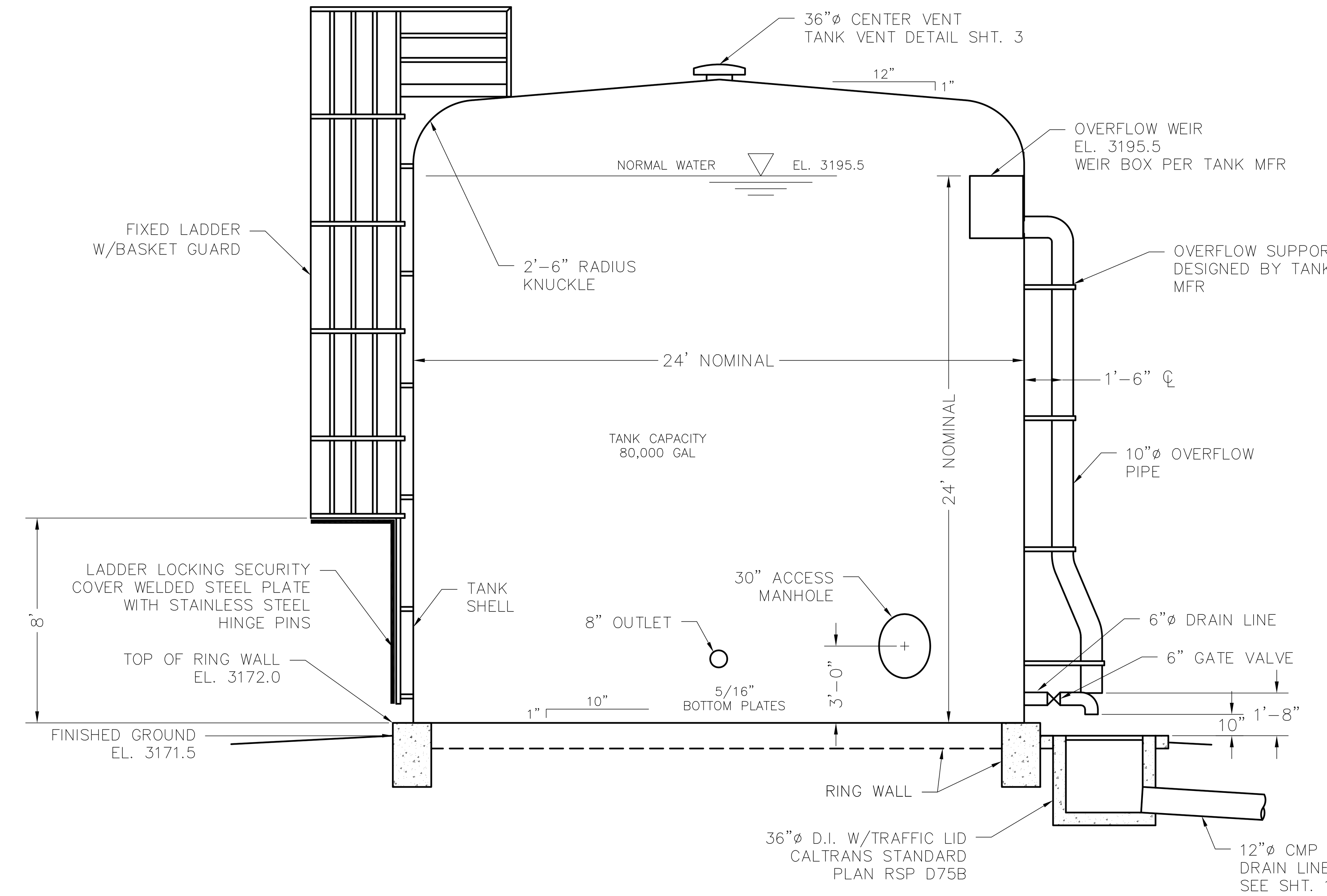
LIST OF TANK ACCESSORIES

1. 8" OUTLET
2. 6" DRAIN LINE W/GATE VALVE
3. 10" OVERFLOW
4. ROOF VENT
5. 30" ACCESS HATCH WITH DAVIT ARM COVER
6. LADDER AND HANDRAILING
7. JUNCTION BOX
8. LIQUID LEVEL INDICATOR
9. 8" INLET
10. 1" ELECTRICAL CONDUIT, TERMINATE AT JUNCTION BOX (BOTH ENDS)
11. ROOF HATCH



ORIENTATION PLAN

SCALE: 1" = 40'



ELEVATION VIEW

NTS

NOTES:

1. TANK, FOUNDATION AND ACCESSORIES SHALL BE DESIGNED, FABRICATED AND ERECTED IN ACCORDANCE WITH AWWA D100-05 SPECIFICATIONS AND THE FOLLOWING CRITERIA:

   A. GENERAL DESIGN
   - DIAMETER........24 FEET
   - SHELL HEIGHT........24 FEET
   - CAPACITY (NOMINAL)........80,000 GALLONS
   - CORROSION ALLOWANCE........1/16-INCH (IN CONTACT AND NOT IN CONTACT WITH WATER)
   - OVERFLOW RATE........2,000 GAL/MIN WATER FLOW
   - AIR VENTING RATE........2,000 GAL/MIN WATER FLOW
   - ROOF........KNUCKLE TYPE, SELF SUPPORTING OR WITH A CENTRAL COLUMN

   B. LOADS & SEISMIC PARAMETERS
   - SNOW LOAD........50 LBS/SF
   - SOIL BEARING CAPACITY........3,000-PSF
   - SEISMIC USE GROUP........III (I_E=1.5)
   - SITE CLASS........CLASS 'C'
   - SHORT PERIOD (0.2-SEC) RESPONSE ACCELERATION (Ss)........0.458 g
   - SHORT PERIOD SITE COEFFICIENT (Fa)........1.2
   - LONG PERIOD (1.0-SEC) RESPONSE ACCELERATION (S1)........0.191 g
   - LONG PERIOD SITE COEFFICIENT (Fv)........1.6

2. CONCRETE SHALL CONFORM TO SECTION 90 OF STATE STANDARD SPECIFICATION AS FOLLOWS:

   A. MIX DESIGN
   - CALTRANS DESIGNATION........CLASS 2
   - CEMENT CONTENT........MINIMUM 590#/CY TYPE-II PORTLAND CEMENT
   - POZZOLANIC FLY ASH........SUBSTITUTE MAXIMUM 15% BY WEIGHT OF CEMENT CONTENT
   - AGGREGATE GRADING........1" MAX COMBINED AGGREGATE (AS TABULATED IN STANDARD)
   - WATER/CEMENT RATIO........MAXIMUM 0.5
   - SLUMP........2" MIN TO 4" MAX
   - ENTRAINED AIR........4% ± 1%
   - COMPRESSIVE STRENGTH........3,700-PSI @ 28-DAYS

   B. PLACEMENT
   DELIVER AND PLACE READY-MIX WITHIN 90-MINUTES AND BEFORE 300-REVOLUTIONS AFTER FIRST ADDING WATER TO MIX; CONSOLIDATE USING A MECHANICAL VIBRATOR.

   C. REINFORCING STEEL
   REBAR SHALL BE ASTM A615, GRADE 60.

3. TANK SHELL PIPING CONNECTIONS SHALL BE FABRICATED WITH STANDARD WEIGHT (SCHEDULE 40) STEEL PIPE WITH ANSI 150# FLANGES OR AWWA C207, CLASS D FLANGES.

4. CONTRACTOR PREPARE STEEL SURFACES AND PAINT TANK ACCORDING TO AWWA D102-06; INTERIOR AND EXTERIOR PAINT COLORS SHALL BE SELECTED AND APPROVED BY CCWD; THE FOLLOWING COATING SYSTEMS OR APPROVED EQUAL SHALL BE USED:

   A. INSIDE COATING SYSTEM (13-MILS DFT TOTAL)
   - SURFACE PREPARATION........SSPC-SP10/NACE 2 NEAR-WHITE BLAST CLEANING
   - PRIMER........3.0 MILS DFT, TNEMEC 91-H2O OR 94-H2O HYDRO-ZINC
   - INTERMEDIATE........5.0-MILS DFT, TNEMEC N140 POTA-POX PLUS
   - FINISH........5.0-MILS DFT, TNEMEC N140 POTA-POX PLUS

   B. OUTSIDE COATING SYSTEM (10-MILS DFT TOTAL)
   - SURFACE PREPARATION........SSPC-SP-6/NACE 3 COMMERCIAL BLAST CLEANING
   - PRIMER........3.0 MILS DFT, TNEMEC 91-H2O OR 94-H2O HYDRO-ZINC
   - INTERMEDIATE........4.0-MILS DFT, TNEMEC N140 POTA-POX PLUS
   - FINISH........3.0-MILS DFT, TNEMEC 1075 ENDURA-SHIELD II

REV:	DESCRIPTION:	DATE:

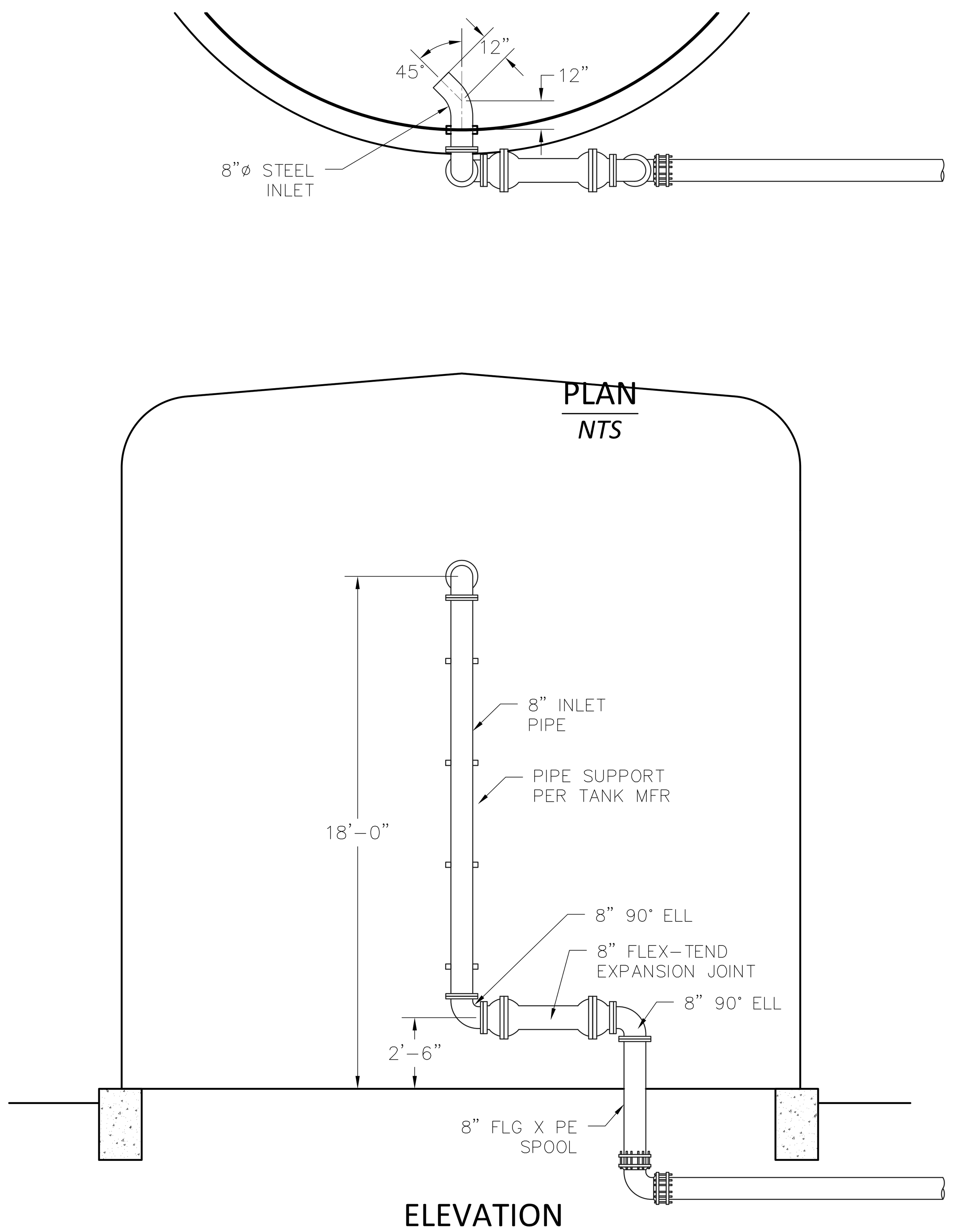
PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

BUMMERVILLE TANK PLAN AND ELEVATION

CALAVERAS COUNTY WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

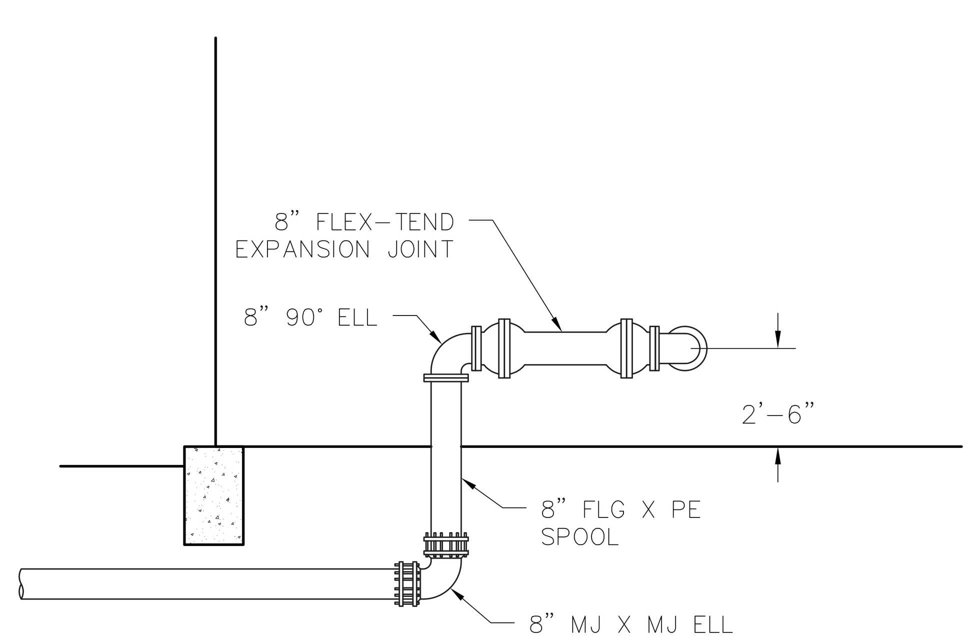
PROJECT: WEST POINT WATER SYSTEM DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010	PROJECT NO: -	SHEET NO. 10
SCALE: AS NOTED	FILE NAME: -	



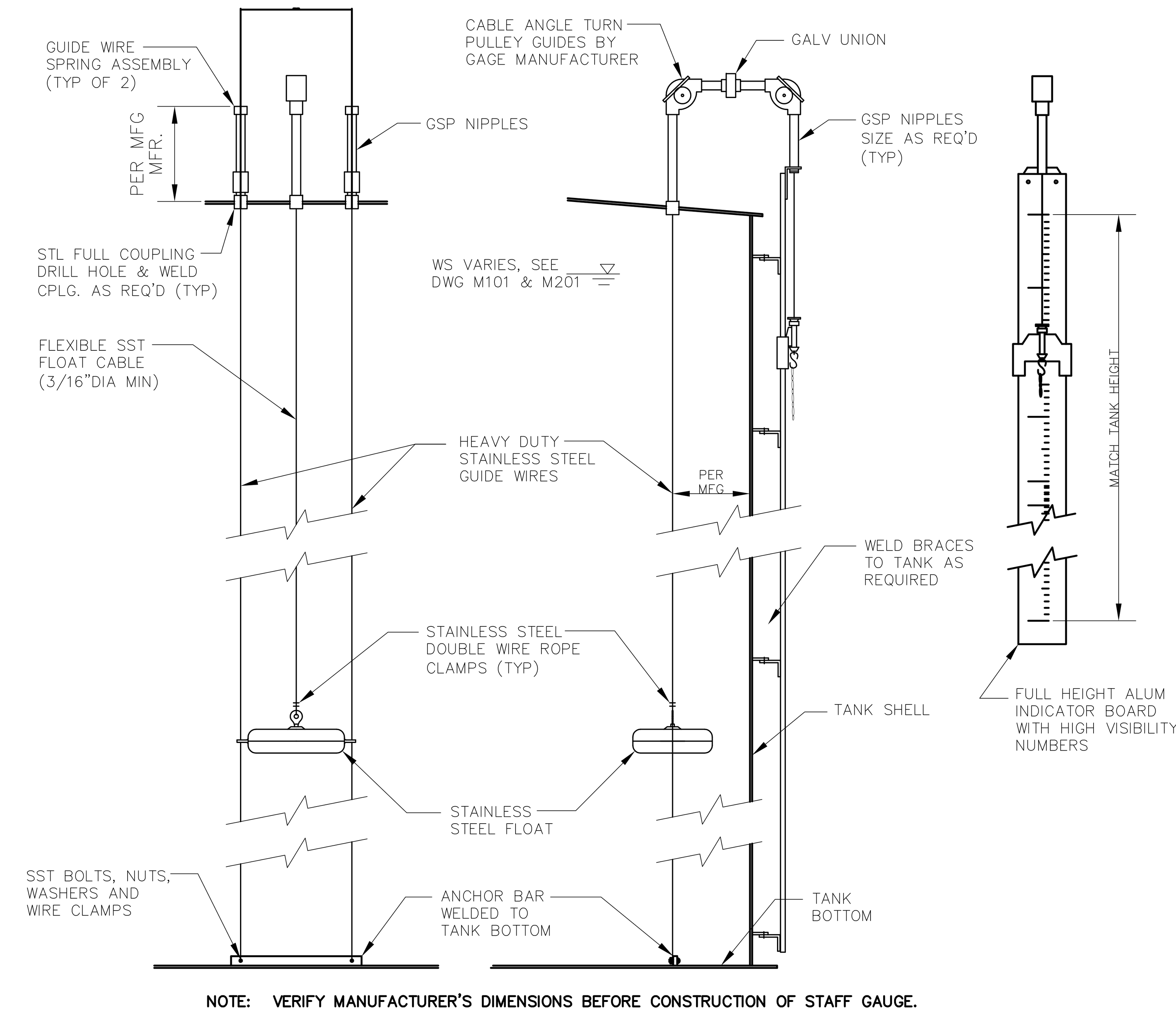
TANK INLET DETAIL

NTS



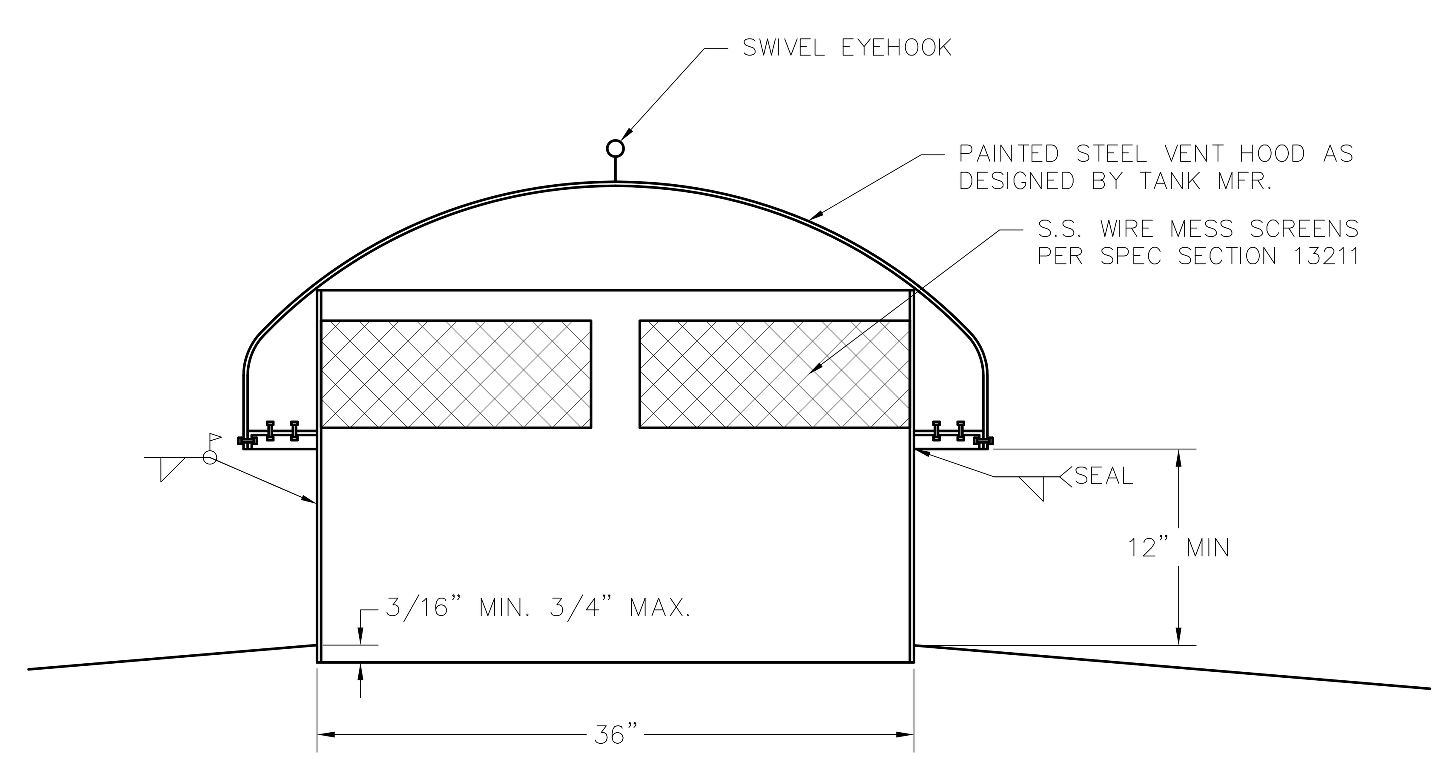
TANK OUTLET DETAIL

NTS



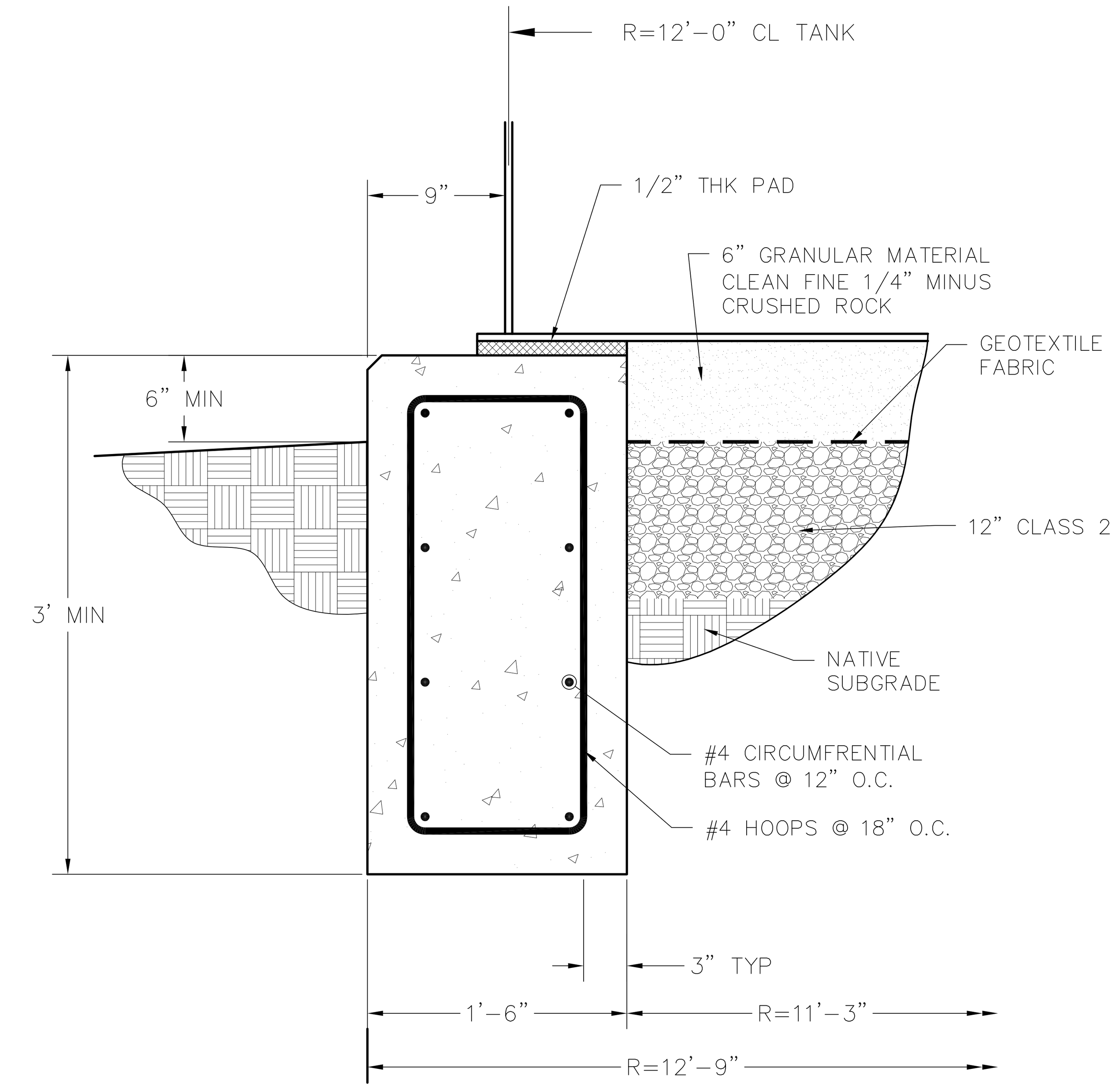
LIQUID LEVEL INDICATOR

SCALE: NTS



ROOF VENT DETAIL

SCALE: 1" = 10"



RING WALL DETAIL

SCALE: 1" = 10"

RING WALL NOTES:

1. ALL IMPORTED BACKFILL AND NATIVE SUBGRADE MATERIALS SHALL BE LEVELED AND UNIFORMLY COMPACTED TO A RELATIVE DENSITY OF 98% TO 100% PER ASTM D1557.
2. MIRAFI 'N' OR 'S' SERIES GOETEXTILE FABRIC SHALL BE PLACED BELOW FINE GRAVEL CUSHION AND SHALL EXTEND OVER ENTIRE PAD AREA WITHIN RINGWALL.

REV:	DESCRIPTION:	DATE:

PROJECT MANAGER: B. PERLEY
ENGINEER: S. HUTCHINGS
CHECKED: -
DRAWN BY: B. LONG

BUMMERVILLE TANK
PLAN AND ELEVATIONS

CALAVERAS COUNTY
WATER DISTRICT
423 EAST SAINT CHARLES STREET
P.O. BOX 846
SAN ANDREAS, CA 95249
PHONE: (209) 754-3543 FAX: (209) 754-1069

PROJECT: WEST POINT WATER SYSTEM
DISTRIBUTION SYSTEM REHABILITATION

DATE: NOVEMBER 5, 2010
PROJECT NO: -
SCALE: AS NOTED
FILE NAME: -
SHEET NO. 11

Letter from Domenichelli and Associates, Inc. documenting West Point Water Distribution System Project Readiness (October 2006)

DOMENICHELLI AND ASSOCIATES, INC.
CIVIL ENGINEERING

October 17, 2006

Ed Pattison
Calaveras County Water District
Post Office Box 846
San Andreas, CA 95249

Subject: West Point Water Distribution System Project Readiness

Dear Mr. Pattison,

This letter is to address the issue of project readiness for the West Point Water Distribution System Improvement project. The project includes replacing an existing undersized and dilapidated pipeline running from the treatment plant to the West Point Distribution system. Replacement and upsizing of this pipeline will greatly increase the capacity of the system to supply fire flows. This pipeline is a vital component of the system and an important first step to fixing the problems with the West Point water distribution system. In order to prepare for the project Calaveras County Water District (CCWD) has developed the following engineering and environmental documents.

1. **Preliminary Engineering Report (PER).** A PER has been prepared for the West Point Water Distribution System Improvement project. This report includes water distribution system modeling to determine which pipes need to be replaced to meet fire flow requirements and to determine new pipe sizes. The report includes a description of existing facilities, an evaluation of project alternatives, a description of the proposed project, an engineer's estimate of probable costs, and a capital recovery analysis.

2. **Environmental Checklist.** As part of the PER an environmental checklist was developed. The checklist summarizes the findings of impacts in the initial research and site reconnaissance work. This checklist is similar to the checklist required in the CEQA process under initial studies.

3. **Preliminary project plans and specifications.** Preliminary project plans include alignments of the proposed pipelines and standard details. Preliminary specifications for the project were also compiled.

Development of the above engineering and environmental documents demonstrate CCWD's readiness to proceed with the West Point Water Distribution System Improvement project. Provided as attachments to this letter are a preliminary cost estimate developed for the PER, a timeline for completion of the project and a list of eligible bidders for construction.

If you have any questions regarding the information provided please feel free to give me a call at (916) 933-1997.

Sincerely,

Joseph Domenichelli, P.E.
President
Domenichelli and Associates, Inc.

ATTACHMENT A – COST ESTIMATE FOR DOWNTOWN WEST POINT DISTRIBUTION SYSTEM IMPROVEMENTS

Overall Cost Estimate for Pipeline Replacement from Treatment Plant to the West Point Distribution System

Element Description	Estimated Quantity	Units	Unit Price (installed)	Estimated Amount
Materials/Installation				
Pipeline				
12-inch Pipe	3,800	LF	$100	$380,000
Valves, Installed				
Along the 12-inch Pipe	13	EA	$1,800	$23,400
Pavement Replacement				
Along the 12-inch Pipe	3,800	LF	$12.50	$47,500
Service Connections	30	EA	$1,100	$33,000
	Materials/Installation subtotal =			$483,900
Planning/Design/Engineering	1	LS		$50,000
Environmental Documentation	1	LS		$50,000
Fees	1	LS		$5,593
Local Government Approvals	1	LS		$1,460
Other: Admin/Legal	1	LS		$12,892
			SUBTOTAL =	$119,945
			TOTAL ESTIMATED COST =	**$603,845**

DOMENICHELLI AND ASSOCIATES, INC.
CIVIL ENGINEERING

ATTACHMENT B – COMPLETION SCHEDULE FOR DOWNTOWN WEST POINT DISTRIBUTION SYSTEM IMPROVEMENTS

Phase 1 Improvements	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14
Final engineering plans and specifications														
Permitting/Environmental documentation														
Bidding process														
Construction														

NOTE: This project schedule is relative starting from the time project funding is secured. Project completion is estimate to take 14-months from the time project funding is secured to the end of construction.

1107 Investment Boulevard, Suite 145 El Dorado Hills, CA 95762 [916] 933-1997 [916] 933-4778 Fax

ATTACHMENT C – LIST OF ELIGIBLE BIDDERS FOR CONSTRUCTION

The following list of contractors are eligible to bid on construction of the downtown West Point distribution system improvements project.

1. Syblon Reid – Folsom, CA
2. Mozingo Construction, Inc., Sonora, CA
3. Pfister Excavating, Inc., Vallejo, CA
4. T & S Construction Co, Inc., Sacramento, CA
5. Ford Construction Co., Inc., Murphys/Lodi, CA
6. K. J. Woods Construction, Inc., San Francisco, CA
7. Floyd Johnston Construction Co., Inc., Clovis, CA
8. Twain Harte Construction Co., Twain Harte, CA
9. Ranger Pipelines, Inc., San Francisco, CA
10. RCS Associates, San Leandro, CA
11. JMB Construction, Inc., San Francisco, CA
12. California Trenchless, Inc., Hayward, CA

Letter from U.S. Department of Agriculture to Calaveras County Water District summarizing USDA Rural Development Funding Award (December, 2010) cc: Joone

USDA Rural Development

Committed to the future of rural communities.

United States Department of Agriculture
Rural Development
California
www.rurdev.usda.gov/ca

December 17, 2010

Mr. Ed Pattison
Calaveras County Water District
423 East Charles Street
San Andreas, CA 95249-9002

Dear Mr. Pattison:

The USDA Rural Development has committed $3.29 million loan and $1million in grant funds for water system improvements in West Point.

Due to the low income in the area, we would be willing to reduce our loan amount by any grant funds you receive.

We look forward to working with you in the future.

Sincerely,

Lantenna Hungate
for JANICE L. WADDELL
Community Programs Director

430 G Street • Agency 4169 • Davis, CA 95616
Phone: (530) 792-5800 • Fax: (530) 792-5837 • TDD: (530) 792-5848

Committed to the future of rural communities

Resolution 2008-24, executed by Calaveras County Water District Board of Directors authorizing General Manager to execute and implement funding agreement with USDA (Calaveras County Water District, March 2008)

RESOLUTION NO. 2008 – 24

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CALAVERAS COUNTY WATER DISTRICT AUTHORIZING THE GENERAL MANAGER TO BE SIGNATORY TO A UNITED STATES DEPARTMENT OF AGRICULTURE – RURAL DEVELOPMENT LOAN AGREEMENT AND TO CARRY OUT LOAN REQUIREMENTS AS OUTLINED IN THE ATTACHED LETTER OF CONDITIONS

WHEREAS, the Calaveras County Water District staff submitted a grant/loan application to the United States Department of Agriculture – Rural Development to fund water distribution system improvements in West Point; and

WHEREAS, a 2004 engineering analysis shows the water distribution system contains serious deficiencies and does not meet California Fire Code standards for fire flow; and

WHEREAS, water distribution system improvements will improve fire fighting capability and the Health and Safety of the entire community, as well as conservation of water and a cost reduction to the District for treatment and delivery of water to the community.

NOW, THEREFORE, BE IT RESOLVED the Board of Directors of CALAVERAS COUNTY WATER DISTRICT authorizes signatory authority to the General Manager, or his designee, to execute documents to enter into a United States Department of Agriculture – Rural Development loan agreement and to carry out loan requirements as outlined in the attached letter of conditions.

BE IT FURTHER RESOLVED the Board of Directors of CALAVERAS COUNTY WATER DISTRICT does hereby approve the Loan Resolution (RUS Bulletin 1780-27) attached hereto and made a part hereof.

PASSED AND ADOPTED this 12th day of March 2008 by the following vote:

AYES: Directors Rich, Underhill, McCartney, and Dean
NOES: None
ABSTAIN: None
ABSENT: Director Davidson

CALAVERAS COUNTY WATER DISTRICT

Robert T. Dean
President of the Board of Directors

ATTEST:

Mona Walker
Clerk to the Board

Letter from Domenichelli and Associates, Inc. documenting West Point/Bummerville/Wilseyville Water Distribution System Code Deficiencies (July 2005)

DOMENICHELLI & ASSOCIATES
CIVIL ENGINEERING

July 27, 2005

Ed Pattison
Calaveras County Water District
Post Office Box 846
San Andreas, CA 95249

Subject: West Point/Bummerville/Wilseyville Water Distribution System Code Deficiencies

Dear Mr. Pattison,

The West Point/Bummerville/Wilseyville communities, including a Native American Reservation are quite rural and located in heavily wooded areas subject to high fire danger potential. Based on system modeling for the subject water distribution system, significant deficiencies were identified relative to system pressure requirements and delivery of adequate fire protection flows.

Per the California Fire Code, Division III fire protection flows, and the type and sizes of existing structures within the study area, major deficiencies in residual pressures were found for both commercial and residential users. At several hydrant locations, providing the recommended fire flow of 1000gpm actually resulted in negative system pressures. Some locations could not even deliver 50gpm while maintaining standard residual pressure (20psi). Most of the problems are due to inadequate pipe sizes throughout the system, with under capacity pumping facilities adding to the problems. In addition to the pressure concerns, hydrant spacing is also an issue for much of the developed areas. These conditions are not in compliance with the State Fire Code regulations.

Other obvious deficiencies relate to undersized minor lateral lines. As shown on Figure 1 of the April *West Point Water System Master Plan*, there exists several 1 and 2-inch lateral pipelines which serve multiple residences. During maximum demand periods, pressures near the end of these laterals drop well below acceptable levels, resulting in actual loss of useable water supply and frequent complaints to the District.

The West Point/Bummerville/Wilseyville area has very low protection from fire danger and many substandard pipelines for typical water supply services. These water distribution system deficiencies pose a very real danger to property and health of the people living within these communities. We recommend that these problems be addressed as soon as possible.

Please give me a call if you have any questions.

Sincerely,

Joe Domenichelli, PE
Owner
Domenichelli & Associates

1107 Investment Boulevard, Suite 145 El Dorado Hills, CA 95762 [916] 933-1997 [916] 933-4778 Fax

Letter from Senator Feinstein and Congressman Lungren supporting CCWD's application for financial assistance under the USDA Rural Development Funding Program (May 2005)

Congress of the United States
Washington, DC 20515

May 4, 2005

The Honorable Michael Johanns
Secretary of Agriculture
1400 Independence Ave., SW
Washington, DC 20250

Dear Secretary Johanns:

We write to express our support for the Calaveras County Water District's application for financial assistance through the Department's Rural Utilities Service. As you know, both the House and Senate Appropriations Committee Reports on the FY 2005 Agriculture Appropriations bill express support for the District's request for financial assistance.

The small rural communities that make up the District's West Point Service Area – West Point, Wilseyville, and Bummerville – are faced with unaffordable water system replacement costs for aging supply and distribution systems. This infrastructure is critical to health, safety, and existence of these communities, and also serves a local Native American Reservation. Funding for these improvements is needed to assist in the upgrade, reconstruction, and repair of water system infrastructure critical for basic water pressure and fire flow in the low income area. It also will fund the replacement of dilapidated water storage tanks, which compromise the water supply for these residents.

In light of the critical needs facing the Calaveras County Water District, and Congress' stated priority for this project, we request that the Department give favorable consideration to the District's request for assistance and fund its grant/loan application for water supply for the West Point Service Area.

Sincerely,

Dianne Feinstein
United States Senator

Daniel E. Lungren
Member of Congress

cc: Janice Waddell; Community Programs Director; Davis, CA

Preliminary Engineering Report (Calaveras County Water District, May 2005)

Project Planning Area

Location

Calaveras County is located on the eastside of the Central Valley of California and encompasses approximately 1,028 square miles of land, stretching across more than 50 miles of valleys, foothills, and mountain peaks. The topography ranges from approximately 200 feet above mean sea level (ft-msl) in the northwestern region of the County, to a peak height of 8,170 ft-msl near Alpine County. See attached topographic map showing the project area.

The communities of West Point, Wilseyville and Bummerville are located in the northeastern portion of the county in the sparsely populated higher foothills. The topography ranges from approximately 2,500 feet in Wilseyville to 3,200 feet in Bummerville. Mild summers and cold winters characterize the region, with temperatures ranging from the low 20's to the middle 80's. Snow accounts for a large percentage of the precipitation in the watersheds supplying the study area.

In the fall of 1946 Calaveras County Water District (CCWD) was organized under the laws of the State of California as a public agency for the purpose of developing and administering the water resources in Calaveras County. CCWD filed for the development of the water resources within Calaveras County on March 24, 1947. This filing was for the use of the Middle and South Forks of the Mokelumne River, the Calaveras River, and the North Fork of the Stanislaus River. The filing initiated the preserving of the water rights and resources of Calaveras County being a "County of Origin". Calaveras County, being a "County of Origin" with respect to water rights in California, enjoys certain protections regarding the use of water originating in the County. Calaveras County Water District (CCWD) owns and operates the domestic water system in West Point, Wilseyville, Bummerville and part of Sandy Gulch.

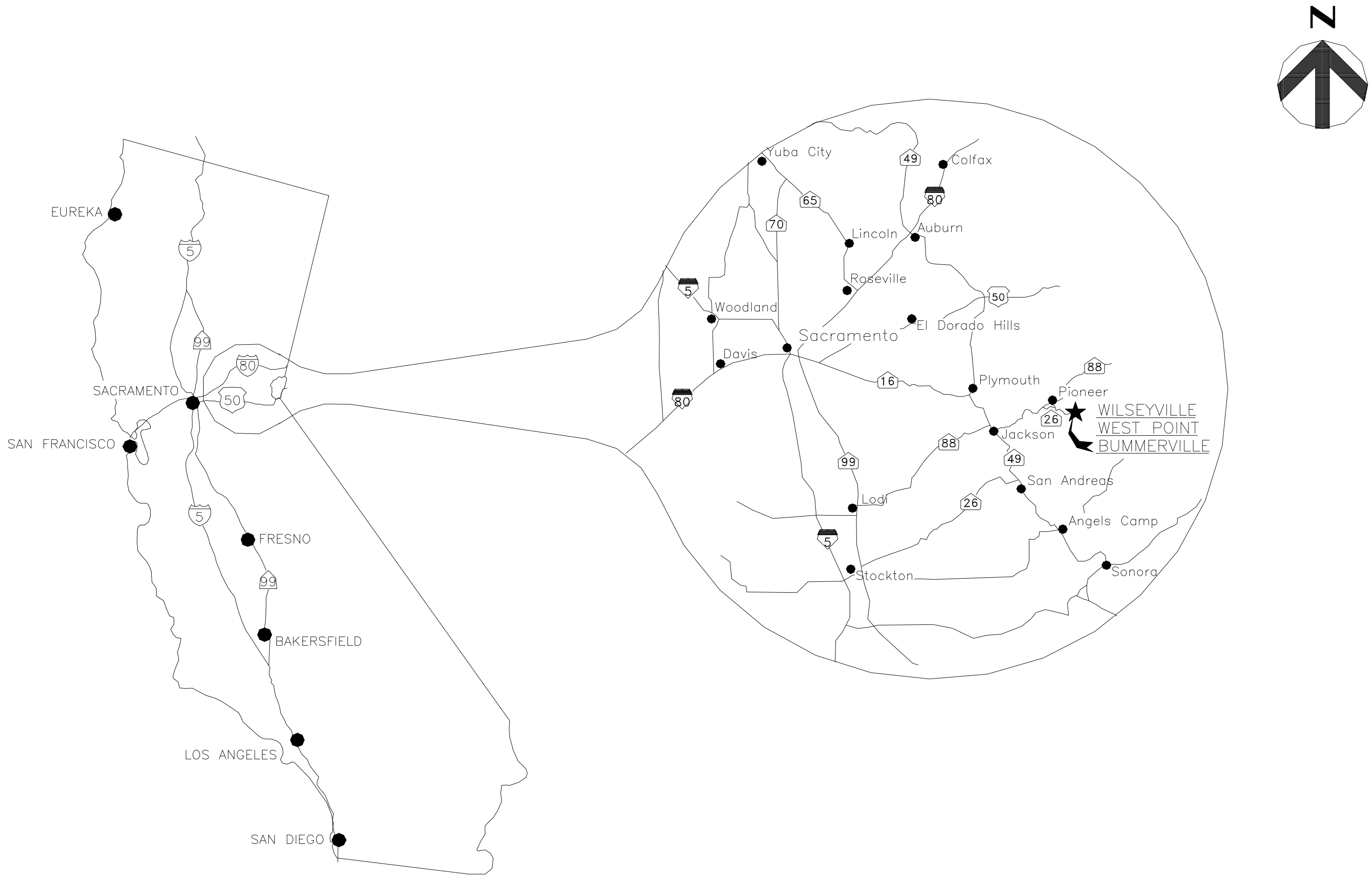


Figure 1. Overall location map

Environmental Resources Present

Background and Findings

The environmental review and environmental checklist contained in this section correspond with the general guidance found in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (Guidelines). Several resources were consulted to obtain information to complete the evaluation and checklist, among them the General Plan for Calaveras County, environmental documentation for the West Point Water Treatment Plant improvement project and public databases (a complete list of references is located at the end of this report).

Generally speaking, the maintenance and repair projects proposed in this Feasibility Report would have no impact, or a less than significant impact on most of the topical areas included in the environmental checklist. In some cases, mitigation would be required to reduce potential impacts to less than significant levels. Overall, the project is expected to have beneficial impacts to the rural communities that have inadequate water storage, delivery systems, and fire fighting capabilities. The two topical areas from the checklist that could potentially have the greatest environmental impacts are the areas of biological and cultural resources. The impacts and recommendations for mitigating those impacts are described below.

Biological Resources

The vegetation in the project study area consists mainly of Sierran Mixed Conifer Forest as described by Holland (1986). The Sierran Mixed Conifer Forest occurs from the west side of the Sierra Nevada to the east side further north. This community ranges in elevation from approximately 3000 – 6000 ft in the northern part of the range, and from 5000 – 7000 ft in the southern part of the range. The dominant species is ponderosa pine (*Pinus ponderosa*), with Douglas fir (*Pseudotsuga menziesii*) and black oak (*Quercus kellogii*) of almost equal importance. The understory is dominated by mountain misery (*Chamaebatia foliolosa*) and Ceanothus spp.

The California Natural Diversity Data Base (CNDDB) was consulted for known occurrences of any Special Status Species or habitats, and two field surveys were conducted for biological resources, paying special attention to habitat for Special Status Species. Special Status Species are defined as those species that are listed by the Federal government as threatened or endangered under the Federal Endangered Species Act (FESA), or by the State of California as rare, threatened or endangered under the California Endangered Species Act (CESA), or by either the federal or state government(s) as a Species of Special Concern, or a plant species included on the California Native Plant Society (CNPS) 1B list. No records of any Special Status Species were found for the project area, although nesting habitat for both the Northern Goshawk and Sharp-shinned Hawk were indicated for the Devils Nose quadrangle in Calaveras County. No Special Status Species (plant or animal) were found during the field surveys, and it was determined that the project area was unlikely to harbor nesting habitat for these two bird species. The portion of the proposed project that would have the greatest effect on biological resources is the replacement of the pipeline from Bear Creek to the Regulating Reservoir, which was constructed in 2004/2005. The pipe replacement follows the same disturbed alignment as the existing pipeline, and the majority of the trees (Douglas Fir and Ponderosa Pine) growing along the pipeline route are under 6" diameter (indicating that they have grown since the pipeline was installed), it was determined that the project would not affect nesting habitat for either bird species. However, it was recommended that any tree removal be conducted outside of the nesting season, in order to eliminate any potential impacts to nesting birds.

Potential habitat does exist in Bear Creek and the Middle Fork of the Mokelumne River for the Foothill Yellow-legged Frog (*Rana boylii*), a Federal Species of Concern and a State Species of Special Concern. In order to eliminate potential impacts to the foothill yellow-legged frog, it is recommended that surveys for the frog be conducted by a qualified biologist prior to any construction activities along Bear Creek and the Middle Fork of the Mokelumne River, and that exclusion fencing be installed around the project area near those streams to keep any frogs out of the construction zone. It is also recommended that a biologist familiar with this species be onsite while exclusion fencing is installed.

The biological surveys were conducted in July, after the blooming period for two rare plant species, Stebbin's lomatium (*Lomatium stebbinsii*) and pansy monkeyflower (*Mimulus pulchellus*), which have been documented in the Devils Nose or West Point USGS quadrangles. Stebbin's lomatium is listed on the CNPS 1B list, and is also a Federal Species of Concern. Pansy monkeyflower is listed on the CNPS 1B list, and as such, is considered to be a Special Status Species and subject to consideration under the California Environmental Act (CEQA). It is therefore recommended that focused surveys for these two species be conducted in the project area during their blooming periods (March-May for the Stebbin's lomatium and May-July for the pansy monkeyflower) prior to any construction activities.

Cultural Resources

A review of the available information on Cultural Resources was conducted for the proposed project. The proposed project has a moderate to high potential for prehistoric and/or historic resources. It is recommended that further study be undertaken at specific project sites prior to construction of the project. It is also recommended that a qualified archeologist be consulted regarding Best Management Practices to be followed during the construction phase of the project. These measures will be matured with additional language and incorporated into each repair project's specifications as they are developed. A work plan and cost estimate will be prepared for such mitigation as the situation warrants.

Environmental Checklist

The following environmental checklist required by the grant application process summarizes the findings of impacts in the initial research and site reconnaissance work. This checklist is similar to the checklist required in the CEQA process under initial studies.

ENVIRONMENTAL IMPACT CHECKLIST:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
I. LAND USE AND PLANNING. *Would the proposal*:				
a) conflict with general plan designation or zoning? (Ia)	☐	☐	☐	☒
b) conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project? (II)	☐	☐	☐	☒
c) be incompatible with existing land use in the vicinity? (Ia)	☐	☐	☐	☒
d) affect agricultural resources or operations (e.g., impacts to soils or farmlands, or impacts from incompatible land uses)? (Ia, II)	☐	☐	☐	☒
e) disrupt or divide the physical arrangement of an established community (including a low-income or minority community)? (Ia, II)	☐	☐	☐	☒
II. POPULATION AND HOUSING. *Would the proposal:*				
a) cumulatively exceed official regional or local population projections? (II)	☐	☐	☐	☒
b) induce substantial growth in an area either directly or indirectly (e.g., through projects in an undeveloped area or extension of major infra-structure)? (II)	☐	☐	☒	☐
c) displace existing housing, especially affordable housing? (Ia, II)	☐	☐	☐	☒
III. GEOLOGIC PROBLEMS. *Would the proposal result in or expose people to potential impacts involving:*				
a) fault rupture? (Ig, j)	☐	☐	☐	☒
b) seismic ground shaking? (Ig)	☐	☐	☐	☒
c) seismic ground failure, including liquefaction? (Ig)	☐	☐	☐	☒
d) seiche, tsunami, or volcanic hazard? (II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
e) landslides or mudflows? (Ig, II)	☐	☐	☒	☐
f) erosion, changes in topography or unstable soil conditions from excavation, grading, or fill? (Ig, II)	☐	☐	☒	☐
g) subsidence of land? (Ig, II)	☐	☐	☐	☒
h) expansive soils? (Ig, II)	☐	☐	☐	☒
i) unique geologic or physical features? (II)	☐	☐	☐	☒
IV. WATER. *Would the proposal result in:*				
a) changes in absorption rates, drainage patterns, or the rate and amount of surface runoff? (II)	☐	☐	☐	☒
b) exposure of people or property to water-related hazards such as flooding? (II)	☐	☐	☐	☒
c) discharge into surface waters or other alteration of surface water quality (e.g., temperature, dissolved oxygen or turbidity? (II)	☐	☐	☒	☐
d) changes in the amount of surface water in any water body? (II)	☐	☐	☒	☐
e) changes in currents, or the course of direction of water movements? (II)	☐	☐	☐	☒
f) change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of ground-water recharge capability? (II)	☐	☐	☐	☒
g) altered direction of rate of flow of groundwater? (II)	☐	☐	☐	☒
h) impacts to groundwater quality? (II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
i) substantial reduction in the amount of groundwater otherwise available for public water supplies? (II)	☐	☐	☐	☒
V. AIR QUALITY. *Would the proposal:*				
a) violate any air quality standard or contribute to an existing or projected air quality violation? (II)	☐	☐	☐	☒
b) expose sensitive receptors to pollutants? (II)	☐	☐	☐	☒
c) alter air movement, moisture, or temperature, or cause any change in climate? (II)	☐	☐	☐	☒
d) create objectionable odors? (II)	☐	☐	☒	☐
VI. TRANSPORTATION/CIRCULATION. *Would the proposal result in:*				
a) increased vehicle trips or traffic congestion? (II)	☐	☐	☒	☐
b) hazards to safety from design features (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? (II)	☐	☐	☐	☒
c) inadequate emergency access or access to nearby uses?(II)	☐	☐	☐	☒
d) insufficient parking capacity onsite or offsite? (II)	☐	☐	☐	☒
e) hazards or barriers for pedestrians or bicyclists? (II)	☐	☐	☐	☒
f) conflicts with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks)?(II)	☐	☐	☐	☒
g) rail, waterborne, or air traffic impacts?(II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VII. BIOLOGICAL RESOURCES. *Would the proposal result in impacts to :*				
a) endangered, threatened, or rare species or their habitats (including but not limited to plants, fish, insects, animals, and birds)? (II)	☐	☐	☐	☒
b) locally designated species (e.g., heritage trees)? (II)	☐	☐	☐	☒
c) locally designated natural communities (e.g., oak forest, coastal habitat, etc.)? (II)	☐	☐	☐	☒
d) wetland habitat (e.g., marsh, riparian, and vernal pool)? (II)	☐	☐	☒	☐
d) wildlife dispersal or migration corridors? (II)	☐	☐	☐	☒
VIII. ENERGY AND MINERAL RESOURCES. *Would the proposal:*				
a) conflict with adopted energy conservation plans? (II)	☐	☐	☐	☒
b) use nonrenewable resources in a wasteful and inefficient manner? (II)	☐	☐	☐	☒
c) result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State? (Id, j)	☐	☐	☐	☒
IX. HAZARDS. *Would the proposal involve :*				
a) a risk of accidental explosion or release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation)? (II)	☐	☐	☒	☐
b) possible interference with an emergency response plan or emergency evacuation plan? (II)	☐	☐	☐	☒
c) the creation of any health hazard or potential health hazard? (II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
d) exposure of people to existing sources of potential health hazards? (II)	☐	☐	☐	☒
e) increased fire hazard in areas with flammable brush, grass, or trees? (II)	☐	☐	☐	☒
X. NOISE. *Would the proposal result in:*				
a) increases in existing noise levels? (II)	☐	☐	☒	☐
b) exposure of people to severe noise levels? (II)	☐	☐	☐	☒
XI. PUBLIC SERVICES. *Would the proposal have an effect upon, or result in a need for new or altered government services in any of the following areas:*				
a) fire protection? (II)	☐	☐	☐	☒
b) police protection? (II)	☐	☐	☐	☒
c) schools? (II)	☐	☐	☐	☒
d) maintenance of public facilities, including roads? (II)	☐	☐	☐	☒
e) other government services? (II)	☐	☐	☐	☒
XII. UTILITIES AND SERVICE SYSTEMS. *Would the proposal result in a need for new systems or supplies, or substantial alterations to the following utilities:*				
a) power or natural gas? (II)	☐	☐	☐	☒
b) communications systems? (II)	☐	☐	☐	☒
c) local or regional water treatment or distribution facilities? (II)	☐	☐	☐	☒
d) sewer or septic tanks? (II)	☐	☐	☐	☒
e) storm water drainage? (II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
f) solid waste disposal? (II)	☐	☐	☐	☒
g) local or regional water supplies? (II)	☐	☐	☐	☒
XIII. AESTHETICS. *Would the proposal:*				
a) affect a scenic vista or scenic highway? (II)	☐	☐	☐	☒
b) have a demonstrable negative aesthetic effect? (II)	☐	☐	☐	☒
c) create light or glare? (II)	☐	☐	☐	☒
XIV. CULTURAL RESOURCES. *Would the proposal :*				
a) disturb paleontological resources? (II)	☐	☐	☒	☐
b) disturb archaeological resources? (Ii, II)	☐	☒	☐	☐
c) have the potential to cause a physical change which would affect unique ethnic cultural values? (Ii)	☐	☐	☒	☐
d) restrict existing religious or sacred uses within the potential impact area? (Ii)	☐	☐	☒	☐
XV. RECREATION. *Would the proposal:*				
a) increase the demand for neighborhood or regional parks or other recreational facilities? (II)	☐	☐	☐	☒
b) affect existing recreational opportunities? (II)	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVI. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	☐	☐	☐	☒
c) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☐	☒
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

XVII. EARLIER ANALYSIS.

Earlier analysis may be used, where pursuant to the tiering, program EIR, or other CEQA process, one or more effects have been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a discussion should identify the following on attached sheets:

a) **Earlier analyses used.** Identify earlier analyses and state where they are available for review.

b) **Impacts adequately addressed.** Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

c) **Mitigation measures.** For effects that are "Less than Significant with Mitigation Incorporated," describe the mitigation measures which are incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

Authority: Public Resources Code Sections 21083 and 21087. Reference: Public Resources Code Sections 21080(c), 21080.1, 21083, 21083.3, 21093, 21094, 21151; *Sunstrum v. County of Mendocino, 202 Cal.App.3d 296 (1988); Leonoff v. Monterey Board of Supervisors, 222 Cal.Ap.3d 1337 (1990*).

The following statements answer those questions identified in the provided Environmental Checklist.

I. Land Use and Planning

a) The proposed repair projects will not have a significant impact on land use planning programs within Calaveras County or conflict with CCWD operating plans given that the proposed project is consistent with the Calaveras County General Plan and zoning designations. The project is expected to have beneficial impacts to the community through improved water delivery, and by providing water for fire-fighting in existing developed communities. No amendments to existing or planned land uses would be required to support the projects outlined in the Feasibility Report.

b) The proposed project improvements will not conflict with any environmental plans or policies developed by agencies with jurisdiction over the project since only existing infrastructure would be repaired or replaced. The improved infrastructure would not impact new areas or significantly modify an existing project site.

c-e)The proposal will have no effect on existing land use in the vicinity of the project since all existing uses would continue to operate as they do today, both during and after construction. Additionally, there are no agricultural resources or operations in the areas proposed for infrastructure repair to impact. Consequently, no physical arrangements of an established community, or community patterns, would occur as a result of the proposed projects.

II. Population and Housing

a-c) The purpose of the proposed project is to repair the existing water delivery system. The project would also provide water for fire protection in existing developed areas that currently have little to no fire suppression capabilities during the dry season. Given these project objectives, repairing the existing infrastructure would not, in and of itself, alter existing population or housing conditions, nor provide the necessary stimulus for alterations in population, housing or growth projections.

III. Geologic Problems

a-i) The geologic conditions that currently exist at the project sites today would not be altered by implementation of the proposed project. No deep excavation, trenching or loading that could potentially alter or exacerbate exiting geologic conditions would occur. Specifically, the proposed project sites are not located in areas that would be affected by seiches, tsunamis, or vulcanism and do not contain unique geologic features. Moreover, the project sites are not located in areas uniquely subject to subsidence, landslides, mudflows soil expansion or loss of topsoil. Regardless, the standard use of Best Management Practices (e.g., silt fences and/or other erosion control features) during construction of the project would reduce any potential impacts from erosion and soil stability to less than significant levels.

IV. Water

a) The proposed projects would not result in changes in absorption rates, drainage patterns, or the rate and amount of surface runoff since no new project features are proposed that would alter existing patterns. The proposed projects would essentially mirror existing patterns.

b) The proposed projects consist of either water delivery or storage facilities and, given the scale of these facilities, would not result in exposure of people or property to water-related hazards such as flooding.

c) The proposed project is not expected to result in discharge into surface waters or other alteration of surface water quality (e.g., temperature, dissolved oxygen or turbidity). Silt fencing and/or other erosion control measures would be in place to prevent discharge of construction related debris into Bear Creek and the Middle Fork of the Mokelumne River. If any water diversions were to become necessary they would be only temporary and intended to allow safe construction. If temporary impoundment, diversions or other such features are identified as necessary for safe construction, appropriate permitting with the resource agencies will be obtained prior to construction. However, at this time, no such features are planned.

d) The proposed project will not result in changes in the amount of surface water in any water body. Part of the project involves replacement of a leaking dam on Wilson Lake. Replacement of this dam is necessary in order to prevent its failure, and the new dam would be the same size as the existing dam. Wilson Lake would be drained during construction of the new dam, but would be returned to normal water levels upon completion of the project. However, changes in storage capacity are not part of the proposed project. Additional environmental documentation for the dam repair project would be required at the time when it appears feasible to initiate those projects.

e) The proposed project will not result in changes to currents, or the course of direction of water movements since there are none in the project area to be affected by project improvements.

f-i) There would be no impact to groundwater as a result of this project. The proposed projects do not have features that directly extract or inject water into groundwater systems. Consequently, groundwaters would not be depleted as a result of the proposed project actions, nor would it discharge any materials that would affect groundwater quality.

V. Air Quality

Calaveras County is located in the Mountain Counties Air Basin, which is designated by the California Air Resources Board as a non-attainment area for the criteria pollutants ozone and PM10. As such, consideration of air quality impacts revolves around construction and operation emissions. From an operations standpoint, the proposed projects do not contain any features or equipment that emit more pollutants than existing equipment. In fact, when some pieces of equipment are replaced with modern pieces, such as pumps, the new equipment will actually operate more efficiently thereby reducing emissions over existing levels.

During the construction phase of the various projects, it will not be possible to reduce the amount of ozone and PM10 emissions to less than significant levels because the air basin is already in non-attainment for these two constituents. With this understanding, the Mountain Counties Air Basin has standard construction activity mitigation measures that are required of all contractors that reduce the severity of this impact to acceptable levels. The CCWD, as a standard part of their engineering practice, require all contractors they employ in this type of work to comply with these mitigation measures. As a result, temporary construction impacts to air quality are reduced to less than significant levels with incorporation of these measures which are added to the contractor specifications.

a) Construction of the proposed project would not violate any air quality standard or contribute to an existing or projected air quality violation, beyond those allowed in the Mountain Counties Air Basin non-attainment program for construction emissions.

b) Whereas the proposed project features would not, in and of themselves, expose sensitive receptors to substantial pollutant loads, the fact that the air basin is in non-attainment for two criteria pollutants suggests that temporary construction emissions could be of concern to some sensitive receptors in the project study area. This impact is reduced to less than significant levels through incorporation of Mountain Counties Air Basin standard construction mitigation measures.

c) The proposed project improvements do not contain any features that would have the ability to effect or alter air movement, moisture, or temperature, or any change in climate in the study area.

d) The proposed project may result in a temporary increase in objectionable odors during construction as a result of operating construction equipment. Any impact would be temporary and is considered to be less than significant.

VI. Transportation/Circulation

The proposed projects would not create additional traffic on local roads or negatively alter existing traffic levels of service since improving the existing infrastructure would not alter vehicle maintenance or trip patterns. However, it is possible that during construction, there could be a temporary impact on local traffic patterns. Most of this would occur as trucks bring materials to the project sites. In some cases, where the water conveyance system is located in or immediately adjacent to streets, traffic may need to be routed around construction areas. If such traffic diversions were to become necessary, the contractor would be required to submit detour plans to CCWD prior to construction and provide appropriate safety personnel at the impact area to mitigate this impact. With such required traffic mitigation, this impact would be reduced to less than significant levels.

a) The proposed projects may result in increased vehicle trips and/or traffic congestion while under construction, but would not create a notable increase in operational trips. Any construction impacts would be temporary and are considered to be less than significant.

b) The proposed projects will not result in hazards due to design features of the project, or incompatible uses since no such design work is included as part of the proposed projects.

c) The proposed projects would not modify or affect any existing emergency access route or access to nearby uses.

d) The proposed projects would not need to modify any existing parking plans in or adjacent to the CCWD service area.

e) The proposed projects would not create pedestrian or bicycle hazards or barriers during operation. It is possible that some sidewalks or bike routes could be affected during construction, however, these impacts would be addressed as part of the traffic management plan that would have to be approved by CCWD prior to construction. Through incorporation of this standard mitigation practice, potential impacts would be reduced to less than significant.

f-g) The proposed projects are an improvement to the current water delivery program and would have no impact resulting in conflict with adopted policies supporting alternative transportation, nor would it result in impacts to rail, waterborne or air traffic.

VII. Biological Resources

Two field surveys were conducted within the project area, for biological resources in the winter and spring of 2001/2001. General surveys were conducted for Special Status Species, habitat for Special Status Species, and wetlands. No endangered, threatened, rare or Special Status species, or wetlands, were encountered during these surveys. Bear Creek and the Middle Fork of the Mokelumne River contain potential habitat for Foothill yellow-legged frogs, a species that is considered a Species of Concern by the Federal government and as a Species of Special Concern by the State of California. Impacts to Bear Creek and the Mokelumne would be minimal, and would be temporary in nature; only during the construction of the project. If it were necessary to de-water Bear Creek and the Middle Fork of the Mokelumne River during construction of the project, all care would be taken to ensure adequate flows downstream of the project site during the diversion period, and all construction related debris would be kept out of the creek. A qualified biologist would be on site during construction activities to make sure that no aquatic resources were adversely affected by construction. In all cases, biological surveys would be conducted during early project planning to ensure that sensitive biologic resources would not be impacted, or were avoided to the extent practicable. Where necessary, permitting through the appropriate resource agency(s) would be conducted prior to finalization of project plans.

a) The proposed project is not expected to have any adverse impacts to endangered, threatened, or rare species or their habitats based on the field reviews conducted and literature consulted as part of this study. Additional field studies would be initiated during the planning of the various project features to ensure that threatened or endangered species are not present on the project site, or if they are, that appropriate measures are taken to meet the requirements of the federal and/or state endangered species acts.

b) No "locally designated" species have been identified in the project study area.

c) No "locally designated" natural communities have been identified in the project study area.

d) No wetlands are anticipated to be affected by this project. The area upstream of the intake structure on Bear Creek, a riparian area, would be dredged as silt is filling in the creek at the intake. The pump area on the Middle Fork of the Mokelumne River may also require some excavation. Both of these areas contain potential habitat for the foothill yellow-legged frog, a Species of Special Concern. Measures that would be undertaken to ensure avoidance of impacts to the foothill yellow-legged frog during construction were described at the beginning of Chapter 6 of this report. Some of these include: pre-construction surveys for foothill yellow-legged frogs; presence of a qualified biological monitor on the construction site; installation of silt fencing and /or other erosion control materials to keep runoff and construction related debris from entering the creekbed; de-watering of the area to be dredged, with water piped around the construction site so that adequate flows would be maintained downstream of the project site. As each project is planned for improvement, additional environmental work will be initiated to ensure that special status species are managed according to appropriate protocols. At that time, any site specific surveys and/or permitting will be conducted prior to finalization of project plans.

e) The proposed project is a repair/replacement/enhancement project, and would not affect wildlife dispersal or migration corridors since none such designated corridors exist in the study area.

VIII. Energy and Mineral Resources

a-b) The proposed project consists of repair, replacement, and enhancement of inadequate water storage and delivery facilities. It would have no effect on energy conservation plans nor would it use nonrenewable resources in a wasteful and inefficient manner. It is anticipated that as some newly replaced project features are brought on line, such as pumps, the energy efficiency of thee new features would reduce energy demands.

c) Information regarding the mineral resources of Calaveras County can be found in the report: Mines and Mineral Resources of Calaveras County, California, published by the California Division of Mines and Geology. There are no known mineral resources within the project area, and the nature of the project would not result in the loss of availability of a mineral resource that would be of future value to the region and the residents of the State.

IX. **Hazards**

a) The proposed project will have a less than significant impact involving risk of accidental explosion or release of hazardous substances due the standard safety protocols established by the state for the handling of such materials. During construction of the project, there could be a slight chance of contamination by the release of petroleum products from the operation of construction equipment. Standard construction activity BMPs would be incorporated into contractor specifications to ensure that any petroleum leaks or spills would be contained and cleaned up according to appropriate regulations. Silt fencing and/or other erosion control measures would be used to prevent construction related debris (including oil) from entering any stream channels or other bodies of water.

b) The proposed project would not interfere with any emergency response or evacuation plan in the project study area and largely exists outside of well traveled portions of the CCWD service area.

c-d) The proposed project would not create, nor would it expose people to, potential health hazards nor would it expose people to existing health hazards. The proposed project is expected to have beneficial impacts, as it will correct a potentially harmful distribution condition. The raw water pipe that delivers drinking water from Bear Creek has several leaks and large holes from which debris could enter the water supply.

e) The proposed project would not result in increased fire hazard. The project is expected to have beneficial impacts in that it will provide water to existing developed areas that currently do not have adequate water supplies during the dry season from which to suppress or fight fires.

X. Noise

a-b) Operation of the proposed projects is not expected to result noise conditions above those currently experienced today. In some cases, the replacement of aged equipment with new equipment could reduce noise emission is some cases. During construction operations of the various project features, there could be a temporary increase in local noise levels as project features are installed. Through the use of standard noise mitigation, such as requiring all appropriate construction equipment to be properly muffled, would reduce this impact to less than less than significant levels. Further, the project would not generate noise levels in excess of the allowable levels described in the Noise Element of the Calaveras County General Plan, December 1996. The proposed projects do not contain any features that would result in exposure of people to severe noise levels.

XI. Public Services

a-e) The proposed projects would only improve the existing water delivery and storage systems and are expected to have beneficial impacts to public services. Further, the projects are expected to improved water delivery capabilities for fire suppression during the dry season in those areas that do not currently have adequate water supplies. No additional public services, such as police, schools, or other government facilities, would be required to support the proposed projects.

XII. Utilities and Service Systems

a-b) Given that upgrades of some project features will result in the installation of more energy efficient equipment, the proposed projects are expected to reduce the demand on existing power and natural gas for many applications. Communication system impacts are expected to be minimal at best, and in all cases, would not result in significant demands for additional service.

c) The proposed project is considered to have beneficial impacts on water distribution and treatment facilities, and is in fact, part of the purpose of the project.

d-f) The proposed project will have no impact on sewer or septic tanks, storm water drainage or solid waste disposal programs currently in effect since modifications to these facilities are not included as part of proposed projects. Further, there are very few of such facilities in the project study areas to be affected by the project.

g) The proposed project will have beneficial impacts to local/regional water supplies. The water delivery system will be repaired and upgraded to better serve the existing developed portions of CCWD's service area.

XIII. Aesthetics

a-c) The proposed project is not located on a scenic highway and would not effect any designated scenic vistas. The majority of the project would be a cut and cover project and would therefore have buried project features. The above ground features would replace existing ones, or augment exiting ones on the same site thereby not creating any new visual impacts. Further, no substantial night lighting features are included in the project that would create new sources of significant light or glare.

XIV. Cultural Resources

a) Based on past paleontological studies conducted in the study area, the proposed project is not anticipated to disturb paleontological resources. Should paleontological resources be discovered during construction of the project, a qualified paleontologist would be consulted to determine the appropriate remediation actions.

b-d) The proposed project is not expected to result in disturbance to archeological resources, affect ethnic cultural values, or restrict existing religious or sacred uses within the project area. The project would replace existing water storage and delivery systems, and would be constructed in areas that have been disturbed by past construction. Current use of the project area would remain the same. In addition, Native American groups were contacted regarding existing religious or sacred uses in the project area, and no responses beyond an acknowledgement of the request, were received. However, in the event cultural resources are discovered during construction, a qualified archaeologist will be consulted to determine the appropriate remediation actions.

XV. Recreation

a-b) The proposed project would not result in an increased demand for neighborhood or regional parks or other recreational facilities, nor would it affect existing recreational opportunities since none currently exist around CCWD facilities.

XVI. Mandatory Findings of Significance

a) The proposed project has the potential, unless mitigation is incorporated, to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory. Implementation of the following measures will ensure that any impacts to biological resources and cultural resources will be less than significant.

i. Pre-construction surveys would be conducted for foothill yellow-legged frogs. Surveys would be conducted by qualified biologists. Exclusion fencing would be installed, if necessary, to keep any frogs out of the construction area while the project is under construction.

ii. Silt fencing and/or other erosion control measures will be installed prior to any work in Bear Creek or the Mokelumne River, to ensure that no construction related debris enters any water body. The construction area would be returned to as natural a condition as feasible upon completion of the project.

iii. A construction monitoring program for both biological and cultural resources will be implemented during construction of the proposed project. The biological monitoring will ensure that the project is in compliance with all environmental permits. Cultural resources monitoring will ensure that if buried cultural materials are discovered during construction of the project, work would be halted in the vicinity until a qualified archeologist or paleontologist were able to assess the significance of the find under the appropriate regulations.

b. The proposed project does not have the potential to achieve short-term, to the disadvantage of long-term, environmental goals.

c. The proposed project does not have impacts that are individually limited, but cumulatively considerable.

d. The proposed project will not have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly. The proposed project is expected to have beneficial effects on the human environment due to the improved water delivery and supply system.

Growth Areas and Population Trends

Current and Projected Demands

The existing water system serves approximately 540 connections, a total population of 1,298 in the communities of West Point, Wilseyville, and Bummerville. Population growth in the service area has generally averaged less than one percent annually over the last 15 years. The following information from the US Census Bureau for the Year 2000 highlights the population in the project area.

FACT SHEET

West Point CDP, California

Census 2000 Demographic Profile Highlights:

General Characteristics - show more >>	**Number**	**Percent**	**U.S.**		
Total population	746	100.0	100%	map	brief
Male	342	45.8	49.1%	map	brief
Female	404	54.2	50.9%	map	brief
Median age (years)	44.8	(X)	35.3	map	brief
Under 5 years	43	5.8	6.8%	map	
18 years and over	564	75.6	74.3%		
65 years and over	147	19.7	12.4%	map	brief
One race	708	94.9	97.6%		
White	612	82.0	75.1%	map	brief
Black or African American	9	1.2	12.3%	map	brief
American Indian and Alaska Native	61	8.2	0.9%	map	brief
Asian	5	0.7	3.6%	map	brief
Native Hawaiian and Other Pacific Islander	0	0.0	0.1%	map	brief
Some other race	21	2.8	5.5%	map	
Two or more races	38	5.1	2.4%	map	brief
Hispanic or Latino (of any race)	60	8.0	12.5%	map	brief
Average household size	2.43	(X)	2.59	map	brief
Average family size	2.86	(X)	3.14	map	
Total housing units	345	100.0	100.0%	map	
Occupied housing units	305	88.4	91.0%		brief
Owner-occupied housing units	206	67.5	66.2%	map	
Renter-occupied housing units	99	32.5	33.8%	map	brief
Vacant housing units	40	11.6	9.0%	map	

Social Characteristics - show more >>	**Number**	**Percent**	**U.S.**		
Population 25 years and over	483	100.0			
High school graduate or higher	296	61.3	80.4%	map	brief
Bachelor's degree or higher	7	1.4	24.4%	map	
Civilian veterans (civilian population 18 years and over)	108	20.5	12.7%	map	brief
Disability status (population 21 to 64 years)	167	43.4	19.2%	map	brief
Foreign born	54	7.6	11.1%	map	brief
Now married (population 15 years and over)	327	60.1	54.4%		brief
Speak a language other than English at home (5 years and over)	97	14.7	17.9%	map	brief

Economic Characteristics - show more >>	**Number**	**Percent**	**U.S.**		
In labor force (population 16 years and over)	239	44.3	63.9%		brief
Mean travel time to work in minutes (population 16 years and over)	32.6	(X)	25.5	map	brief
Median household income (dollars)	25,417	(X)	41,994	map	
Median family income (dollars)	27,794	(X)	50,046	map	
Per capita income (dollars)	11,439	(X)	21,587	map	
Families below poverty level	53	28.2	9.2%	map	brief
Individuals below poverty level	236	33.9	12.4%	map	

Housing Characteristics - show more >>	**Number**	**Percent**	**U.S.**		
Single-family owner-occupied homes	162	100.0			brief
Median value (dollars)	98,000	(X)	119,600	map	brief
Median of selected monthly owner costs	(X)	(X)			brief
With a mortgage	792	(X)	1,088	map	
Not mortgaged	317	(X)	295		

(X) Not applicable.

Historic Connections and Demands

The District provided historical data on active connections and water demands served by the West Point WTP. The demands included the average day demand (ADD) and the maximum day demand (MDD), the single highest demand day in a year. The demand data are based on production values recorded at the treatment plant, so they include lost and unaccounted-for water and are summarized in Table 1.

The ratio of MDD to ADD has ranged from 2.2 to 3.3. The MDD per connection has ranged from 750 to 1,118 gpd.

Table 1. Historic Growth in Connections and Demands.

Year	New Connections	Total Connections	Volume Produced (MG)	ADD (MGD)	ADD / Connection (gpd)	MDD (MGD)	MDD:ADD	MDD / Connection (gpd)
1985		315	38.3	0.10	333	0.30	2.9	952
1986	13	328	39.2	0.11	327	0.32	3.0	976
1987	3	331	43.6	0.12	361	0.37	3.1	1,118
1988	8	339	42.8	0.12	346	0.35	3.0	1,032
1989	71	410	50.5	0.14	337	0.38	2.7	927
1990	16	426	55.5	0.15	357	0.41	2.7	962
1991	26	452	50.9	0.14	309	0.42	3.0	929
1992	(1)	451	55.0	0.15	334	0.39	2.6	865
1993	6	457	55.0	0.15	330	0.40	2.7	875
1994	4	461	57.3	0.16	341	0.43	2.7	933
1995	2	463	55.1	0.15	326	0.36	2.4	769
1996	7	470	57.7	0.16	336	0.42	2.6	889
1997	-	470	62.8	0.17	366	0.37	2.2	796
1998	3	473	55.2	0.15	320	0.45	3.0	945
1999	2	475	63.2	0.17	365	0.41	2.4	867
2000	44	519	61.7	0.17	326	0.43	2.5	829
2001	8	527	67.0	0.18	348	0.46	2.5	869
2002	5	532	59.0	0.16	304	0.53	3.3	996
2003	8	540	57.0	0.16	289	0.41	2.6	750

Notes: Connection and demand data provided by the District.

The District also provided monthly demand data for three years to evaluate the seasonal variability in demand. These monthly demands are shown in Table 2 and Figure 2 below.

Table 2. Monthly Demands.

		2001		2002		2003	
Month	Days	Millions of Gal. per month	Avg MGD	Millions of Gal. per month	Avg MGD	Millions of Gal. per month	Avg MGD

		2001		2002		2003	
Month	Days	Millions of Gal. per month	Avg MGD	Millions of Gal. per month	Avg MGD	Millions of Gal. per month	Avg MGD
January	31	3.1	0.100	3.111	0.100	2.839	0.092
February	28	2.829	0.101	3.22	0.115	2.283	0.082
March	31	3.303	0.107	2.945	0.095	2.447	0.079
April	30	3.265	0.109	3.245	0.108	2.622	0.087
May	31	6.326	0.204	4.602	0.148	3.84	0.124
June	30	8.445	0.282	7.086	0.236	7.008	0.234
July	31	9.651	0.311	8.975	0.290	8.586	0.277
August	31	9.633	0.311	7.908	0.255	7.322	0.236
September	30	7.835	0.261	6.493	0.216	7.413	0.247
October	31	5.745	0.185	5.24	0.169	5.855	0.189
November	30	3.538	0.118	3.427	0.114	3.393	0.113
December	31	3.312	0.107	2.799	0.090	3.209	0.104

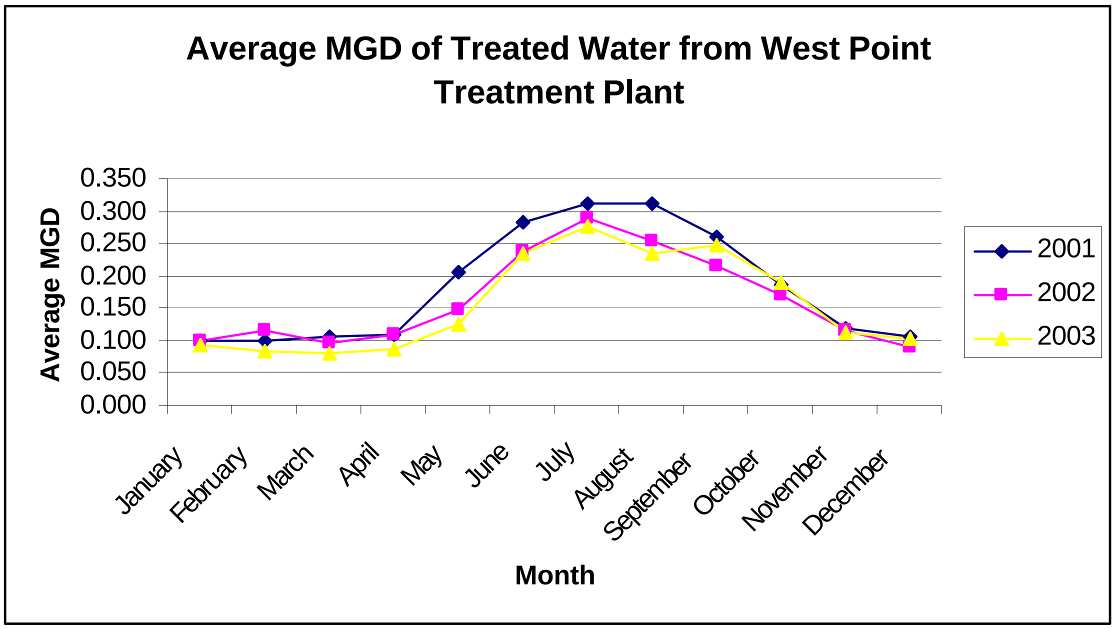


Figure 2. Average MGD of Treated Water from West Point WTP.

Demand Projections

The District's Board of Directors has adopted a policy to plan for an ADD of 200 gpd per capita and 2.5 persons per dwelling unit in the West Point area. The corresponding ADD is 500 gpd per connection. District policy has also established a MDD:ADD ratio of 2.0 for future planning purposes, resulting in a MDD of 1,000 gpd per connection. In 2003 the ADD was 290 gpd per connection. For planning purposes, the ADD was assumed to transition from the existing value of 290 to the design value of 500 over a 20-year period. For areas of new development, the assumed ADD is 500 gpd per connection, with an MDD:ADD ratio of 2.0. The assumed peak hour demand (PHD) is 3.0 times the ADD, in accordance with the District's Improvement Standards.

A projection of buildout conditions was made to estimate the ultimate demands in the service area. Growth will come in two ways: infill within the existing service area and expansion of the service area. The Calaveras County General Plan was reviewed for land use designations. West Point is designated as a Community Center with Residential Centers in the vicinity. Land use in the centers are between 7,000 square feet up to five acres in areas with roadways with levels of service A, B, and C. These levels of service evaluate the time delays and travel speeds of motorists on the roadways. The Calaveras Council of Governments has established six levels of service, A being the best down through F, for roadways in the County in the Regional Transportation Plan (RTP). State Route 26 is currently designated with a "C" average daily Level of Service in the West Point Area. The RTP expects the level of service for State Route 26 in the West Point area to decline to "D" through the planning year 2022, and the RTP does not recommend improvement for State Route 26. Therefore, the zoning is not expected to increase in density significantly through the planning period.

The existing service area includes approximately 800 parcels. It is assumed that at buildout, each parcel will represent one connection, with an average density of one connection for two acres. Since there are 540 current connections, the infill potential is the difference of 260 connections. For years between now and buildout, District staff and consultants reviewed the historic growth in connections and established a planned growth rate of five new connections per year, consistent with the historical growth rate, through buildout in 2057.

Previous reports have identified several potential areas of expansion of the West Point Water System. However, based on discussion with District personnel, development of these areas is currently considered unlikely. Therefore this report only considers infill, and expansion of the service area will not be considered for the West Point water system. A summary of the growth projections is shown in Table 3.

Table 3. Growth Projections.

Parameter	2005	2015	2025	Buildout	Comments
ADD (gpd/connection)	290	395	500	500	20-year phase-in for existing connections
Connections	540	590	640	800	
ADD (gpd)	156,600	238,300	320,000	400,000	
MDD (gpd)	313,200	476,600	640,000	800,000	
PHD (gpd)	469,800	714,900	960,000	1,200,000	
Annual use (AF)	175	267	358	448	Calculated for supply planning
ADD (gpm)	109	165	222	278	Calculated for hydraulic model
MDD (gpm)	218	331	444	556	Calculated for hydraulic model
PHD (gpm)	326	496	667	833	Calculated for hydraulic model

Notes:
MDD:ADD ratio 2.0
PHD:ADD ratio 3.0
New connections per year 5

Buildout connections in service area	800

The demand data provided by the District are not categorized by pressure zone. As an approximation, the existing demands were allocated among the pressure zones based on acreage in each pressure zone. The allocation of demands by zone is shown in Table 4.

Table 4. Projected Demands by Zone.

	West Point	Wilseyville	Bummerville	Total
Acres	1,413	123	294	1,830
2005 ADD (gpd)	120,916	10,526	25,159	156,600
2005 ADD (gpm)	84	7	17	109
2015 ADD (gpd)	183,999	16,017	38,284	238,300
2015 ADD (gpm)	128	11	27	165
2025 ADD (gpd)	247,082	21,508	51,410	320,000
2025 ADD (gpm)	172	15	36	222
Buildout ADD (gpd)	308,852	26,885	64,262	400,000
Buildout ADD (gpm)	214	19	45	278
Buildout MDD (gpd)	617,705	53,770	128,525	800,000
Buildout MDD (gpm)	429	37	89	556
Buildout PHD (gpm)	643	56	134	833

Notes:

Total 2005 ADD (gpd)	156,600
Total 2015 ADD (gpd)	238,300
Total 2025 ADD (gpd)	320,000
Buildout ADD (gpd)	400,000
MDD:ADD ratio	2.0
PHD:ADD ratio	3.0

Existing Facilities

Treated Water Distribution

Existing Service Area

The West Point Water System serves the communities of West Point, Wilseyville and Bummerville located in the northeastern portion of Calaveras County in the sparsely populated higher foothills. The topography ranges from approximately 2,500 feet in Wilseyville to 3,200 feet in Bummerville. Mild summers and cold winters characterize the region, with temperatures ranging from the low 20's to the middle 80's. Snow accounts for a large percentage of the precipitation in the watersheds supplying the study area.

The existing water system serves approximately 540 connections, a total population of 1,298 in the communities of West Point, Wilseyville, and Bummerville. The current facilities include two raw water reservoirs (Wilson Lake and the Regulating Reservoir), two raw water diversion facilities (Bear Creek gravity supply and Middle Fork Mokelumne pumped supply), one water treatment plant (West Point), two treated water pump stations (Bummerville and Upper Wilseyville), and the associated distribution and storage system.

Figure 3 provides an illustration of the water systems and the interconnection of the water supply and distribution between the three communities.

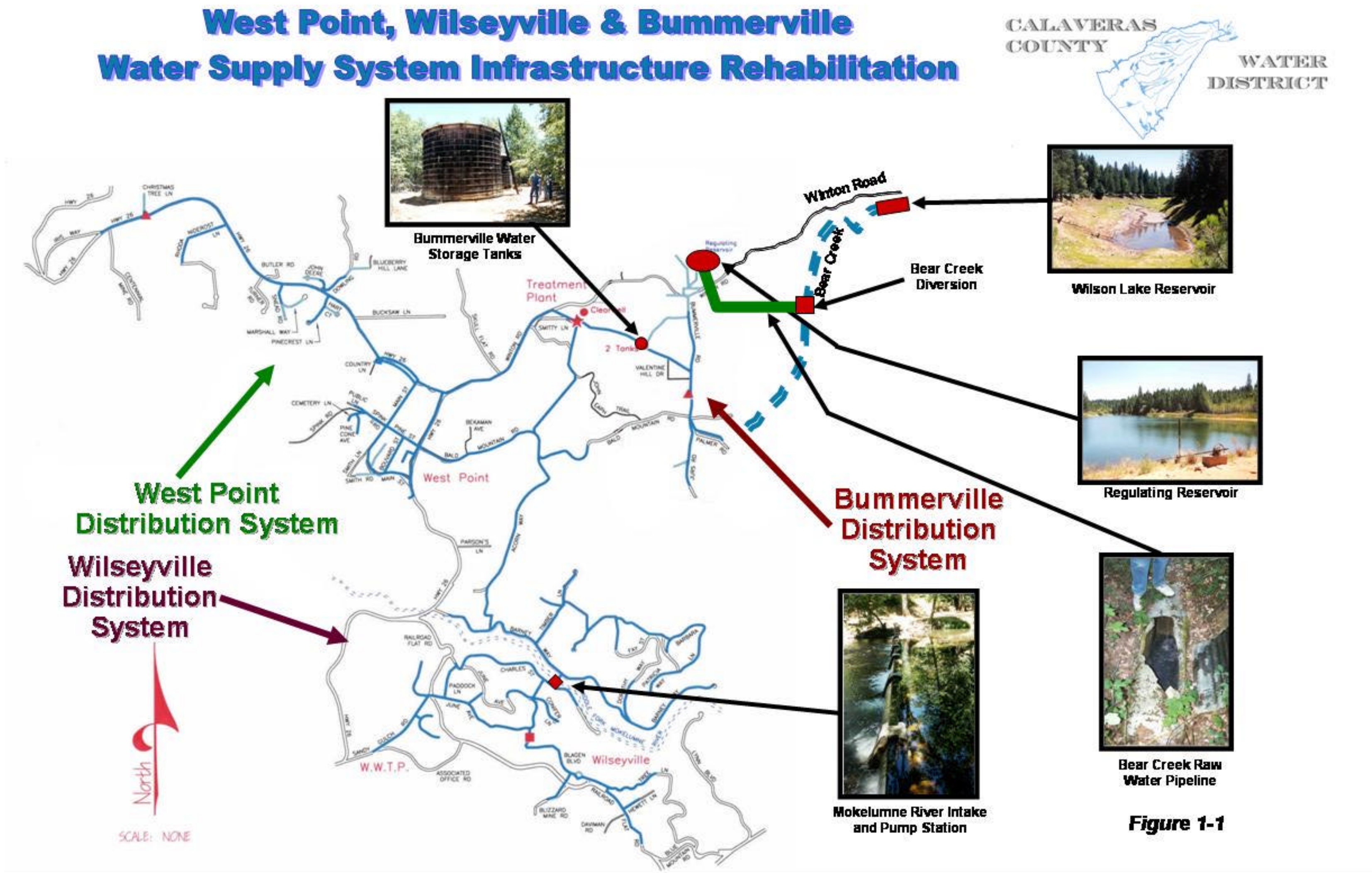


Figure 3. West Point, Wilseyville and Bummerville water supply system

The two main sources for water supply are the Bear Creek diversion, and the pumped source from the Mokelumne River. Both sources are generally of good quality and are easily treated to potable standards. Water rights are derived from agreements for diversion of flow from Bear Creek and from the Middle Fork of the Mokelumne River for diversion of up to1,930 acre feet annually. Even full build out of adjacent areas not presently within the water supply service area would consume no more than 790-acre feet per year. Only during periods of extreme drought is there any threat to the adequacy of the water available to the communities. As a backup source, the District can purchase from Calaveras Public Utility District (CPUD) up to 100-acre feet per year from the Middle Fork of the Mokelumne River. Conveyance, storage and distribution of the water are greater issues than the entitlements to the water.

The water treatment plant has recently been upgraded to a capacity of 1 mgd. This capacity is very close to the projected average daily demands through the year 2020. The figures below show the new water treatment plant.

Figure 4. View of West Point Water Treatment Plant

Figure 5. View of entrance to West Point Water Treatment Plant

Water Supply

The West Point water system has two sources of supply: the Bear Creek Diversion and a pumped source from the Middle Fork of the Mokelumne River. Both sources are generally of good quality and are easily treated to potable standards. The District has rights to divert up to 1,830 acre-feet (AF) annually through the Bear Creek Diversion and can obtain an additional 100 AF per year from the Calaveras Public Utility District (CPUD) through the Mokelumne Pump Station, located on the Middle Fork of the Mokelumne River.

Bear Creek Diversion

Water flowing from the Wilson Lake Dam continues down Bear Creek to the Bear Creek diversion. Bear Creek is the primary and preferred source of water for the West Point Water Treatment Plant (West Point WTP). Since 1967, the District has had a permit to divert water at a rate of four cubic feet per second (ft^3/sec) from Bear Creek to the West Point WTP. This diversion, located east of Bummerville at an elevation of about 3,300 feet, is the primary raw water source for the West Point/Wilseyville domestic water system. The permit allows a maximum annual use from Bear Creek to the West Point WTP of 1,830 acre-feet. The diversion structure is a 5-foot-high concrete structure in the creek channel. The diversion is equipped with a sluice gate that allows water to enter a newly constructed 16-inch 10,000 foot HDPE transmission pipeline from the creek to the regulating reservoir.

Mokelumne River Intake and Pump Station

An additional water supply for the District is the diversion from the Mokelumne River near Wilseyville. This is currently the secondary water supply to the West Point WTP. This diversion consists of a small seasonal dam, which diverts flow to an existing pumping station. The diversion dam is a flashboard structure installed during times when the Bear Creek supply and available regulating reservoir storage cannot provide adequate flow to the West Point WTP. The District is able to divert 100 acre-feet of water from the river according to an agreement with CPUD.

The water in the Mokelumne River used by the District originates from Schaads Reservoir. Water is released from Schaads Reservoir to the Middle fork of the Mokelumne River under an agreement with the CPUD. Flows in the Mokelumne River are typically well in excess of the 1MGD (or 1.5 cubic feet per second) diversion rate needed when flows are not available from the Bear Creek. This rate is a maximum diversion rate, as opposed to a constant diversion rate, which depends on actual demands.

Raw water from the Mokelumne River to the Regulating Reservoir flows through approximately 10,000 feet of 6-inch polyvinyl chloride (PVC) pipeline constructed in 1991. The approximate capacity of the existing facility is 200 gallons per minute (gpm) or approximately 0.3 MGD.

The existing Middle Fork Mokelumne Pump Station consists of two housed 30-hp vertical turbine pumps with a capacity of 200 gpm each. The pump intakes are located in separate collection sumps that gather water from the river through a gravity system or infiltration gallery.

The pumps have 4-inch discharges which connect into a single 8-inch steel discharge pipe. The 8-inch discharge pipe is reduced to a 6-inch PVC pipe that crosses the river and continues up to the West Point WTP approximately two miles to the north. There is a 25-hp booster pump station located along Acorn Way which assists in passing the flow to the West Point WTP.

The infiltration gallery consists of two 12-inch perforated pipes that extend underground approximately 65 feet into the river, and a newer intake system of flashboards and perforated 12-inch PVC pipe above ground. The underground pipes were installed when the pump station was constructed. The underground pipes are placed approximately 2.5 feet below the invert of the channel. Water passing over the gallery is filtered through the gravel bed, collected via the perforations then flows by gravity to the sumps. Per the original design plans, dated July 16, 1974, the pipes were constructed of 12-inch corrugated pipe. The intake pipes are currently buried; therefore, their condition is unknown. The newer system consists of a series of concrete pedestals placed across the river with slots for flashboards and saddles to place a 12-inch perforated pipe that connects into the pre-existing infiltration gallery. The flashboards back up the river allowing head to build over the 12-inch perforated PVC pipe. Water is then passed to a solid PVC pipe connected to the pre-existing 12-inch pipes then carried to the sumps.

The existing pump station is a 23 foot x 10.5 foot metal building housing the pumps and associated controls located in the floodplain of the Middle Fork of the Mokelumne River.

Raw Water Storage Facilities

The District has the ability to store up to 75 AF in its water diversion facilities.

Wilson Lake Dam

The Wilson Lake Dam was constructed in 1937. The embankment is approximately 35 feet tall and 150 feet long. The current operating capacity of the Lake is 25 AF. Exploration work performed by Woodward-Clyde-Sherard (WCS) in 1963 indicated that no provisions had been made for underseepage cutoff and that, in fact, no effort had been made to even remove vegetation and residual soil from underneath the embankment. A sinkhole observed in the downstream slope during the exploration is likely due to collapse of all or part of an old wooden box culvert that was incorporated in the original construction.

The existing dam is a homogeneous earthen embankment with a crest width of approximately 15 feet and upstream and downstream slopes of 3:1 and 2:1, respectively. Currently, the outlet works leak, and the District diverts the leakage. An unlined, open channel is located on the left abutment.

The dam is approximately one mile upstream from the District’s Bear Creek Diversion. The lakeside face of the dam has slumped, forming a sink hole about 15 feet in diameter and 8 feet deep. The upstream reach of the Lake is silted.

Regulating Reservoir

Water from Bear Creek and the Mokelumne River is usually stored first in the Regulating Reservoir. The existing Regulating Reservoir was constructed under the jurisdiction of the State Division of Safety of Dams (DSOD) in 1964. The dam is approximately 35 feet high, 500 feet long and impounds 50 AF. Permission was obtained from the DSOD in 1987 to install flashboards to capture late spring runoff through the Bear Creek Diversion that increases the storage capacity to a total of 60 AF.

Water is released from an outlet structure consisting of a slanted sluice gate connected to an outlet pipe. The gate can be operated from the top of the reservoir via a hand valve operator. In addition, there is an existing diversion ditch located on the southern side of the reservoir. The purpose of this ditch is to prevent unwanted natural runoff from the surrounding basin from entering the reservoir.

Alternatively, water can be diverted directly to the treatment plant from the Bear Creek Diversion pipeline without entering the reservoir.

Water Treatment Facilities

The West Point WTP was upgraded in 2002 and has a current capacity of 1.0 MGD. The West Point WTP uses the Microfloc contact filtration process and free chlorine for disinfection. The West Point WTP is required to maintain 1.6 mg/l free chlorine residual at the point of entry to the distribution system.

Treated Water Distribution System

The system is operationally divided into three pressure zones. The largest zone is the West Point Zone, which is served by the clearwell at the West Point WTP and includes the lower parts of the Wilseyville area. The upper areas of Wilseyville are served by a hydropneumatic pump station that maintains the hydraulic grade line (HGL) in the Wilseyville Camp area. The Bummerville Zone is located east of the West Point WTP and is served by one redwood tank. The existing pressure zones and available storage are summarized in Table 5.

Table 5. Existing Pressure Zones and Treated Water Storage.

Zone	Acres	Portion of Total Area	HGL	Storage
West Point	1,413	77%	2,910	500,000-gallon clearwell at WTP
Bummerville	294	16%	3,180	One redwood tank –useful capacity of approximately 25,000 gallons
Wilseyville	123	7%	3,230	None-hydropneumatic
Total	**1,830**	**100%**		

Treated Water Storage Facilities

Currently, the treated water storage consists of the West Point Treatment Plant clearwell, which serves West Point and Wilseyville, and the redwood tank that serves Bummerville. The clearwell capacity is 500,000 gallons and is located at 2,910 foot elevation. The clearwell is estimated to be over 50 years old and is of questionable condition. The redwood tank was built in 1978, is located at 3,180 foot elevation, and has a useful volume of approximately 25,000 gallons.

Treated Water Pumping Stations

The distribution system includes two treated water pumping stations for moving water between pressure zones. The treated water pumping stations are summarized in Table 6.

Table 6. Treated Water Pumping Stations.

	Bummerville Pump Station	Wilseyville Pump Station
Location	West Point WTP	Old Wilseyville WTP
Draws Water From	West Point Clearwell	West Point Pressure Zone
Pumps Water To	Bummerville Zone and Bummerville Tanks	Wilseyville Pressure Zone
Pumps	One 7.5-hp, one 10-hp	Two 15-hp, 40-gpm domestic; one 40-hp, 750-gpm fire

Treated Water Pipelines

The distribution system includes approximately 17 miles of distribution pipe ranging from 1 inch to 8 inches in diameter as shown in Figure 7. The West Point system is composed mainly of 6-inch pipe with mostly 4-inch pipe to terminal services. The smallest pipe diameter found is 1-inch. Most of Wilseyville's distribution system consists of newer 6-inch and 8-inch lines. The Bummerville distribution grid consists of mainly 4-inch lines with some 2-inch, and only two sections of 6-inch lines.

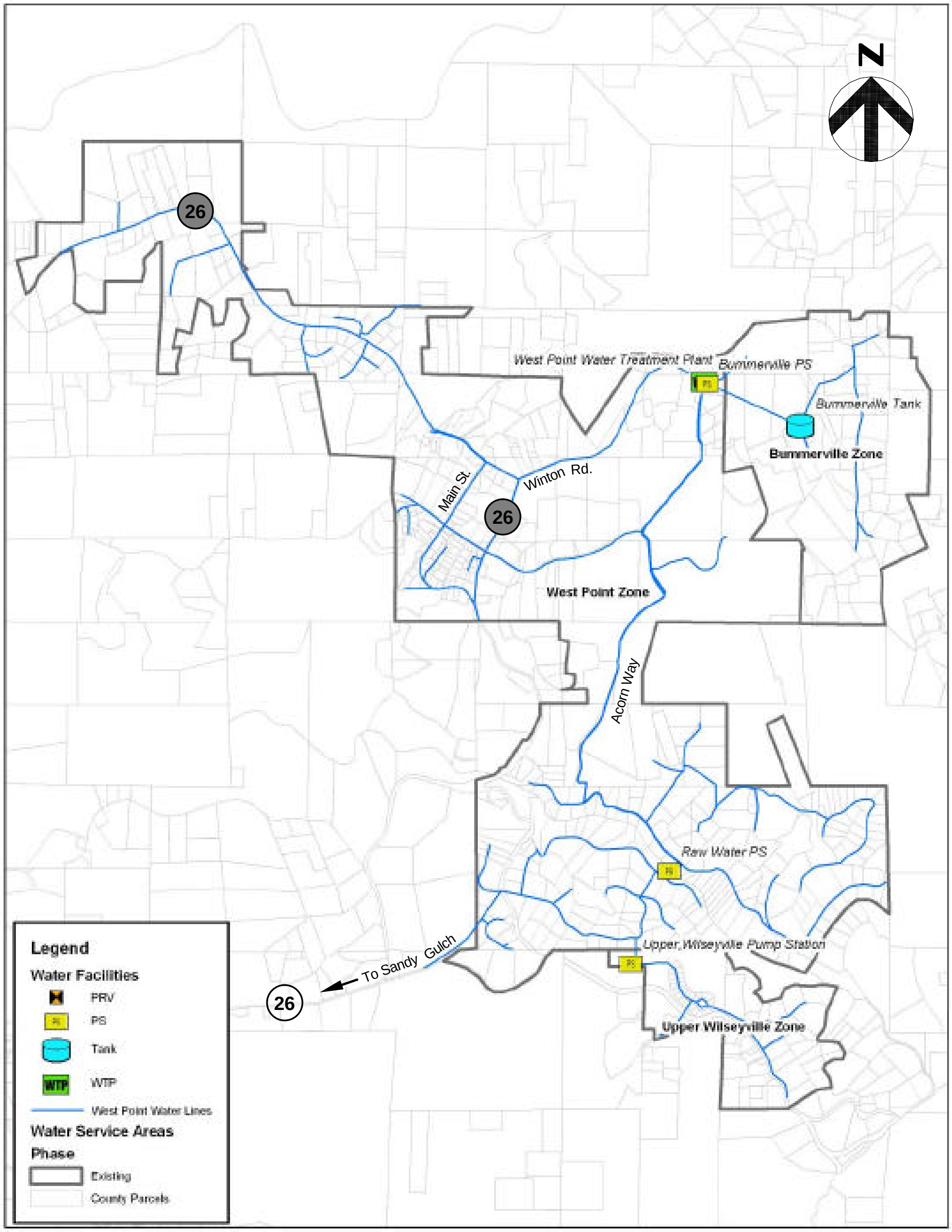


Figure 6. Layout of Distribution System

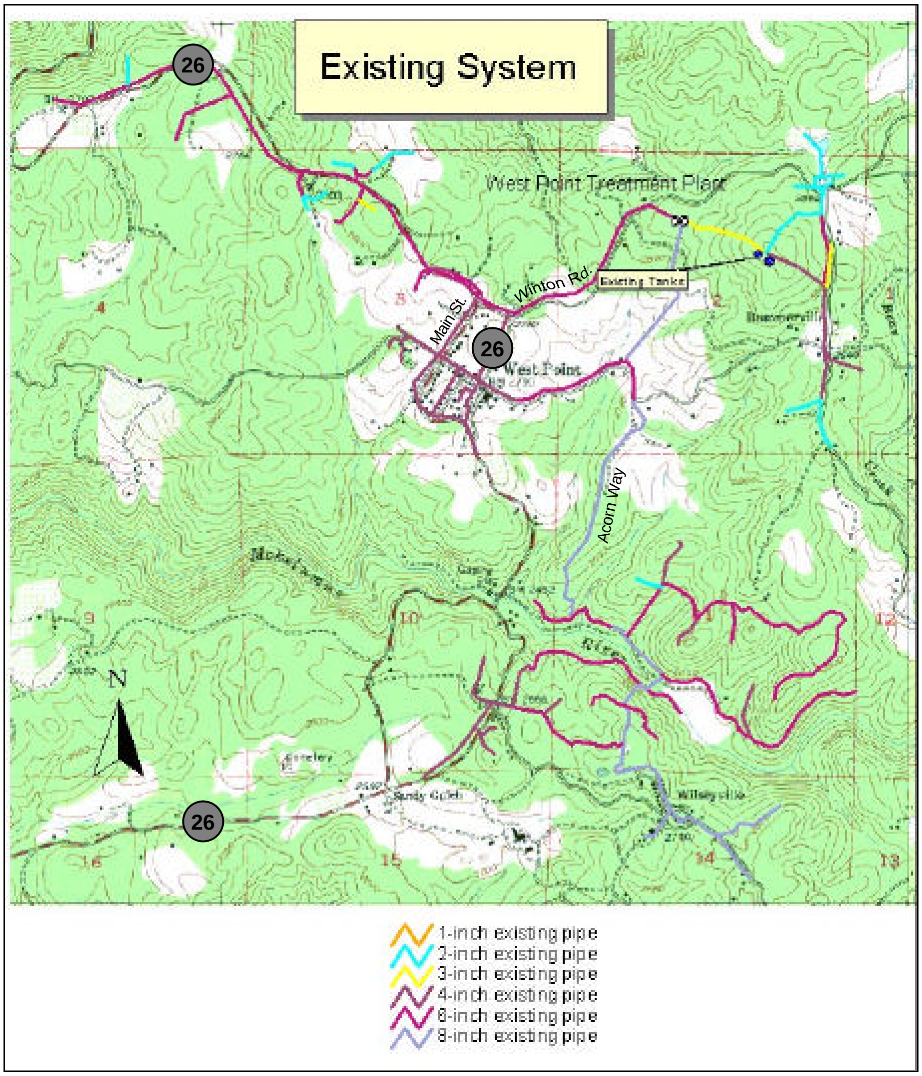


Figure 7. Existing Distribution System with Pipe Diameters.

Current Condition of the Existing System

Bummerville Tanks and Distribution System

The existing tanks leak continuously at an estimated rate of 40 to 60 gallon per hour depending on the depth in each tank. This equates to more than one acre foot of treated water per year.

Almost, the entire distribution system in Bummerville is over 50 years old, and inadequate in capacity to deliver fire flows. Based on the treated water loss records provided by the District (see attachment G-3), approximately 40% (or 74 acre –feet) of the delivered treated water is lost in the water distribution systems within the service district each year. With the Bummerville system comprising of approximately 11% of the service district deliveries, this equates to a potential loss of 8 acre-feet per year in the Bummerville system alone.

Figure 8. View of the Damage and Leakage on the Tanks

West Point and Wilseyville Distribution System

The West Point and Wilseyville distribution system is currently in such a condition that the District estimates nearly 25 percent of the treated water conveyed to the system is lost between leaking pipelines and the leaking tanks. The distribution losses are the main component of this water loss. These systems are some of the oldest systems in the area and are entirely sub-standard in terms of capacity to deliver fire flows and overall reliability to serve the community. Replacement of the pipelines will show immediate improvement in water pressure and capacity.

Regulating Reservoir

The Regulating Reservoir is currently in operating condition. Certain components of the reservoir are old and should eventually be replaced. The gate is currently quite old and difficult to operate, The potential of this nearly 40 year old gate to fail to operate at all in the near future is quite high.

Wilson Lake Embankment

The embankment is currently failing with excessive leaking and slumping. With the presence of an existing large sink-hole at the upstream side of the embankment, the potential for complete failure imposes a significant risk to downstream properties and riparian habitat. Under current conditions with the leaks in the dam, the existing sink-hole and downstream toe erosion is expected to continue.

Middle Fork Mokelumne River Intake and Pump Station

Failing components at the pumping facility would include the clogged and rusted infiltration gallery pipe. The infiltration gallery is completely ineffective. Other potential failures would be the concrete columns for the diversion structure, which is subject to large debris flows. If this structure should fail, no flow could be diverted from the river. Providing a new infiltration gallery with proper cleaning facilities is the recommended solution for this potential problem.

Need for the Project

The purpose of this project is to conserve water by rehabilitating the existing treated water system facilities serving the communities of West Point and Bummerville. This water system is currently deficient due to failing and leaking components, and components that are unable to meet fire flow requirements.

The need for this project is based on a hydraulic evaluation of the system to determine the system's ability to deliver fire flows and provide sufficient storage. The following section details the criteria used in the hydraulic evaluation and the results of the modeling.

Project Objectives:

1. Replace failing or leaking water system components in order to conserve water and increase the overall reliability and efficiency of the system;

2. Site, replace and construct the proposed facilities so that environmental impacts are minimized to the extent feasible.

Evaluation Criteria

The system was evaluated using hydraulic criteria defined by the District and local fire protection districts.

The District standards state storage capacity will be equal to the sum of the following three components:

1. Fire flow storage, a minimum of four hours times the appropriate fire flow demand;
2. System peaking storage, equal to 20 percent of the maximum day flow; and
3. Emergency storage, equal to four hours of the maximum day demand.

The storage tank size was based upon the water demand for build-out. The storage tank capacity equation was based on the District's June 1997 Improvement Standards.

Tank Size (gal) = 20% Max Day + 4Hrs Fire Flow + 4Hrs Max Day

Where:

Max Day = 2 * Average Day Demand
Ave Day = 200 gallons per day per person * 2.5 people per service
= 500 gallons per day per service (gpd)

The District standard for minimum system pressure is 35 psi, per the 1997 District improvement standards. Minimum system pressure may decrease to 20 psi during fire flow events.

The District and local fire district fire flow requirements are listed in Table 7. Fire Flow demands that will be used in modeling are the more stringent of the District's improvement standards or the local Fire District minimum standards, and are shown in Table 8.

Table 7. Fire Flow Requirements by Authority.

Authority	Building Type	Flow Requirement
District Improvement Standard	Single Family and Duplex Residential Areas	500 gpm
	Townhouse, Multiple Residential	1,000 gpm
	Commercial	1,500 gpm
West Point Fire District	Residential (up to 3,600 sf fire area)[a]	1,000 gpm
	Townhouse, Multiple Residential	1,500 gpm
	Commercial (fire area limit varies) [b]	1,500 gpm

a. Residential fire flow limited to protect dwellings up to 3,600 square feet of fire area (floor area) per California Fire Code, Division III, Fire Protection, Appendix III-A - Fire Flow Requirements for Buildings (attached). It is assumed that residences larger than 3,600 sf of fire area will be required to supply the additional fire flow demands using alternate means.

b. Commercial fire flow is 1,500 gpm minimum, and is limited to protect structures with fire areas from 3,600 sf up to 22,700 fire area, depending on type of commercial construction (see California Fire Code, Division III, Fire protection, Appendix III-A - Fire Flow Requirements for Buildings). It is assumed that commercial buildings larger than the area protected by 1,500 gpm, will be required to supply the additional fire flow demands using alternate means.

Table 8. Fire Flow Demands for Hydraulic Modeling.

	West Point System
Residential	1,000 gpm
Townhouse, Multiple Residential	1,500 gpm
Commercial	1,500 gpm

A computer hydraulic model was used to evaluate the distribution system in its existing condition and in buildout condition. The model output was reviewed to identify existing and future deficiencies of the treated water distribution and storage system. The hydraulic evaluation criteria used are summarized in Table 9.

Table 9. Hydraulic Evaluation Criteria.

Parameter	Value	Units	Source
Required fire flow - single family	1,000	gpm	West Point Fire District
Required fire flow - multi-family	1,500	gpm	District Improvement Standards
Required fire flow - commercial	1,500	gpm	District Improvement Standards
Minimum pressure excluding fires	35	psi	District Improvement Standards
Minimum pressure during fire	20	psi	District Improvement Standards
Fire flow storage	4	hours	District Improvement Standards
Emergency storage (hours of MDD)	4	hours	District Improvement Standards
Operational storage (% of MDD)	20%		District Improvement Standards

Treated Water Storage Evaluation

The available storage in each zone was compared to the required storage based on the identified criteria. The storage evaluation is summarized in Table 10.

Table 10. Evaluation of Available Storage.

	West Point/Wilseyville[a]	Bummerville[b]
Available storage (gallons)	500,000	30,000
Highest fire flow requirement in zone (gpm)	1,500	1,000
Required fire flow storage (gallons)	360,000	240,000
Buildout MDD (gpd)	672,000	129,000
Required emergency storage (gallons)	112,000	21,500
Required operational storage (gallons)	134,400	25,800
Total required storage (gallons)	606,400	287,300
Storage deficit (gallons)	106,000	257,000**

Notes:

Required fire flow storage (hours) 4
Emergency storage (hours of MDD) 4
Operational storage (% of MDD) 20%

a. The Wilseyville area distribution system is integral with the West Point Water System; therefore, available storage to the West Point area is also available to Wilseyville.

b. The Bummerville area distribution system's storage deficit is large enough to create water quality problems if a single storage tank is constructed to satisfy the deficit. Therefore, a smaller tank with an accompanying fire flow pump could be used in lieu of a single larger tank.

Treated Water Pumping Evaluation

Each booster pumping station should have the ability to pump the peak hour demand of the uphill zone to which it is pumping. In addition, if the uphill zone does not have adequate storage for fire flow, the booster pumping station should have the ability to deliver fire flow to the higher zone.

Treated Water Pipeline Evaluation

The critical condition is MDD plus fire flow. Therefore this demand scenario is used to analyze the distribution system, and forms the basis of recommendations. The available fire flow was calculated at every node and compared to the required fire flow.

Based on the hydraulic model results, only locations in the immediate vicinity of the treatment plant meet the fire flow requirements under existing MDD. Furthermore, under buildout conditions, the number of locations satisfying the fire flow requirements decreases. All other locations in the distribution system do not meet the fire flow and/or residual pressure requirements under existing MDD. This is a significant change from the Feasibility Study performed in 2002 as the fire flow demand evaluated at that time was 500 gpm under MDD. As the fire flow demand analyzed now is 1,000 gpm, system deficiencies have increased.

Alternatives Considered

Optimizing the Current Facilities (No Construction)

The first alternative considered was to use the current facilities to provide as much fire flow and storage as possible to meet the criteria established by the District and the local fire improvement district.

However, based on the hydraulic evaluation described in the previous section the current system cannot meet the criteria for fire flow and storage. Based on the results from the hydraulic modeling an alternative to increase the pipe sizes and storage to meet these requirements was developed and is described in detail below.

Alternative to Meet Fire Flows

This alternative was developed using information from the hydraulic modeling to determine the minimum pipe sizes and storage required to meet the minimum fire flows. The alternative to meet the minimum fire flows is described below.

Description and Design Criteria

Treated Water Storage

Based on the storage system evaluation criteria stated previously, the redwood tank currently in place serving the Bummerville system is inadequate in capacity. Additional storage capacity is required to meet the District standards for treated water storage.

Replace Bummerville Storage Tank

The deficit for the Bummerville treated water storage is calculated at 263,000 gallons; therefore, the recommendation is to replace the existing redwood tank with a new tank. However, a single tank of sufficient size to supply the entire treated water storage required would promote water quality deterioration and increased DBP formation during normal operation. Therefore, a smaller tank and an upgraded fire flow pump are recommended to satisfy the four-hour fire flow demand. The storage tank would be situated at the existing location of the redwood tank and would be a minimum of 50,000 gallons. The tank would be supporting a zone of single-family homes and residential fire demand of 1,000 gpm. The tank would also provide the required emergency and operational storage per District standards.

Replace Treatment Plant Clearwell

The recommendation is to replace the existing clearwell with a new clearwell. The location would be approximately 300 feet away from the existing clearwell and approximately 10 feet higher in elevation than the existing clearwell. The capacity would be a minimum of 586,600 gallons. For the purpose of cost estimation, the tank size used was 600,000 gallons. The tank would be supporting a zone of single-family homes, commercial demands and a commercial fire demand of 1,500 gpm. The tank would also provide the required emergency and operational storage per District standards for the West Point zone and the Wilseyville zone.

Approximately 300 feet of 8-inch pipe would be installed as a dedicated fill line to tie in the treatment plant to the storage tank. The storage tank would serve to provide the adequate chlorination contact time. Treated water for the Bummerville tank would be pumped from the clearwell through a new 6-inch fill line. In addition, between the clearwell and the Bummerville tank are four local services that would be served from the 6-inch fill line.

Treated Water Distribution

Recommended improvements to the distribution system reflect the District Improvement Standards. In general, pipes less than 6 inches in diameter will be upgraded to a minimum of 6 inches in diameter and 8-inch diameter mains will be required for commercial districts. Also a new 10-inch main is recommended for the upper West Point area, and a 12-inch main is recommended for distribution of treated water from the treatment plant south to Wilseyville and Sandy Gulch. Almost all of the pipes would need to be replaced with larger diameter pipelines to meet fire flow demand while maintaining 20 psi residual pressure and 20 psi minimum system pressure.

For pipe replacement or installation recommendations, all new pipes received a Hazen-Williams C-factor of 140 in the hydraulic model. Existing pipes use the C-factor currently assigned in the model - frequently the C -factor is 120.

As a general comparison, improvements to pipes in the distribution system were considered for 500 gpm as well as 1,000 gpm fire flow during maximum day demand at buildout. That comparison is shown in Table 11.

Table 11. Comparison of Distribution System Improvements Using 500 gpm vs. 1000 gpm Fire Flow.

	500 gpm FF Standard	1000 gpm FF Standard	Additional Pipe required for 1,000 gpm FF criteria
Diameter	feet of pipe	feet of pipe	feet of pipe
6" pipe	8600	17804	9204
8" pipe	5200	5135	-65
10" pipe	6500	6407	-93
12" pipe	13800	13886	86

The additional cost estimated to improve the distribution system to the design standard of 1,000 gpm fire flow versus 500 gpm fire flow is approximately $2.9 million, or an additional 58% of the estimated construction cost for improving the distribution system to the 500 gpm fire flow standard.

Distribution System

West Point/Wilseyville

Based on modeling results, the existing water distribution system does not meet fire flow standards under MDD. The primary reason the system fails to support the fire demand is inadequate pipe diameters. The existing system is composed mainly of 6-inch diameter pipe mains and 4-inch diameter pipe to terminal service lines. The smallest pipe diameter recorded on the District treated water distribution map is 1-inch diameter with 8-inch diameter as the largest pipeline in the system.

A majority of the pipes in the West Point zone would have to be replaced. The service main between the treatment plant and the rest of the distribution network along Winton Road would need to be upgraded from a 6-inch diameter to a 12-inch diameter pipeline.

The other difficulty in the distribution grid is elevation changes throughout the system. The existing storage elevation is 2,910 feet. The grid has problems with service area that have too little and/or too much pressure. Several locations along Highway 26, near Pinecrest Lane and Dowling Road, are above 2,840 feet in elevation that is 1.5 miles away from the treatment plant. Based on static conditions alone, these services do not meet the minimum residual pressure of 35 psi. Reasonable increases in pipe diameters produce very little benefit in mitigating these low-pressure concerns. It is recommended that localized booster pumps be installed to bolster fireflow volumes and pressures in these areas. The District is in the process of upgrading the Wilseyville fire flow pump and power generator, which will supply adequate fire flow to the south easternmost area of Wilseyville.

Bummerville

For the Bummerville system, the primary deficiency is inadequate pipe size. The Bummerville distribution grid also consists of 4-inch diameter and 6-inch diameter pipe. The primary service main runs north/south on Bummerville Road and is connected to the redwood storage tank, by a 4-inch loop. The recommendation is to upsize the existing 4-inch and 6-inch diameter pipes to 6-inches and 8-inches, respectively. Also, any pipe less than four inches in diameter will need to be upsized to 6-inches.

System Sub-division

For the purposes of prioritization, recommended improvements for the West Point/Wilseyville Distribution system have been divided into 3 sub-systems. System 1 consists of the main distribution pipe from the West Point Water Treatment Plant and the Downtown West Point area. System 2 includes the Upper Northwest West Point system. System 3 consists of improvements to the Wilseyville area. The system sub-division is shown in Figure 9.

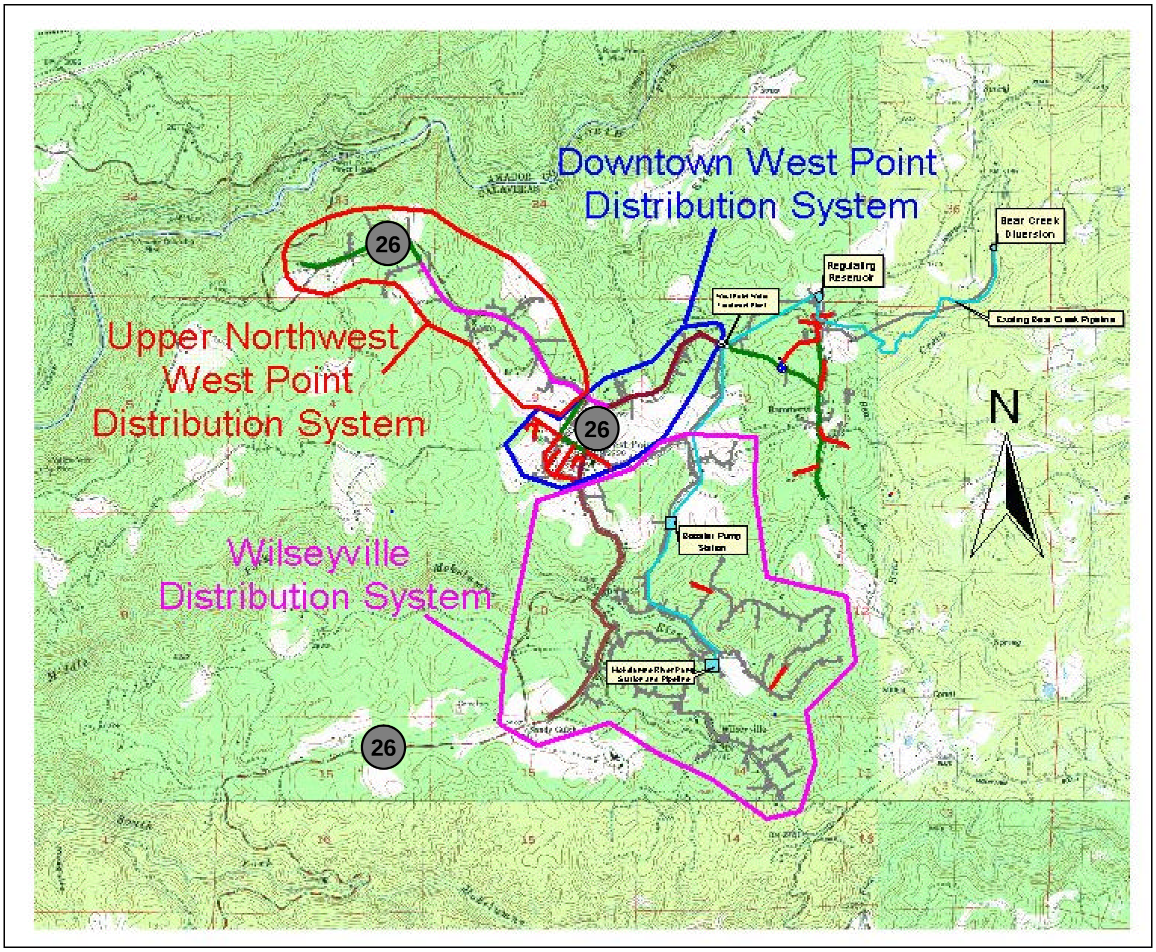


Figure 9. Sub-System Division.

Recommendation Priorities

The improvements are recommended as follows:

1. Downtown West Point Distribution System
2. Upper Northwest West Point Distribution System
3. Wilseyville Distribution System

The highest priority is given to the downtown area to provide increased fire flows to the commercial district and the school. This area has had fire problems in the past and is a high priority for the District. The next priority is given to the Upper Northwest West Point to provide adequate fire flows to this area which lies at a higher elevation and has some of the lowest fire flows. The final priority is given to Wilseyville.

In summary, the recommended improvements to the distribution system are shown on Figure 10 and are described following the figure.

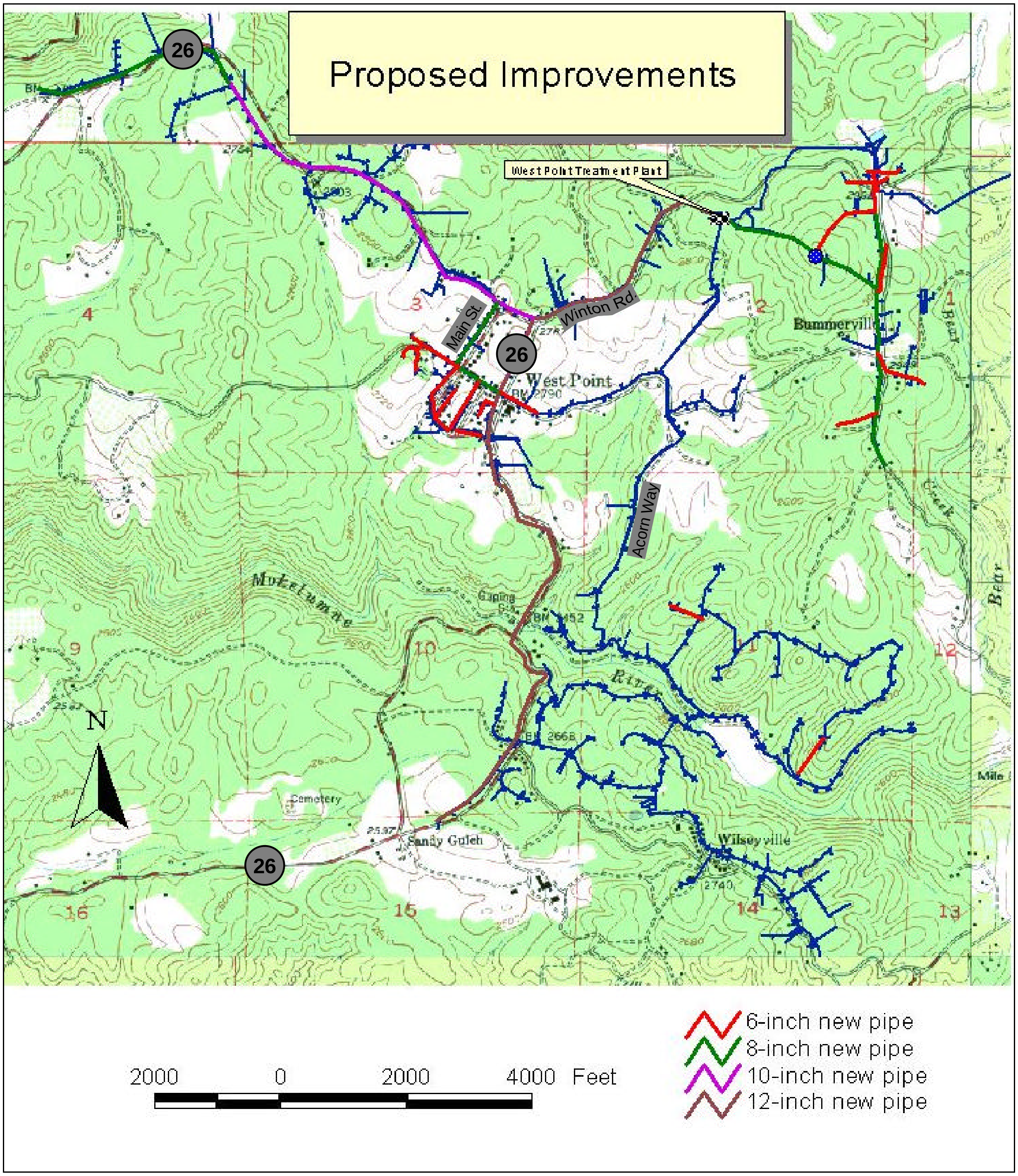


Figure 10. Recommended Loops and Proposed Changes to the Distribution System.

Downtown West Point Distribution System:

1. Upsize the existing pipeline from the treatment plant along Winton Road onto State Highway 26 southbound to Main Street to 12 inches in diameter (approximately 5,800 feet).
2. Upsize the existing pipeline along State Highway 26 from Winton Road to Main Street to 10 inches in diameter (approximately 600 feet).
3. Upsize the existing pipeline along Main Street from State Highway 26 to Pine Street to 8 inches in diameter (approximately 2,000 feet).
4. Upsize all remaining pipelines to 6 inches in diameter (approximately 7,000 feet).

Upper Northwest West Point Distribution System:

1. Upsize the existing pipeline along State Highway 26 from Main Street to Rhoda Niderost Lane to 10 inches in diameter (approximately 5,807 feet).
2. Upsize the existing pipeline along State Highway 26 from Rhoda Niderost Lane to the terminus at Centennial Mine Road to 8 inches in diameter (approximately 3,135 feet).
3. Upsize the pipeline branches along State Highway 26 to a minimum of 6 inches in diameter (approximately 6,036 feet).

Wilseyville Distribution System:

1. Install new 12-inch diameter pipeline connected to the upsized 12-inch diameter line at State Highway 26 and Main Street. Continue southbound onto Railroad Flat Road and Sandy Gulch Road to the terminus immediately prior to the intersection of Sandy Gulch Road and State Highway 26 (approximately 8,086 feet).
2. Upsize other 2-inch and 4-inch diameter pipelines to a minimum of 6-inches in diameter (approximately 293 feet and 4,475 feet respectively).

3. Loop Patricia Way to the southwest to Barney Way using a 6-inch diameter pipeline (approximately 752 feet).

Cost Estimates:

The cost estimates included herein are based on recent similar projects, recent bid prices, and historical trends. They are not based on detailed engineering design and analysis. Therefore, the construction cost estimates are considered to range from +30 percent to –30 percent of the expected bid prices. A 25 percent contingency has been applied to the baseline construction cost to account for unforeseen events and unknown conditions and a cost equal to 20 percent of construction cost (including contingencies) has been applied to account for additional items such as engineering, administration, construction management, and inspection costs. Cost Estimates are provided in Appendix B.

Table 12. Summary of Cost Estimates for All Improvements.

Improvements	Estimated Capital Costs
Bummerville Distribution System & Storage Tank	$1457,000
Mokelumne Pump Station	$1,262,000
Regulating Reservoir Improvements	$107,000
Replacement of Wilson Dam	$304,000
West Point / Wilseyville Distribution System & Clearwell Replacement	$5,638,000
Total Improvement Costs	$8.77 Million

Table 13. Summary of Phase 1 breakdown of Cost Estimates for recommended improvements for the West Point / Wilseyville Distribution System.

Phase 1 Improvements	Year 1	Year 2	Year 3	Year 4	Year 5
Downtown West Point Distribution System	$878,000	$980,000			
Bummerville Storage Tank	$393,000				
Replacement of Wilson Dam			$304,000		
Bummerville Fire Flow Pump			$99,000		
Replacement of Clearwell			$650,000		
Upper Northwest West Point Pipelines				$717,000	$842,000
Bear Creek Diversion SCADA				$95,600	
Total Improvement Costs	$1.27 Million	$0.98 Million	$1.05 Million	$0.81 Million	$0.84 Million

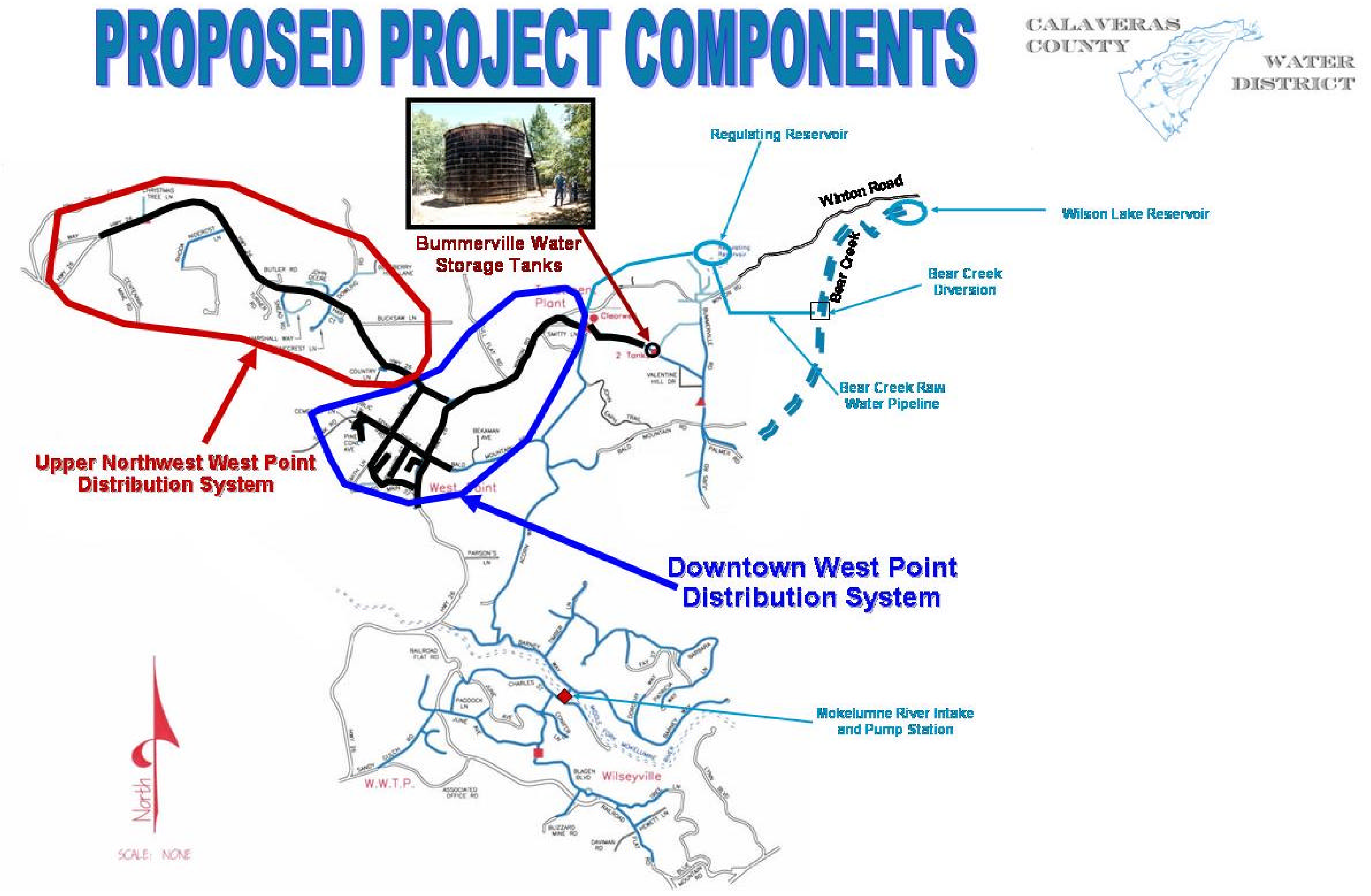
Advantages/Disadvantages:

Critical local water issues include adequate supply of water for fire protection and a continuous reliable potable water supply. Local fires have caused significant damage within the local communities due to inadequate distribution facilities. The project features will enhance the fire protection for the area. Conservation of water is an important local, regional, CalFed Bay-Delta, state and federal issue addressed by this project. Replacement of old, leaking raw water conveyance and distribution facilities will significantly improve the efficiency and level of conservation within the project area.

The goals of this project are consistent with local water management plans (West Point/Wilseyville Domestic Water Master Plan, Charpier, Martin and Associates 1996 and Calaveras County Water Master Plan, Borcalli and Associates 1996) calling for infrastructure rehabilitation and increased fire protection. The conservation aspects of this project will meet the goals of local, regional, CalFed Bay-Delta, state and federal management plans. The District is currently in the process of developing a 2005 Water Master Plan which will be considered during final project design.

Proposed Project (Recommended Alternative)

For the purposes of this grant application the proposed project consists of replacing distribution lines in the downtown West Point area and replacing the Bummerville Tank. While additional improvements are required the scope of the project was limited to the downtown West Point area and the Bummerville Tank as they are the highest priorities for the overall system. The following figure highlights the proposed project components.


PROPOSED PROJECT COMPONENTS
CALAVERAS COUNTY WATER DISTRICT
Bummerville Water Storage Tanks
Regulating Reservoir
Winton Road
Wilson Lake Reservoir
Bear Creek
Bear Creek Diversion
Bear Creek Raw Water Pipeline
Upper Northwest West Point Distribution System
Downtown West Point Distribution System
Mokelumne River Intake and Pump Station
West Point
Wilseyville
W.W.T.P.
North
SCALE: NONE

Summary of Project Features

Downtown West Point Distribution System: Replace undersized and deteriorating pipelines to meet current fire protection standards and to eliminate water loss

- 6,036 feet - 6-inch pipe
- 3,135 feet - 8-inch pipe
- 5,807 feet - 10-inch pipe

Upper Northwest West Point Distribution System: Replace undersized and deteriorating pipelines to meet current fire protection standards and to eliminate water loss

- 7,000 feet - 6-inch pipe
- 2,000 feet - 8-inch pipe
- 600 feet - 10-inch pipe
- 5,800 feet - 12-inch pipe

Bummerville Storage Tanks Replacement: Replace deteriorating storage tanks to eliminate water loss

- 50,000 gal tank at Bummerville, with 3,150 feet of 6-inch fill line and booster pump

Project Design

Preliminary design plans have been developed for the downtown West point Distribution system and the Bummerville Tank Replacement. These preliminary plans are attached.

Total Project Costs

Downtown West Point Distribution System: $1,720,000
Upper Northwest West Point Distribution System: $1,586,000
Bummerville Storage Tanks Replacement: $492,000

Total Project Costs = $3,798,000

Overall Cost Estimate for Downtown West Point Distribution System Improvements

Element Description	Estimated Quantity	Units	Unit Price (installed)	Estimated Amount
Materials/Installation				
Pipeline				
6-inch Pipe	7,000	LF	$45	$315,000
8-inch Pipe	2,000	LF	$55	$110,000
10-inch Pipe	600	LF	$70	$42,000
12-inch Pipe	5,800	LF	$80	$464,000
Valves, Installed				
Along the 6-inch Pipe	23	EA	$850	$19,550

Along the 8-inch Pipe	7	EA	$1,000	$7,000
Along the 10-inch Pipe	2	EA	$1,200	$2,400
Along the 12-inch Pipe	19	EA	$1,500	$28,500
Pavement Replacement				
Along the 6-inch Pipe	7,000	LF	$8	$56,000
Along the 8-inch Pipe	2,000	LF	$10	$20,000
Along the 10-inch Pipe	600	LF	$10	$6,000
Along the 12-inch Pipe	5,800	LF	$12.50	$72,500
Service Connections	120	EA	$950.00	$114,000
	Materials/Installation subtotal =			$1,256,950
Planning/Design/Engineering	12%	LS		$150,834
Environmental Mitigation/Enhancement	3%	LS		$37,709
Other/Environmental Documentation	1	LS	$50,000	$50,000
				$238,543
			SUBTOTAL =	$1,495,493
Contingency Costs	15%	LS		$224,324
			TOTAL ESTIMATED COST =	**$1,720,000**

Overall Cost Estimate for Upper Northwest West Point Distribution System Improvements

Element Description	Estimated Quantity	Units	Unit Price (installed)	Estimated Amount
Materials/Installation				
Pipeline				
6-inch Pipe	6,036	LF	$45	$271,620
8-inch Pipe	3,135	LF	$55	$172,425
10-inch Pipe	5,807	LF	$70	$406,490
Valves, Installed				
Along the 6-inch Pipe	21	EA	$850	$17,850
Along the 8-inch Pipe	11	EA	$1,000	$11,000
Along the 10-inch Pipe	20	EA	$1,200	$24,000
Pavement Replacement				
Along the 6-inch Pipe	6,036	LF	$8	$48,288
Along the 8-inch Pipe	3,135	LF	$10	$31,350
Along the 10-inch Pipe	5,807	LF	$10	$58,070
Service Connections	120	EA	$950.00	$114,000
	Materials/Installation subtotal =			$1,155,093

Planning/Design/Engineering	12%	LS		$138,611
Environmental Mitigation/Enhancement	3%	LS		$34,653
Other/Environmental Documentation	1	LS	$50,000	$50,000
				$223,264
			SUBTOTAL =	$1,378,357
Contingency Costs	15%	LS		$206,754
			TOTAL ESTIMATED COST =	**$1,586,000**

Cost Estimate for Bummerville Tank

Element Description	Estimated Quantity	Units	Unit Price (installed)	Estimated Amount
Materials/Installation				
6-inch Pipe	3,150	LF	$50	$157,500
Pump Control Valve, 6-inch valve	1	EA	$7,500	$7,500
Butterfly Valve, 6-inch valve	1	EA	$1,200	$1,200
			Materials/Installation subtotal =	**$166,200**
Structures				
Pump Station	1	LS	$35,000	$35,000
Steel Tank for Bummerville	50,000	GAL	$0.75	$37,500
Removal of Existing Tanks	1	LS	$10,000	$10,000
			Structures subtotal =	**$82,500**
Planning/Design/Engineering	8%	LS		$19,896
Environmental Mitigation/Enhancement	3%	LS		$7,461
Construction Administration/Overhead	10%	LS		$24,870
Other/Environmental Documentation	1	LS	$40,000	$40,000
				$92,227
			SUBTOTAL =	$340,927
Contingency Costs	15%	LS		$51,139
			TOTAL ESTIMATED COST =	**$393,000**

Cost Estimate for Bummerville Fire Flow Pump

Element Description	Estimated Quantity	Units	Unit Price (installed)	Estimated Amount
Structures				
Fire Booster Pump Station	1	LS	$65,000	$65,000
			Structures subtotal =	**$65,000**

Planning/Design/Engineering	8%	LS		$5,200
Environmental Mitigation/Enhancement	3%	LS		$1,950
Construction Administration/Overhead	10%	LS		$6,500
Other/Environmental Documentation	1	LS	$10,000	$10,000
			SUBTOTAL =	$23,650
Contingency Costs	15%	LS		$9,750
			TOTAL ESTIMATED COST =	**$99,000**

Capital Recovery Analysis

The following table outlines the engineering economics analysis to determine the annual capital recovery costs for the project. This analysis assumes a minimum 50 year project life and an interest rate of 5% (from Appendix C of the OMB Circular A-94).

	Capital Cost Category (a)	Cost (b)	Percent (c)	Dollars (d) (b x c)	Subtotal (e) (b + d)
(a)	Land Purchase/Easement	*Not applicable*	0.15	---	---
(b)	Planning/Design/Engineering	314,550	0.15	$47,183	$361,733
(c)	Materials/Installation	$2,578,000	0.15	$386,700	$2,964,700
(d)	Structures	$147,500	0.15	$22,125	$169,625
(e)	Equipment Purchases/Rentals	*Not applicable*	0.15	---	---
(f)	Environmental Mitigation/Enhancement	$81,500	0.15	$12,225	$93,725
(g)	Construction Administration/Overhead	$31,370	0.15	$4,706	$36,076
(h)	Project Legal/License Fees		0.15	---	---
(i)	Other	$150,000	0.15	$22,500	$172,500
(j)	Total (1) (a + ….+j)	$3,302,920	0.15	$495,438	$3,798,000
(k)	Capital Recovery Factor 0.2281 (5%; 50 years)	---	---	---	0.0548
(l)	Annual Capital Costs (jxk)	---	---	---	$208,000

CALAVERAS COUNTY WATER DISTRICT

WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM

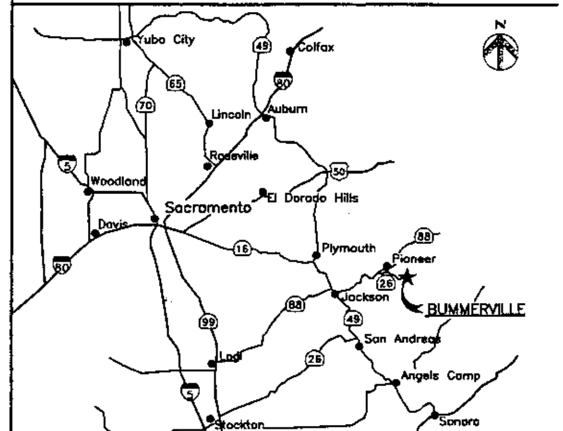
PREDESIGN SUBMITTAL
NOVEMBER 2002

HDR

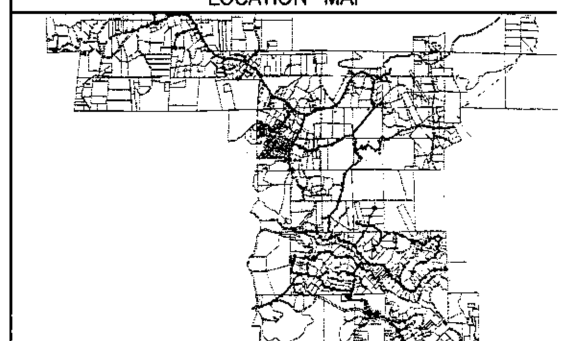
HDR Engineering Inc.
271 Turn Pike Drive
Folsom, CA 95630

Underground Service Alert
TWO DAYS BEFORE YOU DIG
Call : TOLL FREE 1 (800) 642 - 2444

REGIONAL MAP



LOCATION MAP



LIST OF DRAWINGS

SHEET NUMBER	DRAWING NUMBER	DESCRIPTION
1	G-1	COVER SHEET, LIST OF DRAWINGS, AND PROJECT LOCATION MAPS
2	G-2	GENERAL ABBREVIATIONS
3	G-3	GENERAL SYMBOLS
4	G-4	OVERALL SITE PLAN
5	C-1	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
6	C-2	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
7	C-3	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
8	C-4	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
9	C-5	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
10	C-6	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
11	C-7	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
12	C-8	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
13	C-9	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
14	C-10	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
15	C-11	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
16	C-12	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
17	C-13	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
18	C-14	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
19	C-15	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN
20	C-16	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM – PLAN

GENERAL ABBREVIATIONS

AB	ANCHOR BOLT
ABND	ABANDON
AC	ASPHALTIC CEMENT CONCRETE
A/C	AIR CONDITIONING
ACP	ACOUSTIC CEILING PANELS
ACT	ACOUSTIC CEILING TILE
ACST	ACOUSTIC
ADDN	ADDITION, ADDITIONAL
ADJ	ADJUST, ADJUSTABLE
ADMIN	ADMINISTRATION
ADWF	AVERAGE DRY WEATHER FLOW
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AI	AREA INLET
AL	ALUMINUM
ALT	ALTERNATE
ANC	ANCHOR
AR	AIR RELEASE
AS	AIR SUPPLY, ACTIVATED SLUDGE
ASC	ACCOUSTICAL SUSPENDED CEILING
ASSY	ASSEMBLY
ATM	ATMOSPHERE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
B-B	BACK TO BACK
BC	BOLT CENTER
BD	BOARD
BE	BELL END
BF	BLIND FLANGE
BL	BASELINE
BLDG	BUILDING
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT, BIOCHEMICAL OXYGEN DEMAND
BOG	BOTTOM OF GRILL
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BP	BASE PLATE
BRG	BEARING
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BU	BELL UP
BUR	BUILT-UP ROOF
BW	BOTH WAYS
C	STEEL CHANNEL SHAPE, CENTIGRADE
C&G	CURB & GUTTER
CAB	CABINET
CAP	CAPACITY
CAV	CAVITY
CB	CATCH BASIN
CCW	COUNTER CLOCKWISE
C-C	CENTER TO CENTER
CCF	CONCRETE FLOOR
CD	CONDENSATE DRAIN, CEILING DIFFUSER
CER	CERAMIC
CF	CUBIC FEET (FOOT)
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CURB INLET
CIMJ	CAST IRON MECHANICAL JOINT
CJ	CONSTRUCTION JOINT
CL	CENTERLINE
CLJ	CONTROL JOINT
CLKG	CAULKING
CLO	CLOSET
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COL	COLUMN
COMM	COMMUNICATION
COMP	COMPRESSIBLE
CON	CONCENTRIC
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
CORR	CORRIDOR
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSC	COMPRESSION SLEEVE COUPLING
CSD	CEILING SUPPLY DIFFUSER
CSK	COUNTERSINK
CT	CERAMIC TILE
CTR	CENTER, CONTRACTOR
CVT	CULVERT
CU	COPPER, CUBIC
CW	CLOCKWISE
D	DIFFUSER
DB	DUCT BANK
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DEP	DEPRESSED
DF	DOUGLAS FIR
DI	DROP INLET
DIA	DIAMETER
DIAG	DIAGONAL
DIAPH	DIAPHRAGM
DIFF	DIFFERENTIAL
DIM	DIMENSION
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DMJ	DOUBLE MECHANICAL JOINT
DN	DOWN
DO	DISSOLVED OXYGEN
DP	DEPTH
DR	DRAIN ROCK
DT	DOUBLE TEE
DTL	DETAIL
DWG	DRAWING
DWLS	DOWELS
DWR	DRAWER
E	EAST
EA	EACH, EXHAUST AIR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLD
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBD	EMBEDDED
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EX	EXTRA
EXC	EXCAVATION
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR, EXTERNAL
F	FAHRENHEIT, FACE
FAB	FABRICATE (D), (TION)
FB	FLOOR BEAM
FBD	FIBERBOARD
FBG	FIBERGLASS
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FDC	FLEXIBLE DUCT CONNECTION
FDN	FOUNDATION
FE	FLANGED END, FLOW ELEMENT
FF	FAR FACE
F-F	FACE TO FACE
FFE	FINISHED FLOOR ELEVATION
FIG	FIGURE
FIN	FINISHED
FJT	FLUSH JOINT
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FLS	FLASHING or FLUSH
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET, FOOT
FT/FT	FOOT PER FOOT
FTG	FOOTING
FTGS	FITTINGS
FUR	FURRED or FURRING
FURN	FURNITURE
FUT	FUTURE
FWD	FORWARD
FXC	FLEXIBLE
G	GRILLE
GA	GAGE, METAL THICKNESS
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK, GRAB BAR
GD	GUARD
GL	GLASS
GLB	GLASS BLOCK
GN	GENERAL
GND	GROUND
GO	GRATING OPENING
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GP	GUY POLE
GR	GRADE
GRT	GROUT
GRTG	GRATING
GSB	GYPSUM SHEATHING BOARD
GSKT	GASKET
GWB	GYPSUM WALL BOARD
HBD	HARDBOARD
HC	HANDICAPPED
HDR	HEADER
HDW	HARDWARE
HGR	HANGER
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER, HIGH PRESSURE
HR	HANDRAIL, HOUR
HS	HEADED STUD
HT	HEIGHT
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HW	HARDWARE
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IN	INCH, INCHES
INF	INFLUENT
INSTR	INSTRUMENT, INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR
INTR	INTERMEDIATE
JB	JUNCTION BOX
JC	JANITOR'S CLOSET
JST	JOIST
JT	JOINT
KB	KNEE BRACE
KD	KNOCK DOWN
KO	KNOCK OUT
L	LEFT, LENGTH
LAB	LABORATORY
LAM	LAMINATED
LAT	LATERAL, LAMINATE
LAU	LAUNDRY
LAV	LAVATORY
LB	POUND
LB/FT	POUND(S) PER FOOT
LB/IN.	POUND(S) PER INCH
LDG	LANDING
LF	LINEAR FOOT (FEET)
LG	LONG
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LOC	LOCATION
LP	LOW PRESSURE
LR	LONG RADIUS
LTL	LINTEL
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
MAINT	MAINTENANCE
MAN	MANUAL(LY)
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBH	THOUSAND BTUs PER HOUR
MBR	MEMBER
MC	MECHANICAL COUPLING
MCB	METAL CORNER BEAD
MCJ	MASONRY CONTROL JOINT
MDMJ	MODIFIED DOUBLE MECHANICAL JOINT
MECH	MECHANICAL
MED	MEDIUM
MEE	MISCELLANEOUS ELECTRICAL EQUIPMENT
MEZZ	MEZZANINE
MFR	MANUFACTURER
MGD	MILLION GALLONS PER DAY
MG/L	MILLIGRAMS PER LITER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
ML	MILLILITER
MLDG	MOLDING
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODIFIED, MODIFICATION
MPT	MALE PIPE THREAD
MTD	MOUNTED
MTG	MOUNTING
MU	MASONRY UNIT
MW	MONITORING WELL
N	NORTH
NAT	NATURAL
NEG	NEGATIVE
NF	NEAR FACE
NOC	NOT IN CONTRACT
NO	NUMBER
NPT	NATIONAL PIPE THREADS
NRC	NOISE REDUCTION COEFFICIENT
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
OA	OUTSIDE AIR
OC	ON CENTER(S)
OD	OUTSIDE DIAMETER
OED	OPEN END DUCT
OF	OUTSIDE FACE
OH	OVERHEAD
OPG	OPENING
OPP	OPPOSITE
ORIG	ORIGINAL
OX	OXIDATION
PAR	PARALLEL
PB	PULL BOX, PANIC BAR
PBD	PARTICLE BOARD
PC	POINT OF CURVE
PCC	PORTLAND CEMENT CONCRETE
PCF	POUNDS PER CUBIC FOOT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PI	POINT OF INTERSECTION
PL	PLATE, PROPERTY LINE
POC	POINT OF CURVE
PP	POWER POLE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRES	PRESSURE
PRI	PRIMARY
PRL	PARALLEL
PS	PIPE SUPPORT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PST	PRESTRESSED
PT (PT)	POINT OF TANGENCY
PTN	PARTITION
PVMT	PAVEMENT
PWJ	PLYWOOD WEB JOIST
Q	RATE OF FLOW
QT	QUARRY TILE
QTR	QUARTER
QTY	QUANTITY
R	RIGHT, RADIUS, RISERS
R/W	RIGHT OF WAY
RB	RESILIENT BASE
RECD	RECEIVED
RECIRC	RECIRCULATION
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCE, REINFORCING
REM	REMOVE, REMOVABLE
REQD	REQUIRED
RFG	ROOFING
RFL	REFLECTED or REFLECTIVE or REFLECTOR
RH	RIGHT HAND
RL	REQUIRED LAP
RM	ROOM(S)
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
RTN	RETURN
RVT	RESILIENT VINYL TILE
S	SOUTH
S & P	SHELF AND POLE
SAN	SANITARY
SB	SPLASH BLOCK
SC	SOLID CORE
SCHED	SCHEDULE
SCHEM	SCHEMATIC
SCN	SCREEN
SECT	SECTION
SG	SHEET GLASS, SEALANT GROOVE
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SMLS	SEAMLESS
SP	SOUNDPROOF
SPEC	SPECIFICATION
SQ	SQUARE
SR	SHORT RADIUS
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STRUCT	STRUCTURE
SUB	SUBSTITUTE
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
T	THREADS
T/B	TOP OF BANK
T & B	TOP AND BOTTOM
T & G	TONGUE AND GROOVE
TBM	TEMPORARY BENCHMARK
TC	TOP OF CONCRETE
TEL	TELEPHONE
TEMP	TEMPORARY, TEMPERATURE
THD	THREADED
THK	THICK
TOC	TOP OF CURB, TOP OF CONCRETE
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TOG	TOPPING
TR	STAIR TREAD
TS	TUBULAR STEEL
TYP	TYPICAL
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY
VAC	VACUUM
VAR	VARIABLE, VARNISH
VB	VAPOR BARRIER, VINYL BASE
VC	VERTICAL CURVE
VC	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VG	VERTICAL GRAIN
VIF	VERIFY IN FIELD
VTR	VENT THRU ROOF
VWC	VINYL WALL COVERING
W	WEST
WB	WOOD BASE
WD	WOOD, WIDTH
WF	WIDE FLANGE
WG	WIRE GLASS
WI	WROUGHT IRON
WL	WATER LEVEL, WIND LOAD
WP	WATERPROOF(ED) (ING), WORKING POINT
WS	WATERSTOP, WATER SURFACE
WSCT	WAINSCOT
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
W/	WITH
W/O	WITHOUT
XSECT	CROSS SECTION

GENERAL NOTES

THIS SHEET APPLIES TO THE ENTIRE SET OF DRAWINGS. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS HAVE BEEN USED ON THIS PROJECT.

HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD

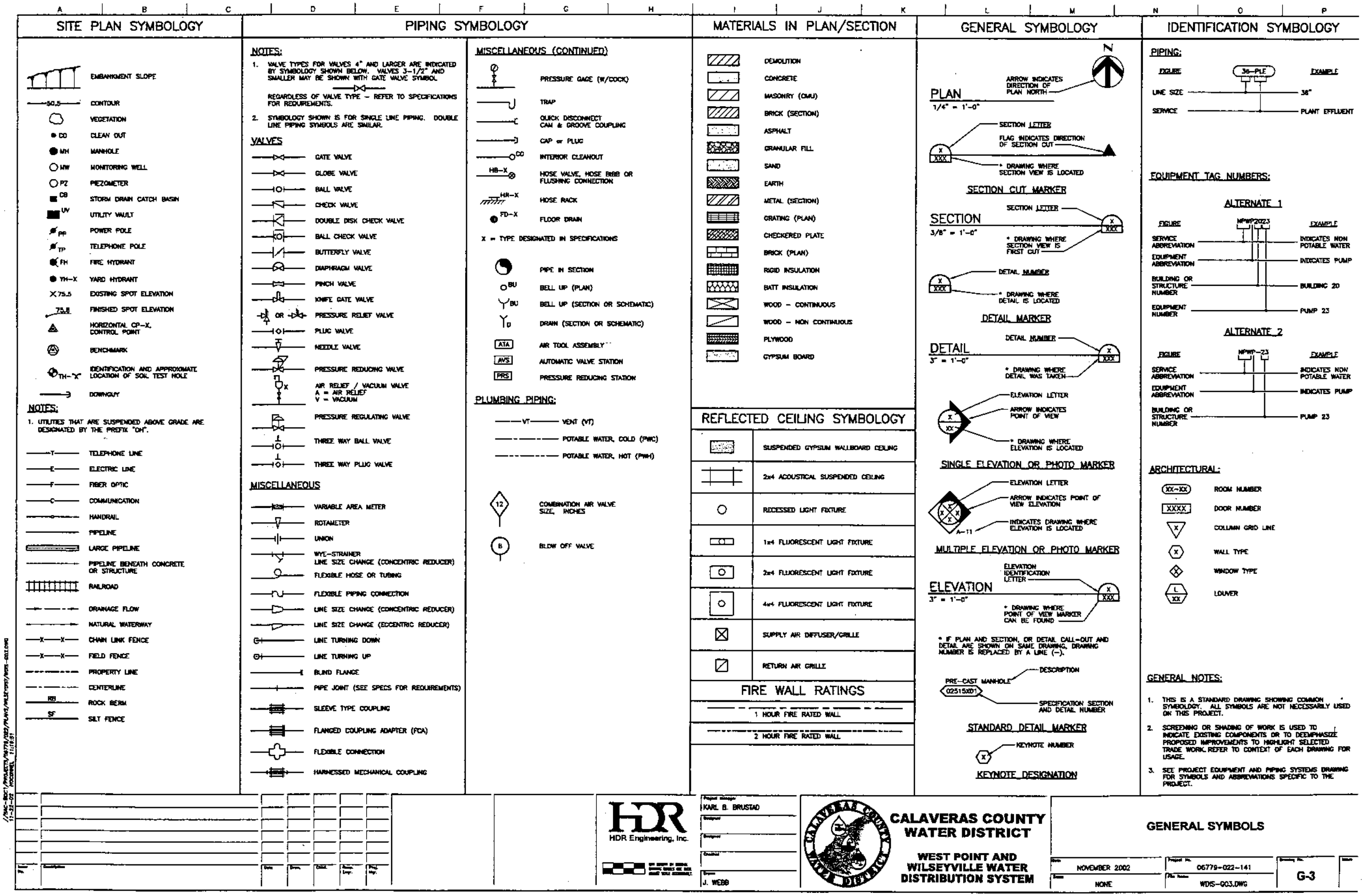
Drawn: J. WEBB

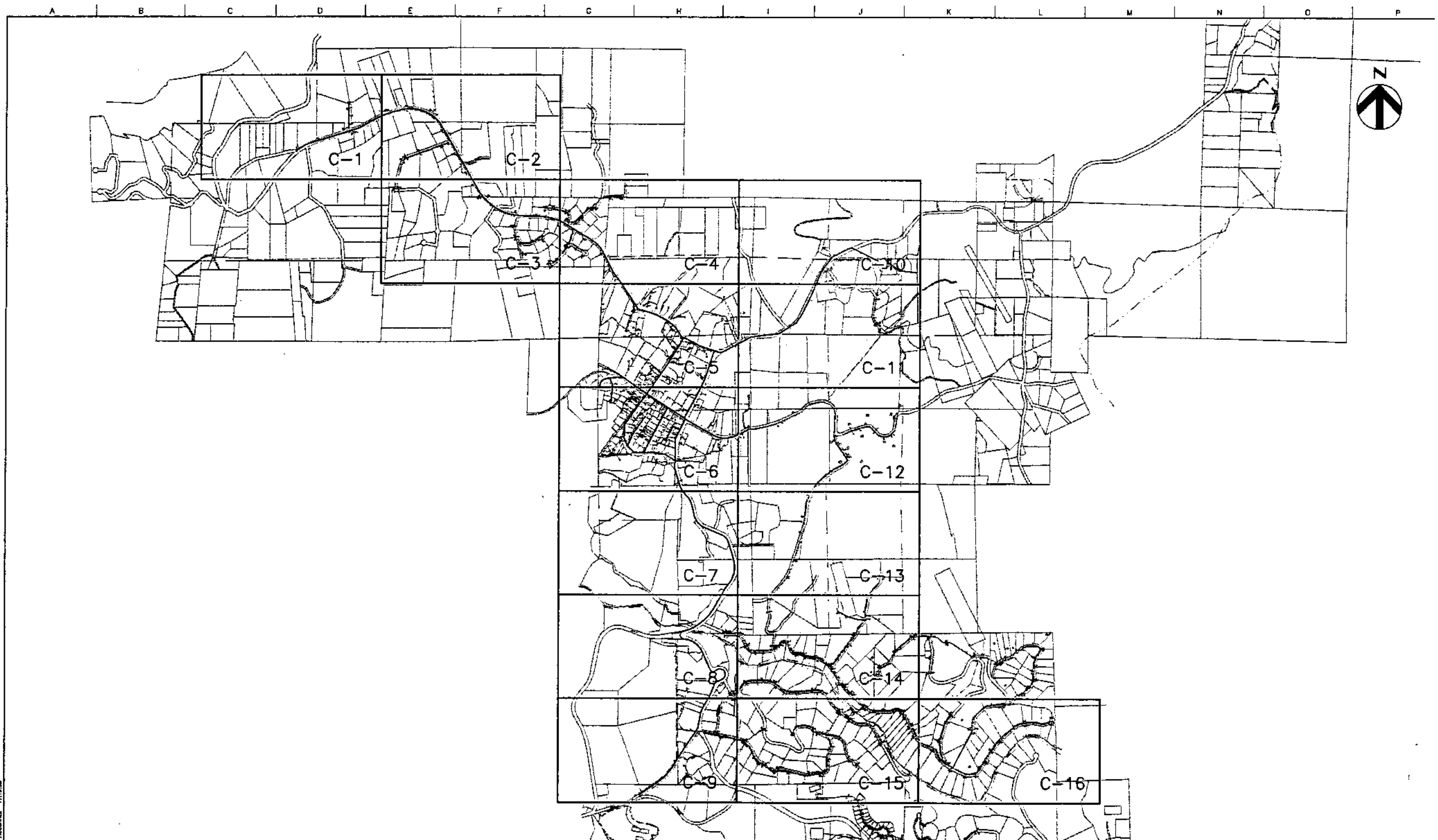
CALAVERAS COUNTY WATER DISTRICT

WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM

GENERAL ABBREVIATIONS

Date: NOVEMBER 2002 | Scale: NONE | Project No.: 06779-022-141 | File Name: WDIS-G02.DWG | Drawing No.: G-2


SITE PLAN SYMBOLOGY
EMBANKMENT SLOPE
50.5 CONTOUR
VEGETATION
CO CLEAN OUT
MH MANHOLE
MW MONITORING WELL
PZ PIEZOMETER
CB STORM DRAIN CATCH BASIN
UV UTILITY VAULT
PP POWER POLE
TP TELEPHONE POLE
FH FIRE HYDRANT
YH-X YARD HYDRANT
X75.5 EXISTING SPOT ELEVATION
75.8 FINISHED SPOT ELEVATION
HORIZONTAL CP-X, CONTROL POINT
BENCHMARK
TH-"X" IDENTIFICATION AND APPROXIMATE LOCATION OF SOIL TEST HOLE
DOWNGUY
NOTES:
1. UTILITIES THAT ARE SUSPENDED ABOVE GRADE ARE DESIGNATED BY THE PREFIX "OH".
T TELEPHONE LINE
E ELECTRIC LINE
F FIBER OPTIC
C COMMUNICATION
HANDRAIL
PIPELINE
LARGE PIPELINE
PIPELINE BENEATH CONCRETE OR STRUCTURE
RAILROAD
DRAINAGE FLOW
NATURAL WATERWAY
X X CHAIN LINK FENCE
X X FIELD FENCE
PROPERTY LINE
CENTERLINE
RB ROCK BERM
SF SILT FENCE
PIPING SYMBOLOGY
NOTES:
1. VALVE TYPES FOR VALVES 4" AND LARGER ARE INDICATED BY SYMBOLOGY SHOWN BELOW. VALVES 3-1/2" AND SMALLER MAY BE SHOWN WITH GATE VALVE SYMBOL.
REGARDLESS OF VALVE TYPE – REFER TO SPECIFICATIONS FOR REQUIREMENTS.
2. SYMBOLOGY SHOWN IS FOR SINGLE LINE PIPING. DOUBLE LINE PIPING SYMBOLS ARE SIMILAR.
VALVES
GATE VALVE
GLOBE VALVE
BALL VALVE
CHECK VALVE
DOUBLE DISK CHECK VALVE
BALL CHECK VALVE
BUTTERFLY VALVE
DIAPHRAGM VALVE
PINCH VALVE
KNIFE GATE VALVE
OR PRESSURE RELIEF VALVE
PLUG VALVE
NEEDLE VALVE
PRESSURE REDUCING VALVE
X AIR RELIEF / VACUUM VALVE A = AIR RELIEF V = VACUUM
PRESSURE REGULATING VALVE
THREE WAY BALL VALVE
THREE WAY PLUG VALVE
MISCELLANEOUS
VARIABLE AREA METER
ROTAMETER
UNION
WYE-STRAINER
LINE SIZE CHANGE (CONCENTRIC REDUCER)
FLEXIBLE HOSE OR TUBING
FLEXIBLE PIPING CONNECTION
LINE SIZE CHANGE (CONCENTRIC REDUCER)
LINE SIZE CHANGE (ECCENTRIC REDUCER)
LINE TURNING DOWN
LINE TURNING UP
BLIND FLANGE
PIPE JOINT (SEE SPECS FOR REQUIREMENTS)
SLEEVE TYPE COUPLING
FLANGED COUPLING ADAPTER (FCA)
FLEXIBLE CONNECTION
HARNESSED MECHANICAL COUPLING
MISCELLANEOUS (CONTINUED)
PRESSURE GAGE (W/COCK)
TRAP
QUICK DISCONNECT CAM & GROOVE COUPLING
CAP or PLUG
CO INTERIOR CLEANOUT
HB-X HOSE VALVE, HOSE BIBB OR FLUSHING CONNECTION
HR-X HOSE RACK
FD-X FLOOR DRAIN
X = TYPE DESIGNATED IN SPECIFICATIONS
PIPE IN SECTION
BU BELL UP (PLAN)
BU BELL UP (SECTION OR SCHEMATIC)
D DRAIN (SECTION OR SCHEMATIC)
ATA AIR TOOL ASSEMBLY
AVS AUTOMATIC VALVE STATION
PRS PRESSURE REDUCING STATION
PLUMBING PIPING:
VT VENT (VT)
POTABLE WATER, COLD (PWC)
POTABLE WATER, HOT (PWH)
12 COMBINATION AIR VALVE SIZE, INCHES
B BLOW OFF VALVE
MATERIALS IN PLAN/SECTION
DEMOLITION
CONCRETE
MASONRY (CMU)
BRICK (SECTION)
ASPHALT
GRANULAR FILL
SAND
EARTH
METAL (SECTION)
GRATING (PLAN)
CHECKERED PLATE
BRICK (PLAN)
RIGID INSULATION
BATT INSULATION
WOOD – CONTINUOUS
WOOD – NON CONTINUOUS
PLYWOOD
GYPSUM BOARD
REFLECTED CEILING SYMBOLOGY
SUSPENDED GYPSUM WALLBOARD CEILING
2x4 ACOUSTICAL SUSPENDED CEILING
RECESSED LIGHT FIXTURE
1x4 FLUORESCENT LIGHT FIXTURE
2x4 FLUORESCENT LIGHT FIXTURE
4x4 FLUORESCENT LIGHT FIXTURE
SUPPLY AIR DIFFUSER/GRILLE
RETURN AIR GRILLE
FIRE WALL RATINGS
1 HOUR FIRE RATED WALL
2 HOUR FIRE RATED WALL
GENERAL SYMBOLOGY
N
PLAN
1/4" = 1'-0"
ARROW INDICATES DIRECTION OF PLAN NORTH
SECTION LETTER
FLAG INDICATES DIRECTION OF SECTION CUT
X
XXX
* DRAWING WHERE SECTION VIEW IS LOCATED
SECTION CUT MARKER
SECTION
3/8" = 1'-0"
SECTION LETTER
* DRAWING WHERE SECTION VIEW IS FIRST CUT
DETAIL NUMBER
* DRAWING WHERE DETAIL IS LOCATED
DETAIL MARKER
DETAIL
3" = 1'-0"
DETAIL NUMBER
* DRAWING WHERE DETAIL WAS TAKEN
ELEVATION LETTER
ARROW INDICATES POINT OF VIEW
* DRAWING WHERE ELEVATION IS LOCATED
SINGLE ELEVATION OR PHOTO MARKER
ELEVATION LETTER
ARROW INDICATES POINT OF VIEW ELEVATION
A-11
INDICATES DRAWING WHERE ELEVATION IS LOCATED
MULTIPLE ELEVATION OR PHOTO MARKER
ELEVATION
3" = 1'-0"
ELEVATION IDENTIFICATION LETTER
* DRAWING WHERE POINT OF VIEW MARKER CAN BE FOUND
* IF PLAN AND SECTION, OR DETAIL CALL-OUT AND DETAIL ARE SHOWN ON SAME DRAWING, DRAWING NUMBER IS REPLACED BY A LINE (–).
PRE-CAST MANHOLE
DESCRIPTION
02515X01
SPECIFICATION SECTION AND DETAIL NUMBER
STANDARD DETAIL MARKER
KEYNOTE NUMBER
KEYNOTE DESIGNATION
IDENTIFICATION SYMBOLOGY
PIPING:
FIGURE
36-PLE
EXAMPLE
LINE SIZE
36"
SERVICE
PLANT EFFLUENT
EQUIPMENT TAG NUMBERS:
ALTERNATE 1
FIGURE
NPWP2023
EXAMPLE
SERVICE ABBREVIATION
INDICATES NON POTABLE WATER
EQUIPMENT ABBREVIATION
INDICATES PUMP
BUILDING OR STRUCTURE NUMBER
BUILDING 20
EQUIPMENT NUMBER
PUMP 23
ALTERNATE 2
FIGURE
NPWP-23
EXAMPLE
SERVICE ABBREVIATION
INDICATES NON POTABLE WATER
EQUIPMENT ABBREVIATION
INDICATES PUMP
BUILDING OR STRUCTURE NUMBER
PUMP 23
ARCHITECTURAL:
XX-XX ROOM NUMBER
XXXX DOOR NUMBER
X COLUMN GRID LINE
X WALL TYPE
WINDOW TYPE
L XX LOUVER
GENERAL NOTES:
1. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLOGY. ALL SYMBOLS ARE NOT NECESSARILY USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DEEMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.
3. SEE PROJECT EQUIPMENT AND PIPING SYSTEMS DRAWING FOR SYMBOLS AND ABBREVIATIONS SPECIFIC TO THE PROJECT.
HDR
HDR Engineering, Inc.
KARL B. BRUSTAD
J. WEBB
CALAVERAS COUNTY WATER DISTRICT
WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM
GENERAL SYMBOLS
NOVEMBER 2002
NONE
06779-022-141
WDS-G03.DWG
G-3



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HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
Drawn: J. WEBB

CALAVERAS COUNTY WATER DISTRICT

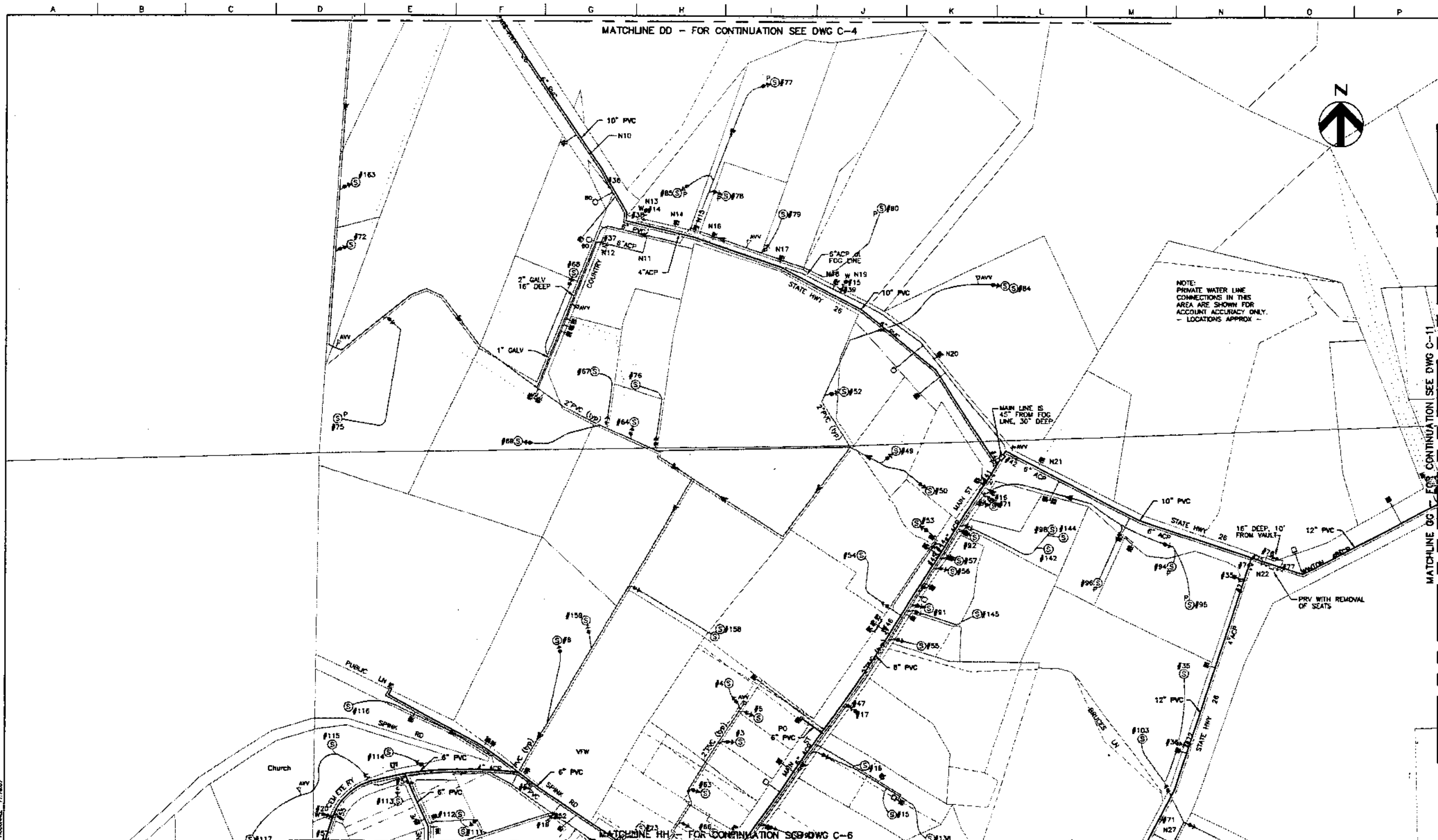
WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM

OVERALL SITE PLAN

Date	Project No.	Drawing No.
NOVEMBER 2002	06779-022-141	G-4
1" = 600'	WDIS-G04.DWG	

No.	Description	Date	Drn.	Chkd.	Sect. Supv.	Proj. Mgr.

//SAC-BOC1/PROJECTS/06779/022/PLANS/WILSEYDIST/WDIS-G04.DWG 11-22-02 HOCONNEL 11:19:58



Issue No.	Description	Date	Drwn.	Chkd.	Desgn. Engr.	Proj. Mgr.

HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD

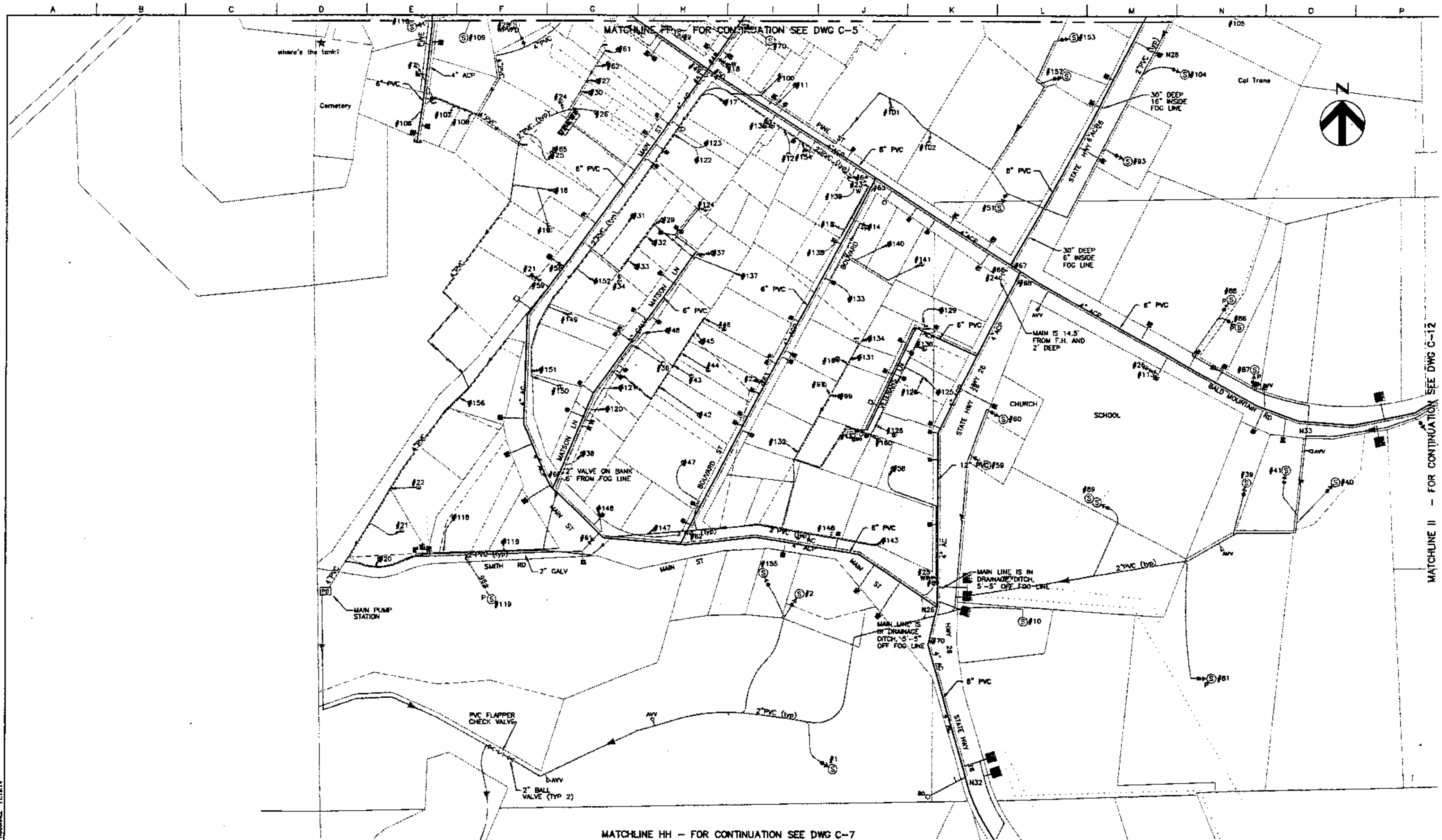
Drawn: J. WEBB

CALAVERAS COUNTY WATER DISTRICT

WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM

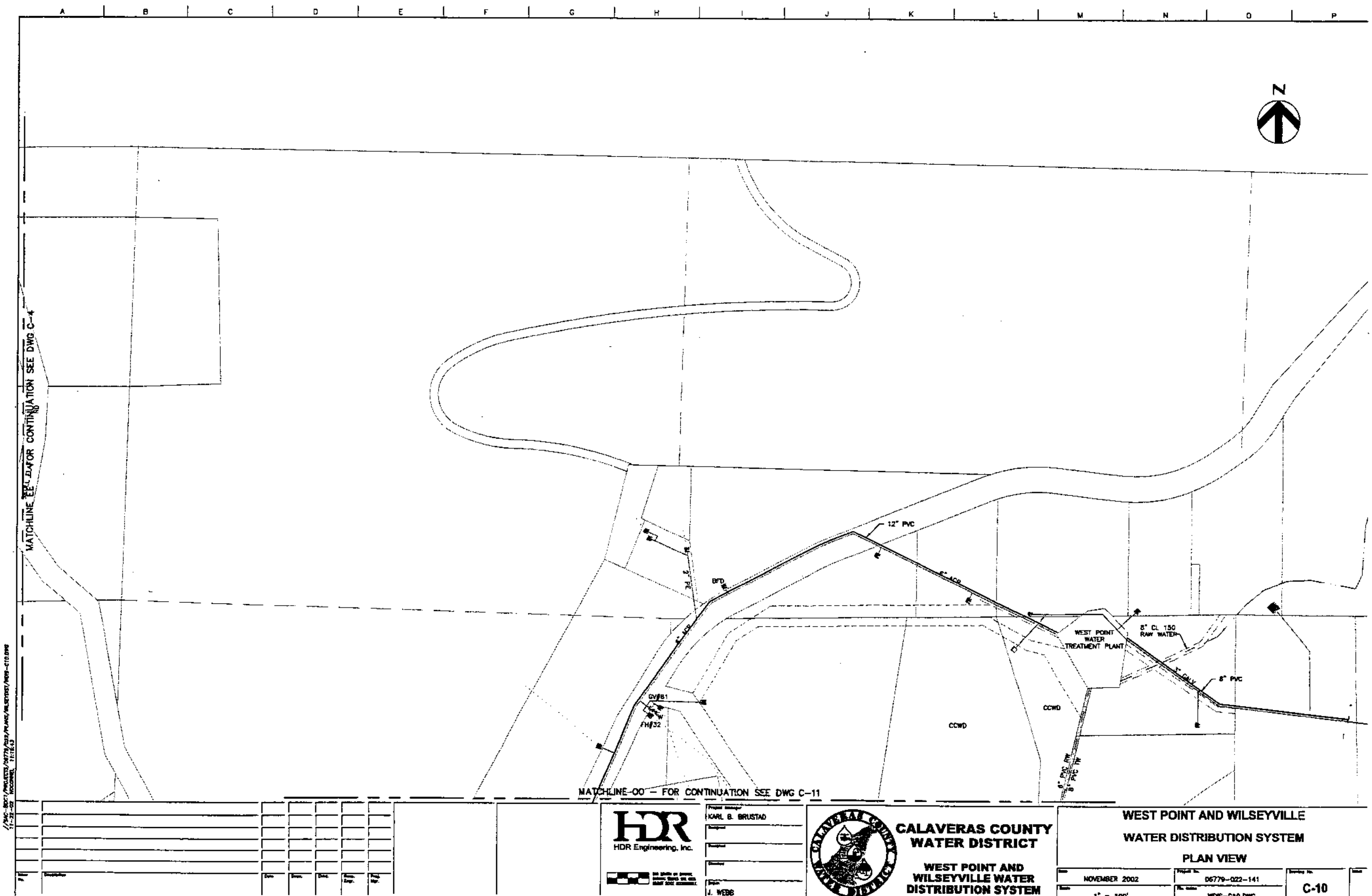
WEST POINT AND WILSEYVILLE
WATER DISTRIBUTION SYSTEM
PLAN VIEW

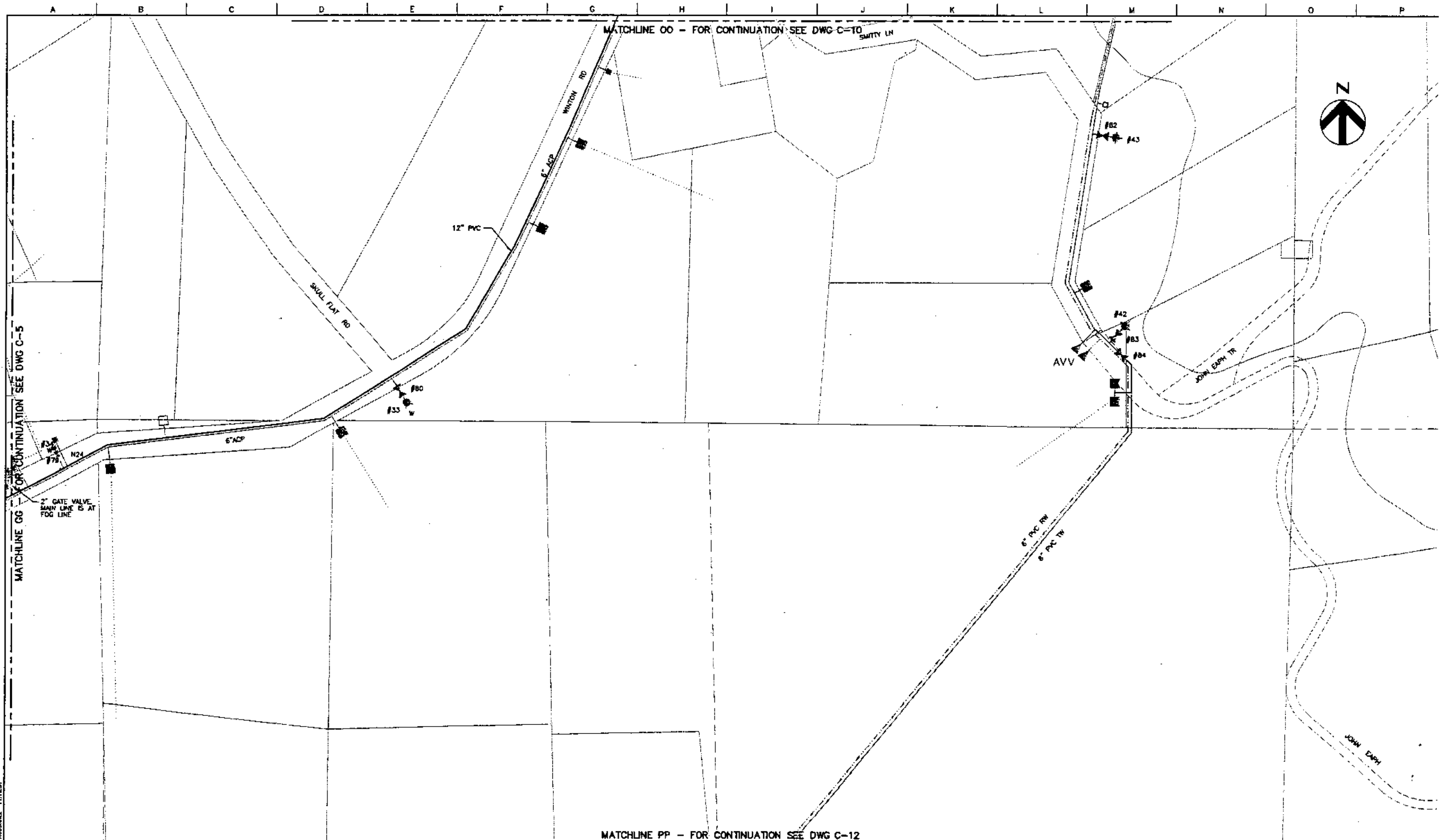
Date: NOVEMBER 2002
Scale: 1" = 100'
Project No.: 06779-022-141
File Name: WDIS-C05.DWG
Drawing No.: C-5



Project manager: KARL B. BRUSTAD	CALAVERAS COUNTY WATER DISTRICT	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM				
Drawn: J. WEBB	WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM	PLAN VIEW				
HDR Engineering, Inc.		Date: NOVEMBER 2002	Project No.: 06779-022-141	Drawing No.: C-6		
		Scale: 1" = 100'	File name: WDS-C06.DWG			

//SAC-BOOT/PROJECTS/06779/022/PLANS/WILSEYDIST/WDS-C06.DWG 11-22-02 MODONNEL 11:16:14


N
12" PVC
6" ACP
2" PE
BFD
GV#81
FH#32
WEST POINT WATER TREATMENT PLANT
8" CL 150 RAW WATER
8" PVC
CCWD
6" PVC RW
8" PVC TW
MATCHLINE-OO – FOR CONTINUATION SEE DWG C-11
MATCHLINE EE FOR CONTINUATION SEE DWG C-4
HDR
HDR Engineering, Inc.
KARL B. BRUSTAD
J. WEBB
CALAVERAS COUNTY WATER DISTRICT
WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM
WEST POINT AND WILSEYVILLE
WATER DISTRIBUTION SYSTEM
PLAN VIEW
NOVEMBER 2002
06779-022-141
1" = 100'
WDIS-C10.DWG
C-10



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HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
Drawn: J. WEBB

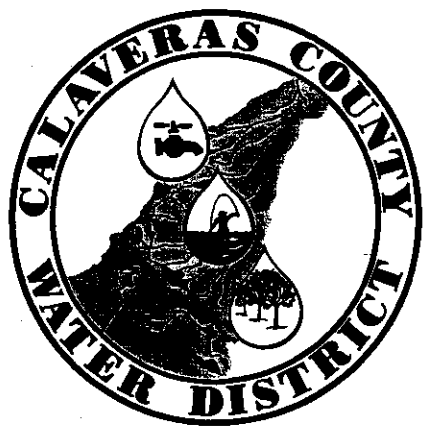
CALAVERAS COUNTY WATER DISTRICT

WEST POINT AND WILSEYVILLE WATER DISTRIBUTION SYSTEM

WEST POINT AND WILSEYVILLE
WATER DISTRIBUTION SYSTEM
PLAN VIEW

Date	Project No.	Drawing No.
NOVEMBER 2002	06779-022-141	C-11
Scale: 1" = 100'	File Name: WDIS-C11.DWG	

CALAVERAS COUNTY WATER DISTRICT

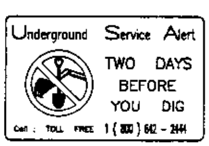


BUMMERVILLE TREATED WATER STORAGE TANKS

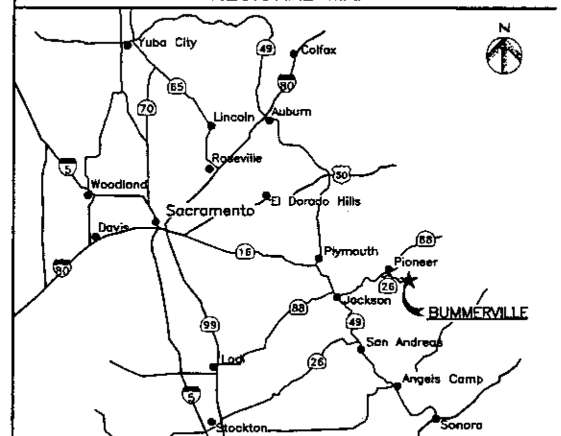
PREDESIGN SUBMITTAL
NOVEMBER 2002

HDR

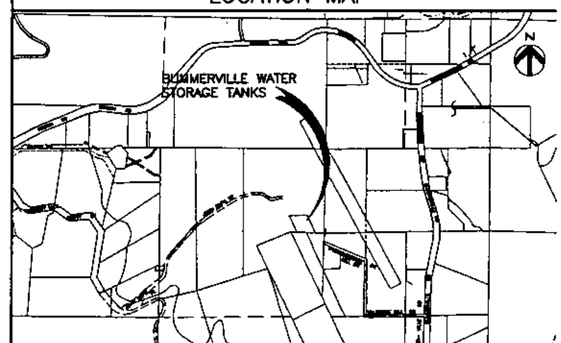
HDR Engineering Inc.
271 Turn Pike Drive
Folsom, CA 95630



REGIONAL MAP



LOCATION MAP



LIST OF DRAWINGS

SHEET NUMBER	DRAWING NUMBER	DESCRIPTION
1	G-1	COVER SHEET, LIST OF DRAWINGS, AND PROJECT LOCATION MAPS
2	G-2	GENERAL ABBREVIATIONS
3	G-3	GENERAL SYMBOLS
4	C-1	WATER RECOVERY TANK – SITE PLAN
5	C-2	WATER RECOVERY TANK – PLAN VIEW AND DETAILS
6	C-3	WATER RECOVERY TANK – SECTION AND DETAILS
7	C-4	WATER RECOVERY TANK – DETAILS I
8	C-5	WATER RECOVERY TANK – DETAILS II
9	C-6	WATER RECOVERY TANK – DETAILS III

GENERAL ABBREVIATIONS

Abbreviation	Meaning
AB	ANCHOR BOLT
ABND	ABANDON
AC	ASPHALTIC CEMENT CONCRETE
A/C	AIR CONDITIONING
ACP	ACOUSTIC CEILING PANELS
ACT	ACOUSTIC CEILING TILE
ACST	ACOUSTIC
ADDN	ADDITION, ADDITIONAL
ADJ	ADJUST, ADJUSTABLE
ADMIN	ADMINISTRATION
ADWF	AVERAGE DRY WEATHER FLOW
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AI	AREA INLET
AL	ALUMINUM
ALT	ALTERNATE
ANC	ANCHOR
AR	AIR RELEASE
AS	AIR SUPPLY, ACTIVATED SLUDGE
ASC	ACCOUSTICAL SUSPENDED CEILING
ASSY	ASSEMBLY
ATM	ATMOSPHERE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
B-B	BACK TO BACK
BC	BOLT CENTER
BD	BOARD
BE	BELL END
BF	BLIND FLANGE
BL	BASELINE
BLDG	BUILDING
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT, BIOCHEMICAL OXYGEN DEMAND
BOG	BOTTOM OF GRILL
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BP	BASE PLATE
BRG	BEARING
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BU	BELL UP
BUR	BUILT-UP ROOF
BW	BOTH WAYS
C	STEEL CHANNEL SHAPE, CENTIGRADE
C&G	CURB & GUTTER
CAB	CABINET
CAP	CAPACITY
CAV	CAVITY
CB	CATCH BASIN
CCW	COUNTER CLOCKWISE
C-C	CENTER TO CENTER
CCF	CONCRETE FLOOR
CD	CONDENSATE DRAIN, CEILING DIFFUSER
CER	CERAMIC
CF	CUBIC FEET (FOOT)
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CURB INLET
CIMJ	CAST IRON MECHANICAL JOINT
CJ	CONSTRUCTION JOINT
CL	CENTERLINE
CLJ	CONTROL JOINT
CLKG	CAULKING
CLO	CLOSET
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COL	COLUMN
COMM	COMMUNICATION
COMP	COMPRESSIBLE
CON	CONCENTRIC
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
CORR	CORRIDOR
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSC	COMPRESSION SLEEVE COUPLING
CSD	CEILING SUPPLY DIFFUSER
CSK	COUNTERSINK
CT	CERAMIC TILE
CTR	CENTER, CONTRACTOR
CVT	CULVERT
CU	COPPER, CUBIC
CW	CLOCKWISE
D	DIFFUSER
DB	DUCT BANK
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DEP	DEPRESSED
DF	DOUGLAS FIR
DI	DROP INLET
DIA	DIAMETER
DIAG	DIAGONAL
DIAPH	DIAPHRAGM
DIFF	DIFFERENTIAL
DIM	DIMENSION
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DMJ	DOUBLE MECHANICAL JOINT
DN	DOWN
DO	DISSOLVED OXYGEN
DP	DEPTH
DR	DRAIN ROCK
DT	DOUBLE TEE
DTL	DETAIL
DWG	DRAWING
DWLS	DOWELS
DWR	DRAWER
E	EAST
EA	EACH, EXHAUST AIR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLD
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBD	EMBEDDED
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EQ	EQUAL
EQUIP	EQUIPMENT
EW	EACH WAY
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EX	EXTRA
EXC	EXCAVATION
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR, EXTERNAL
F	FAHRENHEIT, FACE
FAB	FABRICATE (D), (TION)
FB	FLOOR BEAM
FBD	FIREBOARD
FBG	FIBERGLASS
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FDC	FLEXIBLE DUCT CONNECTION
FDN	FOUNDATION
FE	FLANGED END, FLOW ELEMENT
FF	FAR FACE
F-F	FACE TO FACE
FFE	FINISHED FLOOR ELEVATION
FIG	FIGURE
FIN	FINISHED
FJT	FLUSH JOINT
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FLS	FLASHING or FLUSH
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET, FOOT
FT/FT	FOOT PER FOOT
FTG	FOOTING
FTGS	FITTINGS
FUR	FURRED or FURRING
FURN	FURNITURE
FUT	FUTURE
FWD	FORWARD
FXC	FLEXIBLE
G	GRILLE
GA	GAGE, METAL THICKNESS
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK, GRAB BAR
GD	GUARD
GL	GLASS
GLB	GLASS BLOCK
GN	GENERAL
GND	GROUND
GO	GRATING OPENING
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GP	GUY POLE
GR	GRADE
GRT	GROUT
GRTG	GRATING
GSB	GYPSUM SHEATHING BOARD
GSKT	GASKET
GWB	GYPSUM WALL BOARD
HBD	HARDBOARD
HC	HANDICAPPED
HDR	HEADER
HDW	HARDWARE
HGR	HANGER
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER, HIGH PRESSURE
HR	HANDRAIL, HOUR
HS	HEADED STUD
HT	HEIGHT
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HW	HARDWARE
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IN	INCH, INCHES
INF	INFLUENT
INSTR	INSTRUMENT, INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR
INTR	INTERMEDIATE
JB	JUNCTION BOX
JC	JANITOR'S CLOSET
JST	JOIST
JT	JOINT
KB	KNEE BRACE
KD	KNOCK DOWN
KO	KNOCK OUT
L	LEFT, LENGTH
LAB	LABORATORY
LAM	LAMINATED
LAT	LATERAL, LAMINATE
LAU	LAUNDRY
LAV	LAVATORY
LB	POUND
LB/FT	POUND(S) PER FOOT
LB/IN	POUND(S) PER INCH
LDG	LANDING
LF	LINEAR FOOT (FEET)
LG	LONG
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LOC	LOCATION
LP	LOW PRESSURE
LR	LONG RADIUS
LTL	LINTEL
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
MAINT	MAINTENANCE
MAN	MANUAL(LY)
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBH	THOUSAND BTUs PER HOUR
MBR	MEMBER
MC	MECHANICAL COUPLING
MCB	METAL CORNER BEAD
MCJ	MASONRY CONTROL JOINT
MDMJ	MODIFIED DOUBLE MECHANICAL JOINT
MECH	MECHANICAL
MED	MEDIUM
MEE	MISCELLANEOUS ELECTRICAL EQUIPMENT
MEZZ	MEZZANINE
MFR	MANUFACTURER
MGD	MILLION GALLONS PER DAY
MG/L	MILLIGRAMS PER LITER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
ML	MILLILITER
MLDG	MOLDING
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODIFIED, MODIFICATION
MPT	MALE PIPE THREAD
MTD	MOUNTED
MTG	MOUNTING
MU	MASONRY UNIT
MW	MONITORING WELL
N	NORTH
NAT	NATURAL
NEG	NEGATIVE
NF	NEAR FACE
NOC	NOT IN CONTRACT
NO	NUMBER
NPT	NATIONAL PIPE THREADS
NRC	NOISE REDUCTION COEFFICIENT
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
OA	OUTSIDE AIR
OC	ON CENTER(S)
OD	OUTSIDE DIAMETER
OED	OPEN END DUCT
OF	OUTSIDE FACE
OH	OVERHEAD
OPG	OPENING
OPP	OPPOSITE
ORIG	ORIGINAL
OX	OXIDATION
PAR	PARALLEL
PB	PULL BOX, PANIC BAR
PBD	PARTICLE BOARD
PC	POINT OF CURVE
PCC	PORTLAND CEMENT CONCRETE
PCF	POUNDS PER CUBIC FOOT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PI	POINT OF INTERSECTION
PL	PLATE, PROPERTY LINE
POC	POINT OF CURVE
PP	POWER POLE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRES	PRESSURE
PRI	PRIMARY
PRL	PARALLEL
PS	PIPE SUPPORT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PST	PRESTRESSED
PT (PT)	POINT OF TANGENCY
PTN	PARTITION
PVMT	PAVEMENT
PWJ	PLYWOOD WEB JOIST
Q	RATE OF FLOW
QT	QUARRY TILE
QTR	QUARTER
QTY	QUANTITY
R	RIGHT, RADIUS, RISERS
R/W	RIGHT OF WAY
RB	RESILIENT BASE
RECD	RECEIVED
RECIRC	RECIRCULATION
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCE, REINFORCING
REM	REMOVE, REMOVABLE
REQD	REQUIRED
RFG	ROOFING
RFL	REFLECTED or REFLECTIVE or REFLECTOR
RH	RIGHT HAND
RL	REQUIRED LAP
RM	ROOM(S)
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
RTN	RETURN
RVT	RESILIENT VINYL TILE
S	SOUTH
S & P	SHELF AND POLE
SAN	SANITARY
SB	SPLASH BLOCK
SC	SOLID CORE
SCHED	SCHEDULE
SCHEM	SCHEMATIC
SCN	SCREEN
SECT	SECTION
SG	SHEET GLASS, SEALANT GROOVE
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SMLS	SEAMLESS
SP	SOUNDPROOF
SPEC	SPECIFICATION
SQ	SQUARE
SR	SHORT RADIUS
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STRUCT	STRUCTURE
SUB	SUBSTITUTE
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
T	THREADS
T/B	TOP OF BANK
T & B	TOP AND BOTTOM
T & G	TONGUE AND GROOVE
TBM	TEMPORARY BENCHMARK
TC	TOP OF CONCRETE
TEL	TELEPHONE
TEMP	TEMPORARY, TEMPERATURE
THD	THREADED
THK	THICK
TOC	TOP OF CURB, TOP OF CONCRETE
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TOG	TOPPING
TR	STAIR TREAD
TS	TUBULAR STEEL
TYP	TYPICAL
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY
VAC	VACUUM
VAR	VARIABLE, VARNISH
VB	VAPOR BARRIER, VINYL BASE
VC	VERTICAL CURVE
VC	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VG	VERTICAL GRAIN
VIF	VERIFY IN FIELD
VTR	VENT THRU ROOF
VWC	VINYL WALL COVERING
W	WEST
WB	WOOD BASE
WD	WOOD, WIDTH
WF	WIDE FLANGE
WG	WIRE GLASS
WI	WROUGHT IRON
WL	WATER LEVEL, WIND LOAD
WP	WATERPROOF(ED) (ING), WORKING POINT
WS	WATERSTOP, WATER SURFACE
WSCT	WAINSCOT
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
W/	WITH
W/O	WITHOUT
XSECT	CROSS SECTION

GENERAL NOTES

THIS SHEET APPLIES TO THE ENTIRE SET OF DRAWINGS. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS HAVE BEEN USED ON THIS PROJECT.

HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
K. BRUSTAD
Drawn: J. WEBB

CALAVERAS COUNTY WATER DISTRICT
BUMMERVILLE TREATED WATER STORAGE

GENERAL ABBREVIATIONS

Date: NOVEMBER 2002 | Scale: NONE | Project No. 06779-022-141 | File: BUMR-G02.DWG | Drawing No. G-2

SITE PLAN SYMBOLOGY

- EMBANKMENT SLOPE
- 50.5 CONTOUR
- VEGETATION
- CD CLEAN OUT
- MH MANHOLE
- MW MONITORING WELL
- PZ PIEZOMETER
- CB STORM DRAIN CATCH BASIN
- UV UTILITY VAULT
- PP POWER POLE
- TP TELEPHONE POLE
- FH FIRE HYDRANT
- YH-X YARD HYDRANT
- X75.5 EXISTING SPOT ELEVATION
- 75.8 FINISHED SPOT ELEVATION
- HORIZONTAL CP-X, CONTROL POINT
- BENCHMARK
- TH-X IDENTIFICATION AND APPROXIMATE LOCATION OF SOIL TEST HOLE
- DOWNGUY

NOTES:

1. UTILITIES THAT ARE SUSPENDED ABOVE GRADE ARE DESIGNATED BY THE PREFIX "OH".

- T TELEPHONE LINE
- E ELECTRIC LINE
- F FIBER OPTIC
- C COMMUNICATION
- HANDRAIL
- PIPELINE
- LARGE PIPELINE
- PIPELINE BENEATH CONCRETE OR STRUCTURE
- RAILROAD
- DRAINAGE FLOW
- NATURAL WATERWAY
- X X CHAIN LINK FENCE
- X X FIELD FENCE
- PROPERTY LINE
- CENTERLINE
- RB ROCK BERM
- SF SILT FENCE

PIPING SYMBOLOGY

NOTES:

1. VALVE TYPES FOR VALVES 4" AND LARGER ARE INDICATED BY SYMBOLOGY SHOWN BELOW. VALVES 3-1/2" AND SMALLER MAY BE SHOWN WITH GATE VALVE SYMBOL.

   REGARDLESS OF VALVE TYPE – REFER TO SPECIFICATIONS FOR REQUIREMENTS.

2. SYMBOLOGY SHOWN IS FOR SINGLE LINE PIPING. DOUBLE LINE PIPING SYMBOLS ARE SIMILAR.

VALVES

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- CHECK VALVE
- DOUBLE DISK CHECK VALVE
- BALL CHECK VALVE
- BUTTERFLY VALVE
- DIAPHRAGM VALVE
- PINCH VALVE
- KNIFE GATE VALVE
- OR PRESSURE RELIEF VALVE
- PLUG VALVE
- NEEDLE VALVE
- PRESSURE REDUCING VALVE
- X AIR RELIEF / VACUUM VALVE, A = AIR RELIEF, V = VACUUM
- PRESSURE REGULATING VALVE
- THREE WAY BALL VALVE
- THREE WAY PLUG VALVE

MISCELLANEOUS

- VARIABLE AREA METER
- ROTAMETER
- UNION
- WYE-STRAINER
- LINE SIZE CHANGE (CONCENTRIC REDUCER)
- FLEXIBLE HOSE OR TUBING
- FLEXIBLE PIPING CONNECTION
- LINE SIZE CHANGE (CONCENTRIC REDUCER)
- LINE SIZE CHANGE (ECCENTRIC REDUCER)
- LINE TURNING DOWN
- LINE TURNING UP
- BLIND FLANGE
- PIPE JOINT (SEE SPECS FOR REQUIREMENTS)
- SLEEVE TYPE COUPLING
- FLANGED COUPLING ADAPTER (FCA)
- FLEXIBLE CONNECTION
- HARNESSED MECHANICAL COUPLING

MISCELLANEOUS (CONTINUED)

- PRESSURE GAGE (W/COCK)
- TRAP
- QUICK DISCONNECT CAM & GROOVE COUPLING
- CAP or PLUG
- CO INTERIOR CLEANOUT
- HB-X HOSE VALVE, HOSE BIBB OR FLUSHING CONNECTION
- HR-X HOSE RACK
- FD-X FLOOR DRAIN

X = TYPE DESIGNATED IN SPECIFICATIONS

- PIPE IN SECTION
- BU BELL UP (PLAN)
- BU BELL UP (SECTION OR SCHEMATIC)
- D DRAIN (SECTION OR SCHEMATIC)
- ATA AIR TOOL ASSEMBLY
- AVS AUTOMATIC VALVE STATION
- PRS PRESSURE REDUCING STATION

PLUMBING PIPING:

- VT VENT (VT)
- POTABLE WATER, COLD (PWC)
- POTABLE WATER, HOT (PWH)
- 12 COMBINATION AIR VALVE SIZE, INCHES
- B BLOW OFF VALVE

MATERIALS IN PLAN/SECTION

- DEMOLITION
- CONCRETE
- MASONRY (CMU)
- BRICK (SECTION)
- ASPHALT
- GRANULAR FILL
- SAND
- EARTH
- METAL (SECTION)
- GRATING (PLAN)
- CHECKERED PLATE
- BRICK (PLAN)
- RIGID INSULATION
- BATT INSULATION
- WOOD – CONTINUOUS
- WOOD – NON CONTINUOUS
- PLYWOOD
- GYPSUM BOARD

REFLECTED CEILING SYMBOLOGY

- SUSPENDED GYPSUM WALLBOARD CEILING
- 2x4 ACOUSTICAL SUSPENDED CEILING
- RECESSED LIGHT FIXTURE
- 1x4 FLUORESCENT LIGHT FIXTURE
- 2x4 FLUORESCENT LIGHT FIXTURE
- 4x4 FLUORESCENT LIGHT FIXTURE
- SUPPLY AIR DIFFUSER/GRILLE
- RETURN AIR GRILLE

FIRE WALL RATINGS

- 1 HOUR FIRE RATED WALL
- 2 HOUR FIRE RATED WALL

GENERAL SYMBOLOGY

N — ARROW INDICATES DIRECTION OF PLAN NORTH

PLAN
1/4" = 1'-0"

- SECTION LETTER
- FLAG INDICATES DIRECTION OF SECTION CUT
- * DRAWING WHERE SECTION VIEW IS LOCATED

SECTION CUT MARKER

SECTION
3/8" = 1'-0"

- SECTION LETTER
- * DRAWING WHERE SECTION VIEW IS FIRST CUT

- DETAIL NUMBER
- * DRAWING WHERE DETAIL IS LOCATED

DETAIL MARKER

DETAIL
3" = 1'-0"

- DETAIL NUMBER
- * DRAWING WHERE DETAIL WAS TAKEN

- ELEVATION LETTER
- ARROW INDICATES POINT OF VIEW
- * DRAWING WHERE ELEVATION IS LOCATED

SINGLE ELEVATION OR PHOTO MARKER

- ELEVATION LETTER
- ARROW INDICATES POINT OF VIEW ELEVATION
- A-11 INDICATES DRAWING WHERE ELEVATION IS LOCATED

MULTIPLE ELEVATION OR PHOTO MARKER

ELEVATION
3" = 1'-0"

- ELEVATION IDENTIFICATION LETTER
- * DRAWING WHERE POINT OF VIEW MARKER CAN BE FOUND

* IF PLAN AND SECTION, OR DETAIL CALL-OUT AND DETAIL ARE SHOWN ON SAME DRAWING, DRAWING NUMBER IS REPLACED BY A LINE (–).

- PRE-CAST MANHOLE 02515X01
- DESCRIPTION
- SPECIFICATION SECTION AND DETAIL NUMBER

STANDARD DETAIL MARKER

- X KEYNOTE NUMBER

KEYNOTE DESIGNATION

IDENTIFICATION SYMBOLOGY

PIPING:

FIGURE	36-PLE	EXAMPLE
LINE SIZE		36"
SERVICE		PLANT EFFLUENT

EQUIPMENT TAG NUMBERS:

ALTERNATE 1

FIGURE	NPWP2023	EXAMPLE
SERVICE ABBREVIATION		INDICATES NON POTABLE WATER
EQUIPMENT ABBREVIATION		INDICATES PUMP
BUILDING OR STRUCTURE NUMBER		BUILDING 20
EQUIPMENT NUMBER		PUMP 23

ALTERNATE 2

FIGURE	NPWP-23	EXAMPLE
SERVICE ABBREVIATION		INDICATES NON POTABLE WATER
EQUIPMENT ABBREVIATION		INDICATES PUMP
BUILDING OR STRUCTURE NUMBER		PUMP 23

ARCHITECTURAL:

- XX-XX ROOM NUMBER
- XXXX DOOR NUMBER
- X COLUMN GRID LINE
- X WALL TYPE
- WINDOW TYPE
- L/XX LOUVER

GENERAL NOTES:

1. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLOGY. ALL SYMBOLS ARE NOT NECESSARILY USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DEEMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.
3. SEE PROJECT EQUIPMENT AND PIPING SYSTEMS DRAWING FOR SYMBOLS AND ABBREVIATIONS SPECIFIC TO THE PROJECT.

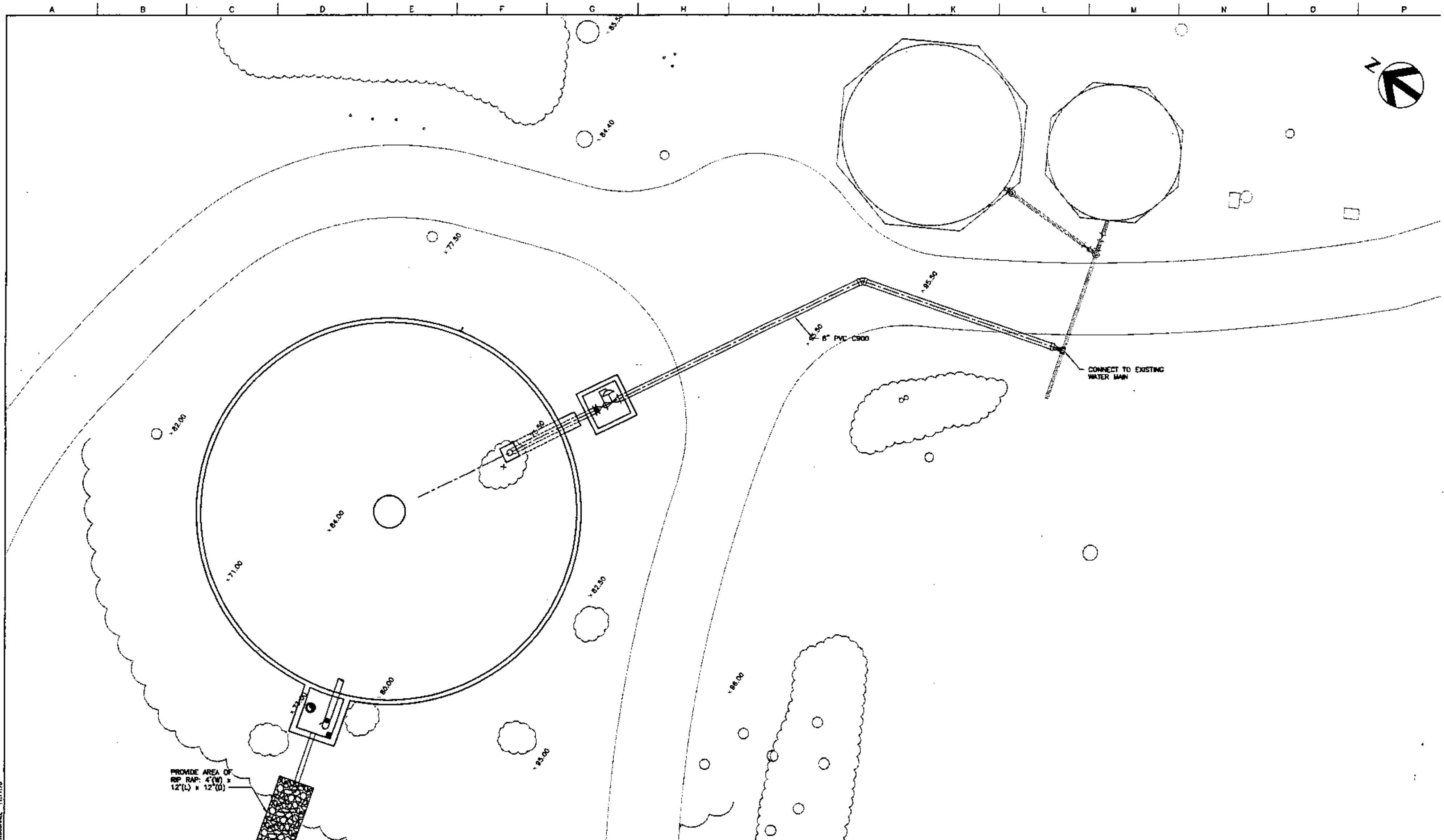
HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
Designed: K. BRUSTAD
Drawn: J. WEBB

CALAVERAS COUNTY WATER DISTRICT
BUMMERVILLE TREATED WATER STORAGE

GENERAL SYMBOLS

NOVEMBER 2002
NONE
Project No. 06779-022-141
File name BUMR-G03.DWG
Drawing No. G-3



HDR
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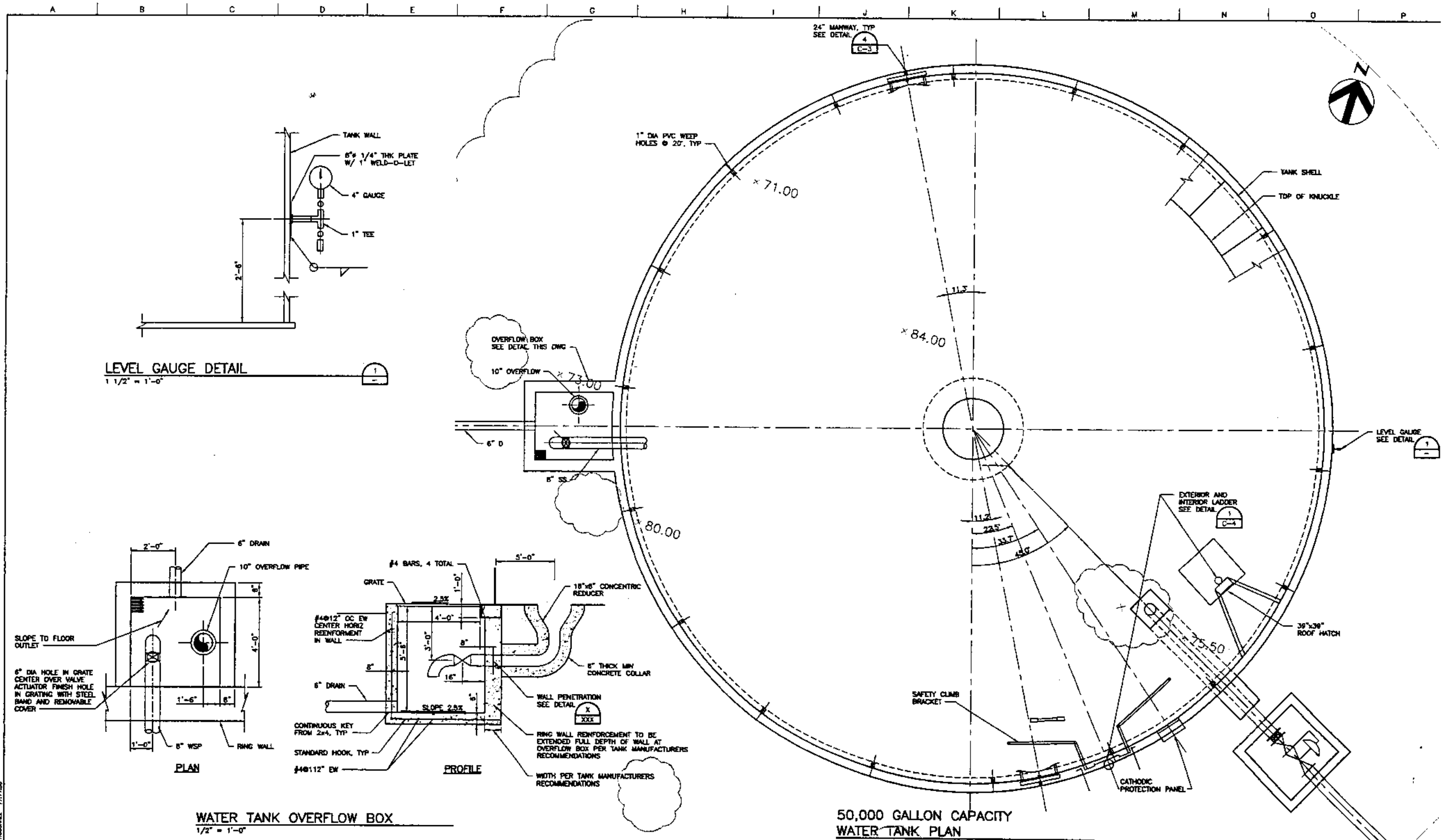
CALAVERAS COUNTY WATER DISTRICT

BUMMERVILLE TREATED WATER STORAGE

WATER RECOVERY TANK

SITE PLAN

Date: NOVEMBER 2002
Scale: 1" = 5'
Project No.: 06779-022-141
File Name: BUMR-C01.DWG
Drawing No.: C-1



HDR
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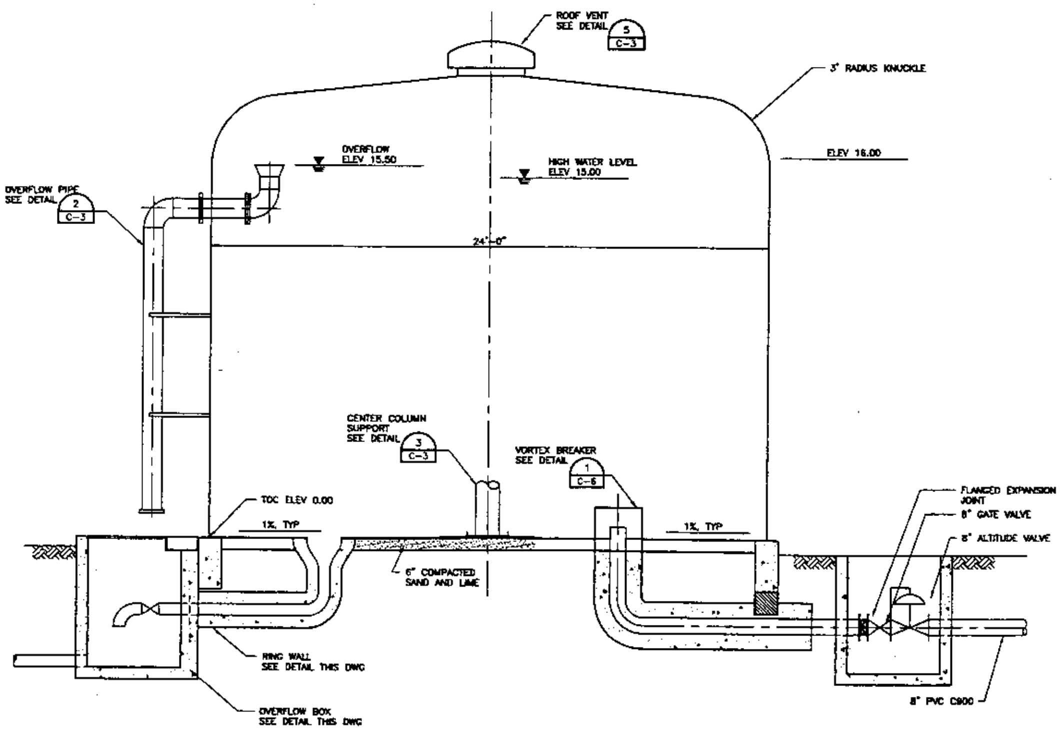
CALAVERAS COUNTY WATER DISTRICT

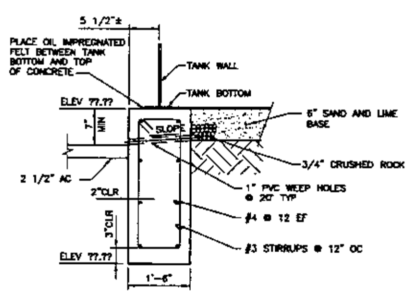
SUMMERVILLE TREATED WATER STORAGE

WATER RECOVERY TANK
PLAN VIEW AND DETAILS

Date	Project No.	Drawing No.
NOVEMBER 2002	06779-022-141	C-2
Scale: AS NOTED	File Name: BUMR-C02_GRANT.DWG	



SECTION
3/8" = 1'-0"
A C-1



RING WALL DETAIL
1" = 1'-0"

HDR Engineering, Inc.

Project Manager	KARL B. BRUSTAD
Designed	K. BRUSTAD
Analyzed	
Checked	
Drawn	J. WEBB

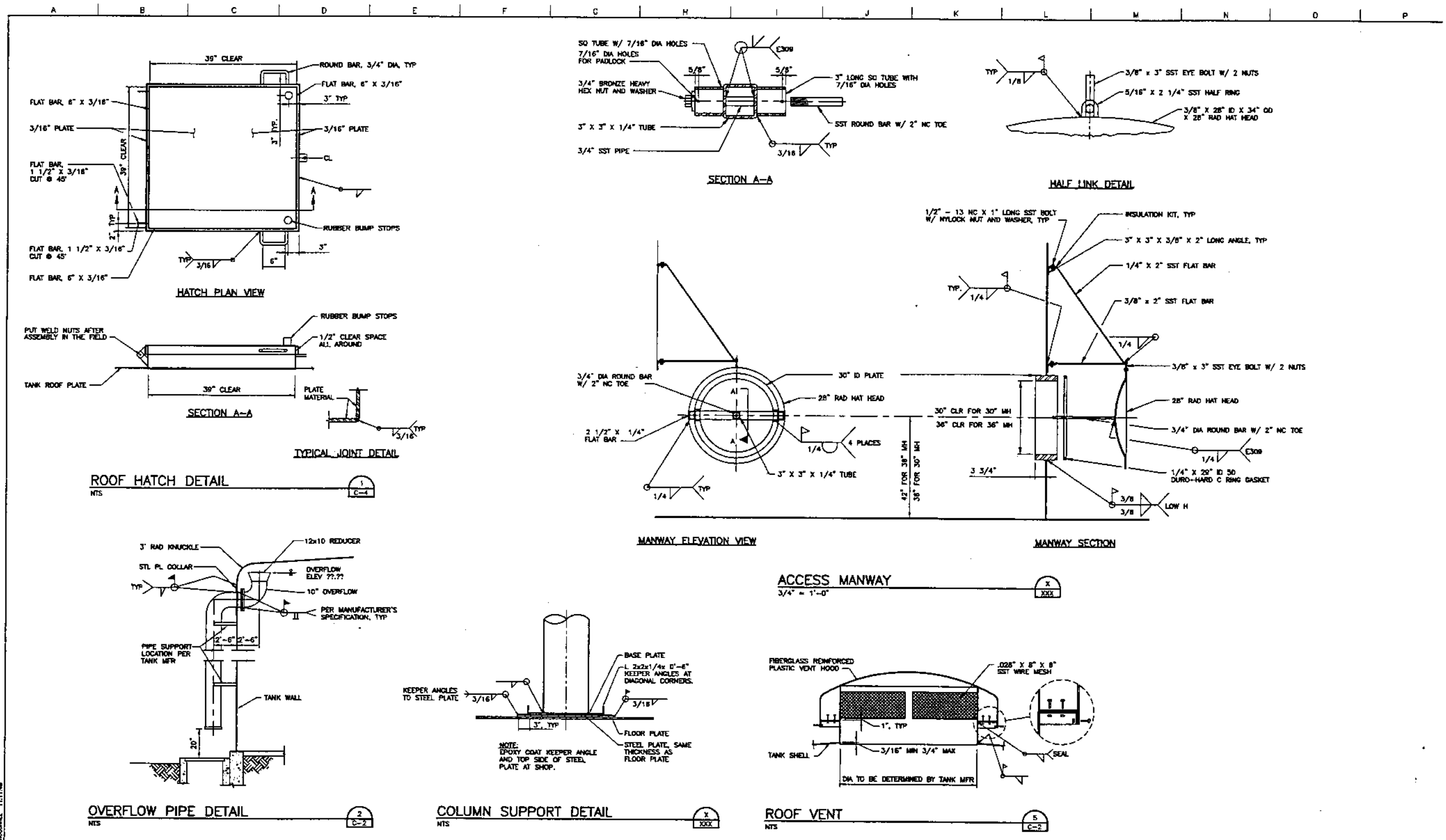
CALAVERAS COUNTY WATER DISTRICT
BUMMERVILLE TREATED WATER STORAGE

WATER RECOVERY TANK
SECTION AND DETAILS

Date	NOVEMBER 2002
Scale	AS NOTED
Project No.	06779-022-141
File Name	BUMR-C03_GRANT.DWG
Drawing No.	C-3

Issue No.	Description	Date	Drwn.	Chkd.	Desgn. Engr.	Proj. Mgr.

//SAC-BOC1/PROJECTS/06779/023/PLANS/BUMTANK/BUMR-C03_GRANT.DWG 11-22-02 HOODWIC1 11:11:42



HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
Designed: K. BRUSTAD
Drawn: J. WEBB

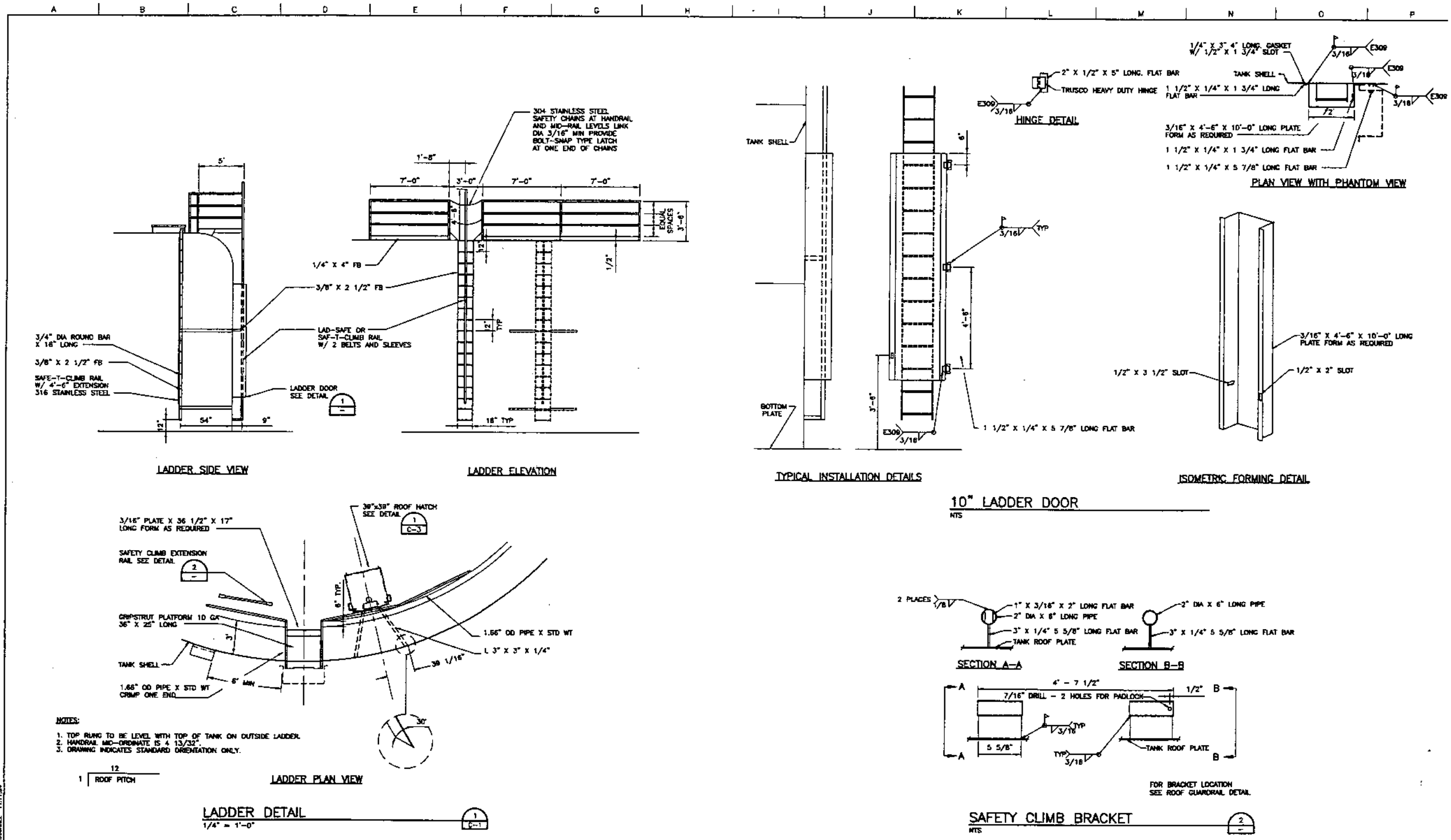
CALAVERAS COUNTY WATER DISTRICT

BUMMERVILLE TREATED WATER STORAGE

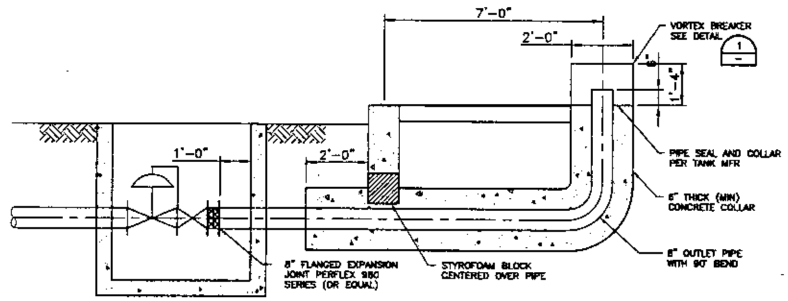
WATER RECOVERY TANK

DETAILS

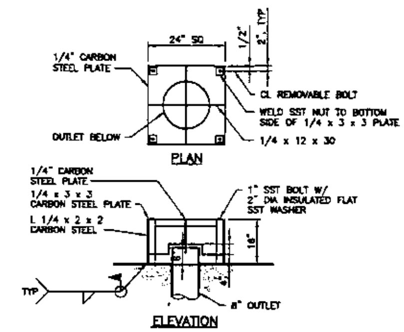
Date	Project No.	Drawing No.
NOVEMBER 2002	06779-022-141	C-4
Scale: AS NOTED	File Name: BUMR-C04.DWG	



HDR Engineering, Inc.	KARL B. BRUSTAD; K. BRUSTAD; J. WEBB	CALAVERAS COUNTY WATER DISTRICT — BUMMERVILLE TREATED WATER STORAGE	WATER RECOVERY TANK — DETAILS II
			NOVEMBER 2002 / 06779-022-141 / C-5
			AS NOTED / BUMR-C05.DWG



INLET/OUTLET PIPE
AND VORTEX BREAKER
1/2" = 1'-0"



8" OUTLET AND VORTEX BREAKER
NTS

HDR
HDR Engineering, Inc.

Project Manager: KARL B. BRUSTAD
K. BRUSTAD
J. WEBB

CALAVERAS COUNTY
WATER DISTRICT

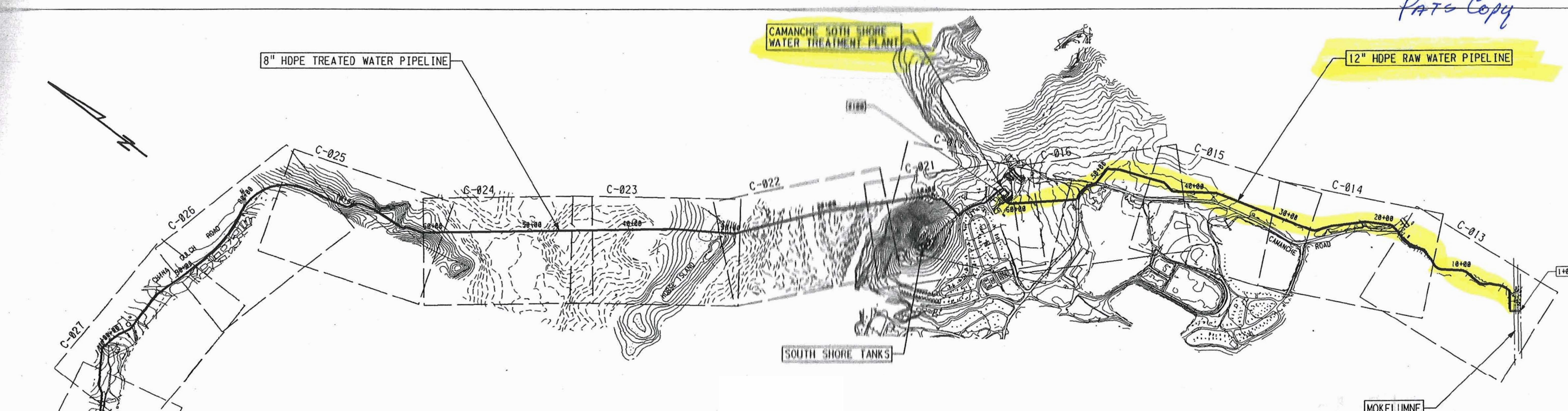
BUMMERVILLE TREATED
WATER STORAGE

WATER RECOVERY TANK
SECTION AND DETAILS

NOVEMBER 2002	06779-022-141	C-6
AS NOTED	BUMR-C06.DWG	

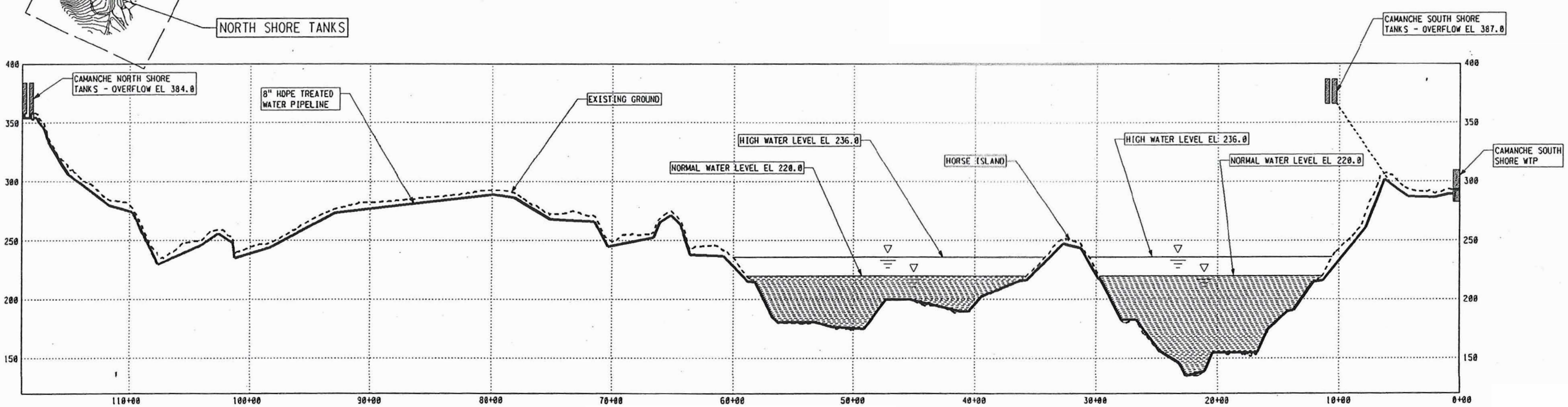
Camanche Regional Water Treatment Plant Plans (East Bay Municipal Utilities District)

Pat's Copy



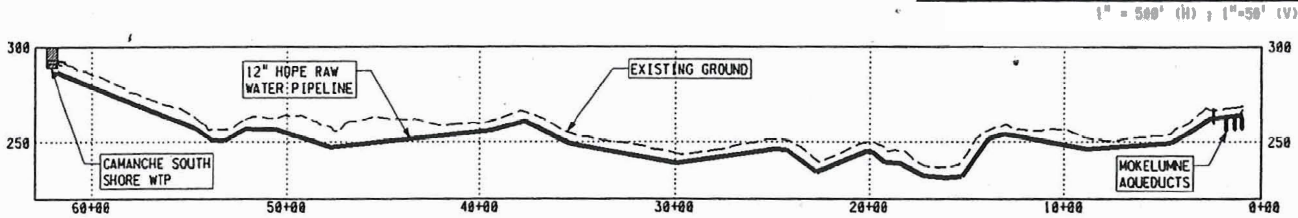
PIPELINE INDEX MAP

1" = 500'



PROFILE - 8" TREATED WATER PIPELINE

1" = 500' (H) ; 1"=50' (V)



PROFILE - 12" RAW WATER PIPELINE

1" = 500' (H) ; 1"=50' (V)

APPROXIMATE PIPE FOOTAGES				
PIPE SIZE	MATERIAL	TYPE (LOCATION)	LINEAR FEET	SUPPLIER
8"	ML&PCS	RW (CASS)	210'	DISTRICT
12"	ML&PCS	RW (CASS)	10'	DISTRICT
12"	HDPE	RW (CASS)	5,935'	CONTRACTOR
8"	HDPE	TW (CASS)	1,070	CONTRACTOR
8"	HDPE	TW (RESV)	4,770'	CONTRACTOR
8"	HDPE	TW (CANS)	5,930'	CONTRACTOR

PIPELINE APPURTENANCE QUANTITIES	
ITEMS	QUANTITY
1" A & VR ASSEMBLY	10
4" BLOWOFF ASSEMBLY	9
BUOYS	11
BALLAST WEIGHTS	268
6" GATE VALVE	1
8" GATE VALVES	14
12" BFV VALVES	5
MARKER POSTS-RW*	12
MARKER POSTS-TW*	16

* SEE NOTE 5 ON DWG Z-001.2

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGN — DESIGNED BY

DESIGN CHECKED BY

DRAWN BY FACILITY DRAFTING

REVIEW — PROJECT ENGR. R.P.E. NO. C 56562

RECOMMENDED SR. CIVIL ENGR. R.P.E. NO. C 32298

APPROVED MGR. OF DESIGN R.P.E. NO. C 39851

EAST BAY MUNICIPAL UTILIT
OAKLAND, CALIFORN

CAMANCHE SOUTH SH
WATER TREATMENT PLANT RE
CIVIL
PIPELINE INDEX AND NOTES

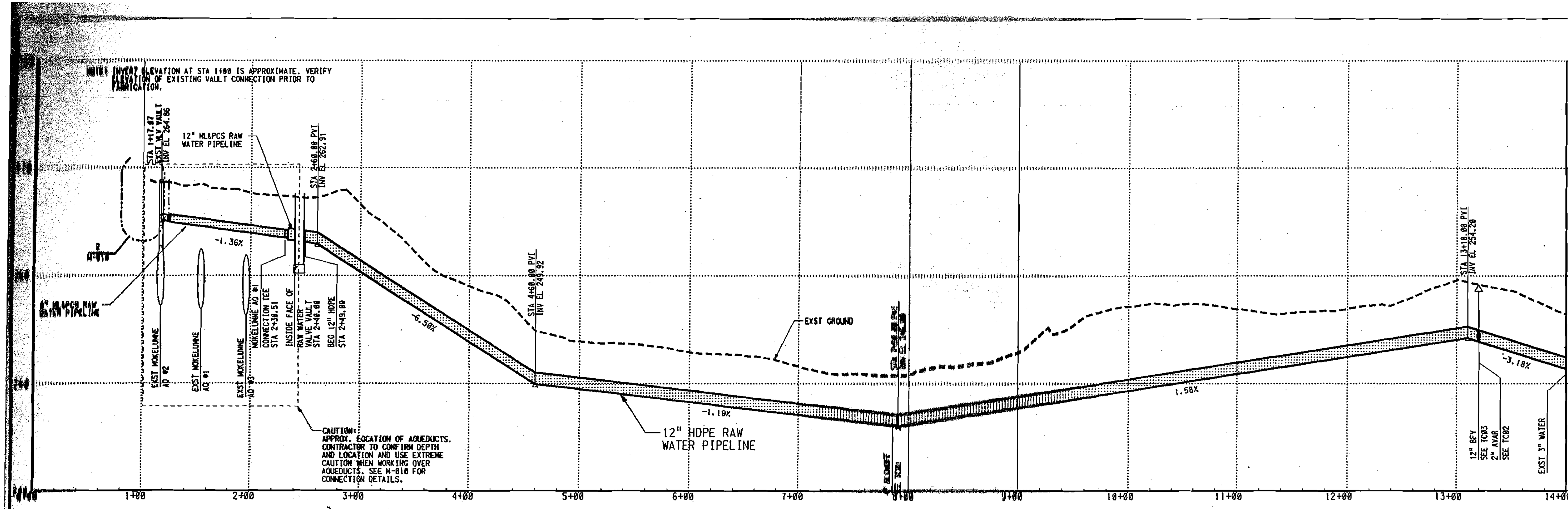
PROJ NO. Z-001

SCALE 1"=500'

DATE

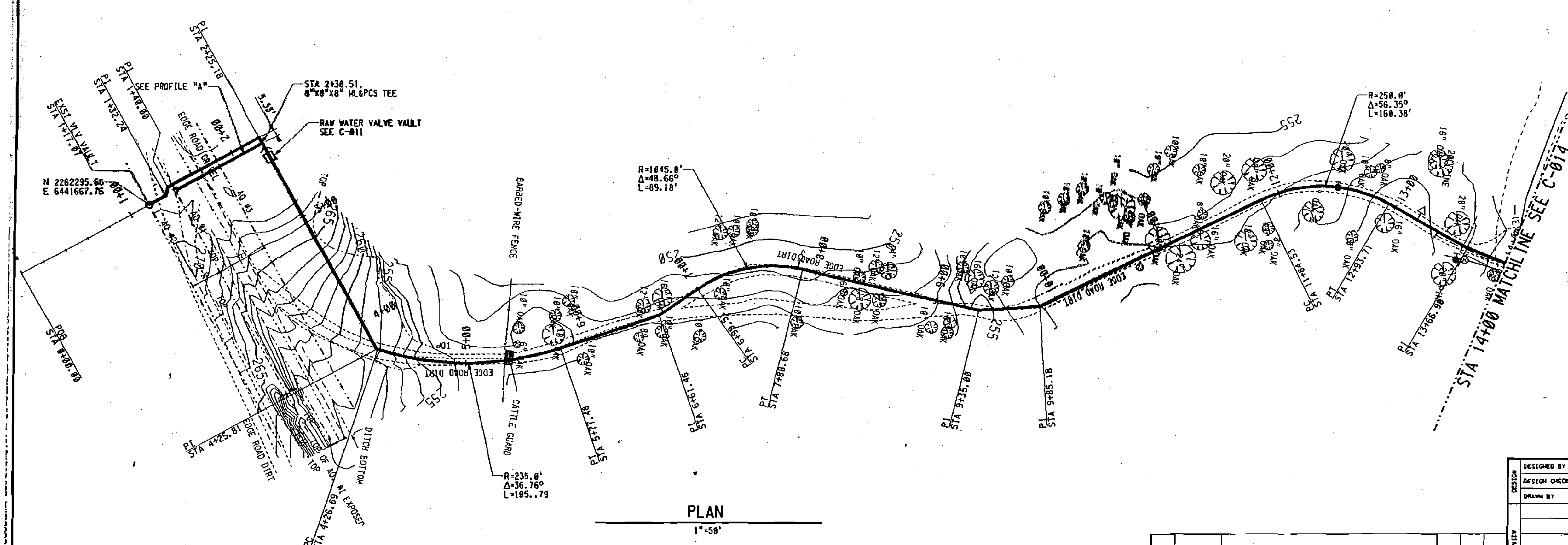
105.36-C-012	0
STRUCT. DISC. NUMBER	REV.

PLOT SCALE:
ER: mbrown
ATE: 14-NOV-2002 12:05
ILE: s:sed-cadcams-FacDataStorsrawscamanches105.36s105s36c012.r00
REF 1:
REF 4:



PROFILE - STA 1+00 TO 14+00

1"=50' (H) : 1"=5' (V)



PLAN

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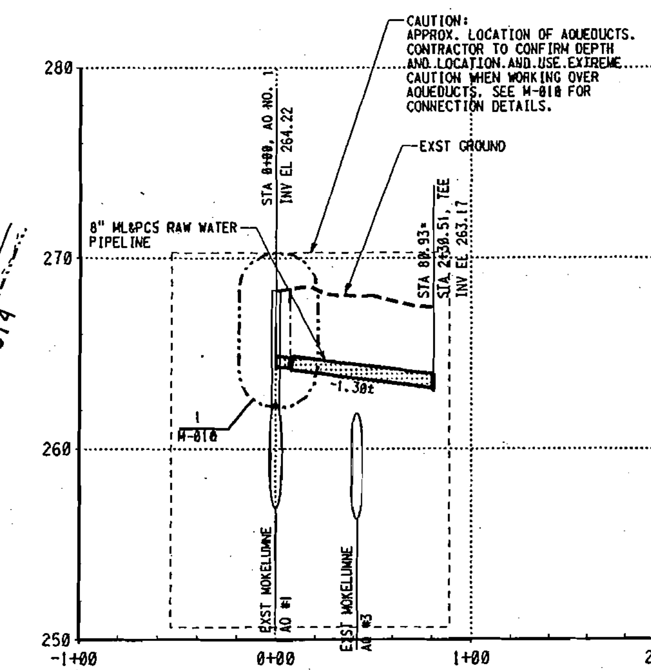

MOKELUMNE AQUEDUCT #1 CONNECTION

PROFILE "A"

1"=50' (H) : 1"=5' (V)

3" ON ORIGINAL DOCUMENT

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DESIGN CHECKED BY
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PROJECT ENGR. R.P.E. NO. C 56962
RECOMMENDED SR. CIVIL ENGR. R.P.E. NO. C 33294
APPROVED MGR. OF DESIGN R.P.E. NO. C 35851

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

CAMANCHE SOUTH SHORE
WATER TREATMENT PLANT REPLACEMENT

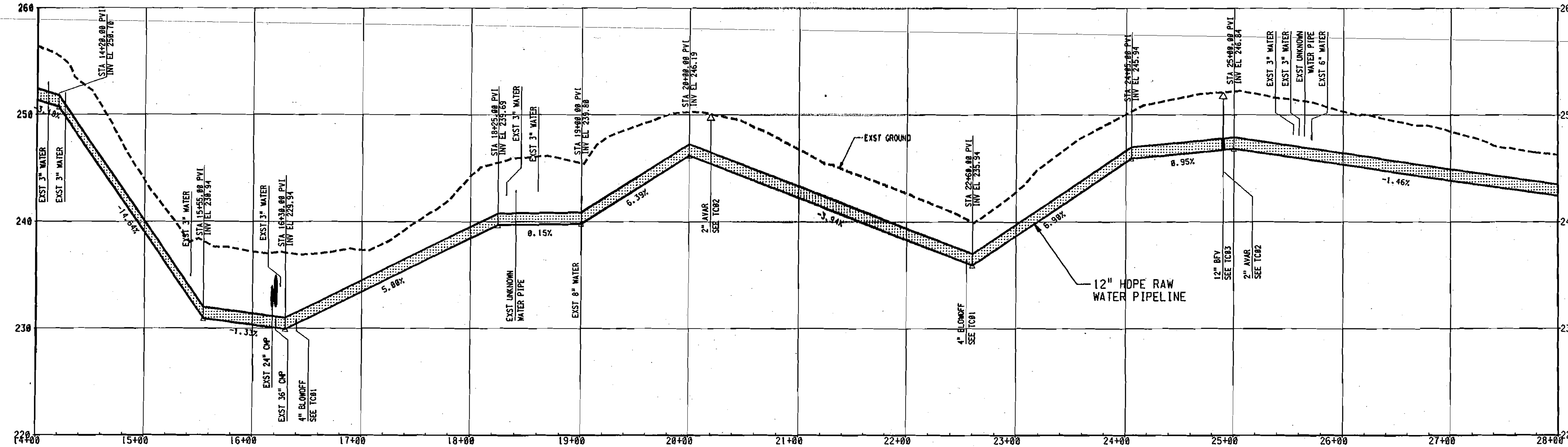
CIVIL

RAW WATER PIPELINE
PLAN AND PROFILE
SHEET 1 OF 5

PROJ NO. Z-001
SCALE AS SHOWN
DATE

105.36-C-013 | 0

STRUCT. DISC. NUMBER REV.



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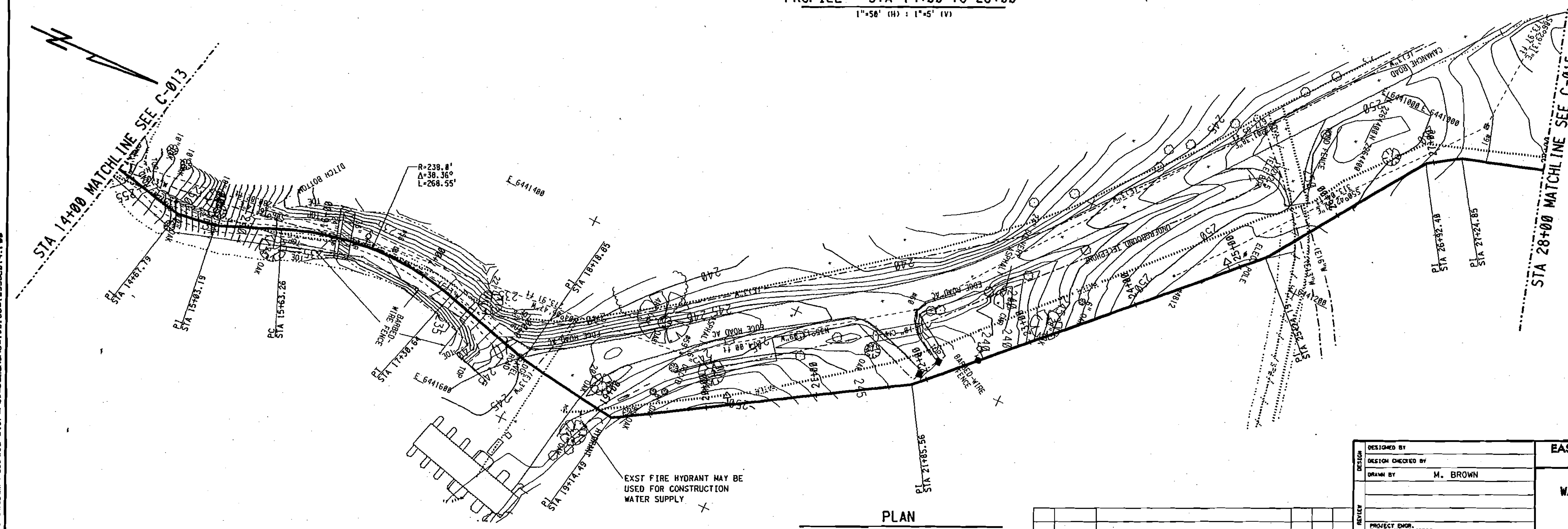

PLAN

3" ON ORIGINAL DOCUMENT

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PROJECT ENGR. R.P.E. NO. C 56562
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EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

CAMANCHE SOUTH SHORE
WATER TREATMENT PLANT REPLACEMENT

CIVIL

RAW WATER PIPELINE
PLAN AND PROFILE

SHEET 2 OF 5

PROJ NO. Z-001
SCALE AS SHOWN
DATE

105.36-C-014

STRUCT. DISC. NUMBER

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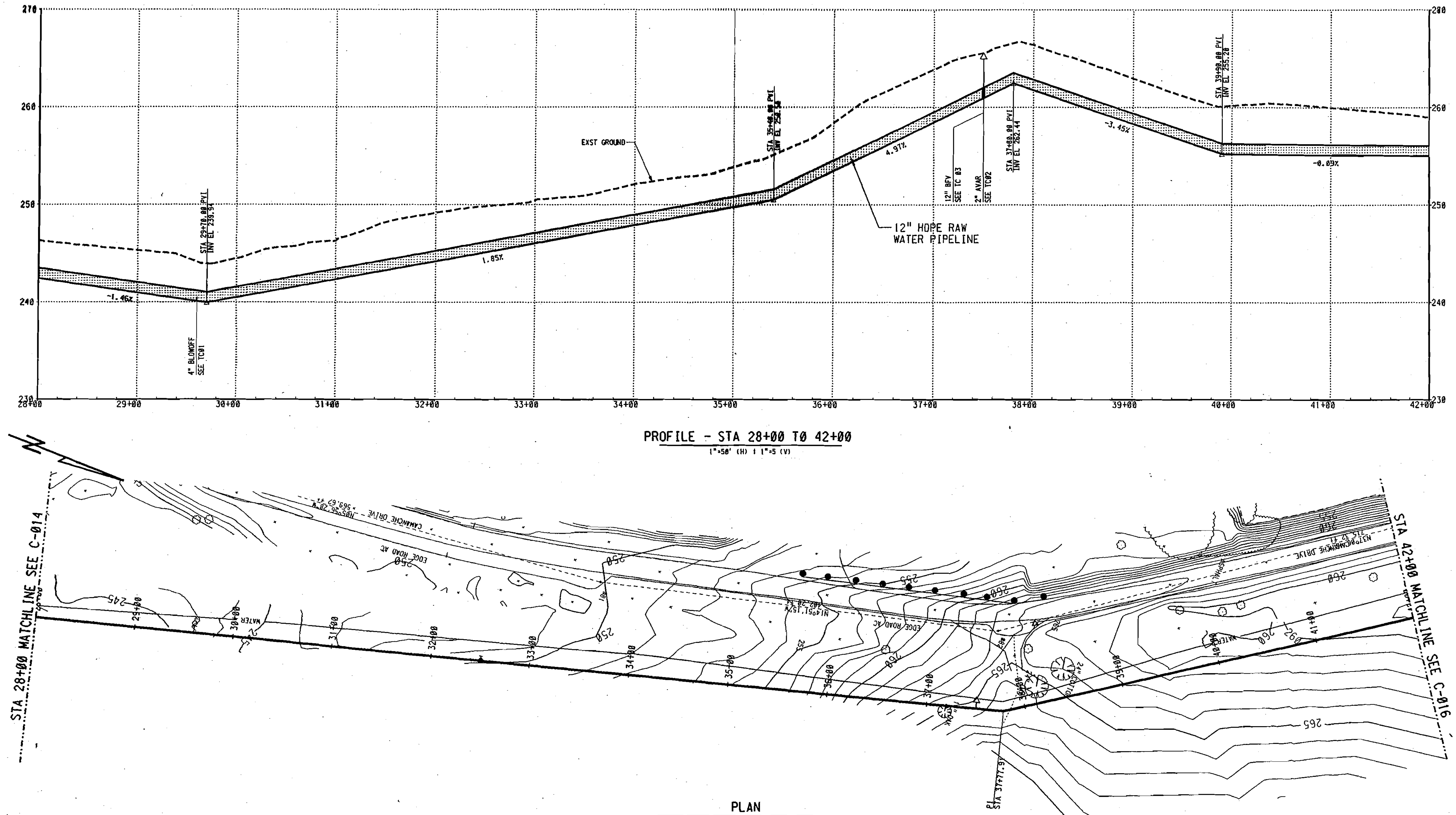

3" ON ORIGINAL DOCUMENT 0 1 2 3

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EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

CAMANCHE SOUTH SHORE
WATER TREATMENT PLANT REPLACEMENT
CIVIL
RAW WATER PIPELINE
PLAN AND PROFILE
SHEET 3 OF 5

PROJ NO. Z-001
SCALE AS SHOWN
DATE

105.36-C-015 | 0
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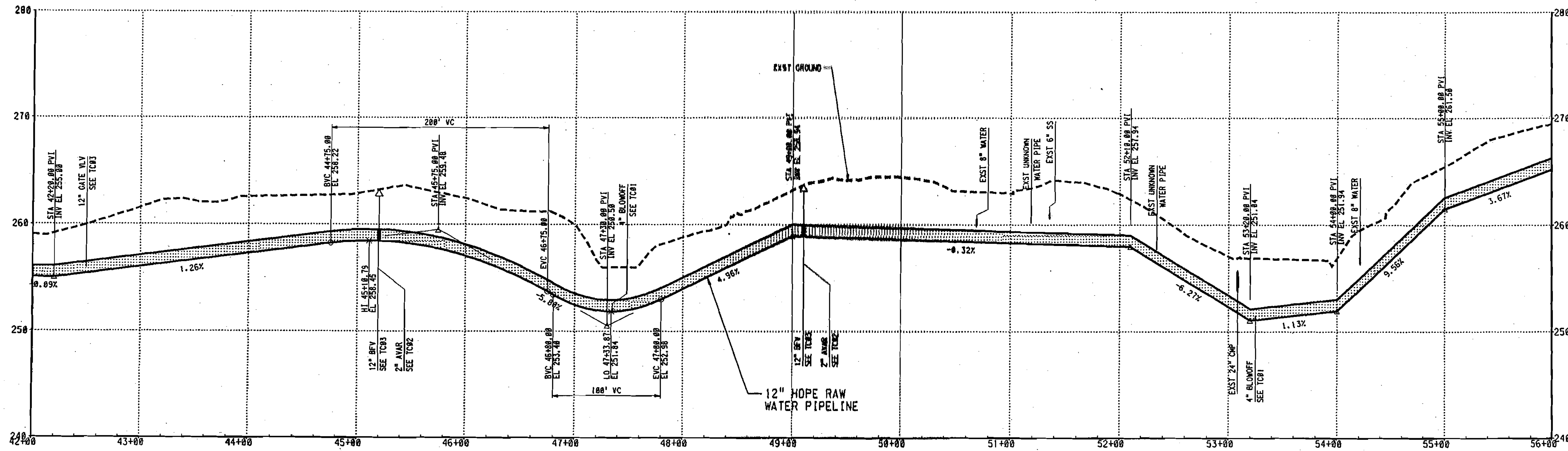

PROFILE - STATION 42+00 TO 56+00

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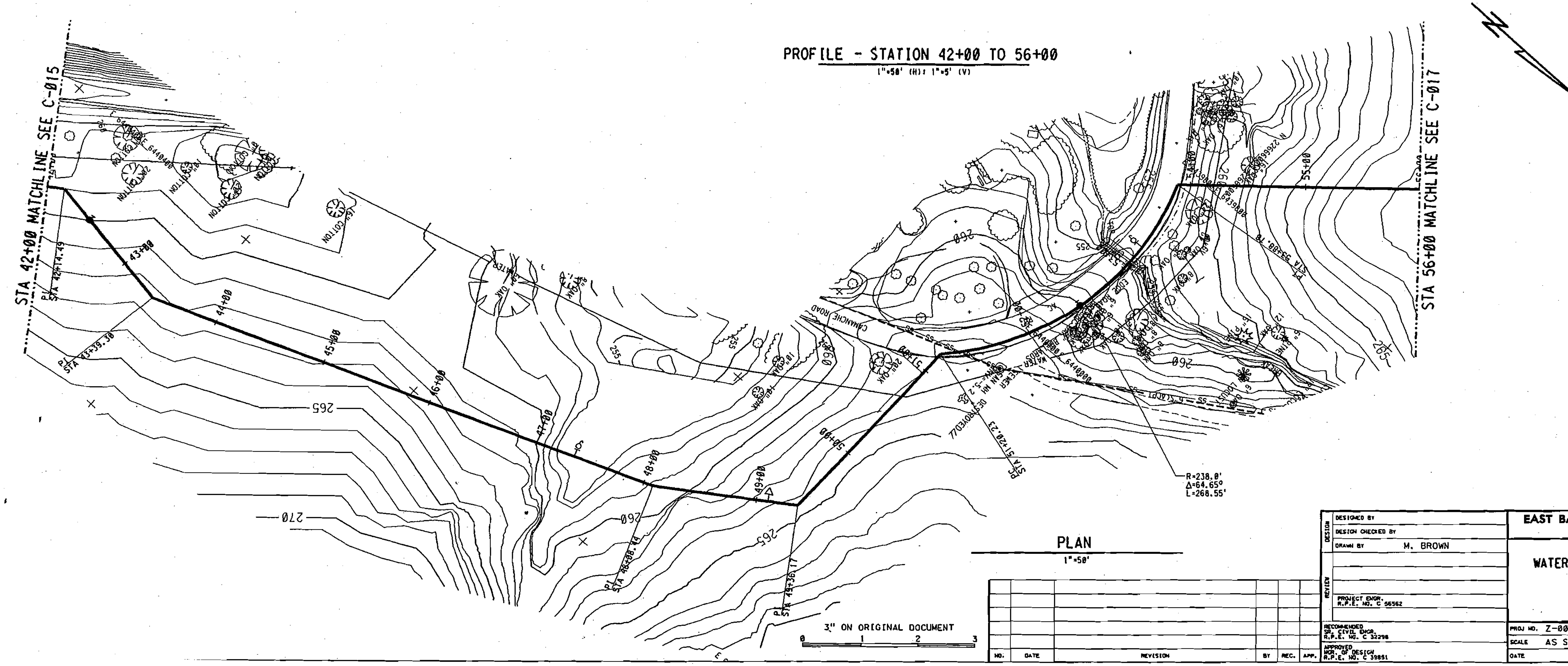

PLAN

1"=50'

3" ON ORIGINAL DOCUMENT

0 1 2 3

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EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

CAMANCHE SOUTH SHORE
WATER TREATMENT PLANT REPLACEMENT

CIVIL

RAW WATER PIPELINE
PLAN AND PROFILE

SHEET 4 OF 5

PROJ NO. Z-001	105.36-C-016	
SCALE AS SHOWN		
DATE	STRUCT. DISC. NUMBER	REV

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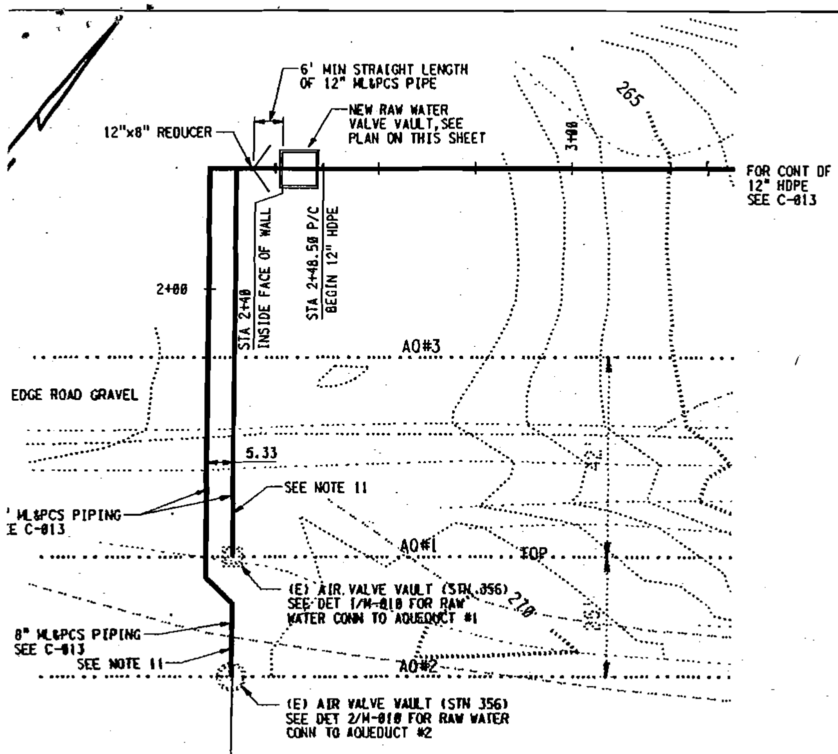
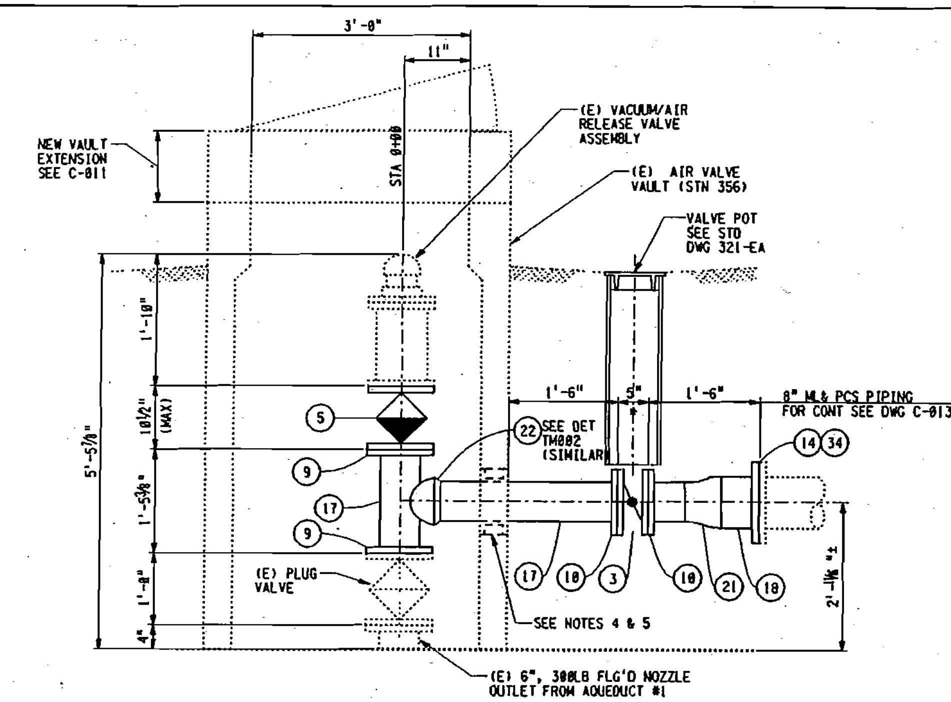


RAW WATER VAULT LOCATION

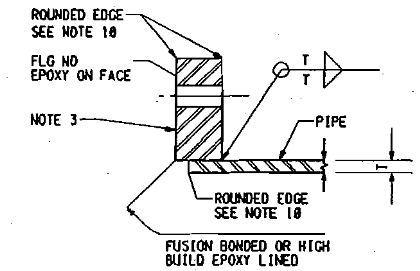
1"=20'



RAW WATER CONNECTION TO AQUEDUCT #1

DETAIL 1 / M-010

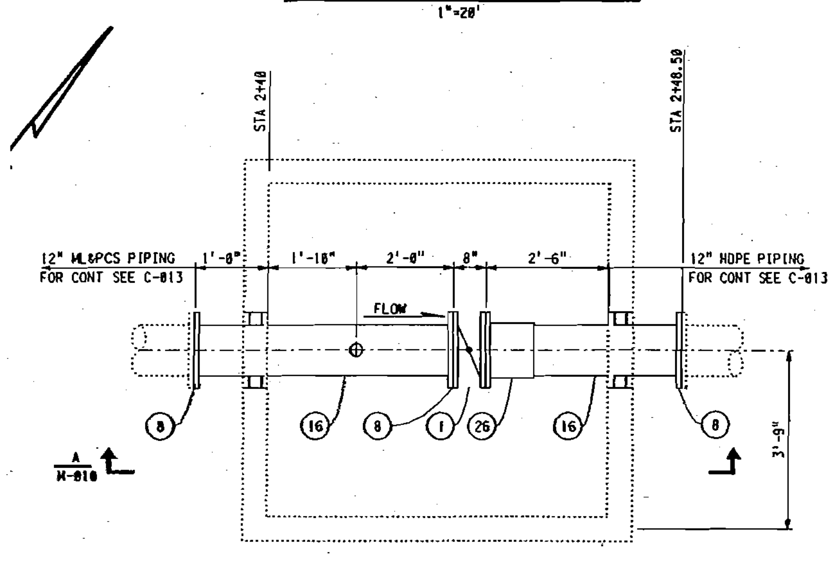
¾"=1'-0"



TYP FLG WELDING DET

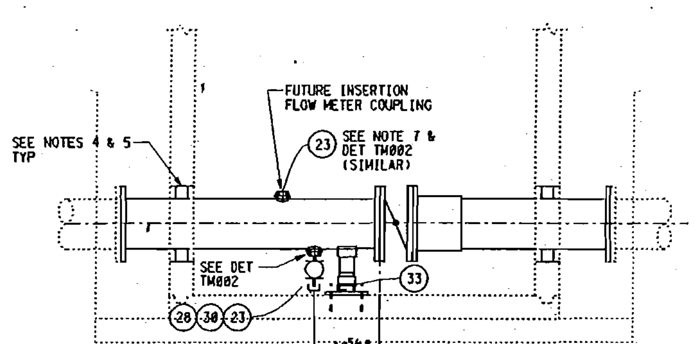
DETAIL 4 / M-010

NTS



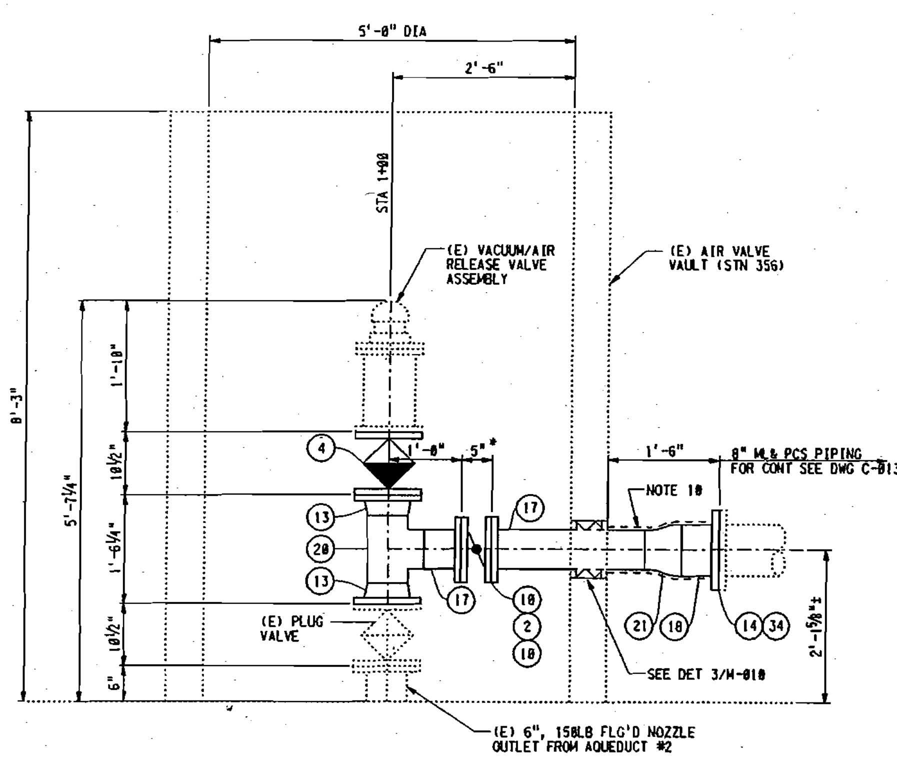
PLAN - RAW WATER VALVE VAULT

½"=1'0"



SECTION A / M-010

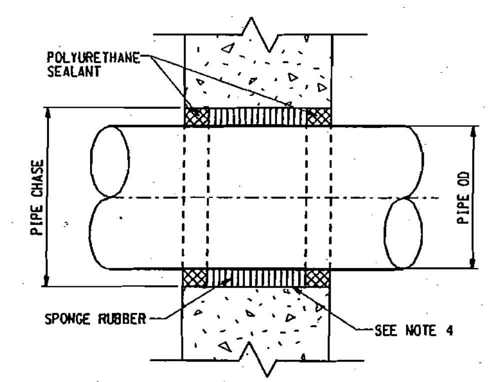
½"=1'-0"



RAW WATER CONNECTION TO AQUEDUCT #2

DETAIL 2 / M-010

¾"=1'-0"



WALL PENETRATION DETAIL

DETAIL 3 / M-010

NTS

MATERIAL LIST

ITEM	REQUIRED	DESCRIPTION	REMARKS
1	1	BUTTERFLY VALVE, 12" AWWA CL 150B, CI, FLGD	
		W/ HANDWHEEL OPERATOR	
2	1	BUTTERFLY VALVE, 6" AWWA CL 150B, CI, FLGD	
		W/ HANDWHEEL OPERATOR	
3	1	BUTTERFLY VALVE, 6" AWWA CL 150B, CI FLGD	
		W/ NUT OPERATOR, BURIED SERVICE, CLOCKWISE TO OPEN	
4	1	ECCENTRIC NON-LUBRICATED PLUG VALVE, CI BODY	
		175 PSI CWP RATED W/ ANSI 150 LB FLG, HANDWHEEL OPERATOR	
5	1	ECCENTRIC NON-LUBRICATED PLUG VALVE, CI BODY	
		175 PSI CWP RATED W/ ANSI 250 LB FLG, HANDWHEEL OPERATDR	
6			
7			
8	3	12" SLIP-ON FLANGE, ANSI, 150 LB, FLAT FACE	
9	2	6" SLIP-ON FLANGE, ANSI, 300 LB, FLAT FACE	
10	4	6" SLIP-ON FLANGE, ANSI, 150 LB, FLAT FACE	
11			
12			
13	2	6" WELDING NECK FLANGE, ANSI, 150 LB, FLAT FACE	
14	2	8" SLIP-ON FLANGE, ANSI, 150 LB, FLAT FACE	
15			
16	AS REQ'D	12" STEEL PIPE, STD WT	
17	AS REQ'D	6" STEEL PIPE, STD WT	
18	AS REQ'D	8" STEEL PIPE, STD WT	
19			
20	1	6" WELDING TEE, STD WT	
21	2	8"x6" CONCENTRIC REDUCER, STD WT	
22	1	6" WELDING OUTLET BY 6" RUN, 3000 LB	
23	2	2" WELDING OUTLET BY 12" RUN, THREADED, 3000 LB	
24			
25			
26	1	FLANGE COUPLING ADAPTER, 12" 150 LB	
27			
28	1	BALL VALVE, 2" NPT, BRONZE BODY, SST BALL	
29			
30	1	NIPPLE, 2"x CLOSE, SST, SCH 40	
31			
32			
33	1	ADJUSTABLE PIPE PEDESTAL	
34	2	8" INSULATING GASKET SET	
35			

NOTES

1. DIMENSIONS MARKED WITH AN ASTERISK (*) ARE NOMINAL AND DEPEND UPON DIMENSIONS OR COMPONENTS FURNISHED BY CONTRACTOR. VERIFY DIMENSIONS PRIOR TO FABRICATING PIPING.
2. DIMENSIONAL ALLOWANCES FOR GASKETS AND WELDS ARE NOT SHOWN BUT MUST BE PROVIDED.
3. FLANGE GASKETS SHALL BE ONE PIECE 1/16" THICK, FULL FACE PREMIUM BUNA-N.
4. PIPING PENETRATING EXISTING OR NEW CONCRETE WALL SHALL NOT COME IN CONTACT WITH REBAR.
5. PROVIDE AND INSTALL LINKING PIPE WALL SEAL AROUND PIPING AT WALL PENETRATION (TM002).
6. ALL PIPING AND FITTINGS 6" AND LARGER SHALL BE LINED AND COATED WITH FUSION BONDED EPOXY. HOLD BACK COATINGS 2" FOR FIELD WELDED JOINTS. LINING/COATING SHALL BE REPAIRED AFTER WELDING, WHERE POSSIBLE.
7. WELD 2" THREADED OUTLET TO PIPING. DO NOT CUT HOLE INTO PIPING.
8. MISCELLANEOUS MATERIALS NOT LISTED OR NOTED BUT NECESSARY FOR INSTALLATION SUCH AS BOLTS, GASKETS, ETC. SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
9. APPLY FINISH COAT PER FINISH SCHEDULE ON DRAWING 105.36-Z-001.2 FOR 6" OR LARGER INTERIOR VALVE VAULT PIPING.
10. APPLY 1/8" THICK MORTAR COAT OVER EPOXY COATING FROM WALL TO INSULATING GASKET.
11. INSTALL GALVANIC ANODE PER STD. DWG 286EA FIG B.

3" ON ORIGINAL DOCUMENT

0 1 2 3

NO.	DATE	REVISION	BY	REC.	APP.

DESIGN: DESIGNED BY / DESIGN CHECKED BY / DRAWN BY HCC

REVIEW: PROJECT ENGR. R.P.E. NO. C 56562

RECOMMENDED SR. MECH. ENGR. R.P.E. NO. M 25462

APPROVED MGR. OF DESIGN R.P.E. NO. C 39851

EAST BAY MUNICIPAL UTILITY DISTRICT
OAKLAND, CALIFORNIA

CAMANCHE SOUTH SHORE
WATER TREATMENT PLANT REPLACEMENT
MECHANICAL
MOKELUMNE AQUEDUCT RAW WATER CONNECTION

PROJ NO. Z-001
SCALE AS SHOWN
DATE

105.36-M-010

0

Camanche South and North Shore Water Treatment Plants Evaluation
(East Bay Municipal Utilities District, May 2003)

EBMUD

Camanche South and North Shore Water Treatment Plants Evaluation

May 2003

Table of Contents

Section 5 – Evaluation of Alternatives (continued)

Appendices

List of Tables

List of Figures

SECTION 1
PURPOSE

1.1 Purpose

The purpose of the evaluation is to identify the best alternative to provide reliable water treatment for Camanche North Shore (CANS) and Camanche South Shore (CASS) that meets future water quality regulations with the lowest life cycle cost.

1.2 Background and Information

Two water treatment plants serve the Camanche Recreation area: Camanche North Shore Water Treatment Plant (WTP) and Camanche South Shore Water Treatment Plant. See Figures 1-1 and 1-2. CANS uses well water from up to four wells to meet potable and non-potable demand. The treatment train consists of greensand filters followed by calcium hypochlorite disinfection. CASS WTP treats Camanche Reservoir water using dual-media filtration and calcium hypochlorite for disinfection. Both systems were built in the 1960's and do not have automation.

Several studies have been completed which evaluate different treatment technologies for use at a new CASS WTP. Joint projects with Calaveras County Water District (CCWD) and/or Amador County were part of these evaluations, so facilities have previously been sized for 0.5 mgd initially with expansion to 2.0 mgd. While no joint project is moving forward at this time, the option to expand facilities to meet CCWD and Amador County needs will be considered in each proposed project.

In 1994, EBMUD and Calaveras County Water District hired SPH Associates in association with West Yost & Associates to write a Predesign Report for Water Treatment Facilities Camanche South Shore Recreation Area. This report evaluated three types of treatment to be used at a new water treatment plant to serve CASS and CCWD: a direct filtration package plant, a microfiltration facility and an ultrafiltration facility. At that time, a package plant similar to that used by CCWD was recommended based on a life cycle cost evaluation. In addition, it was planned to use Mokelumne aqueduct water in lieu of Camanche Reservoir as the water supply source for the new plant.

In 1999, KASL was retained to perform the Camanche South Shore Water Treatment Plant Feasibility Study for a new Water Treatment Plant at CASS that would replace both existing WTPs at Camanche using Mokelumne Aqueduct water. This report provided an update in costs and regulations to the SPH report and also provided water treatment for CANS. KASL evaluated microfiltration, ultrafiltration, and ozone in conjunction with a package plant. At that time, the cost of ultrafiltration had come down sufficiently and the regulations at that time, made ultrafiltration the recommended water treatment alternative.

On the basis of KASL's recommendations, the District completed CEQA documentation and design for an ultrafiltration plant located adjacent to the existing South Shore Water Treatment plant. The new water treatment plant was designed to replace the two existing

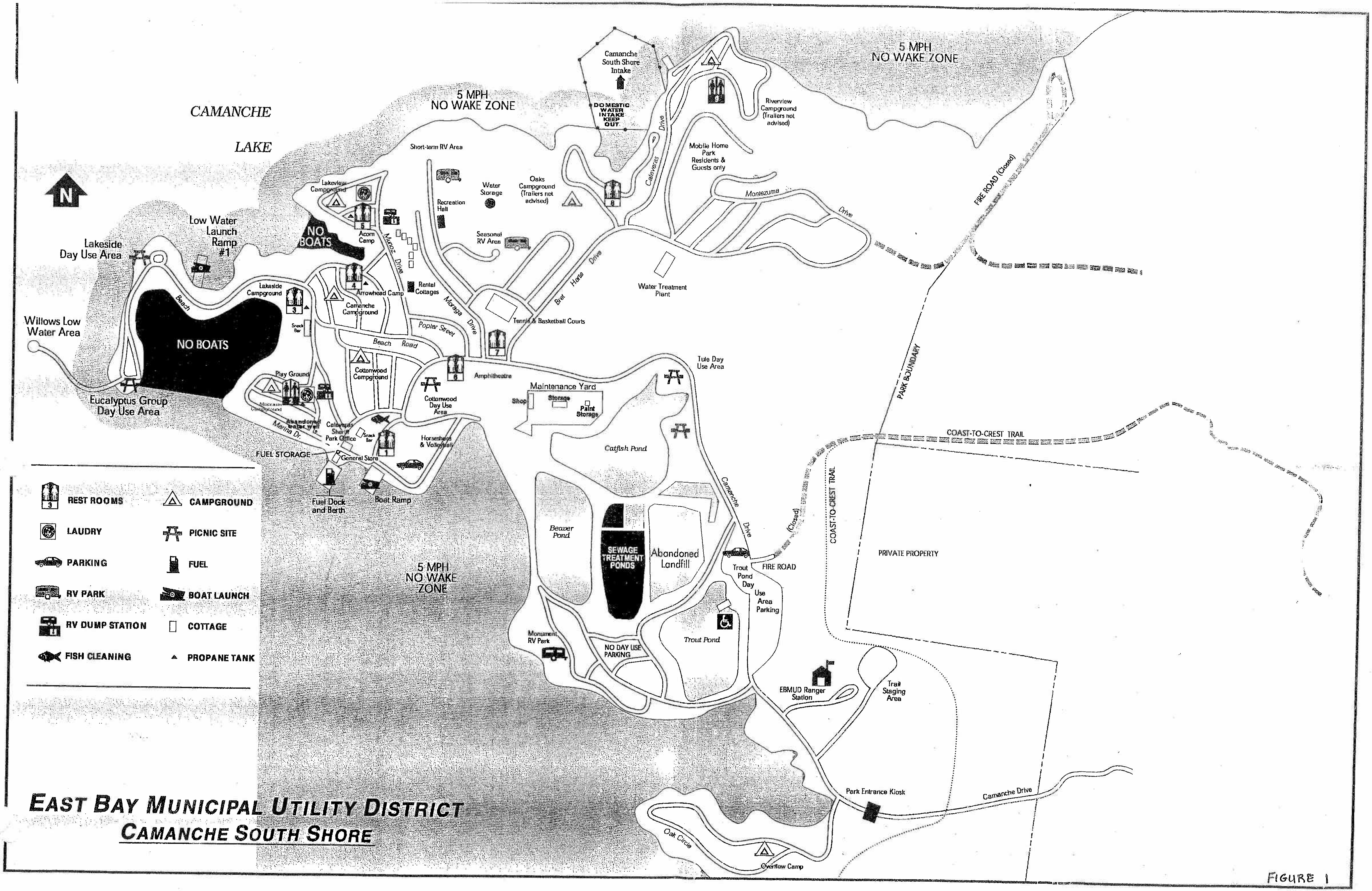

EAST BAY MUNICIPAL UTILITY DISTRICT
CAMANCHE SOUTH SHORE
CAMANCHE
LAKE
5 MPH
NO WAKE ZONE
Camanche South Shore Intake
DOMESTIC WATER INTAKE KEEP OUT
Lakeside Day Use Area
Low Water Launch Ramp #1
Willows Low Water Area
NO BOATS
Eucalyptus Group Day Use Area
Lakeside Campground
Lakeview Campground
Acorn Camp
Arrowhead Camp
Camanche Campground
Cottonwood Campground
Play Ground
Snack Bar
Abandoned water well
Calaveras Sheriff Park Office
General Store
FUEL STORAGE
Fuel Dock and Berth
Boat Ramp
Marina Dr.
Beach
Beach Road
Poplar Street
Munoz Drive
Moraga Drive
Bret Harte Drive
Calaveras Drive
Montezuma Drive
Rental Cottages
Short-term RV Area
Recreation Hall
Water Storage
Oaks Campground (Trailers not advised)
Seasonal RV Area
Tennis & Basketball Courts
Water Treatment Plant
Mobile Home Park Residents & Guests only
Riverview Campground (Trailers not advised)
FIRE ROAD (Closed)
Cottonwood Day Use Area
Horseshoes & Volleyball
Amphitheatre
Maintenance Yard
Shop
Storage
Paint Storage
Tule Day Use Area
Catfish Pond
Beaver Pond
SEWAGE TREATMENT PONDS
Abandoned Landfill
Camanche Drive
Trout Pond
Trout Pond Day Use Area Parking
FIRE ROAD
(Closed)
Monument RV Park
NO DAY USE PARKING
COAST-TO-CREST TRAIL
PARK BOUNDARY
PRIVATE PROPERTY
EBMUD Ranger Station
Trail Staging Area
Park Entrance Kiosk
Oak Circle
Overflow Camp
REST ROOMS
CAMPGROUND
LAUDRY
PICNIC SITE
PARKING
FUEL
RV PARK
BOAT LAUNCH
RV DUMP STATION
COTTAGE
FISH CLEANING
PROPANE TANK
FIGURE 1

FIGURE 1

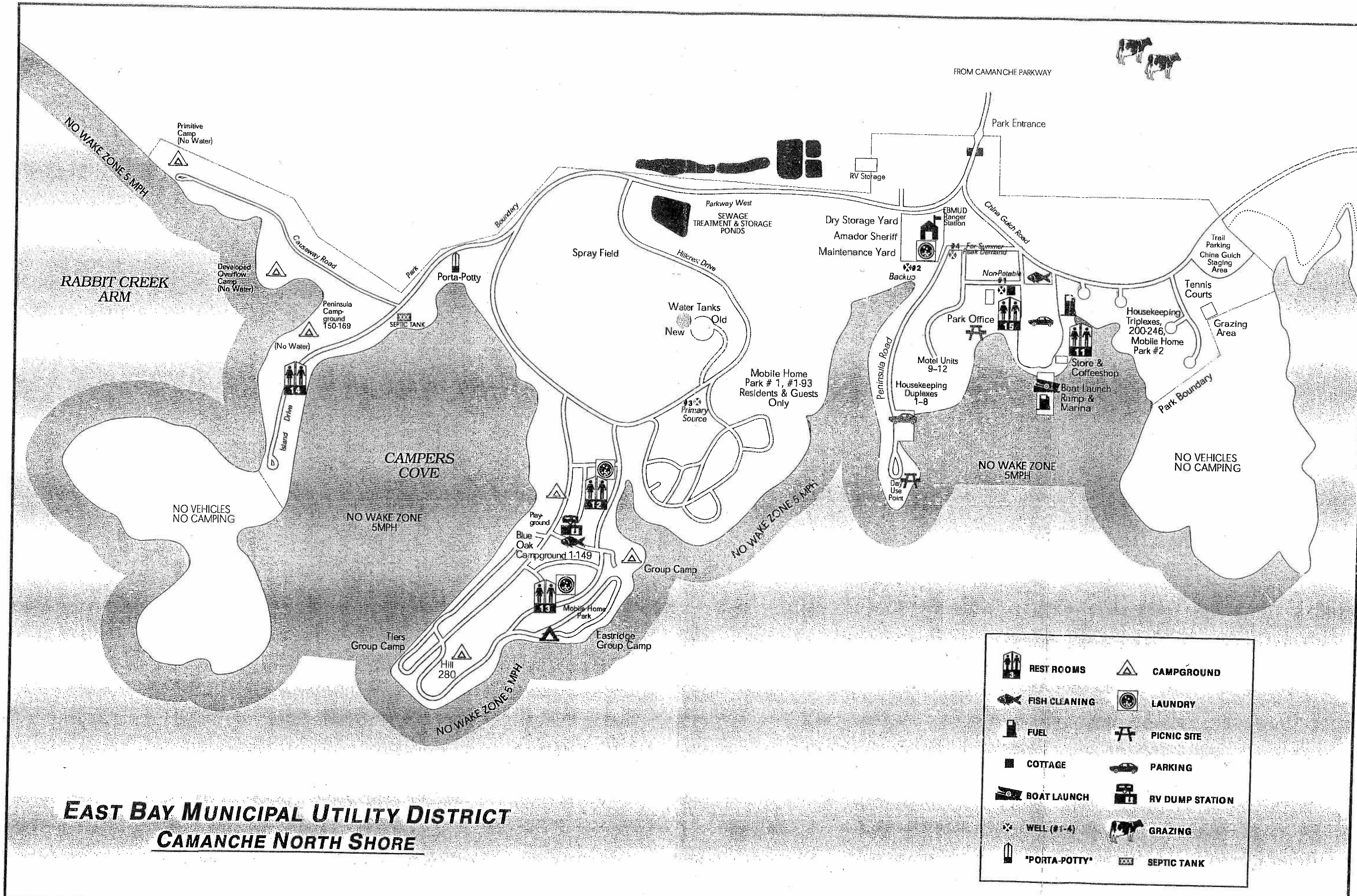

NO WAKE ZONE 5 MPH
Primitive Camp (No Water)
RABBIT CREEK ARM
Developed Overflow Camp (No Water)
Causeway Road
Peninsula Campground 150-169
(No Water)
Island Drive
SEPTIC TANK
Park
Boundary
Porta-Potty
Spray Field
Parkway West
SEWAGE TREATMENT & STORAGE PONDS
Hillcrest Drive
Water Tanks
Old
New
#3 Primary Source
Mobile Home Park # 1, #1-93 Residents & Guests Only
FROM CAMANCHE PARKWAY
Park Entrance
RV Storage
Dry Storage Yard
Amador Sheriff
Maintenance Yard
EBMUD Ranger Station
China Gulch Road
#4 For Summer Peak Demand
#2 Backup
Non-Potable #1
Trail Parking China Gulch Staging Area
Tennis Courts
Grazing Area
Park Office
Housekeeping Triplexes, 200-246, Mobile Home Park #2
Motel Units 9-12
Peninsula Road
Housekeeping Duplexes 1-8
Store & Coffeeshop
Boat Launch Ramp & Marina
Park Boundary
Day Use Point
NO WAKE ZONE 5MPH
NO VEHICLES NO CAMPING
CAMPERS COVE
NO WAKE ZONE 5MPH
NO VEHICLES NO CAMPING
Playground
Blue Oak Campground 1-149
Group Camp
Mobile Home Park
Eastridge Group Camp
Tiers Group Camp
Hill 280
NO WAKE ZONE 5 MPH
REST ROOMS
CAMPGROUND
FISH CLEANING
LAUNDRY
FUEL
PICNIC SITE
COTTAGE
PARKING
BOAT LAUNCH
RV DUMP STATION
WELL (#1-4)
GRAZING
"PORTA-POTTY"
SEPTIC TANK
EAST BAY MUNICIPAL UTILITY DISTRICT
CAMANCHE NORTH SHORE

FIGURE 2

Camanche WTPs, and has a 0.5 mgd capacity. 0.25 mgd was to serve CASS demands, and 0.25 mgd was to be sent to CANS via a treated water pipeline to serve CANS demands. The plant was designed to be expandable to 2.0 mgd in order to serve future Calaveras and Amador County needs. This was in response to a request by EBMUD's Board of Director's to keep this option open.

This report will update the assumptions that went into previous evaluations, facility costs and regulatory information.

1.3 Goals and Objectives

The goals that must be met by a Camanche water treatment plant project are as follows:

1) Meet present and future (15-year) regulatory requirements.

2) Provide water treatment for EBMUD demands of 0.25 mgd at CASS and 0.25 mgd at CANS.

Objectives that must be met by the project are as follows:

1) Raw Water supply options will be limited to Camanche Reservoir, Mokelumne Aqueduct, and Well Water.

2) Alternatives must not increase the amount of operator/maintenance time required, due to limited operations and maintenance staffing at Pardee.

3) All CASS projects must address distribution system pressure problems at Camanche South Shore. California Department of Health Services (DHS) currently requires a minimum distribution system pressure of 20 psi. When power outages occur at CASS, pressure in the upper portion of the distribution system drops below this level. DHS requires disinfection when this occurs.

4) All projects at CASS and CANS must include backwash ponds that meet low-threat permit requirements. Camanche South Shore backwash ponds need to be constructed as part of the project. CASS currently discharges backwash water to a creek without a permit. EBMUD's regulatory compliance section is working on a low-threat permit application for CASS that includes discharge to backwash ponds.

5) All projects must include emergency power supply for reliability at CASS WTP.

6) All projects need to meet Distribution Storage Capacity for DHS Waterworks Standards. The new Waterworks Standards require a system to have storage for peak day or 4 peak hours.

7) Emergency power for CASS sewage lift stations 5 and 6 was included as part of the CASS WTP Replacement Project. When determining alternative costs include line item for emergency power for sewage lift stations.

SECTION 2
REGULATIONS FOR SMALL SYSTEM

2.1 Current Drinking Water Regulations

The major current drinking water regulations that impact small systems are shown in Table 2-1. The table identifies the regulations and the contaminants associated these regulations.

Table 2-1

Current Federal and State Regulations for Small Systems

Regulation	Targeted Contaminants	Small System Requirements	Compliance Date
Phase I, II and V Regulations	VOCs, SOCs, and IOCs	Monitoring & Reporting	Already in Effect
National Primary Drinking Water Regulations – Radioactivity	Radionuclides	Monitoring	Already in Effect
Surface Water Treatment Rule	Microbes and Turbidity	3-log Giardia & 4-log virus inactivation/removal	Already in Effect
Total Coliform Rule (TCR)	Microbes	Monitoring & Reporting	Already in Effect
Lead and Copper Rule (LCR)	Corrosion By-Products	Monitoring & Reporting	Already in Effect
Methyl Tertiary-Butyl Ether (DOHS)	MTBE	Monitoring and Reporting	Already in Effect
National Pollutant Discharge Elimination System (NPDES)	Pollutant Discharges	Permit for surface water discharge	Already in Effect
Stage 1 Disinfectants and Disinfection By-Product Rule (D/DBPR)	Disinfectants DBPs	1. New DBP MCLs 2. TOC Removal 3. Disinfectant Max. Residual Levels	January 2004
Interim Enhanced Surface Water Treatment Rule (IESWTR)	Microbes and Turbidity	Sanitary Survey (All Systems) 2-log Crypto Inactivation/Removal (Systems > 10,000)	December 2004
Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)	Microbes and Turbidity	1. 2-log Crypto Removal 2. Combined Filter Turbidity Limits (<0.3 NTU 95%, Max 1 NTU) 3. Individual Filter Turbidity Monitoring 4. Disinfection Profiling	January 2005

Based on these regulations, the Environmental Protection Agency (EPA) has developed two categories of drinking water standards; primary standards and secondary standards. National Primary Drinking Water Regulation (NPDWR) or primary standards is a legally- enforceable standard that applies to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in water. They take the form of Maximum Contaminant Levels (MCLs) or Treatment Techniques (TTs). Table 2-2 shows the State of California primary standards.

The National Secondary Drinking Water Regulation (NSDWR) or secondary standards is a non-enforceable guideline regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards. In California, DHS secondary standards are enforceable. Table 2-2 shows the California secondary standards.

The CANS system is meeting existing regulations. Only two current regulations impact CASS: NPDES and LT1ESWTR.

2.1.1 NPDES

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Municipal facilities must obtain permits if their discharges go directly to surface waters. The existing CASS WTP discharges backwash water, filter-to-waste and service water directly to a drainage ditch which flows to the trout ponds. Water from the trout ponds eventually is discharged into Camanche Reservoir. The District does not have a permit for this discharge, although a permit application for a low-threat discharge will be submitted in May. All projects proposed at CASS need to include backwash ponds and water quality that meets low-threat discharge requirements.

2.1.2 LT1ESWTR

The purpose of the LT1ESWTR is to extend the IESWTR to systems smaller than 10,000 connections. It requires 2-log *Crypto* credit for all systems. Limits for combined filter turbidity are set at less then 0.3 NTU 95% of the time with a maximum allowable turbidity of 1 NTU. The existing CASS WTP meets the turbidity requirements of the LT1ESWTR and so gets the required 2-log *Crypto* credit. In preparation of the upcoming regulation, Pardee staff has already installed individual filter turbidimeters. Pardee staff is currently working on adding data logging devices that will meet the regulation's requirement for storing individual filter turbidity every 15 minutes.

Table 2-2
California PHGs and MCLs, Dec. 2002

Comparisons of PHGs, DLRs, and MCLs. Units are in milligrams per liter (mg/L), unless otherwise noted.

Contaminant	DLR	MCL
Inorganic Chemicals		
Aluminum	0.05	1
Antimony	0.006	0.006
Arsenic [compliance with new arsenic MCL of 0.01 mg/L is required in 2006]	0.002	0.05
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	0.2 MFL	7 MFL
Barium	0.1	1
Beryllium	0.001	0.004
Cadmium	0.001	0.005
Chromium (In Nov 2001, OEHHA withdrew its 1999 PHG of 0.0025 mg/L)	0.01	0.05
Chromium-6	0.001	--
Cyanide	0.1	0.2
Fluoride	0.1	2.0
Mercury (inorganic)	0.001	0.002
Nickel	0.01	0.1
Nitrate (as NO3)	2	45
Nitrite (as N)	0.4	1 as N
Nitrate + Nitrite	--	10 as N
Perchlorate	0.004	--
Selenium	0.005	0.05
Thallium	0.001	0.002
Copper and Lead (Values identified as MCLs are "Action Levels" under the lead and copper rule)		
Copper	0.05	1.3
Lead	0.005	0.015
Radioactivity [units are picocuries per liter (pCi/L)]		
Gross alpha particle activity	3	15
Gross beta particle activity	4	50
Radium-226	1	--
Radium-228	1	--
Radium-226 + Radium-228	--	5
Strontium-90	2	8

Tritium	1,000	20,000
Uranium	2	20
Organic Chemicals		
(a) Volatile Organic Chemicals (VOCs)		
Benzene	0.0005	0.001
Carbon tetrachloride	0.0005	0.0005
1,2-Dichlorobenzene	0.0005	0.600
1,4-Dichlorobenzene (p-DCB)	0.0005	0.005
1,1-Dichloroethane (1,1-DCA)	0.0005	0.005
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005
1,1-Dichloroethylene (1,1-DCE)	0.0005	0.006
cis-1,2-Dichloroethylene	0.0005	0.006
trans-1,2-Dichloroethylene	0.0005	0.01
Dichloromethane (Methylene chloride)	0.0005	0.005
1,2-Dichloropropane	0.0005	0.005
1,3-Dichloropropene	0.0005	0.0005
Ethylbenzene	0.0005	0.7
Methyl tertiary butyl ether (MTBE)	0.005	0.013
Monochlorobenzene	0.0005	0.07
Styrene	0.0005	0.1
1,1,2,2-Tetrachloroethane	0.0005	0.001
Tetrachloroethylene (PCE)	0.0005	0.005
Toluene (1999)	0.0005	0.15
1,2,4-Trichlorobenzene	0.0005	0.07
1,1,1-Trichloroethane (1,1,1-TCA)	0.0005	0.2
1,1,2-Trichloroethane (1,1,2-TCA)	0.0005	0.005
Trichloroethylene (TCE)	0.0005	0.005
Trichlorofluoromethane (Freon 11)	0.005	0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	0.01	1.2
Vinyl chloride	0.0005	0.0005
Xylenes	0.0005	1.75
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)		
Contaminant	**DLR**	**MCL**
Alachlor	0.001	0.002
Atrazine	0.001	0.003
Bentazon	0.002	0.018
Benzo(a)pyrene	0.0001	0.0002

Carbofuran	0.005	0.018
Chlordane	0.0001	0.0001
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.01	0.07
Dalapon	0.01	0.2
1,2-Dibromo-3-chloropropane (DBCP)	0.00001	0.0002
Di(2-ethylhexyl)adipate	0.005	0.4
Di(2-ethylhexyl)phthalate (DEHP)	0.003	0.004
Dinoseb	0.002	0.007
Diquat	0.004	0.02
Endrin	0.0001	0.002
Endothal	0.045	0.1
Ethylene dibromide (EDB)	0.00002	0.00005
Glyphosate	0.025	0.7
Heptachlor	0.00001	0.00001
Heptachlor epoxide	0.00001	0.00001
Hexachlorobenzene	0.0005	0.001
Hexachlorocyclopentadiene	0.001	0.05
Lindane	0.0002	0.0002
Methoxychlor	0.01	0.04
Molinate	0.002	0.2
Oxamyl	0.02	0.2
Pentachlorophenol	0.0002	0.001
Picloram	0.001	0.5
Polychlorinated biphenyls (PCBs)	0.0005	0.0005
Simazine	0.004	0.004
2,4,5-TP (Silvex)	0.001	0.05
2,3,7,8-TCDD (dioxin)	$5x10^{-9}$	$3x10^{-8}$
Thiobencarb	0.001	0.07
Toxaphene	0.001	0.003

SECONDARY STANDARDS (Aesthetics)	MCL	UNITS
Aluminum	0.2	ppm
Chloride *	500-600	ppm
Color	15	units
Conductivity *	1,600-2,200	umhos/cm
Copper	1,000	ppb
Iron	300	ppb
Manganese	50	ppm
MBAS	0.5	ppm
Silver	100	ppb
Sulfate *	500-600	ppm
Thiobencarb	1	ppb
Threshold Odor Number	3	TON
Total Dissolved Solids *	1,000-1,500	ppm
Turbidity	5	NTU
Zinc	5,000	ppb

2.2 Proposed Regulations

Currently, EPA is developing several water quality regulations. Impending regulations that impact small systems are given in Table 2-3. Specific impending rules that may impact the CASS and CANS systems are: LT2ESWTR, the Groundwater Rule, the Filter Backwash Recycling Rule (FBRR), Recreational Use Permit requirements, and the proposed Waterworks Standards.

Table 2-3
Future Regulations

Regulation	Effective Date of Regulation*	Regulatory Objectives
Radionuclides	2003	Reduction of radiological risk
FBRR	2004	Reduce potential reintroduction of pathogens
LT1ESWTR	2004	Reduction of pathogen risk in small systems equivalent to those required for larger systems in Stage I D/DBP Rule
Groundwater Rule	2006	Reduction of microbial risk in ground water.
Stage 2 – D/DBPR	2006	Lower limits for TTHM, HAA, and other disinfection by-products with compliance based on each sample location
LT2ESWTR	2006	Further reduction of pathogen risk focusing on *Cryptosporidium*
Radon	2006	Reduction of radiological risk
Arsenic	2006	Reduction of cancer/toxic health risk – 5 ppb proposed
Recreational Use Permits at Domestic Water Supply Reservoirs	No Date Set	Reduction of pathogen risk
Waterworks Standards	No Date Set	Establish standards for construction and operation of water systems

*Based on EPA rule implementation calendar.

2.2.1 LT2ESWTR

This regulation applies to all systems. It categorizes water sources into four bins based on raw water *Crypto.* concentrations. The highest raw water quality is Bin 1; the other three bin categories require additional treatment for *Crypto.* removal/inactivation. A "toolbox" table lists various additional treatment techniques and specifies the *Crypto.* log inactivation for each alternative.

CASS will be required to conduct one year of *E. coli* monitoring; sampling every two weeks. If the average of these samples is greater than 10/100 mL, CASS will be required to conduct one year of *Crypto.* monitoring. If this sampling shows average *Crypto.* above 0.075/L, additional *Crypto.* credit will be needed.

The average *E. Coli* reading in CASS influent since 1995 is 3.8 MPN/100 mL. The running average for the data shows a maximum in 1996 of 8 MPN/100mL. More recent data has remained level at 2 MPN/100mL. Therefore, *Crypto.* monitoring will probably not be necessary. However, if the average *E.coli* readings were above 10 /mL AND the *Crypto.* monitoring showed concentrations between 0.075 and 1.0/L, CASS would be put in Bin 2. In this case 1.5-log additional *Crypto.* credit would be needed for the existing in-line plant. One of the items in the "toolbox" table is credit for low finished water turbidity: 1-log extra credit is given if individual filter turbidities are less than 0.15 NTU in 95% of samples each month.

2.2.2 Groundwater Rule (GWR)

The purpose of GWR is to require the appropriate use of disinfection in groundwater and addresses other components of groundwater systems to assure public health protection. GWR establishes multiple barriers to protect against bacteria and viruses in drinking water from groundwater sources and will establish a targeted strategy to identify groundwater systems at high risk for fecal contamination. The GWR is scheduled to be issued as a final regulation in Spring 2003, and will be effective in 2006. The GWR requires the following:

- *System sanitary surveys conducted by the State and identification of significant deficiencies*
- *Hydrogeologic sensitivity assessments for undisinfected systems*
- *Source water microbial monitoring by systems that do not disinfect and draw from hydrogeologically sensitive aquifers or have detected fecal indicators within the system's distribution system;*
- *Corrective action by any system with significant deficiencies or positive microbial samples indicating fecal contamination*
- *Compliance monitoring for systems that disinfect to ensure that they reliably achieve 4-log (99.99 percent) inactivation or removal of viruses.*

CANS is considered a community system and will need to conduct sanitary surveys every three years. Under the Drinking Water Source Assessment Program, the District has already completed an inventory of potential contaminating activities. The inventory showed that the wastewater treatment plant ponds are located within the 2,500 foot radius of influence and are a potential contaminate of the groundwater supply. The GWR may require corrective action if fecal contamination is detected. The District already provides disinfection of all well water.

2.2.3 Filter Backwash Recycling Rule (FBRR)

The purpose of the FBRR is to require public water systems to review their recycle practices and, where appropriate, work with the State Primacy Agency to make any necessary changes to recycle practices that may compromise microbial control.

The FBRR requires that recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes must be returned to a location such that all processes of a system's conventional or direct filtration including coagulation, flocculation, sedimentation (conventional filtration only) and filtration, are employed.

EPA believes that establishing such a regulation will improve performance at conventional and direct filtration plants by reducing the opportunity for recycle practices to adversely affect plant performance in a way that would allow microbes such as *Cryptosporidium* to pass through into finished water.

The existing Camanche South Shore WTP is a direct filtration plant and does not recycle backwash water at this time. Any proposed WTPs would need to meet this regulation.

2.2.4 Recreational Use Permits at Domestic Water Supply Reservoirs

The California Health and Safety Code (HSC) establishes as State policy that all public waters are to be used for multiple purposes, to the extent that uses are consistent with health and safety. The HSC prohibits body contact recreation in a reservoir where water is stored for domestic use but makes several exceptions. The state laws do not specifically address reservoirs that store water for multiple purposes, including domestic water supplies.

DHS is developing guidelines for recreational use permits that include body contact recreation in California reservoirs. The draft guidelines recommend use of microbiological risk assessment in a recreational use permit application when body contact recreation is allowed.

The draft guidelines recommend weekly monitoring for total and fecal coliform, and monthly monitoring of protozoa. (The District is already required to monitor total and fecal coliform along the shoreline in summer months as part of its water supply permit.) In addition, the guidelines limit annual number of visitors per acre-foot in storage capacity above thermocline during peak visitation period. If the number of visitor's is above the recommended guidelines, then a biological risk assessment will be required. In 1999, the total number of visitors to CANS and CASS was 353,965. The District maintains 28,000 Ac-feet of water in the hypolimnion between May and October. Assuming the reservoir water surface is maintained at El 220, then the ratio of annual number of visitors per acre foot in storage capacity is 1.16. This ratio is below the maximum ratio allowed by the guidelines to permit swimming in the reservoirs. However, if the water surface elevation drops to El 200, then the ratio increases to 2.14. This is above the allowed ratio of 2.1, and would require a biological risk assessment.

2.2.5 Waterworks Standards

The draft Department of Health Services Waterworks Standards proposes standards for water system construction and operation. Topics in this draft document that could impact the CASS and CANS water systems include the following sections:

- Section 64554. New and Existing Source Capacity.
  "A system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD), and the system shall be able to meet four hours of peak hourly demand (PHD) with source capacity, storage capacity and/or other auxiliary or emergency source connections. Both the MDD and PHD requirements shall be met in the system as a whole and in each individual pressure zone. If at any time the system does not have this capacity, the system shall be subject to a service connection moratorium until such time as it can demonstrate that the source capacity has been increased to meet the MDD as required."

For CASS and CANS, the MDD would be based on the highest daily demand over the past ten years and the PHD would obtained from the MDD multiplied by a peaking factor of at least 1.5. CASS can currently meet this requirement. However, the combined storage and treatment systems at CANS do not meet this provision.

- Section 64602. Minimum Pressure.
  "Each distribution system shall be operated in a manner to assure that the minimum operating pressure in the water main at the user service line connection throughout the distribution system is not less than 20 pounds per square inch at all times."

Currently this requirement cannot be met in the CASS upper pressure zone immediately following a power outage. This supports the hydropneumatic tank system proposed at CASS.

It should be noted that no date has been set for promulgation of this statute.

SECTION 3
EXISTING SYSTEMS

3.1 CANS

The CANS Water Treatment Plant is located on the north shore of Camanche Reservoir and on the northern side of the mobile home park #1 community. The CANS WTP was acquired by EBMUD in 1991, and has been operated by EBMUD since that time. Water is drawn from wells, then pre-oxidized for iron/manganese/hydrogen sulfide removal, filtered, and disinfected at the plant prior to distribution. On average, the plant treats approximately 187,000 gallons per day.

3.1.1 Process Description & Evaluation

Figure 3-1 shows the water treatment system schematic.

Raw Water Conveyance

Description

Raw water is pumped to the plant through two separate 4-inch supply pipelines. A 4-inch PVC pipeline connects Well #4 discharge piping to the Well #2 supply line to the plant. Well #3 is located in the plant building itself, and flows to a common header with Well #2 (or #4). While the pumps at each well provide a constant flow, the operator can adjust flow to the plant using a globe valve on each supply line. Each of the raw water pumps has a 130-gpm capacity. However, due to sudden drop-off in water production at higher pumping rates, typically two pumps are in service at any time to provide a combined flow of 180 gpm. Groundwater is typically pumped 6 to 12 hours a day depending on demand. CANS recreation area demands are met during peak summer periods by increasing the time of pumping and relying on two 140,000 gallon storage tanks.

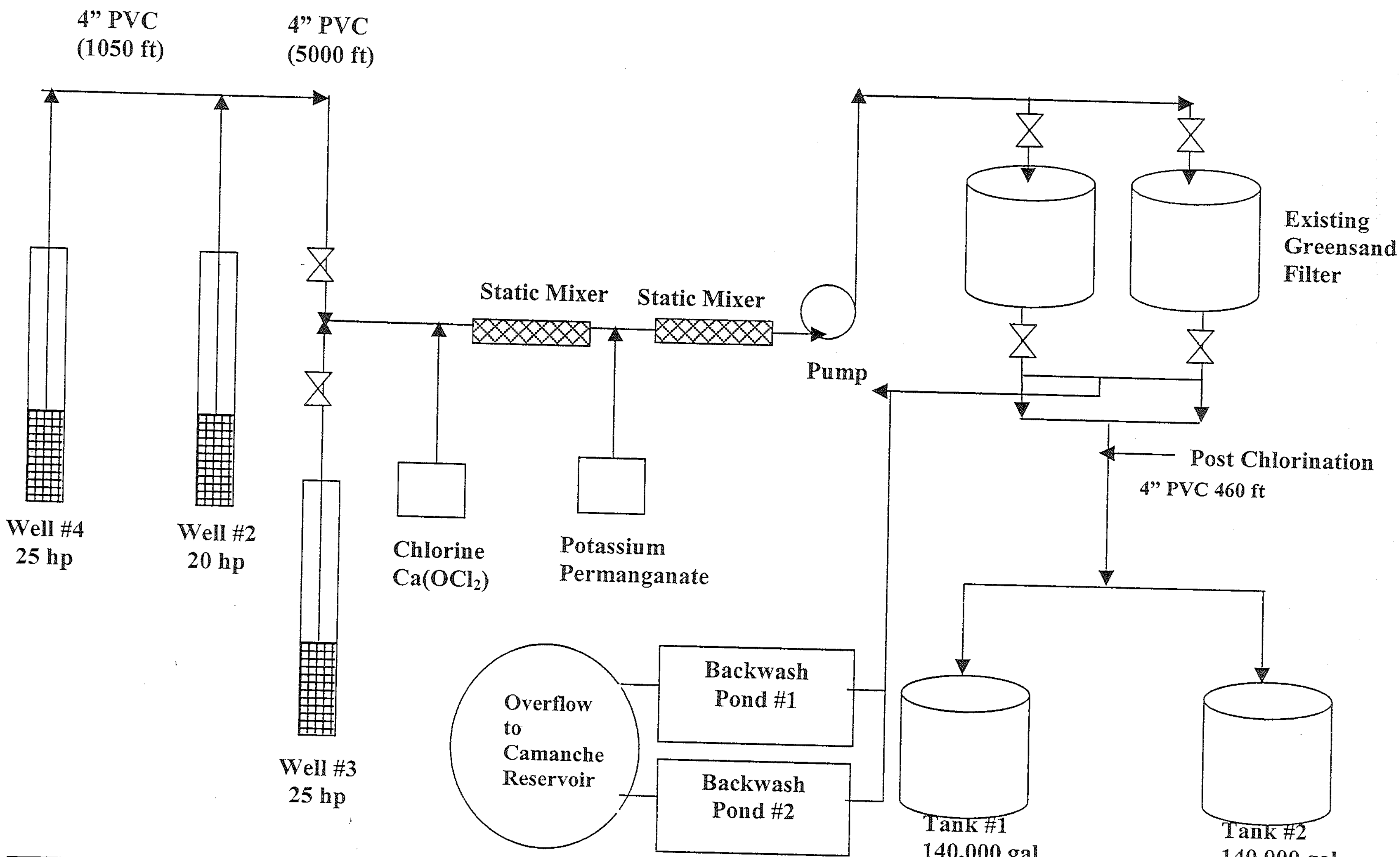
Evaluation

The raw water conveyance system is adequate for the existing plant, with the exception of the flow control system. There is no automation to the system, so that operators are required to visit the WTP to adjust water supply rates from each well. The globe valves installed in the supply lines do not provide stable control and the level set by the operator often drops overnight by 10 or 20 gpm. With fluctuating H_2S levels combined with variations in flow due to the valves, taste and odor complaints are not uncommon.

The Well #2 pump was recently replaced. By using a globe valve to continuously throttle the pump, lower pump efficiencies are experienced and cavitation may be occurring in the pump due to the high backpressure. Pardee personnel reported that Well #3 flows may be showing signs of a similar problem.

Another concern at CANS is the condition of the discharge piping at Wells #3 and #4. The discharge piping in Well #2 was recently replaced due to extensive corrosion. Approximately 85% of the well casing perforations in the well were plugged due to

Figure 3-1 – Schematic of Current CANS Water Treatment Plant



calcification. Again, it is believed that there may be similar problems with Wells #3 and #4.

Pretreatment/Coagulation

Description

The water supply lines are joined at a common header before feeding directly into two greensand filters that are operated in parallel. Chlorine and potassium permanganate solution are metered into the water immediately upstream of the static mixer, prior to entering the greensand filter system.

Potassium Permanganate is added to aid in the filtering and removal of iron and manganese; hydrogen sulfide oxidation and removal; and other particulate matter, which may affect the taste and odor of the potable water. Dosage is currently about 2 mg/L.

Pre-chlorination is required when Well #2 is in use due to a past history of positive total coliform readings. In addition, the District limits flow from this well to approximately 90 gpm, since positive coliform readings seem to occur when higher flows are used.

Evaluation

A calcium hypochlorite tablet system was recently installed to replace the old gaseous chlorine system. The advantages of the calcium hypochlorite system are that it simple and safe to use; the primary disadvantage is that the feed dose cannot be precisely controlled and chlorine residual can fluctuate accordingly. These fluctuations are manageable with manual dosage control, however they mean that it would not be possible to convert the existing system to an automated system with residual feedback control.

With no chemical feedback controls, potassium permanganate levels are set by the operator each day based on maximum dose that can be fed prior to forming pink water. Since operators visit the plant once a day, the plant has had some taste and odor problems due to under feeding $KMnO4$. In addition, customer complaints have occurred from over feeding $KMnO4$, which results in "pink" water.

Filtration

Description

The process train has two 20 square-foot filters, which consist of two upright five-feet diameter cylindrical vessels. The underdrain system is constructed of plastic pipe embedded in 10 inches of gravel. The filter media consists of approximately 3 inches of sand and 21 inches of green sand. Each vessel has a service flow rate of approximately 95 gpm (4.75 gpm/ft2) for a total flow rate capacity of 190 gpm. The District is operating the greensand filter system in the parallel mode. The maximum design pressure of the vessels is approximately 100 psi. The water enters either of two parallel greensand filters. The iron and manganese are oxidized to insoluble salts (precipitates) and filtered out of the effluent by the greensand. Precipitates are then removed by backwashing.

Backwashing is automatically initiated when a 10 psi headloss across the filters occurs; every 24 hours of filter-use; or after a plant shutdown. A semi-automated control panel pneumatically opens and closes valves when the backwashing operation is performed. During the backwash cycle, one filter treats the water while the other is being backwashed. Water for backwashing is obtained from one of the 0.14 MG treated water storage tanks located at a sufficient elevation to provide enough head for backwashing. The maximum backwash flow rate is 15 gpm/sf and is automatically controlled; typically this takes 12 to 15 minutes. Before clean filters are returned to service, they are run in filter-to-waste mode until the turbidity drops below 0.2 NTU. Filters are typically backwashed every day or after each plant run cycle. In 1992, the District constructed two earthen backwash ponds adjacent to the WTP. Pond No. 1 has a 74,000 gallon capacity, while Pond No. 2 can store 69,000 gallons. Waste washwater water is discharged to these ponds without treatment.

Although not required for groundwater treatment, turbidimeters are installed on the combined filter effluent to continuously monitor filtered water effluent turbidities.

Evaluation

The greensand is performing well in removing manganese and iron from the well water. However, hydrogen sulfide removal has been a problem and relies on operator experience to avoid taste and odor or color issues. The greensand cannot sufficiently treat the high fluctuations in H_2S, which were seen when Well #4 was in use. A couple years ago, a high concentration of H_2S from Well #4 removed all charge from the greensand to the point it could not be regenerated, and Pardee staff had to replace the media.

Backwash valves on the filters have been sticking and leaking. Pardee staff is currently rehabilitating all 10 valves (one at a time) as staff workload allows.

Disinfection

Description

Disinfection is provided using pre-filter chlorination as described above and post chlorination. Chlorine is added as a disinfectant in the form of calcium hypochlorite. The District uses 65% calcium hypochlorite tables in an "erosion feeder" tablet chlorinator. The chlorinator is located in the plant near well #3. A 1-1/4" line is used to divert a portion of the treated filter effluent through the tablet feeder and into a surge tank contained within the chlorination unit. The chlorinated water is then pumped back into the water line several feet upstream of the filters. The hypochlorite feed rate is adjusted to result in a free chlorine residual of about 0.7 to 1.0 mg/L in the water storage tank. Current pre-chlorination levels are approximately 0.5 mg/L while post chlorination levels are around 5 mg/L.

Evaluation

As a groundwater treatment plant, the Camanche North Shore WTP is not required to provide disinfection at this time. However, the future Ground Water Rule is expected to require disinfection that achieves at least 4-log inactivation or removal of viruses. The current pre-chlorine dose is adequate to meet the future regulations.

Instrumentation

Description

The following table summarizes the process monitoring instrumentation at the Camanche North Shore WTP:

Table 3-1
List of Process Monitoring Stations at CANS WTP

Instrument	# of units	Location
Turbidimeter	1	Raw Water
	1	Combined filter effluent
Chlorine Analyzer	1	Finished water
pH meter	1	Raw water
Flow meter	1	Well #2 or Well #4
	1	Well #3
	1	Filter to Waste
Level indicator	2	Storage tanks

The instruments listed above are used for process monitoring and to provide alarm signals only. Chemical doses are set manually; there is no flow-pacing and no analyzer feedback control. The chemical feed pumps start and stop automatically when the plant starts and shuts down, i.e. when the well pumps start and stop or if there is no flow to the tablet chlorinator.

Malfunction alarms are provided for the following conditions:

- Storage tank levels exceed 22.3 feet
- Storage tank levels drop below 18.5 feet

Automatic plant shutdown occurs for any of the following conditions:

- High storage tank level, exceeding 22.3 feet depth

Evaluation

Since there is no automated process control, the plant has to be manually operated. The CANS plant is normally unattended, but a Treatment Plant Specialist visits the plant daily for approximately two hours to attend to operations duties. The level of attention required at the plant is relatively high for the amount of water produced. It also means that the reliability of the plant performance is highly dependent on the skill and conscientiousness of the operators.

The shutdown interlocks provide a safeguard against inadequately treated water entering the distribution system and fortunately the storage tank volume enables the plant to be shutdown for several hours, under most conditions, without threatening the supply to the customers. Eight of the local alarms at the CANS WTP are connected to the Pardee Area Control Center, which is manned 24-hours per day, via an automatic dialer. However, an operator must respond in person to troubleshoot the problem and start up the plant once shutdown has occurred. In addition, many other local alarms are not tied into the automatic dialer, so that problems will only be recognized when the operator visits the plant.

3.1.2 Water Quality

Raw Water Quality

Table 3-2 shows the raw water quality parameters of concern for each well and the plant effluent based on 1995 to 2002 water quality data. The wells have never exceeded organic or inorganic primary standards. However, as it can be seen in the table, the raw water from these wells exceeds the secondary standards for iron, manganese, and threshold odor number (TON).

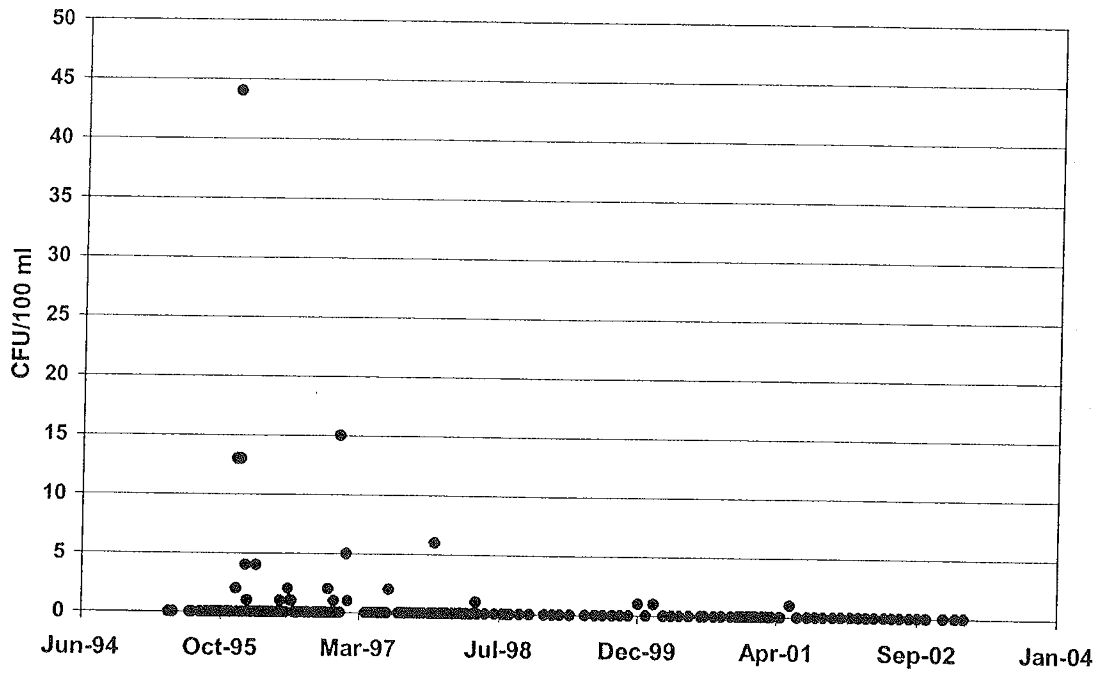
Additionally, Well #2 has experienced total coliform contamination in the past. Figure 3-2 shows total coliform concentration from 1995 to 2002. The data indicates that the well was somehow contaminated in late 1995 but the problem has been solved since late 1997 by limiting flow from the well to 90 gpm. The current water supply permit for operating Well #2 requires chlorination of the water.

Table 3-2
CANS WTP Median Raw and Treated Water Quality (1995-2002)

Parameters	Unit	MCL	Well #2 Raw	Well #3 Raw	Well #4 Raw	Finished Water
Alkalinity - total	mg/L as CaCO3	NS	83	140	140	160
Boron	ug/L	NS	371	129	676	145
Bromide	mg/L	NS	0.06	0.11	0.14	ND
Copper	ug/L	1000*	17.3	3.8	3.7	3.5
Hardness - total	mg/L	NS	78.5	120	70	150
Iron	ug/L	300*	514	17.6	1400	ND
pH	Units	NS	7.8	7.9	8.1	7.9
Manganese	ug/L	50*	73.8	452	249	2.1
Sulfate	mg/L	250	44	43.5	13	46
Threshold Odor Number	TON	3*	3	2**	25	4.5
Total Organic Carbon	mg/L	---	NA	2.2**	NA	2.4**
Total Dissolved Solids	mg/L	500	240	270	270	340
Turbidity	NTU	5*	1.6	0.16	7.9	0.11

NS = No Standard *** = Only one measurement*
ND = Not Detected ** = Secondary Standard* *NA = Not Analyzed*

Figure 3-2 Total Coliform Data for Well No. 2



Treated Water Quality

Table 3-2 also shows the treated water quality data for CANS WTP. The data shows that the plant has met all the primary and secondary MCLs with the exception of TON. TON as secondary MCL it has exceeded due to presence of hydrogen sulfide in the water, especially in Well No. 4.

Figure 3-3 shows TTHM data from two sample points within the CANS distribution system since 1999. All TTHM readings were below 38 μg/L, which is comfortably below the Stage 1 Disinfectants and Disinfection Byproducts Rule TTHM MCL of 80 μg/L and meets the District's system annual running average goal of 40 μg/L.

Figure 3-4 shows HAA5 data from two sample points within the distribution system since 2000. All samples were below 13 μg/L, which is well below the Stage 1 Disinfectants and Disinfection Byproducts Rule HAA5 MCL of 60 μg/L and easily meets the District's goal of 30 μg/L. It should be noted that the ability to produce this kind of plant performance is highly dependent on the skill and conscientiousness of Pardee operators and maintenance staff. It is especially difficult with the lack of plant automation and analyzer feedback control.

Figure 3-3
THM Data for CANS Water Supply System

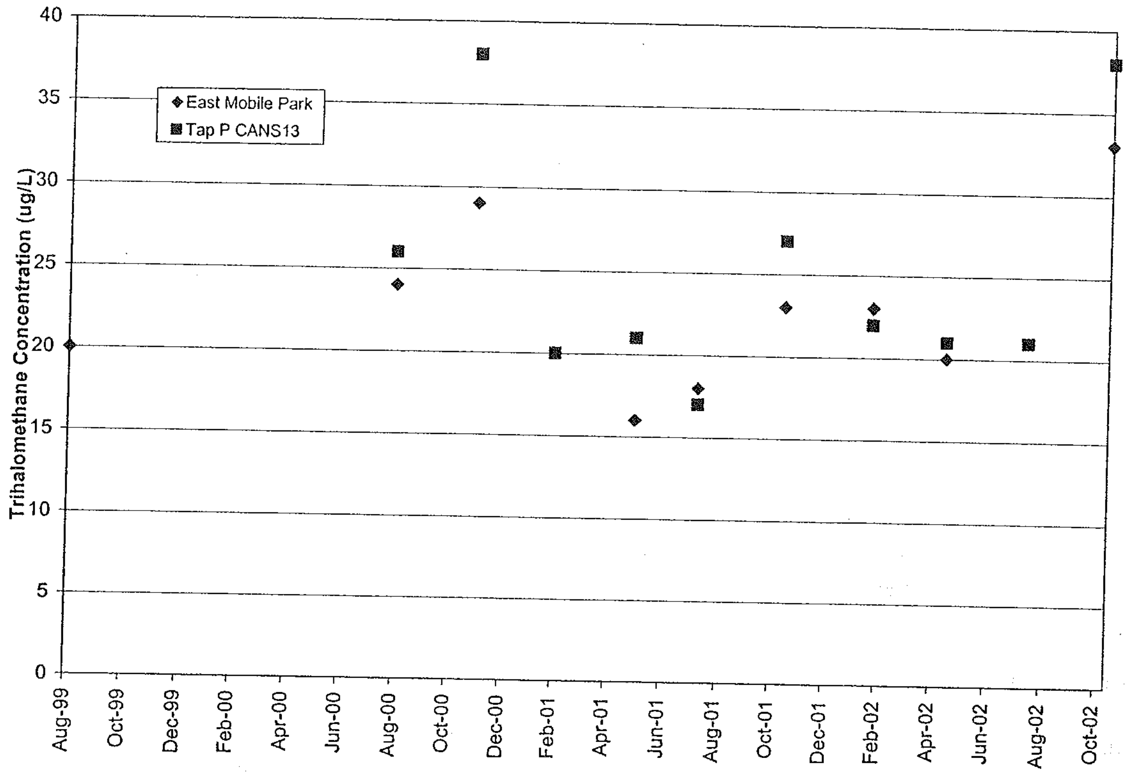
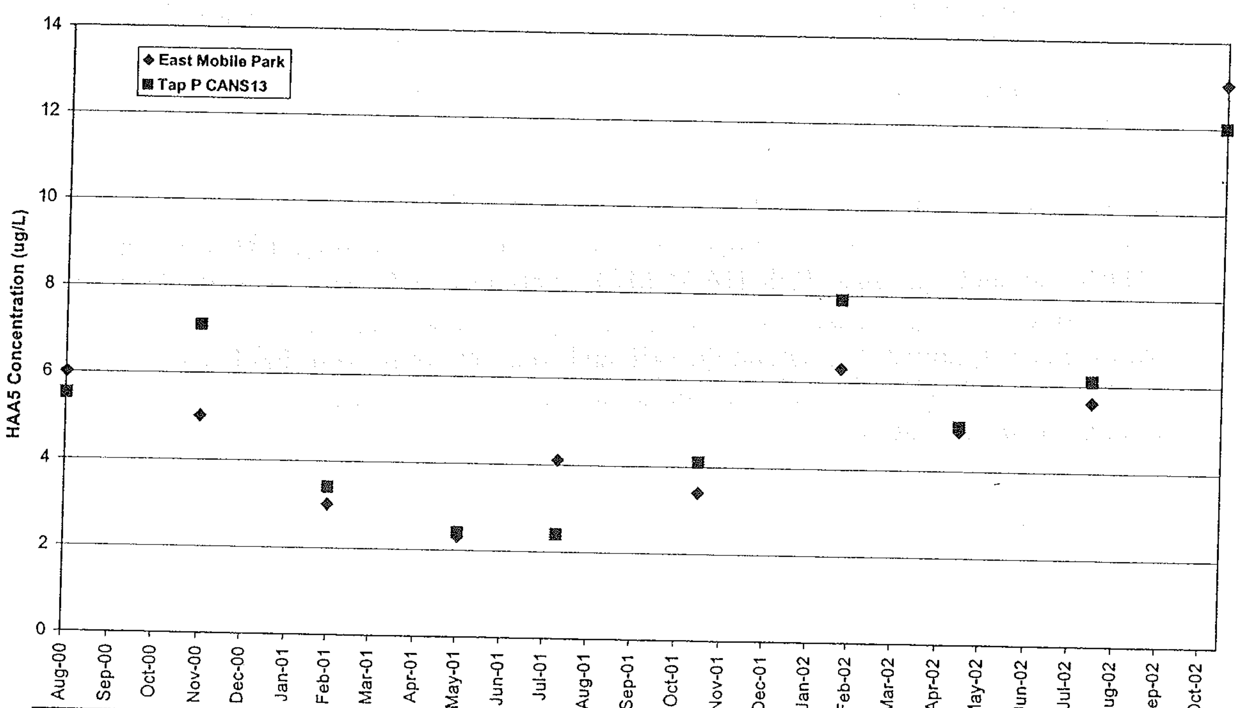


Figure 3-4
HAA Data for CANS Water Supply System



The existing Camanche North Shore WTP can therefore comply with the Stage 1 Disinfectants and Disinfection Byproducts Rule.

Lead and Copper Rule sampling is conducted every three years in the CANS distribution system. Results of three rounds of samples taken since 1995 indicate that lead concentrations have varied between 0.2 and 12.8 µg/L and copper concentrations have varied between 3.1 and 80 µg/L. The MCLs for lead and copper are 15 µg/L and 1,300 µg/L, respectively, based on the 90th percentile value in each round of sampling. Therefore, all Lead and Copper Rule samples to date have been below the lead and copper MCLs.

3.1.3 Demands

CANS DOHS monthly treatment reports were used to determine the peak day demand at the plant. Since a new reservoir was installed in 2002, only 2002 data was reviewed given that operators now have more flexibility to rely on storage during peak periods. Table 3-3 shows monthly demand data for 2002. Based on this data, maximum day demands are 0.28 mgd, while average day demands are 0.19 mgd. The proposed Waterworks Standards calculates peak hour demand as 1.5* maximum day which is 0.42 mgd.

Table 3-3
2002 CANS Demands

Month	Average Day Demand (gpd)	Maximum Day Demand (gpd)
January	172,010	222,857
February	164,228	240,000
March	181,951	240,000
April	197,832	216,986
May	199,949	222,295
June	209,715	276,259
July	206,122	221,965
August	203,700	213,846
September	208,473	224,118
October	162,863	205,263
November	148,644	214,468
December	190,219	244,286
Average	187,142	

Historically, Pardee staff asks the concessionaire one time a year to have residents conserve water for approximately two to four weeks. Reasons for the conservation vary from maintenance issues to low reservoir levels. Last year conservation was required while the District flushed out the system after a "pink" water incident due to overfeed to

KMnO4. Conservation requests will probably decrease now that a second storage tank has been added to the system.

There are no good estimates available for separating out recreation demand from permanent resident demand. Based on the 2000 Watershed Sanitary Survey, there are 70 resident services and 10 trailer services. Average visitors per day to the park were 531, with peak # of campers at 999 and peak# of visitors at 1,578.

3.2 CASS WTP

The CASS Water Treatment Plant has been in operation since about 1973. The plant was owned and operated by a concessionaire until 1991, when EBMUD assumed ownership. Raw water is pumped from Camanche Reservoir and is coagulated, filtered and disinfected at the plant prior to distribution. The plant has a design capacity of 0.691 MGD.

3.2.1 Process Description & Evaluation

Figure 3-5 shows the CASS WTP schematic.

Raw Water Conveyance

Description

Raw water is delivered to the plant by two pumps located on a floating barge on Camanche Reservoir, which is located approximately 1200' offshore. A 500' protection zone is maintained around the raw water intake to prevent recreational activities close to the intake. The shoreline is fenced for about 1,000' in the area closest to the raw water intake and the fence is posted with "Keep Out" notices. Each of the raw water pumps has a 250-gpm capacity; typically one pump in service is more than adequate to meet plant demands in winter. Two pumps are needed to meet summer demand. Water is pumped through 6-inch rubber hoses to a manifold on shore. From the manifold the raw water travels through about 800 feet of 8-inch PVC pipe to the plant. An overflow standpipe at the plant returns excess raw water flow to the creek and ultimately back to Camanche Reservoir. The intake configuration provides flexibility to draw raw water from different reservoir depths and is currently set at 32 feet below surface.

Evaluation

The raw water conveyance system is adequate for the existing plant. However there is no flexibility to withdraw water from different elevations and, reportedly, in past drought it has been necessary to relocate the intake pumps because of low reservoir levels.

Pretreatment/Coagulation

Description

The raw water pipeline divides into to 8" pipelines that supply the two process trains. Each process train consists of a mixing tank and four gravity filters. Calcium hypochlorite and a combination of polyaluminum chloride and cationic polymer are injected into the raw water pipelines upstream of the 1,200-gallon mixing tanks that are equipped with ½ horsepower mechanical mixers.

Evaluation

The pre-filtration calcium hypochlorite dose has been reduced in the last couple of years to minimize disinfection byproduct formation; the current dose is just sufficient to maintain a trace chlorine residual at the bottom of the filters.

The mixing tanks have a minimum detention time of 5 minutes when all four filters in the process train are operating at the maximum filtration rate of 3 gpm/sf, but normally the filters are operated at 1.5 gpm/sf, so the mixing time is generally greater than 10 minutes. The ½ horsepower mixers provide an average velocity gradient, G, of approximately 200 sec^{-1} through the mixing tanks. Recommended design parameters for mechanical rapid mixers are $G = 300\ sec^{-1}$ and a mixing time of 10 to 30 seconds.[1] So the rapid mixing configuration is far from optimal and the mixing time is certainly excessive. Since in-line filtration is not an approved technology in California and since there is a relatively long detention through the mixing tanks that would be adequate for flocculation, it would be worth considering converting the plant to a direct filtration mode if the plant is to be kept in service for much longer. This conversion could easily be made by reducing the level of mixing in the tanks to provide an appropriate mixing energy for flocculation, i.e. a G value of approximately 20 sec^{-1}. This conversion to a direct filtration mode should improve filter performance, particularly during high raw water turbidity events, and should provide greater protection against Giardia and Cryptosporidium breakthrough.

Filtration

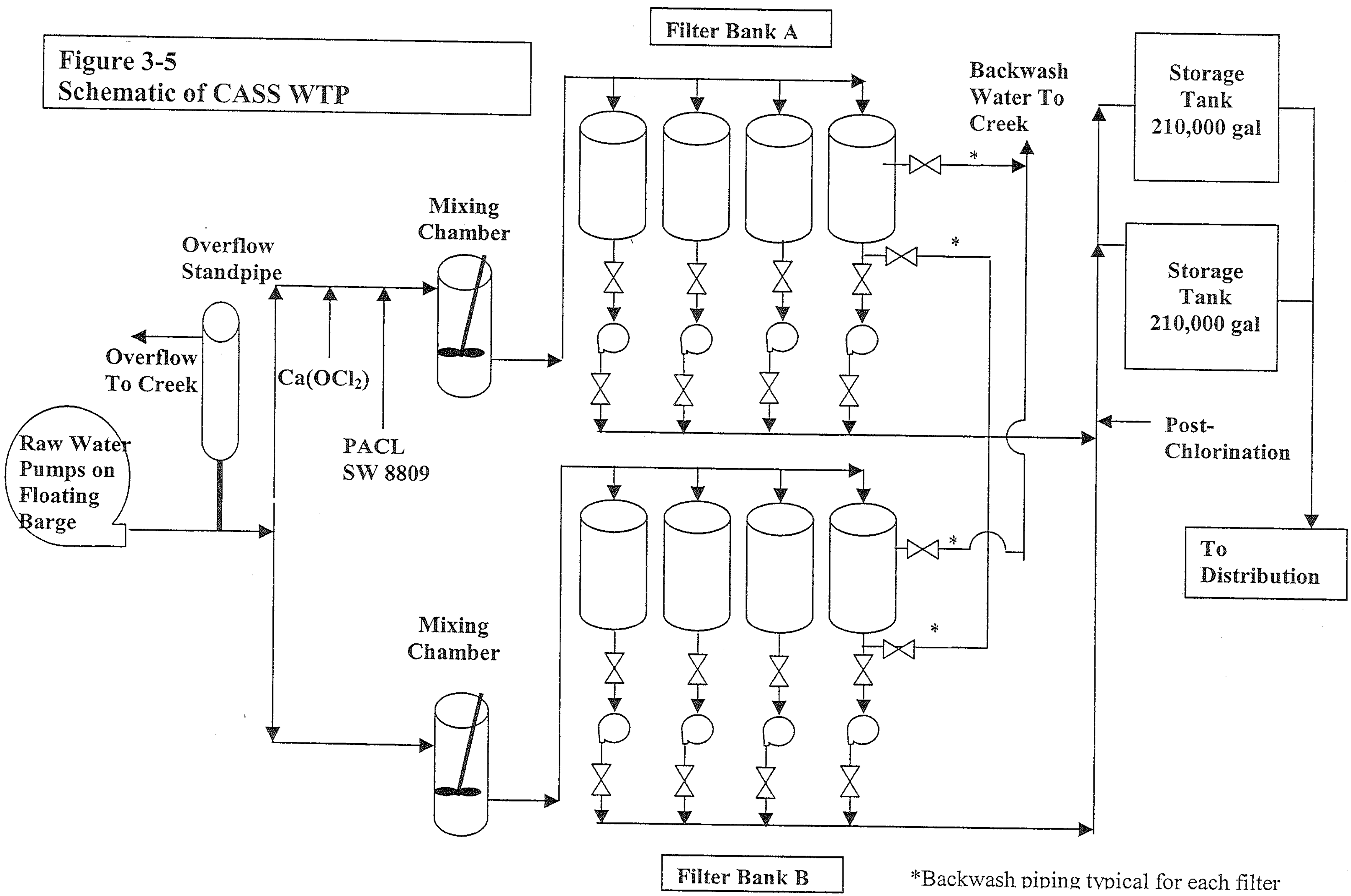
Description

Each process train has four filters, which are constructed from vertical, 12-foot high, 5-foot diameter concrete pipes. The underdrain system is constructed of plastic pipe embedded in 30 inches of gravel. The filter media consists of approximately 18 inches of sand and 30 inches of anthracite.

A pump on each filter effluent line restricts flow through the filters to the permitted filtration rate of 3 gpm/sf. Under most operating conditions two filters are valved to a single pump so that the filtration rate through each filter is 1.5 gpm/sf, however during high summer demand periods it is sometimes necessary to operate the filters at 3 gpm/sf. Manometers are installed on each filter to monitor the headloss accumulation through the filter media. Backwashing is initiated manually and backwash water is supplied from the finished water tanks through reduced pressure backflow preventers. The filters are backwashed at 15 gpm/sf until the backwash water is clear; typically this takes between 8 and 15 minutes. Filter surface wash is performed simultaneously for the first five minutes of backwashing. Before clean filters are returned to service, they are run in filter-to-waste mode until the turbidity drops below 0.2 NTU. Filters are typically backwashed every day in summer and every three days in winter. Waste washwater and

[1] Kawamura, "Integrated Design of Water Treatment Facilities" 1991.

Figure 3-5
Schematic of CASS WTP



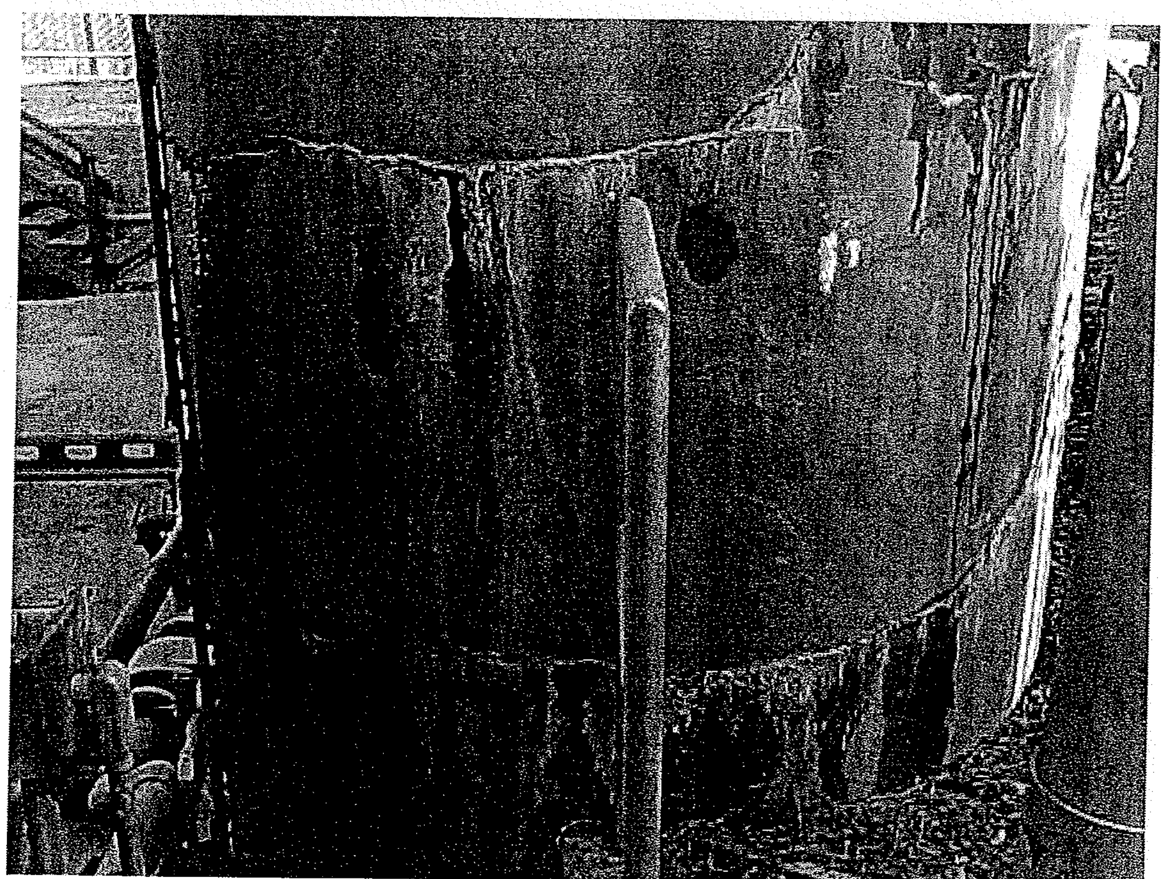
filter-to-waste water is discharged, without treatment, to an adjacent creek, which flows through a series of fishponds and ultimately back to Camanche Reservoir.

Turbidimeters were recently installed on each filter to continuously monitor individual filter effluent turbidities, as required by the Interim Enhanced Surface Water Treatment Rule (IESWTR).

Evaluation

The concrete pipes that house the filters and the coagulant mixing chambers are in very poor condition and have numerous cracks with a significant amount of seepage, as can be seen in Figure 3-6. They appear to be close to the end of their useful life.

Figure 3-6 CASS WTP Filter



Filtered water turbidities are typically around 0.05 NTU although there are occasional excursions up to around 0.1 NTU during winter months when water temperatures are lower and raw water turbidities are higher. Therefore there is no difficulty in meeting the turbidity performance standards of the IESWTR, which stipulates that 95% of measurements taken each month must less than or equal to 0.3 NTU and that the maximum turbidity must never exceed 1 NTU. Fortunately the filters normally only need to be operated at 3 gpm/sf during summer months when water temperatures are high and the raw water turbidity is low, so low filtered water turbidities can be maintained under these conditions. However, it would be substantially more challenging to meet the IESWTR turbidity standards if it were ever necessary to operate the filters at 3 gpm/sf under high turbidity, low temperature winter conditions.

It is unlikely that the practice of returning untreated washwater to the Camanche Reservoir will be acceptable to the Regional Water Quality Control Board indefinitely. Therefore the washwater ponds that have been designed for Camanche South Shore WTP should be constructed even if other parts of the design are not implemented.

Disinfection

Description

Calcium hypochlorite is used for combined filter effluent post-chlorination. Disinfection is achieved by the free chlorine contact time that occurs in the pipeline from the plant to the storage tanks and through the storage tanks, which have a combined volume of 0.4 MG. Currently the calcium hypochlorite dose is controlled to maintain a free chlorine residual of 0.7 mg/L at the tank outlets.

Evaluation

As an in-line plant, the Camanche South Shore WTP is required to provide disinfection that achieves at least 1-log Giardia inactivation and 3-log virus inactivation under the Surface Water Treatment Rule (SWTR). The current post-chlorine dose, which produces a free chlorine residual of 0.7 mg/L at the tank outlets, is more than adequate to meet the SWTR disinfection requirements. CT calculations are routinely performed to ensure that the required level of disinfection is being achieved. The existing Camanche South Shore WTP can therefore meet the disinfection requirements of the SWTR.

The calcium hypochlorite tablet system was recently installed to replace the old gaseous chlorine system. The advantages of the calcium hypochlorite system are that it simple and safe to use; the primary disadvantage is that the feed dose cannot be precisely controlled and chlorine residual can fluctuate accordingly. These fluctuations are manageable with manual dosage control, however they mean that it would not be possible to convert the existing system to an automated system with residual feedback control.

Instrumentation

Description

Table 3-4 summarizes the process monitoring instrumentation at the Camanche South Shore WTP:

Table 3-4
List of Process Monitoring Stations at CASS WTP

Instrument	# of units	Location
Turbidimeter	1	Raw Water
	2	Combined filter effluent from each process train
	8	Individual filter effluent
Chlorine Analyzer	1	Finished water
pH meter	1	Raw water
	1	Finished water
Flow meter	2	Raw water to each process train
Flow indicator	1	Coagulant feed
	1	Calcium hypochlorite feed
Level indicator	2	Storage tanks

The instruments listed above are used for process monitoring and to provide alarm signals only. Chemical doses are set manually; there is no flow-pacing and no analyzer feedback control. The chemical feed pumps start and stop automatically when the plant starts and shuts down, i.e. when the raw water pumps start and stop.

Malfunction alarms are provided for the following conditions:

- Filter effluent turbidity from any filter exceeds 0.3 NTU
- Storage tank levels exceed 387 feet
- Storage tank levels drop below 375 feet
- Loss of electrical power to the plant
- Loss of coagulant feed
- Low chlorine residual in the combined filter effluent, <1.2 mg/L

Automatic plant shutdown occurs for any of the following conditions:

- Filter effluent turbidity from any filter exceeds 0.45 NTU
- Low chlorine residual in the combined filter effluent, <0.3 mg/L
- High storage tank level, exceeding 22 feet depth

Evaluation

Since there is no automated process control, the plant has to be manually operated. This means that the amount of operator attention that is required at the plant is relatively high for the amount of water production. It also means that the reliability of the plant performance is highly dependent on the skill and conscientiousness of the operators.

The shutdown interlocks provide a safeguard against inadequately treated water entering the distribution system and fortunately the storage tank volume enables the plant to be shutdown for several hours, under most conditions, without threatening the supply to the customers.

Distribution System

Description

Filtered water from the CASS WTP is pumped to two storage tanks that have a combined capacity of 0.42 MGD and are located about 1,200 feet from the plant. Treated water is delivered to most of the distribution system by gravity from these storage tanks, but booster pumping is necessary to provide adequate pressure to an upper zone of the distribution system.

Evaluation

The existing system provides adequate flow and pressure to all parts of the distribution system under normal operating circumstances. However, when power outages occur, there is a 3-minute lag time until the emergency generator starts up and provides power to the booster pumps; during this lag time, pressure in the upper zone can drop to almost zero. CASS sewer lines were installed in the same trench as the potable water distribution pipelines in the upper pressure zone. Sewer lines in this area are in poor condition, and the drop in pressure creates a cross-connection potential that could contaminate sections of the distribution system and cause serious health problems. The draft Department of Health Services Waterworks Standards stipulates that "Each distribution system shall be operated in a manner to assure that the minimum operating pressure in the water main at the user service line connection throughout the distribution system is not less than 20 pounds per square inch at all times." Clearly the existing distribution system is not in compliance with this standard.

Therefore, it is essential for the safe operation of the distribution system that the pressure issues be addressed even if other parts of the design are not implemented at this time.

A second problem with the distribution system is the lack of sufficient fire flow and pressure in the upper pressure zone. Fire flow cannot be met using the existing booster pumps. Instead, the District has installed 2 fire hydrant/pumping tees adjacent to each other that can be hooked up to a temporary pump by the fire department to pump water from the lower zone into the upper zone. The existing hydropneumatic design solved both problems for CASS: 1) maintains pressure above 20 psi in the distribution system and 2) supplies adequate fire flow in the upper zone.

However, due to the limited availability of capital funds at this time, it was decided by District Senior Management to limit the scope of the tank system. Adding UPS to one booster pump to eliminate outage time was investigated but was determined to be too expensive to be warranted. Instead, the District chose only to address the power outage issue at this time and install a 475-gallon tank.

3.2.2 Water Quality

A summary of CASS WTP turbidities from December 1999 to December 2002 is shown in Table 3-5. As can be seen, filtered water turbidities are typically around 0.05 NTU although there are occasional excursions up to around 0.1 NTU during winter months when water temperatures are lower and raw water turbidities are higher. Therefore there is no difficulty in meeting the turbidity performance standards of the IESWTR, which stipulates that 95% of measurements taken each month must less than or equal to 0.3 NTU and that the maximum turbidity must never exceed 1 NTU.

Table 3-5
CASS WTP Treated Water Turbidity Data

Month	Average Raw Water Turbidity	Average Filtered Water Turbidity	95% Percentile Filtered Turbidity
Dec-99	0.52	0.04	0.05
Jan-00	0.57	0.05	0.05
Feb-00	1.1	0.05	0.08
Mar-00	1	0.05	0.06
Apr-00	1.2	0.04	0.05
May-00	0.7	0.04	0.05
Jun-00	0.64	0.03	0.05
Jul-00	0.64	0.04	0.05
Aug-00	0.56	0.04	0.06
Sep-00	0.43	0.04	0.05
Oct-00	0.4	0.04	0.05
Nov-00	0.43	0.05	0.05
Dec-00	0.55	0.05	0.12
Jan-01	0.82	0.05	0.05
Feb-01	1.2	0.05	0.05
Apr-01	0.6	0.05	0.06
May-01	0.67	0.05	0.06
Jun-01	0.68	0.05	0.06
Jul-01	0.6	0.05	0.06
Aug-01	0.48	0.05	0.05
Sep-01	0.62	0.05	0.05
Oct-01	0.66	0.05	0.05
Nov-01	0.9	0.05	0.05
Dec-01	1.6	0.05	0.05
Jan-02	1.9	0.08	0.1
Feb-02	1.5	0.05	0.1
Mar-02	1.2	0.05	0.05
Apr-02	0.96	0.05	0.05
May-02	1	0.05	0.05
Jun-02	1.1	0.05	0.05
Jul-02	0.88	0.05	0.05
Aug-02	0.8	0.05	0.05
Sep-02	0.97	0.05	0.05
Oct-02	1	0.05	0.05
Nov-02	1.2	0.05	0.1
Dec-02	1.5	0.07	0.1

Figure 3-7 shows trihalomethane (THM) concentrations at the effluent from the Camanche South Shore WTP since 1994. Chloroform is the predominant THM specie, which reflects the low bromide concentrations in Camanche Reservoir. Since the summer of 2000, the total trihalomethane (TTHM) concentration has decreased from around 50 μg/L to around 20 μg/L; this reduction has resulted from the calcium hypochlorite dose reductions and greater operator attention that has occurred over this period.

Figure 3-7
Camanche South Shore Plant Effluent Trihalomethane Concentrations

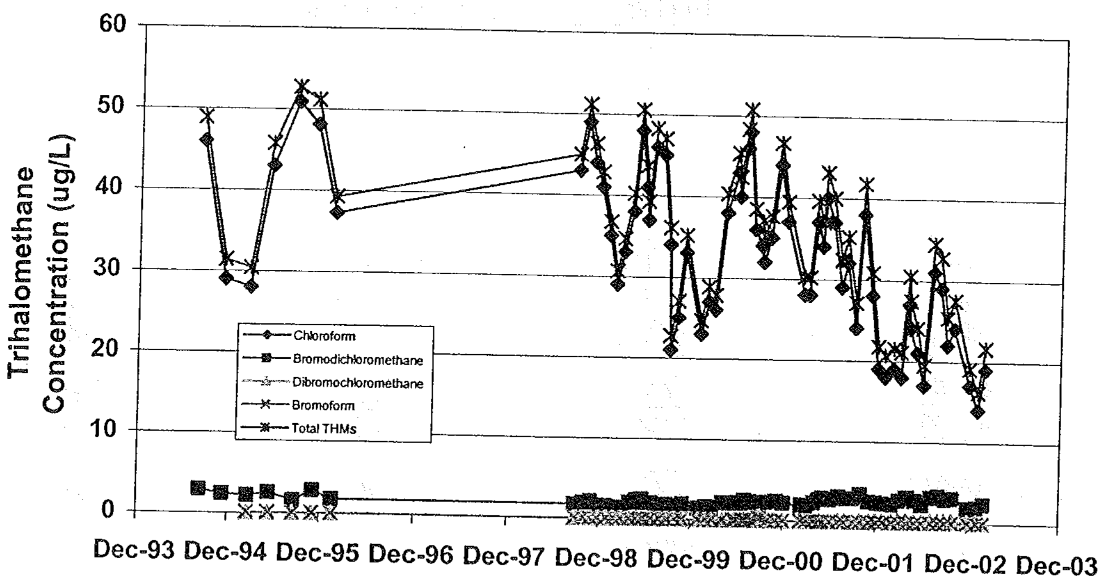


Figure 3-8 shows TTHM data from two sample points within the distribution system since 1999. As in Figure 3-7, the THM reduction since the summer of 2000 is apparent. All TTHM readings during 2002 were below 40 μg/L, which is comfortably below the Stage 1 Disinfectants and Disinfection Byproducts Rule TTHM MCL of 80 μg/L and meets the District's system annual running average goal of 40 μg/L.

Figure 3-8
Trihalomethane Concentrations at Camanche South Shore

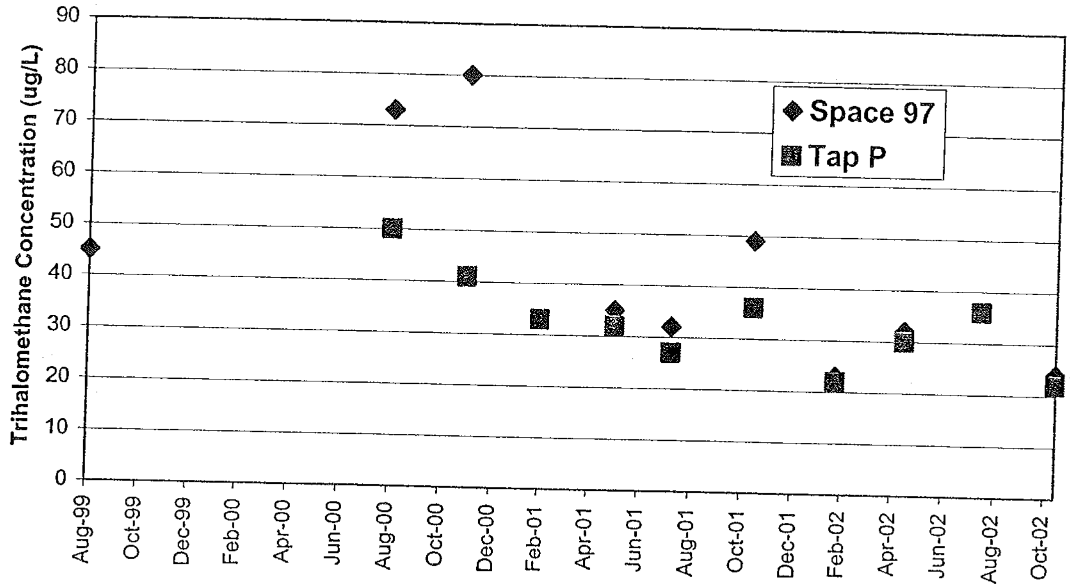
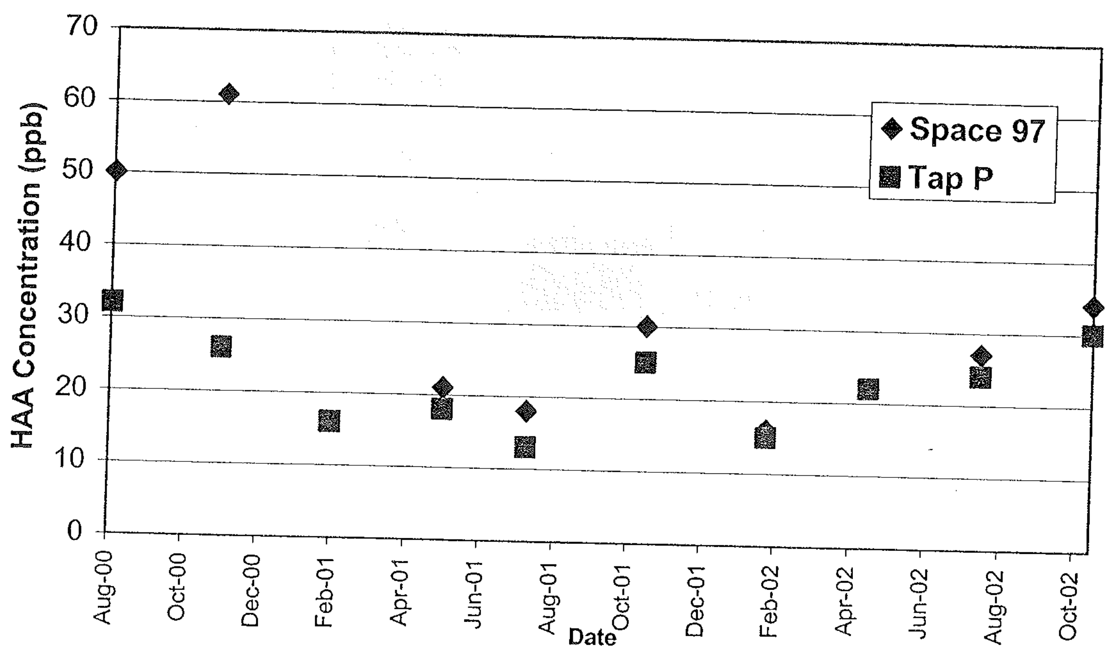


Figure 3-9 shows HAA5 data from two sample points within the distribution system since 2000. All samples in 2001 and 2002 were below 35 µg/L and the system annual running average is 23.8 µg/L, which is well below the Stage 1 Disinfectants and Disinfection Byproducts Rule HAA5 MCL of 60 µg/L and meets the District's goal of 30 µg/L. The existing Camanche South Shore WTP can therefore comply with the Stage 1 Disinfectants and Disinfection Byproducts Rule.

Figure 3-9 HAA5 Concentrations at Camanche South Shore



Lead and Copper Rule sampling is conducted every three years in the CASS distribution system. Results of three rounds of samples taken since 1995 indicate that lead concentrations have varied between 1.2 and 9.3 μg/L and copper concentrations have varied between 17.9 and 409 μg/L. The MCLs for lead and copper are 15 μg/L and 1,300 μg/L, respectively, based on the 90th percentile value in each round of sampling. Therefore, all confirmed Lead and Copper Rule samples to date have been below the lead and copper MCLs.

3.2.3 Demands

CASS DOHS monthly treatment reports were used to determine the peak day demand at the plant. Since a new reservoir was installed in 2002, only 2002 data was reviewed given that operators now have more flexibility to rely on storage during peak periods. Based on this data (Table 3-6), maximum day demands are 0.23 mgd, while average day demands are 0.10 mgd. Peak hour demands are 0.34 mgd based on 1.5* max day demands.

Table 3-6
2002 CASS Demands

Month	Average Day Demand (gpd)	Maximum Day Demand (gpd)
January	78,150	159,000
February	76,204	106,154
March	53,760	102,000
April	87,282	110,069
May	114,655	193,500
June	135,969	213,209
July	161,133	225,818
August	134,114	189,818
September	118,780	182,769
October	99,553	153,333
November	77,937	106,947
December	77,961	135,600
Annual Average	101,291	

SECTION 4
ALTERNATIVES

4.1 Water Supply

Camanche Reservoir, located just downstream of Pardee Reservoir, serves as the source of supply for the District's Camanche South Shore Recreation Area. The District's Camanche North Shore Recreation Area is located along the northern shoreline of Camanche Reservoir, but is supplied by groundwater.

Camanche North Shore and South Shore Recreation Areas' demands are considered incidental uses under the District's existing water rights agreements. As such, both CANS and CASS may use either Camanche Reservoir or Pardee Reservoir as a water supply.

4.1.1 Camanche South Shore Water Supply

Two sources of water are evaluated in this report for a CASS WTP: Camanche Reservoir and Mokelumne Aqueduct water. DHS and District Policy require that the best water supply available be used to meet potable water needs. However, both Camanche Reservoir and Mokelumne Aqueducts have very high raw water quality. The existing design for the CASS WTP uses Mokelumne Aqueduct water as the main water supply, with a backup water supplied from the Camanche Reservoir.

Camanche Reservoir

Camanche Reservoir is the existing water supply for the CASS WTP. Camanche Reservoir is located 10 miles downstream from Pardee Reservoir. It has 63 miles of shoreline, a maximum storage capacity of 417,120 acre-feet, and a maximum water surface area of 7,470 acres. Camanche Reservoir is operated in tandem with Pardee Reservoir to provide water for downstream fisheries and environmental needs, irrigation and stream flow regulations, recreation flow control, water supply, downstream water rights holders, and hydroelectric power generation. While stored water is released to meet obligations to downstream water rights holders, withdrawals are also made to supply the Camanche South Shore recreation facilities and community. Camanche Reservoir is managed to maintain thermal stratification in the reservoir as late as possible in the fall. Stratification in Camanche Reservoir through the end of October is enhanced by providing cold-water releases from Pardee Reservoir when necessary. Camanche Reservoir's storage can be as high as 320,000 acre-feet (elevation 222 feet). However, storage at the reservoir is more typically between 290,000 acre-feet (elevation 217 feet and 310,000 acre-feet (elevation 220) at the end of October.

Camanche Reservoir, including the shoreline areas of Camanche South Shore, permits a wide variety of water-oriented recreation. This includes boating of all kinds (sailing, power-boating), jet skiing, water skiing, fishing and swimming. Visitors using the non-District related facilities enjoy activities that occur proximate to the water bodies or take place on the water bodies. Given the number of visitors and the proximity to water, the potential for degrading water quality increases with use. Also, the increase in off-road vehicle use during recent years has raised concern for the potential impacts to water quality.

The raw water intake supplying the CASS WTP is located about 1,200 feet from the shore along the north side of the recreation area. A minimum 500-foot protection zone is established around the intake location. The shoreline is fenced for 1,000 feet in the area of closest access to the raw water intake. In addition, this area is posted with warning signs for potential trespassers, including swimmers, water skiers, jet skiers and fishing boats. Two, 250-gpm pumps mounted on a floating platform, continuously withdraws raw water from Camanche Reservoir. The pumps draw water from a depth of 32 feet below the surface of the water, but the withdrawal depth can be adjusted if necessary.

Mokelumne Aqueduct Water

Pardee Reservoir has 37 miles of shoreline, a maximum storage capacity of 197,950 acre-feet, and a maximum water surface area of 2,257 acres. It is used for municipal water supply and for power generation. Water for downstream use is released through the Pardee hydroelectric power plant, through sluice valves at the base of Pardee Dam, or released over the Pardee Dam spillway. Diversions are typically drawn through gate inlets at elevations 490 and 460 feet. Cold water is preserved in Pardee Reservoir during the period March through September for release during October by directing water available for Pardee power generation early in the year through Units No. 1 and No. 2 (high level Pardee release) as a first priority, within practical limits, and then through Unit No.3 (low level Pardee relase). The water is conveyed from the reservoir through Pardee tunnel to the Camp Seco facility where it trifurcates to the three Mokelumne Aqueducts. The water then flows by gravity 91.5 miles to the District's service area in the San Francisco Bay area. The turnout for a CASS water supply would be located at Station 356+00 and would allow water to flow by gravity to the WTP.

Current provisions limit recreation and prohibit body contact in Pardee Reservoir in order to protect the District's raw water quality. Mokelumne Aqueduct water is raw water from Pardee Reservoir that has undergone some pretreatment at Pardee. This pretreatment consists of 1) sodium hypochlorite addition to provide disinfection and biofilm control in the aqueducts and 2) lime addition for corrosion control in the aqueducts and in the District's main distribution system.

The main drawback to the Mokelumne Aqueduct supply is that it would require approximately 5,900 feet of 12-inch raw water pipeline (12-inch size based on future inter-agency projects). Impacts of chlorination at Pardee are that some disinfection would be achieved ahead of the plant, but this would result in an increase of disinfection byproduct formation in this pipeline upstream of the treatment plant. Table 4-1 shows the predicted detention times from Pardee to the CASS WTP and also shows estimates of TTHM and HAA5 formation through the raw water pipeline at temperatures of 10°C and 20°C. The TTHM and HAA5 predictions are based on equations for individual THM and

HAA species formation that were developed by Amy et al, and are listed on pages 59 and 61 of the AWWA book "Formation and Control of Disinfection By-Products in Drinking Water".[1] Based on this evaluation, disinfection byproduct formation may be higher than existing using Pardee water, but will still meet District goals and regulations. A study is currently underway to look at changing the disinfection process at Pardee to either chlorine dioxide gas or UV. If this takes place, THM and HAA5 formation from the aqueducts will no longer be a concern.

Table 4-1
Predicted Detention Times and Disinfection Byproduct Formation from Pardee Center to CASS WTP

Flow Rate (MGD)	Detention Time (minutes)	Predicted TTHM Formation (µg/L)		Predicted HAA5 Formation (µg/L)	
		10°C	20°C	10°C	20°C
0.072	814	7.2	13.8	5.8	8.0
0.25	300	5.8	11.0	4.6	6.3

The higher pH from lime addition at Pardee Center should improve corrosion control in the CASS distribution system and could reduce lead and copper concentrations, although so far the CASS system has been easily in compliance with the Lead and Copper Rule requirements. The higher pH of the Mokelumne Aqueduct water may also slightly reduce coagulation and filtration efficiency with in-line filtration.

Comparison of Water Quality

Mokelumne Aqueduct water is generally higher water quality than Camanche Reservoir, as shown in the Water Quality Comparison Table 4-2, although both are very high quality sources. Figures 4-1 through 4-3 compares the microbiological quality of the raw water for the two sources. The data indicates that the two sources are similar to each other and both are very high quality.

E. coli are currently monitored in Camanche Reservoir at both the WTP intake and along the shoreline. The average *E. coli* reading in CASS WTP influent since 1995 is 3.8 MPN/100 mL. The running average for the data shows a maximum in 1996 of 8 MPN/100mL. More recent data has remained level at 2 MPN/100mL.

[1] "Formation and Control of Disinfection By-Products in Drinking Water", AWWA, 1999, First edition. Ed. Dr. Philip Singer.

Table 4-2
Source Water Quality Comparison Table

Sample Name	Unit	Minimum		Maximum		Average	
		Aqueduct	Reservoir	Aqueduct	Reservoir	Aqueduct	Reservoir
Cl Residual	mg/L	0	----	1.5	----	1	----
Temperature	°C	5	6.1	20	29.7	10	14.2
Total Hardness	mg/L	10	6.5	130	57	20.1	15.6
Alkalinity: Total as CACO3	mg/L	14	12	92	26	21	17.9
Calcium	mg/L	4.2	2.07	6.8	31	5.5	4
Color	CU	3	----	7	----	4.7	----
Iron	mg/L	19.5	0.01	146	530	46.7	59.7
Manganese	mg/L	2.4	0.0	14.1	146	5.9	11.2
Total Organic Carbon	mg/L	0.92	----	3.2	----	1.4	2.3
UV254 (abs)		0.01	----	0.09	----	0.04	----
Turbidity	NTU	0.26	0.23	5.1	12	0.91	2.4
pH	pH units	7.0	6.1	9.5	8.17	8.2	7.2
Total Dissolved Solids	mg/L		12		130		37.9
Copper	mg/L		0.0		13		2.5

Notes:
- Blank data fields or fields with "----" indicate that no sample data for this site has been found.
- Aquduct data source: see data source in worksheet Aq Original.
- Camanche reservoir data: LIMS samples for all of camanche reservoir; data from 1994 to present.

Figure 4-1
E. Coli Concentration Cumulative
Camanche Reservoir vs. Pardee Reservoir 1998-2002 Data

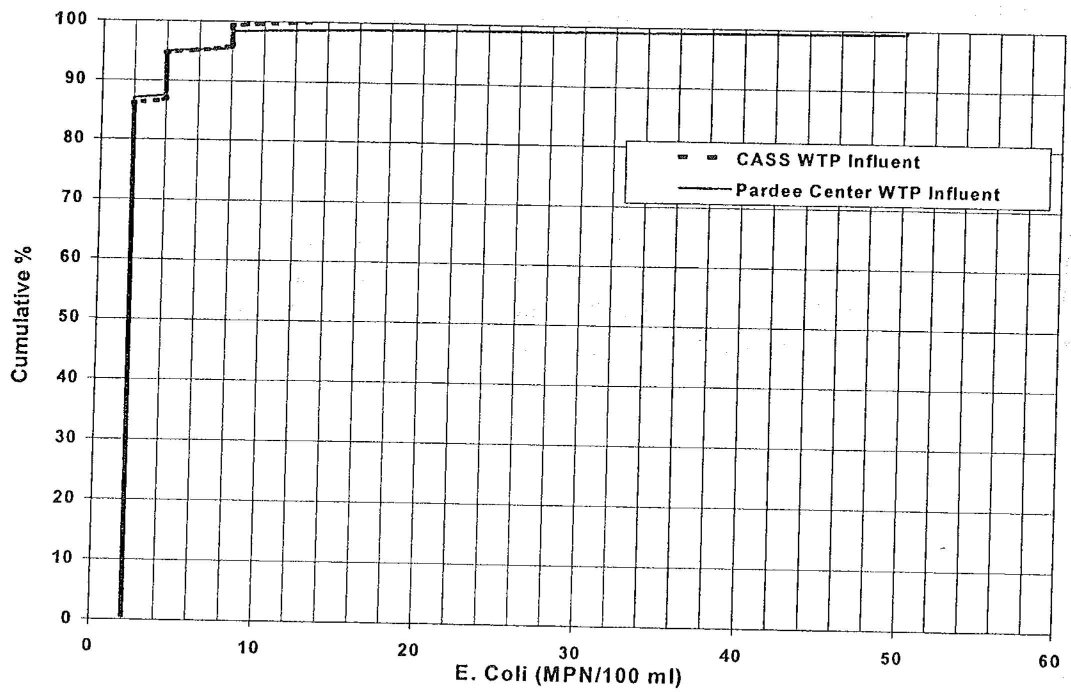


Figure 4-2
Total Coliform Concentration Cumulative
Camanche Reservoir vs. Pardee Reservoir 1998-2002 Data

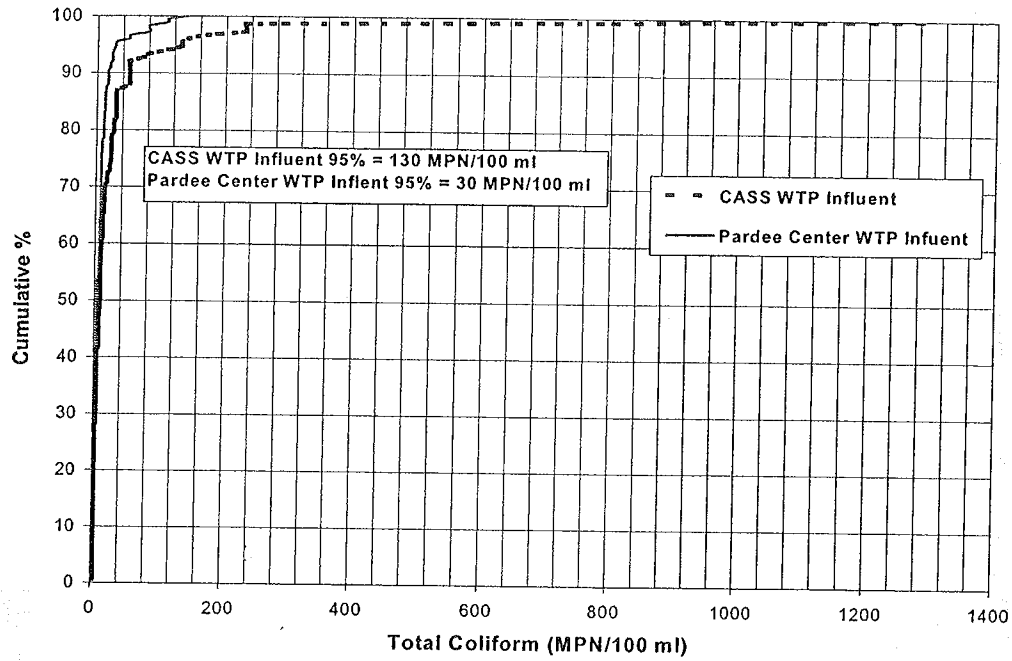
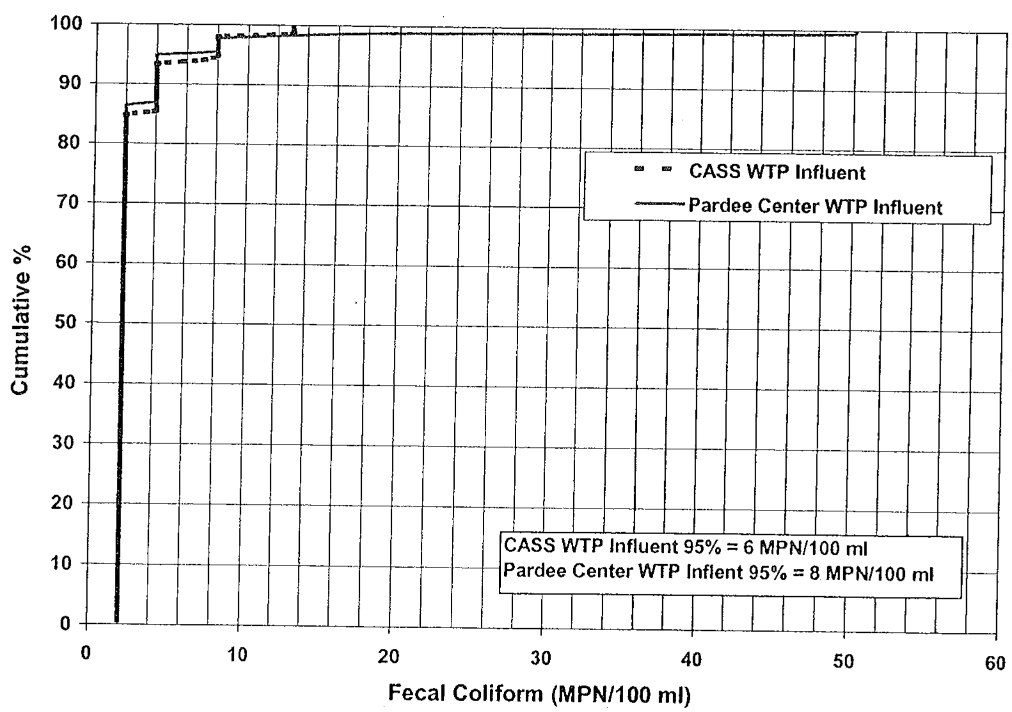


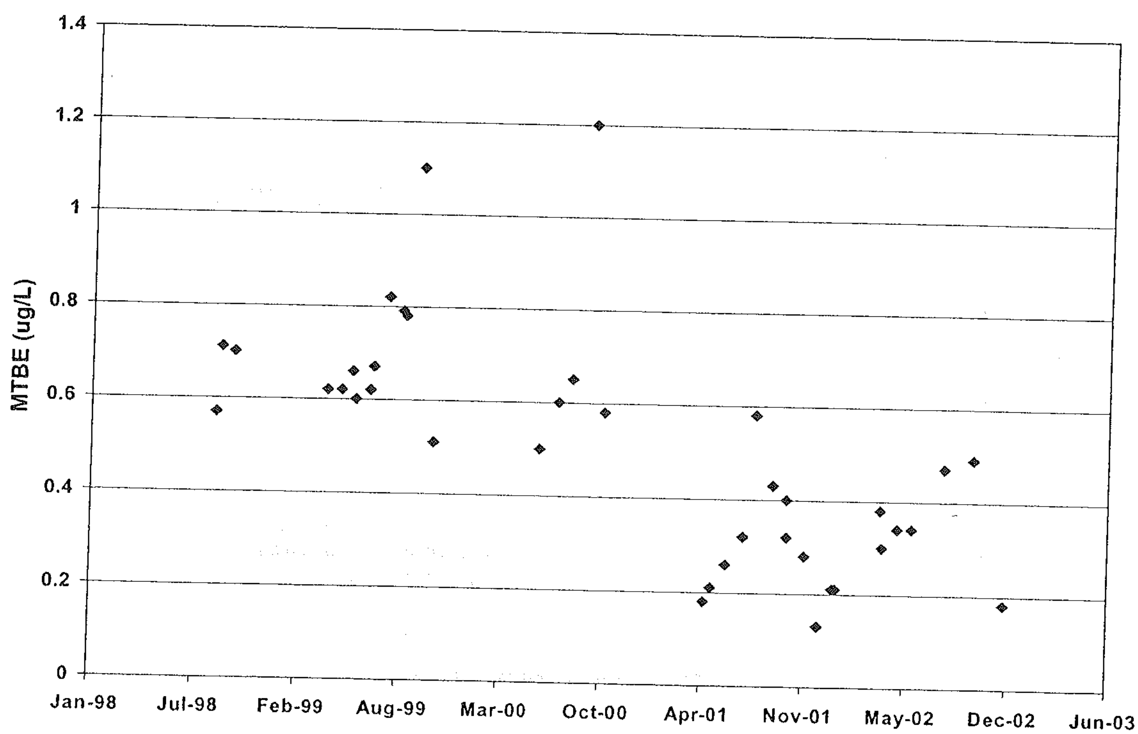
Figure 4-3
Fecal Coliform Concentration Cumulative
Camanche Reservoir vs. Pardee Reservoir 1998-2002 Data



The regulation that may impact treatment due to water supply is LT2SWTR. Pardee water will be in Bin 1 (highest water quality) under the LT2SWTR and not need additional treatment for *Crypto*. While unlikely, it is possible that the Camanche source would be placed in Bin 2 under the LT2SWTR thereby requiring additional treatment for *Crypto*. Under LT2SWTR, if the average *E.coli* readings were above 10 /mL and the *Crypto*. monitoring showed concentrations between 0.075 and 1.0/L, CASS would be put in Bin 2 under the LT2SWTR. In this case additional *Crypto*. credit would be needed. If a new plant is built, treatment credit can probably be met by maintaining low-turbidity effluent. If additional treatment credit is needed, a small ultra-violet disinfection facility would be required. There is no existing *Crypto*. data available for Camanche Reservoir. However, the District plans to initiate *Crypto*. sampling this year at Camanche.

Another concern raised by Pardee operations personnel regarding the Camanche water supply is the risk for water to be contaminated with gasoline and its additives such as MTBE from motorized watercraft activities. MTBE is of particular concern since it is soluble in water and does not degrade easily. The State of California has banned the use of MTBE as gasoline additive effective Dec. 31, 2003. The District has monitored MTBE at CASS WTP influent and the data shows that the MTBE concentration is decreasing in the reservoir and has never been above the State of California's Secondary and Primary MCLs for MTBE that are 5 and 13 ppb, respectively. Figure 4-4 shows the MTBE data in the Camanche Reservoir from January 1998 to December 2002. Moreover, concentration of regulated volatile organic compounds (VOCs) such as gasoline products have been none-detect during this period.

Figure 4-4
MTBE Monitoring at CASS Influent 1998-2002



The main benefit to continued use of Camanche Reservoir is that all major facilities required to supply the water are already in place, so minimal capital expenditure is required. Treated water quality data indicate that the existing plant has been able to meet existing regulations using Camanche water consistently since the District took over operations-- although District operators and maintenance staff achieved this through extreme care and attention.

There are three main drawbacks to using Camanche Reservoir over Mokelumne Aqueduct water as a supply source:

1) Body contact is permitted in the reservoir under restricted conditions. Proposed California DHS guidelines for Recreational Use Permits at Domestic Water Supply Reservoirs will require additional bacteriological testing depending on recreational use at the reservoir. The District's existing water supply permit does allow body contact with additional monitoring, reporting and operational requirements imposed in the water supply permit. A water supply allowing body contact is a greater risk for the water system and adds additional operational cost due to monitoring requirements.

2) During times of severe drought, the water supply intake in the lake may have to be moved to maintain a water supply. This occurred during the drought of 1977-78.

3) Because recreational use is permitted at Camanche Reservoir, there is additional risk for water to be contaminated with gasoline and its additives.

The main benefits to using Mokelumne Aqueduct water are that the District eliminates monitoring requirements at Camanche Reservoir and eliminates the added risk of using a body contact water supply.

4.1.2 Camanche North Shore Water Supply

There are three potential water supply sources for the Camanche North Shore WTP: existing groundwater wells; Camanche Reservoir; and Mokelumne Aqueduct water via a treated water pipeline from CASS.

Wells

Groundwater is the existing water supply for CANS WTP, with three wells currently in use. Well #1 is currently used as a non-potable water supply due to low flow production and nitrate problems. Groundwater drawn from Well #2 and Well #3 is used to meet potable water demands. Well #4 was drilled in 1997 to provide a replacement water supply for Well #2, which at the time tested positive for total coliform. However, groundwater from Well #4 has shown large fluctuations in hydrogen sulfide levels with peaks as high as 5000 mg/L that makes the water difficult to treat. After Well #2 was rehabilitated in 1997, Well #4 became a backup water supply.

As shown in Table 4-3, the groundwater supply is limited at CANS. Defining the water supply available from the wells was more difficult then anticipated due to a lack of hydrogeologic information. A hydrogeologic study would be required to obtain firm numbers. Therefore, well capacity estimates are based on operator experience: Well #2 max is 90 gpm (due to total coliform readings at higher flows); Well #3 max is 130 gpm; and Well #4 max is 100 gpm. These capacities can only be sustained for a couple days. Normally wells are operated for 6 to 12 hours a day to maintain maximum production capability. At these rates and durations, the wells produce approximately 460,800 gpd. Well production drops off rapidly when the wells have been operated without rest periods.

Approximately 5,000 feet of 4-inch pipeline runs from Well #2 to the WTP and serves both Well #2 and Well #4. Friction losses would be extremely high if both wells were operated at maximum capacity. There is no data on well drawdown or sustainability of operating these two wells together. The supply pipeline could be upsized, but it doesn't guarantee an increase in water supply. While the existing system is able to meet future demands at CANS, it will not be possible to expand the system to meet Amador County demands in the future.

Groundwater in all the wells has high iron and manganese concentrations. In addition, hydrogen sulfide levels normally lie between 1 mg/L and 5 mg/L and are a constant treatment issue for the plant.

Table 4-3
Well Water Supply Comparison Table

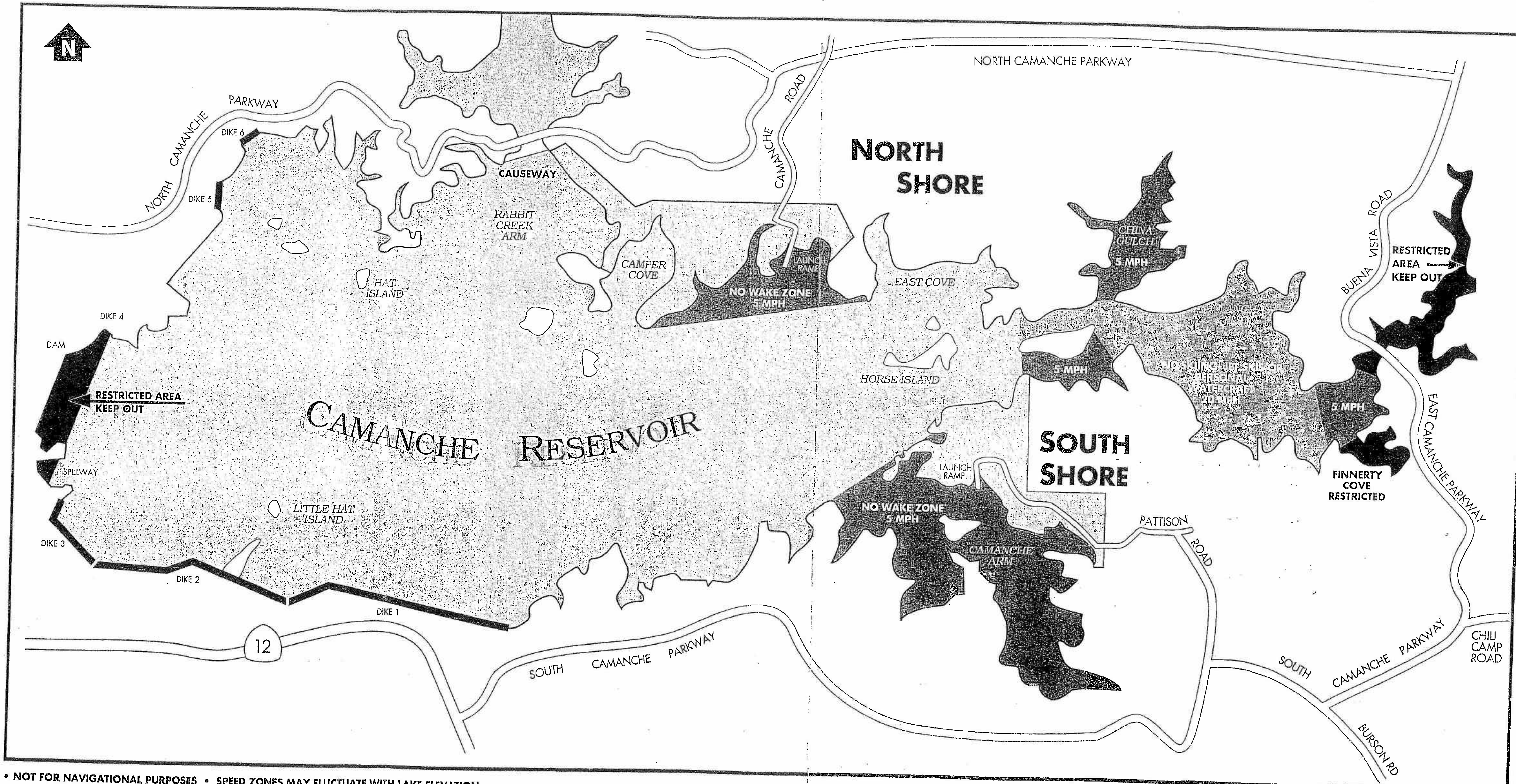
Well	Date Constructed	Well Depth	Pump Capacity (Stand Alone Firm Capacity)	Water Quality Issues
#1	1948	90' (Static water at 40')		Nonpotable water supply
#2	1977 (Rebuilt in 2000)	320' (Static water at 128')	150 gpm (90 gpm)	High in Iron and Manganese; H2S present; Coliform present if draw too much water
#3	1979	228' (Static water at 90')	130 gpm (130 gpm)	High in Iron and Manganese.; H2S present; high heterotrophic plate counts in past
#4	1997	460' (Static water at 127')	125 gpm (100 gpm)	High in Iron, Manganese, Boron and H2S

Camanche Reservoir

The existing CANS WTP is located close to the shore of Camanche Reservoir, which is a high quality surface water source, as discussed in Section 4.1.1. No existing infrastructure is in place to allow CANS WTP to use Camanche Reservoir water. An intake structure, pumps and pipeline would have to be built as part of the project.

The proposed raw water intake structure for CANS treatment plant would be located in the East Cove area approximately 1,750 feet from shore at the deepest part of the channel. Figure 4-5, shows the proposed location of the intake. The intake structure will be a floating type structure (pontoon) with two submersible pumps for conveying the water to the treatment plant. Total depth of the reservoir at this location in normal years is 25 feet and the installed at depth of the pumps is 20 feet below the surface. The floating structure would be anchored to the reservoir bottom with stainless steel mooring cables. Raw water pipe will be constructed of welded steel.

CAMANCHE RESERVOIR



• NOT FOR NAVIGATIONAL PURPOSES • SPEED ZONES MAY FLUCTUATE WITH LAKE ELEVATION

FIGURE 4-5

The new treatment plant is assumed to be located at present CANS treatment plant site.

The main benefits of using Camanche Reservoir as a supply are:

1) Meeting future demands would not be a problem.
2) Problems associated with groundwater sources high in manganese, iron and hydrogen sulfide would be eliminated.
3) Camanche Reservoir would provide a supply much lower in total dissolved solids than the existing groundwater supply.

The primary disadvantages of Camanche Reservoir as a supply are:

1) Reservoir intake facilities and a new pipeline to the CANS WTP would have to be constructed.
2) The CANS WTP would have to be converted to treat surface water instead of groundwater.
3) Conversion from a groundwater supply to a drastically different surface water supply may have a significant impact on the distribution water quality. This could include temporary high turbidities and coliform concentrations associated with biofilm sloughing. Compliance with the Lead and Copper Rule could potentially be problematic and long-term corrosion control treatment may be needed.

Mokelumne Aqueduct Water via CASS

Treated water could be supplied to the CANS distribution system from the CASS WTP. Benefits of this alternative are:

1) A very high quality source of water could be provided to the CANS and CASS distribution systems by a single treatment plant at CASS.
2) A single plant would simplify operations and would reduce O&M costs.

Disadvantages of this alternative are:

1) An 11,800-foot 8" pipeline would have to be installed from the CASS WTP to the CANS storage tanks. This would involve laying 4,160 feet of pipeline at the bottom of Camanche Reservoir.
2) Reliability would be reduced since there would be no backup supply and a break in the treated water pipeline would shutdown supply to the CANS distribution system. If a pipeline break occurred beneath Camanche Reservoir, there would be prolonged outage before a diver could make the repair; raw water could enter the treated water line and there would need to be a thorough disinfection and flushing operation before treated water supply could recommence.
3) Installing the treated water pipeline at the bottom of the raw water reservoir would create a cross-connection potential. Although pressures in the treated water pipeline would normally be much higher than the reservoir pressure head, pressure fluctuations from pump starts and stops or rapid valve closing could briefly reduce the treated water pipeline pressure to the point where infiltration could conceivably be possible.
4) Conversion from a groundwater supply to a drastically different surface water supply may have a significant impact on the distribution water quality. This could

include temporary high turbidities and coliform concentrations associated with biofilm sloughing. Compliance with the Lead and Copper Rule could be problematic and long-term corrosion control treatment may be needed.

5) The detention time through the treated water pipeline would significantly increase disinfection byproduct formation.

4.2 TREATMENT

4.2.1 Camanche South Shore WTP

There are two main treatment alternatives for CASS recreation area based on the source of the water supply. The first set of alternatives is based on using the existing Camanche Reservoir for water supply and the second set of alternatives is based on the use of Mokelumne Aqueduct as the source water. In the following sections, treatment alternatives for each water supply are evaluated.

Existing Plant

Although the existing CASS WTP currently meets existing regulations, the mixing tanks and filters are in poor condition and will need to be replaced at some point in the fairly near future. The plant currently relies heavily on operator skill and a lot of operator time is necessary to ensure the production of safe drinking water. Reliability will decrease and the amount of operator attention that is needed will increase as the plant infrastructure further deteriorates. The plant could be upgraded to provide a greater level of automation, which would improve reliability and reduce the amount of time the operators need to spend at the plant. However, the expense of automating the plant cannot be justified when the basic infrastructure is in such poor condition.

Conventional Package Plant

The existing mixing tanks and filters could be replaced with a skid-mounted conventional package plant. A typical conventional package plant consists of rapid mix, flocculation tanks, high-rate settlers or dissolved air flotation (DAF) tanks, and dual-media filtration. As an example, a 0.38 MGD DAF package plant manufactured by Ondeo Degremont would be 27' 10" long by 7' 9" wide by 10' high. While a conventional package plant could be installed outdoors, the District has decided that a building is required for security reasons.

A DAF package plant would have the following advantages a over high-rate settling package plant:

- Smaller footprint since smaller tanks would be used for flocculation and solids separation
- DAF is particularly well suited to soft, low turbidity waters.
- DAF is much more efficient than high-rate settlers at removing filter-clogging algae

- DAF typically uses lower coagulant doses than sedimentation, since it does not rely on the formation of large, dense floc for effective particle removal. DAF systems have been shown to be effective with polyaluminum chloride (PACl), but the addition of flocculent aid polymer may not be necessary; pilot testing would be necessary to confirm this.
- DAF usually produces higher density sludge than sedimentation.

Chemical feed systems would be housed in the existing building. The package plant should provide automated control of the coagulation, flocculation, solids separation, and filtration processes, but improvements should also be made at the plant to provide chemical flow-pacing and chlorine residual feedback control. In order provide the level of precision needed to automate the chlorination process, it may be necessary to replace the existing calcium hypochlorite tablet system with a liquid sodium hypochlorite system.

A conventional package plant would receive 2.5-log Giardia removal credit, so only 0.5-log Giardia inactivation would be required by disinfection compared to 1-log inactivation that is required with existing plant. This means that the CT disinfection requirement would be halved and, therefore, a lower post-chlorine dose could be used to meet the CT requirement. Additionally, conventional treatment would provide more TOC removal than the existing in-line filtration plant. These two factors would reduce disinfection byproduct formation to significantly lower than existing levels.

A conventional package plant at CASS, with automation improvements to the chemical feed systems, would have the following benefits over the existing plant:

- Long-term performance reliability
- Reduction in amount of operator time needed at the plant
- Less reliance on operator skill to ensure safe drinking water
- Provides an additional barrier (sedimentation of DAF) against Giardia and Cryptosporidium
- Reduces the amount of disinfection required and therefore could reduce disinfection byproduct formation
- Increases TOC removal and therefore reduces disinfection byproduct formation

Membranes

Membrane plants use a semi-porous membrane material to filter particles that are larger than the pore size of the membrane. Membrane systems range from microfiltration with the coarsest pore sizes to reverse osmosis, which has the finest pore size and is capable of removing dissolved ions from the water. For the CASS application, where turbidity and pathogen removal are the objectives, microfiltration and ultrafiltration are feasible membrane alternatives.

Microfiltration can remove particles larger than 0.2 microns, which includes Giardia and Cryptosporidium, but not all viruses. Therefore some disinfection for virus inactivation is required after microfiltration. Ultrafiltration removes all particles larger than 0.01 microns, which includes all viruses; so the only disinfection that is necessary after ultrafiltration is enough chlorination to maintain a 0.2 mg/L chlorine residual in the plant effluent and a trace residual throughout the distribution system.

The 1999 KASL report evaluated microfiltration and ultrafiltration in detail for alternative plant capacities of 0.5 and 2.0 MGD. This evaluation concluded that ultrafiltration would be better alternative for the following reasons:

- Slightly lower capital cost
- Superior particle removal performance
- Ease of operation and good experience with ultrafiltration systems at Pardee Center and Pardee Recreation Area
- Expansion capability

The conclusions of the KASL report appear to be valid and applicable to a 0.25 MGD plant at CASS. Therefore, membrane alternatives will not be re-evaluated here and only ultrafiltration will be analyzed against other treatment technologies.

An ultrafiltration system at CASS would have many of the same benefits as a conventional package plant compared to the existing plant, but in addition there would be:

- A further reduction in amount of operator time needed at the plant
- Even less reliance on operator skill to ensure safe drinking water
- A further reduction in the chlorine residual in the distribution system and therefore a further reduction in disinfection byproduct formation
- A further reduction in finished water turbidity and particle counts
- Already have a complete design with permits in place and a State Revolving Loan for $4.2 million at 2% interest

4.2.2 Camanche North Shore WTP

There are two main treatment alternatives for CANS recreation area based on the source of the water supply. The first set of alternatives is based on using the existing groundwater wells for water supply and the second set of alternatives is based on the use of Camanche Reservoir as the source water. In the following sections, treatment alternatives for each water supply are evaluated.

Groundwater Treatment

As discussed in Section 4.1.2 CANS is supplied by three groundwater wells. Table 4-4, shows the water quality goals for groundwater treatment. The existing wells have high concentrations of iron, manganese, and hydrogen sulfide. Generally, an oxidation process followed by a filtration step removes these contaminants. However, contact time is needed for the oxidation process to be effective, especially for removal of manganese.

The current system of chlorination and greensand filtration does a good job of removing iron and manganese; however, it cannot remove high concentrations of hydrogen sulfide especially from Well No. 4.

Table 4-4
Water Quality Goals for Groundwater Treatment

Contaminant	Treatment Goal	MCL	Safety Factor
Manganese (ug/L)	20	50	2.5
Iron (ug/L)	150	300	2.0
Hydrogen Sulfide (mg/L)	ND	NA	NA
Total Trihalomethane (ug/L) System Wise Running Annual Average	40	80	2.0
Haloacidic Acids (ug/L) System Wise Running Annual Average	30	60	2.0
CT Credit for Log Removal of Viruses	1.5 X CT for 4 Logs	4 Logs	>1.5

Two treatment alternatives for removal of iron, manganese and hydrogen sulfide are discussed below.

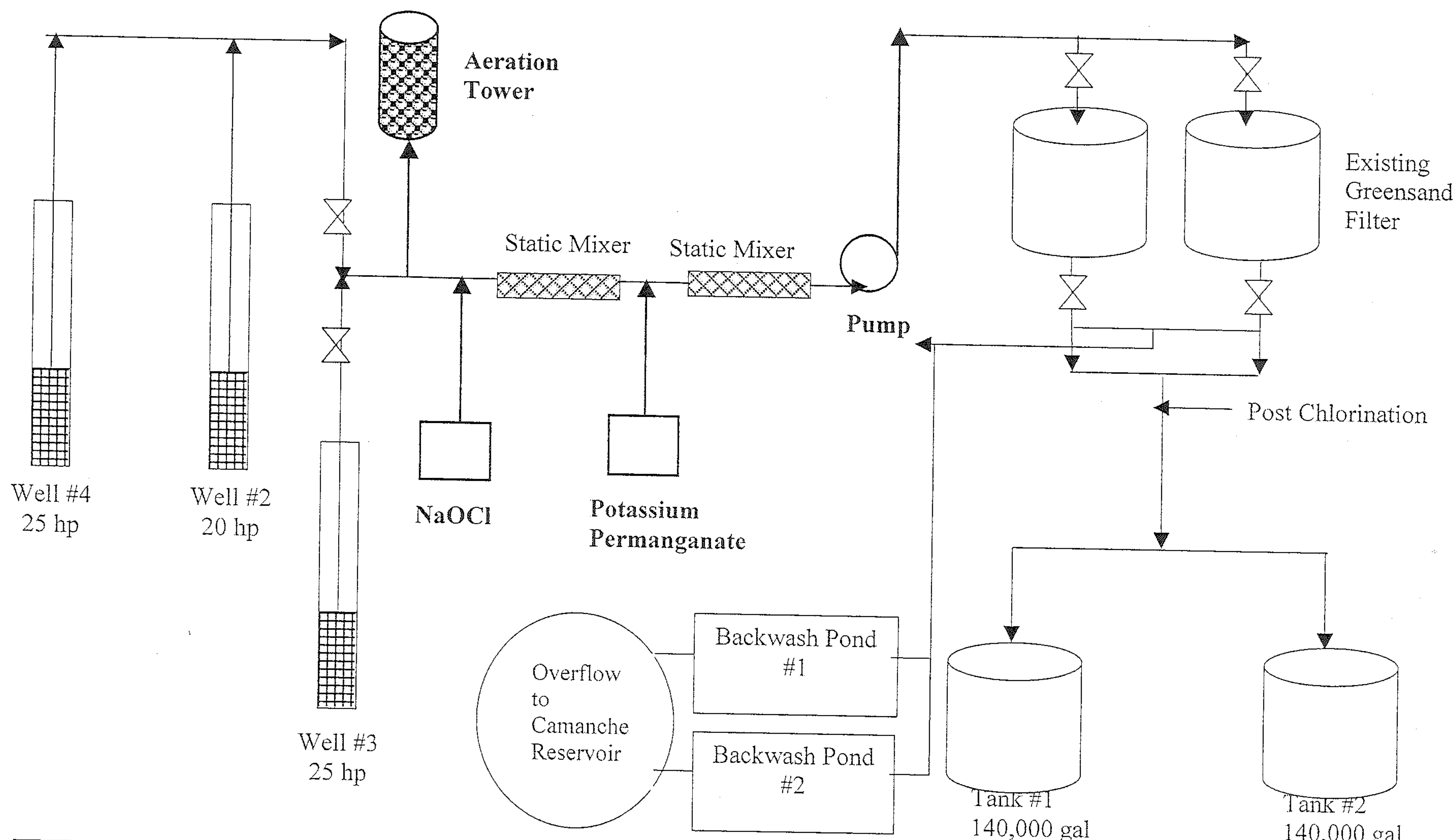
Upgrading the Existing Treatment System

The existing system cannot completely treat high concentrations of hydrogen sulfide found in the groundwater. This leads to taste and odor problems in the distribution system. To effectively deal with this problem three changes would need to take place at the plant: add an aeration basin; replace existing chlorination system; and add a treated water pump station. Normally, 8.3 mg/l of chlorine is needed to oxidize 1 mg/l of hydrogen sulfide. Based on the limited data that is available, the hydrogen sulfide concentration in Well #4 can be as high as 5 mg/l. Therefore, the chlorine dose can be as high as 42 mg/l. To reduce the chemical cost, the groundwater would be aerated prior to chlorine addition. The aeration system would be comprised of an aeration basin and pump station. The raw water has to be pumped after aeration to move it through the filtration system and up to the treated water reservoir. In order to automate the system, the existing calcium hypochlorite system needs to be replaced with a sodium hypochlorite feed system. In addition, the potassium permanganate feed system should be automated. The schematic of this alternative is shown in Figure 4-6.

Manganese Dioxide (Pyrolusite) Filtration

Another alternative for removing iron, manganese, and hydrogen sulfide, is to use pyrolusite filter media. Pyrolusite is produced from MnO_2 ore. The ore is crushed to specific sizes needed for potable water filtration process. A typical media bed is a

Figure 4-6 – Schematic of Upgrades to Existing System Alternative



blended matrix of pyrolusite and sand. Manganese dioxide serves as a seed onto which subsequent MnO_2 adsorbs, thus accelerating the removal of manganese from the water.

In summer of 1999, EBMUD hired EES Consulting, Inc. to do a pilot-scale study of manganese dioxide for removal iron, manganese, and hydrogen sulfide. Based on the results of the pilot study, EEC developed a pre-design report for iron and manganese removal. Figure 4-7, shows the schematic of this alternative.

The proposed system included installation of three manganese dioxide pressure filters with automatic backwash system, and air induction and degassing system. The proposed capacity of the system was 200 gpm. Appendix A shows the cost estimate for the system based on today's costs.

Camanche Reservoir Treatment

In this set of alternatives the Camanche Reservoir is used as the source of raw water for a CANS surface water treatment plant. The proposed treatment processes for CANS are similar to the alternatives that have been developed for CASS. Camanche Reservoir source water will not have the contaminants that are associated with the well water at CANS such as iron, manganese, and hydrogen sulfide. However, the WTP has to treat surface water with higher concentrations of turbidity and bacteriological contaminants. The water quality goals of the treatment alternatives will be the same as the goals that are proposed for a CASS plant.

Conventional Package Plant

Under this alternative, the existing greensand filters would be replaced with a 0.25 mgd new conventional package plant that uses dissolved air flotation followed by gravity filtration as described above for CASS. A new intake pump station and raw water pipeline would also be part of this alternative.

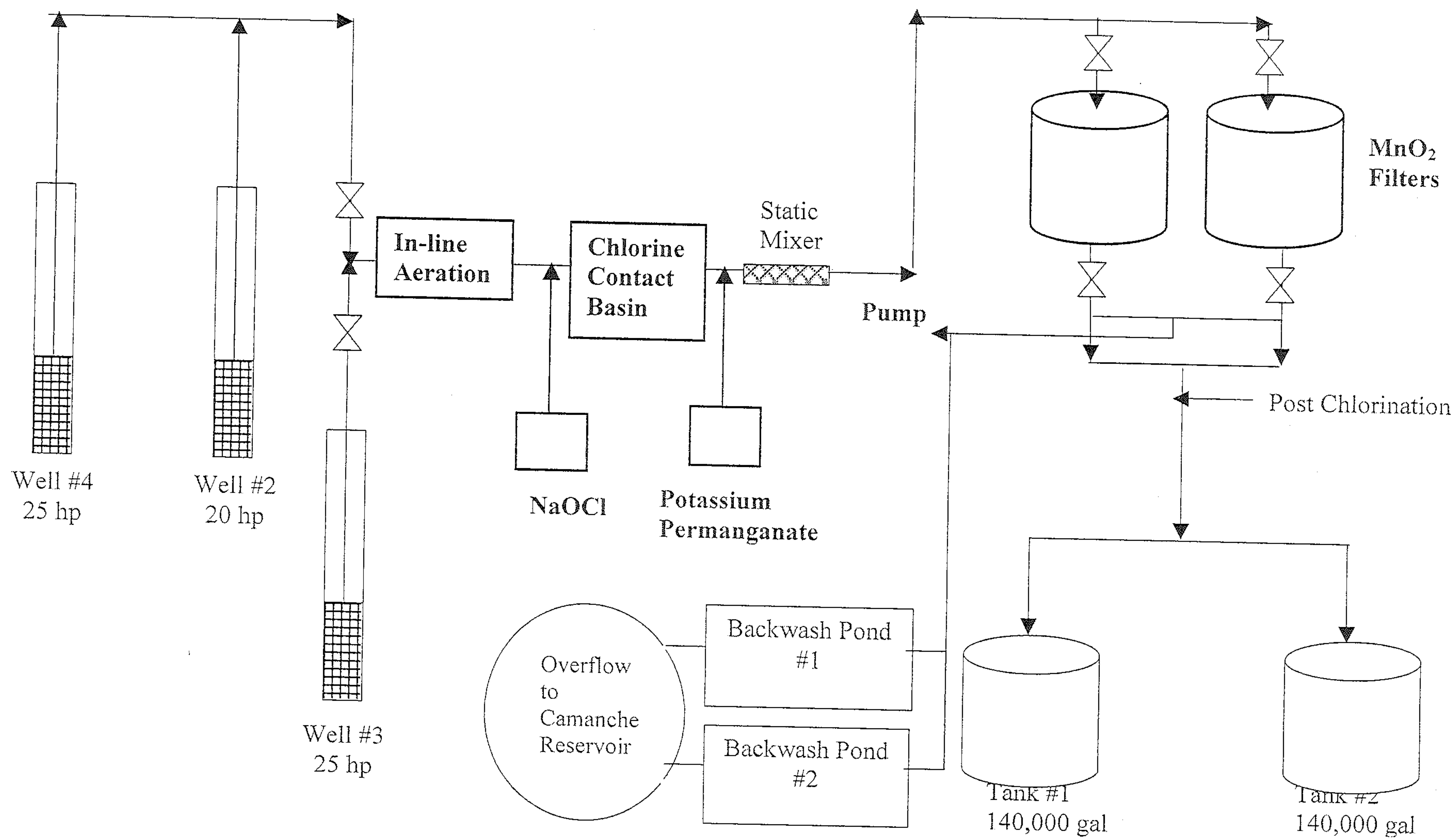
Membranes

Under this alternative, the existing greensand filters would be replaced with a 0.25 mgd ultrafiltration plant as described above for CASS. A new intake pump station and raw water pipeline would also be part of this alternative

4.2.3 Combined Plant at CASS

A combined plant alternative was evaluated for Camanche and Mokelumne Aqueduct water that would replace both existing CASS and CANS WTPs with a new 0.5 mgd WTP. Water would be supplied to the CANS storage reservoirs using an 8-inch HPDE cross-reservoir treated water pipeline. Similar to a CASS WTP, two treatment alternatives were evaluated.

Figure 4-7 – Schematic of Manganese Dioxide (Pyrolusite) Filtration Alternative



Conventional Package Plant

A combined package plant as described in Section 4.2.1, would be installed at CASS to serve the CASS and CANS distribution systems. One benefit of the combined plant is that a 0.5 MGD package plant to serve both systems would not be too much larger or more expensive that a 0.25 MGD package plant. Other advantages and disadvantages of a combined plant are discussed above in Section 4.2.1.

Membrances

An ultrafiltration plant, as described in Section 4.2.1, would be installed to serve the two distribution systems at CASS and CANS. Advantages and disadvantages of a combined plant are discussed above in Section 4.2.1.

SECTION 5
EVALUATION OF ALTERNATIVES

5.1 Criteria

Four types of criteria were used to evaluate alternatives, and are described below.

5.1.1 Cost

Capital Cost

Capital costs were developed using unit costs from Don Todd & Associate's 90% design cost estimate for the existing ultrafiltration WTP design at CASS. For other treatment alternatives, either manufacturers' budget costs or EPA cost estimate information was used. See Appendix A for capital cost data. Table 5-1 describes capital cost factors that were applied to each construction cost to obtain capital cost. Two different engineering factors were used since a complete design already exists for an ultrafiltration facility at CASS. Ultrafiltration projects did not have a contingency factor applied, since the design is complete, but do include a 10% change order factor. Alternatives with other treatment technologies used a 30% planning level contingency.

Table 5-1
Capital Cost Factors

Capital Cost Factor	Percentage of Construction Cost
General Conditions Overhead & Profit	8
Contingencies	30
General Conditions Bonds & Insurance	1.5
Escalation to Midpoint of Construction	3.5
Construction Management	15
Engineering	10
Engineering (for UF System)	1
Change Orders (Used in Lieu of Contingencies for UF Systems)	10

Each alternative was given a score of 1 to 15 based on the capital cost. Capital cost was divided into 15 bands based on cost as summarized in Table 5-2.

Table 5-2
Capital Cost Score Basis

Score	Capital Cost Range
1	$7 – 7.5 mil
2	$6.5 – 7 mil
3	$6 – 6.5 mil
4	$5.5 – 6 mil
5	$5 – 5.5 mil
6	$4.5 – 5 mil
7	$4 – 4.5 mil
8	$3.5 – 4 mil
9	$3 – 3.5 mil
10	$2.5 – 3 mil
11	$2 – 2.5 mil
12	$1.5 – 2 mil
13	$1 – 1.5 mil
14	$0.5 – 1 mil
15	$0 – 0.5 mil

Operations and Maintenance Cost

Historical operations and maintenance costs from the existing CANS and CASS water treatment plants for Fiscal Years FY00, FY01, and FY02 were analyzed. In an effort to look at the real cost of a membrane system, O&M records for Pardee Center were also evaluated. Summaries of key operations and maintenance items (labor, energy, chemicals, and parts) are shown in Appendix B. While operations and maintenance costs are tracked separately at each WTP, it was not possible to predict O&M costs for the alternatives using real data due to the inconsistency of the numbers from year to year and between job numbers. Time charged to the WTP job numbers also contains time spent on the water distribution system. In addition, dollars spent includes projects that were performed by District personnel, such as the conversion from gaseous chlorine to calcium hypochlorite. Furthermore, WTP energy costs at Pardee could not be separated from the total energy costs for Pardee Center. Therefore, the O&M evaluation is qualitative rather then quantitative.

Differential costs were used to determine incremental changes between the existing facilities and a proposed alternative. For example, the treated water pipeline, which would serve CANS, will have an increase in cost at CASS based on the cross-reservoir pumping cost. For an alternative that continues to use Camanche Reservoir as a water supply source, it was estimated that water quality monitoring and bacteriological sampling costs would increase from approximately $3,000 a year to about $8,000 a year. Alternatives using Mokelumne water would have no Camanche monitoring. Based on discussions with Pardee staff, current O&M time spent at the existing plants is approximately 6 hours/day at CASS WTP, 4 hours/day at CANS WTP, and 2 hours/day at Pardee Center WTP. Therefore, a new membrane plant was assumed to reduce staff time to about 2 hours/day while a new package plant needed about 3 hours/day of staff time.

Each alternative was given a score of -2 to 3 based on the change in operations and maintenance costs compared to current O&M. Table 5-3 summarizes the basis of the scores.

Table 5-3
O&M Score Basis

Score	Change in O&M
-2	Significant Increase
-1	Small Increase
0	No Change
1	Small Decrease
2	Medium Decrease
3	Significant Decrease

5.1.2 Reliability

This evaluation set goals for reliability in two areas: meeting future water demands and meeting water treatment and service delivery goals.

Very low growth is expected in the CANS and CASS recreation areas. The District developed demand projections for the Camanche South Shore WTP Replacement Project for the year 2020, based on estimates of future population. Demands are predicted to increase by 5% over a 20-year period at CANS, and 8% at CASS.

Meeting water treatment and service delivery goals was defined as reliability on operator skill and robustness of a process to deal with fluctuations in raw water quality (i.e. H_2S at CANS and turbidity and THMs at CASS). A score of 1 to 5 was given to each alternative, where a score of 5 is the most flexible.

5.1.3 Regulatory

One of the key objectives of any project developed was to meet 15-year regulatory goals. Therefore, alternatives that were less likely to require upgrades or changes to the system to comply with future regulations were ranked higher than those that would require modifications. Membranes were given higher scores then conventional treatment since membranes are much more likely to meet changes in regulations. While groundwater regulations are currently less stringent then surface water regulations, this may change in the future. Conventional plants and membranes are better able to meet these changes then a greensand or pyrolucite system. A score of 1 to 5 was given to each alternative, where a score of 5 is less likely to require changes to the system.

5.1.4 Environmental

The basic environmental goal of any project is to consistently meet current and future environmental regulations related to treatment and transmission facilities. CEQA documentation is a major consideration for each project alternatives. CEQA documentation is complete for an ultrafiltration facility located at CASS. However, a package plant at CASS will require modifications to the existing mitigated negative declaration. In addition, new facilities located at CANS would require either a new mitigated negative declaration or possibly a negative declaration for the pyrolucite at CANS. A score of 1 to 5 was given to each alternative. A score of 5 does not require any further CEQA documentation.

5.2 Evaluation

Capital costs and a description of changes in O&M are summarized in Table 5-4 for each CASS and CANS alternative and in Table 5-5 for combined plant alternatives. During follow-up discussions with District Senior Management after the draft version of this report was issued, it was decided that the District policy had been set previously to avoid using any body contact water supply. Therefore, the water supply at CASS will be switched to Mokelumne Aqueduct water as soon as funds are available.

Table 5-4
Individual Plant Capital and O&M Cost Summary

Alternative	Capital Cost	Capital Cost Score	Difference in O&M	O&M Cost Score
		CANS		
Alt 1A – Greensand w/ Aeration (Wells)	$459,000	15	↑ due to aeration system and pumping to reservoir	-1
Alt 1B – Pyrolucite (Wells)	$85,000	15	No change	0
Alt 2A – Package Plant (Camanche)	$2,888,000	10	↑ due to increased bacterial monitoring (future)	-1
Alt 2B – UF Membranes (Camanche)	$4,004,000	7	↑ due to power & membrane replacement cost ↓ due to less operator attention ↑ due to increased bacterial monitoring	-1
		CASS		
Alt 1A – Package Plant (Mokelumne)	$4,689,000	6	↑ due to power ↓ due to less maintenance ↓ due to less operator attention	1

Alternative	Capital Cost	Capital Cost Score	Difference in O&M	O&M Cost Score
			↑ due to new transmission line maint ↓ due to no Camanche monitoring	
Alt 1B – UF Membranes (Mokelumne)	$4,616,000	6	↑ due to power & membrane replacement cost ↓↓↓ due to less operator attention ↓↓↓ due to less maintenance ↑ due to new transmission line maint. ↓ due to no Camanche monitoring	3
Alt 2A – Package Plant (Camanche)	$3,865,000	8	↓↓ due to less maintenance ↓ due to less operator attention ↑ due to power cost ↑ due to increased bacterial monitoring (future)	1
Alt 2B – UF Membranes (Camanche)	$3,934,000	8	↑ due to power & membrane replacement cost ↓↓↓ due to less maintenance ↓↓↓ due to less operator attention ↑ due to increased bacterial monitoring (future)	2

Table 5-5
Combined Plant Capital and O&M Cost Summary

Alternative	Capital Cost	Capital Cost Score	Difference in O&M	O&M Cost Score
Combined Plant at CASS				
Alt 1A – Package Plant (Mokelumne)	$6,219,000	3	↓↓ due to less maintenance ↓↓ due to less operator attention ↑↑ due to power cost ↑ due to new transmission line maint. ↓ due to no Camanche monitoring	2
Alt 1B – UF	$6,586,000	2	↑↑ due to power & membrane	3

Alternative	Capital Cost	Capital Cost Score	Difference in O&M	O&M Cost Score
Combined Plant at CASS				
Membranes (Mokelumne)			replacement cost ↓↓↓ due to less maintenance ↓↓↓ due to less operator attention ↑ due to new transmission line maint. ↓ due to no Camanche monitoring	
Alt 2A – Package Plant (Camanche)	$5,395,000	5	↓↓ due to less maintenance ↓↓ due to less operator attention ↑↑ due to power cost ↑ due to increased bacterial monitoring (future)	1
Alt 2B – UF Membranes (Camanche)	$5,905,000	4	↑↑ due to power & membrane replacement cost ↓↓↓ due to less maintenance ↓↓↓ due to less operator attention ↑ due to increased bacterial monitoring (future)	2
Best of CANS & CASS Alternatives (Using Mokelumne Supply)				
CANS Alt 1B – Pyrolucite (Wells) and CASS Alt 1B – UF Membranes (Mokelumne)	$4,701,000	6	↑ due to power & membrane replacement cost ↓↓ due to less maintenance ↓↓ due to less operator attention ↑ due to new transmission line maint. ↓ due to no Camanche monitoring	2

Tables 5-6 and 5-7 provide matrices summarizing alternative scores based on the five criteria set for evaluation. Scores of 1-15 were used for life cycle costs based on combined capital and O&M scores, while scores of 1 to 5 were used for the other categories to provide overall rankings. This effectively weighted the life cycle cost equal to the combined weight of reliability, regulatory, and environmental factors. In Table 5-7, the best CANS alternative was combined with the best CASS alternative and re-scored as a separate project to determine whether a combined plant at CASS was warranted or whether separate plants were preferable.

Table 5-6
Evaluation Matrix for Individual Plants

Alternative	Life Cycle Cost Score (1 to 15)	Reliability Score (1 to 5)	Regulatory Score (1 to 5)	Environ. Score (1 to 5)	Total Score
CANS					
Alt 1A – Greensand w/ Aeration (Wells)	14	2	3	3	22
Alt 1B – Pyrolucite (Wells)	15	3	3	4	25
Alt 2A – Package Plant (Camanche)	9	4	4	1	18
Alt 2B – UF Membranes (Camanche)	6	5	5	1	17
CASS					
Alt 1A – Package Plant (Mokelumne)	7	4	4	3	18
Alt 1B – UF Membranes (Mokelumne)	9	5	5	5	24
Alt 2A – Package Plant (Camanche)	9	4	4	3	20
Alt 2B – UF Membranes (Camanche)	10	5	5	5	25

Table 5-7
Evaluation Matrix for Combined Plants

Alternative	Life Cycle Cost Score (1 to 15)	Reliability Score (1 to 5)	Regulatory Score (1 to 5)	Environ. Score (1 to 5)	Total Score
Combined Plant at CASS					
Alt 1A – Package Plant (Mokelumne)	5	4	4	3	16
Alt 1B – UF Membranes (Mokelumne)	5	5	5	5	20
Alt 2A – Package Plant (Camanche)	6	4	4	3	17
Alt 2B – UF Membranes (Camanche)	6	5	5	5	21
Best of CANS & CASS Alternatives (Using Mokelumne Supply)					
CANS Alt 1B – Pyrolucite (Wells) and CASS Alt 1B – UF Membranes (Mokelumne)	8	4	4	4	20

5.3 Recommendation & Discussion

Based on the District's decision to use Mokelumne Aqueduct water; the four criteria that were used in the evaluation; and limitations in budget, the recommended project is to build pyrolucite facilities at CANS and a new ultrafiltration WTP at CASS. In addition, wash water ponds and a small hydropneumatic tank system will be built to support the existing facilities at CASS.

At CANS, the pyrolucite alternative is recommended since the score is clearly the highest of the four alternatives evaluated. Pyrolucite has already been demonstrated to be effective at the CANS WTP and does not require a lot of operator attention. A benefit of continuing to use the groundwater supply is that the disinfection requirement is relatively low and compliance with current and future disinfectant byproduct regulations should not be a problem.

The District has set a policy of only using non-body contact water supplies. Therefore, for the Mokelumne Aqueduct water supply, the CASS ultrafiltration system scored 6 points higher than a conventional package plant. Total scores are directly related to the weighting given to cost versus other criteria. For this evaluation, life cycle cost was considered equal to the combined rankings for reliability, regulatory, and environmental rankings. Life cycle costs between the ultrafiltration system and the conventional package plant were essentially equal. An ultrafiltration plant would be capable of meeting all current and future turbidity regulations. In addition, it requires the least operator attention. It would also provide a greater degree of TOC removal and the amount of disinfection needed for CT compliance would be halved; these two factors should ensure that disinfection byproduct formation would be low enough to meet all current and future DBP regulations. Since an ultrafiltratrion plant meets the objectives of the evaluation for the same cost, it is recommended that the District proceed with an ultrafiltration plant for CASS.

Rankings were the equal for a combined plant at CASS using membranes and the best separate plant alternatives. However, capital cost indicates that maintaining separate facilities at CASS and CANS is justified. As discussed in Section 4, a treated water pipeline has several drawbacks in addition to cost. It was not felt that either the cost or the risk of contamination to the CANS drinking water supply was warranted.

Although a District policy decision has been made to switch from a Camanche water supply to the Mokelumne Aqueducts, there are insufficient funds available to construct the raw water pipeline at this time. There is currently only $1 million dollars in the two-year CIP for capital work at Camanche. Therefore, the entire project cannot be built at this time. For now, it is recommended that the District maintain the current Camanche Reservoir water supply at CASS, and continue to use well water at CANS.

5.4 Flexibility for Inter-Agency Expansion

The capital costs shown in this report include space for expansion capability for future joint projects with Calaveras County Water District (CCWD) or Amador County. While the existing well water system is adequate to meet future demands for the CANS recreation area, the water supply is not sufficient to meet Amador County demands. Therefore, joint projects with Amador County would require construction of the treated water pipeline. At CASS, it would be possible to add additional ultrafiltration membrane skids to serve CCWD. However, expansion of the Camanche water supply would either require construction of a parallel supply line and larger water supply pumps (depending on demands) or construction of the raw water transmission pipeline.

5.5 Project Implementation

Since there are insufficient funds available to build the recommended project at this time, the project was broken into three phases that are summarized in Table 5-8. Phase 1 of the project includes a number of small projects that will allow the existing plants to continue to function for the next five years; meet regulations; and minimize capital expenditure.

This review of regulations and water quality data did not find that the transmission pipeline from the Mokelumne Aqueducts to the CASS WTP need be built in this two-year budget cycle, and can wait until capital funds are available. Phase 2 looks at meeting upcoming regulations and District policy by building major capital improvements that have been delayed due to budgetary constraints. Phase 3 includes projects required to meet inter-agency demands.

Table 5-8
Camanche WTP Improvements Implementation Schedule

Phase	Project	Description	Capital Cost
Phase 1			
	CASS Data Logging Device	Purchase a PC and supply data programmer to provide interface between turbidimeter and PC to read filter turbidity every 15-minutes.	$5,000
	CASS Backwash Ponds	Build two backwash ponds of 60,000 gallons each.	$63,000
	CASS Flocculation	Replace existing mixers in "rapid mix" with slow speed impellers to make into flocculator. This will help improve plant performance during high turbidity events.	$18,000
	CANS Treatment	Add pyrolucite system to provide additional water supply well. Replace two control valves.	$84,000
	Hydropnuematic Tank System for CASS	Build small hydropneumatic tank and associated pipelines to meet max day demands.	$203,000
		Phase 1 Capital Cost	**$373,000**
Phase 2			
	Raw Water Transmission Pipeline	Build 12-inch HDPE/PVC pipeline to change water supply to CASS.	$615,000
	New CASS WTP	Build new UF WTP; backup water supply pipeline; tank improvements	$3,804,000
		Phase 2 Capital Cost	**$4,419,000**
Phase 3			
	Treated Water Transmission Pipeline	Build pipeline across reservoir to meet CANS & Amador County needs.	$803,000
	Expand CASS WTP	Expand WTP to meet inter-agency & CANS demands	Depends on size

Appendix A

Capital Cost of Alternatives

Camanche North and South Shore WTPs Evaluation

CANS Alternatives	Construction Cost
Alt 1A Greensand w/ Aeration (0.25 mgd) using well water	
Aeration & pump Station	$272,740
North Shore Tank Site	$0
CONSTRUCTION COST ESTIMATE =	**$272,740**
GC OVERHEAD & PROFIT (8%)=	$21,819
CONTINGENCIES (30%) =	$81,822
GC BONDS & INSURANCE(1.5%)=	$4,091
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$9,546
ENGINEERING (10%)=	$27,274
CONSTRUCTION MANAGEMENT(15%) =	$40,911
TOTAL CAPITAL COST=	**$458,203**
Alt 1B Pyrolucite w/ Aeration (0.25 mgd) using well water	
Pyrolucite System w/ Aeration	$54,328
4" High Performance BFVs	$2,600
CONSTRUCTION COST ESTIMATE =	**$56,928**
GC OVERHEAD & PROFIT (8%)=	$4,554
CONTINGENCIES (10%) =	$5,693
GC BONDS & INSURANCE(1.5%)=	$854
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$1,992
ENGINEERING (10%)=	$5,693
CONSTRUCTION MANAGEMENT(15%) =	$8,539
TOTAL CAPITAL COST=	**$84,254**

Camanche North and South Shore WTPs Evaluation

CANS Alternatives	Construction Cost
Alt 2A Package Plant (0.25 mgd) using Camanche Water	
Raw Water Intake, Pipeline, Pumps	$300,750
Package Plant	$1,418,245
North Shore Tank Site	$0
CONSTRUCTION COST ESTIMATE =	**$1,718,995**
GC OVERHEAD & PROFIT (8%)=	$137,520
CONTINGENCIES (30%) =	$515,698
GC BONDS & INSURANCE(1.5%)=	$25,785
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$60,165
ENGINEERING (10%)=	$171,899
CONSTRUCTION MANAGEMENT(15%) =	$257,849
TOTAL CAPITAL COST=	**$2,887,911**
Alt 2B UF Membrane (0.25 mgd) using Camanche Water	
Raw Water Intake, Pipeline, Pumps	$300,750
Membrane Plant	$2,579,847
North Shore Tank Site	$0
CONSTRUCTION COST ESTIMATE =	**$2,880,597**
GC OVERHEAD & PROFIT (8%)=	$230,448
CHANGE ORDERS (10%) =	$288,060
GC BONDS & INSURANCE(1.5%)=	$43,209
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$100,821
ENGINEERING (1%)=	$28,806
CONSTRUCTION MANAGEMENT(15%) =	$432,090
TOTAL CAPITAL COST=	**$4,004,030**

Camanche North and South Shore WTPs Evaluation

CASS Alternatives		Construction Cost
Alt 1A	**Package Plant (0.25 mgd) using Mokelumne Water**	
	12" Raw Water Supply Pipe (PVC/HDPE)	$442,510
	Backup Supply Pipe	$47,707
	Package Plant	$2,050,281
	South Shore Tank Site	$108,879
	Wash Water Ponds	$42,369
	Hydropneumatic Tank System	$99,086
	CONSTRUCTION COST ESTIMATE =	**$2,790,833**
	GC OVERHEAD & PROFIT (8%)=	$223,267
	CONTINGENCIES (30%) =	$837,250
	GC BONDS & INSURANCE(1.5%)=	$41,862
	ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$97,679
	ENGINEERING (10%)=	$279,083
	CONSTRUCTION MANAGEMENT(15%) =	$418,625
	TOTAL CAPITAL COST=	**$4,688,599**
Alt 1B	**UF Membrane (0.25 mgd) using Mokelumne Water**	
	12" Raw Water Supply Pipe (HDPE/PVC)	$442,510
	Backup Supply Pipe	$47,707
	UF Membrane Plant	$2,579,847
	South Shore Tank Site	$108,879
	Wash Water Ponds	$42,369
	Hydropneumatic Tank System	$99,086
	CONSTRUCTION COST ESTIMATE =	**$3,320,398**
	GC OVERHEAD & PROFIT (8%)=	$265,632
	CHANGE ORDERS (10%) =	$332,040
	GC BONDS & INSURANCE(1.5%)=	$49,806
	ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$116,214
	ENGINEERING (1%)=	$33,204
	CONSTRUCTION MANAGEMENT(15%) =	$498,060
	TOTAL CAPITAL COST=	**$4,615,353**

Camanche North and South Shore WTPs Evaluation

Combined Alternatives	Construction Cost
Alt 1A Package Plant (0.5 mgd) using Mokelumne Water	
12" Raw Water Supply Pipe (PVC/HDPE)	$442,510
Backup Supply Pipe	$47,707
Package Plant	$2,383,501
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
Treated Water Pipe (PVC,HDPE)	$577,569
CONSTRUCTION COST ESTIMATE =	**$3,701,621**
GC OVERHEAD & PROFIT (8%)=	$296,130
CONTINGENCIES (30%) =	$1,110,486
GC BONDS & INSURANCE(1.5%)=	$55,524
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$129,557
ENGINEERING (10%)=	$370,162
CONSTRUCTION MANAGEMENT(15%) =	$555,243
TOTAL CAPITAL COST=	**$6,218,723**
Alt 1B UF Membrane (0.5 mgd) using Mokelumne Water	
12" Raw Water Supply Pipe (PVC/HDPE)	$442,510
Backup Supply Pipe	$47,707
UF Membrane Plant	$3,419,944
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
Treated Water Pipe (PVC,HDPE)	$577,569
CONSTRUCTION COST ESTIMATE =	**$4,738,065**
GC OVERHEAD & PROFIT (8%)=	$379,045
CHANGE ORDERS (10%) =	$473,806
GC BONDS & INSURANCE(1.5%)=	$71,071
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$165,832
ENGINEERING (1%)=	$47,381
CONSTRUCTION MANAGEMENT(15%) =	$710,710
TOTAL CAPITAL COST=	**$6,585,910**

Camanche North and South Shore WTPs Evaluation

Combined Alternatives	Construction Cost
Alt 2A Package Plant (0.5 mgd) using Camanche Water	
Package Plant	$2,383,501
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
Treated Water Pipe	$577,569
CONSTRUCTION COST ESTIMATE =	**$3,211,404**
GC OVERHEAD & PROFIT (8%)=	$256,912
CONTINGENCIES (30%) =	$963,421
GC BONDS & INSURANCE(1.5%)=	$48,171
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$112,399
ENGINEERING (10%)=	$321,140
CONSTRUCTION MANAGEMENT(15%) =	$481,711
TOTAL CAPITAL COST=	**$5,395,158**
Alt 2B UF Membrane (0.5 mgd) using Camanche Water	
Membrane Plant	$3,419,944
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
Treated Water Pipe (PVC,HDPE)	$577,569
CONSTRUCTION COST ESTIMATE =	**$4,247,848**
GC OVERHEAD & PROFIT (8%)=	$339,828
CHANGE ORDERS (10%) =	$424,785
GC BONDS & INSURANCE(1.5%)=	$63,718
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$148,675
ENGINEERING (0%)=	$42,478
CONSTRUCTION MANAGEMENT(15%) =	$637,177
TOTAL CAPITAL COST=	**$5,904,508**

Camanche North and South Shore WTPs Evaluation

CASS Alternatives	Construction Cost
Alt 2A — Package Plant (0.25 mgd) using Camanche Water	
Package Plant	$2,050,281
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
CONSTRUCTION COST ESTIMATE =	**$2,300,616**
GC OVERHEAD & PROFIT (8%)=	$184,049
CONTINGENCIES (30%) =	$690,185
GC BONDS & INSURANCE(1.5%)=	$34,509
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$80,522
ENGINEERING (10%)=	$230,062
CONSTRUCTION MANAGEMENT(15%) =	$345,092
TOTAL CAPITAL COST=	**$3,865,034**
Alt 2B — UF Membrane (0.25 mgd) using Camanche Water	
Membrane Plant	$2,579,847
South Shore Tank Site	$108,879
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$99,086
CONSTRUCTION COST ESTIMATE =	**$2,830,181**
GC OVERHEAD & PROFIT (8%)=	$226,414
CHANGE ORDERS (10%) =	$283,018
GC BONDS & INSURANCE(1.5%)=	$42,453
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$99,056
ENGINEERING (0%)=	$28,302
CONSTRUCTION MANAGEMENT(15%) =	$424,527
TOTAL CAPITAL COST=	**$3,933,952**

Camanche North and South Shore WTPs Evaluation

	Construction Cost
Phase 1	
Wash Water Ponds	$42,369
Hydropneumatic Tank System	$137,086
CASS Data Logging Device	$3,400
CASS Flocculation	$12,000
Pyrolucite System w/ Aeration	$54,328
4" High Performance BFVs	$2,600
CONSTRUCTION COST ESTIMATE =	**$251,783**
GC OVERHEAD & PROFIT (8%)=	$20,143
CHANGE ORDERS (10%) =	$25,178
GC BONDS & INSURANCE(1.5%)=	$3,777
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$8,812
ENGINEERING (10%)=	$25,178
CONSTRUCTION MANAGEMENT(15%) =	$37,768
TOTAL CAPITAL COST=	**$372,639**

Camanche North and South Shore WTPs Evaluation

	Construction Cost
Phase 2	
12" Raw Water Supply Pipe (PVC/HDPE)	$442,510
Backup Supply Pipe	$47,707
UF Membrane Plant	$2,579,847
South Shore Tank Site	$108,879
CONSTRUCTION COST ESTIMATE =	**$3,178,943**
GC OVERHEAD & PROFIT (8%)=	$254,315
CHANGE ORDERS (10%) =	$317,894
GC BONDS & INSURANCE(1.5%)=	$47,684
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$111,263
ENGINEERING (1%)=	$31,789
CONSTRUCTION MANAGEMENT(15%) =	$476,841
TOTAL CAPITAL COST=	**$4,418,731**

Camanche North and South Shore WTPs Evaluation

	Construction Cost
Phase 3	
Treated Water Pipe (PVC,HDPE)	$577,569
Expansion of UF Membrane Plant (Size??)	$0
	$0
	$0
	$0
	$0
CONSTRUCTION COST ESTIMATE =	**$577,569**
GC OVERHEAD & PROFIT (8%)=	$46,206
CHANGE ORDERS (10%) =	$57,757
GC BONDS & INSURANCE(1.5%)=	$8,664
ESCALATION TO MIDPOINT OF CONSTRUCTION(3.5%)=	$20,215
ENGINEERING (1%)=	$5,776
CONSTRUCTION MANAGEMENT(15%) =	$86,635
TOTAL CAPITAL COST=	**$802,821**

Appendix B

Historical O&M Costs

FY03 O&M Summary (Based on Job #'s)

	Pardee Center	Pardee Rec Area	CASS	CANS
Labor	$47,679	$52,321	$104,502	$75,824
Chemical/Lab Supplies	$5,013	$2,887	$17,367	$4,551
Energy	$0	$1,817	$1,000	$487
Materials/Equip/Fees	$1,651	$4,401	$6,645	$6,544
Total	**$54,343**	**$61,425**	**$129,514**	**$87,405**

FY02 O&M Summary (Based on Job #'s)

	Pardee Center	Pardee Rec Area	CASS	CANS
Labor	$65,402	$82,801	$143,863	$89,804
Chemical/Lab Supplies	$9,454	$7,582	$11,322	$13,223
Energy	$0	$3,305	$0	$716
Materials/Equip/Fees	$6,696	$47,447	$10,722	$7,922
Total	**$81,552**	**$141,136**	**$165,907**	**$111,666**

FY01 O&M Summary (Based on Job #'s)

	Pardee Center	Pardee Rec Area	CASS	CANS
Labor	$91,550	$76,530	$127,167	$129,460
Chemical/Lab Supplies	$14,379	$5,921	$10,851	$21,083
Energy	$0	$2,666	$0	$538
Materials/Equip/Fees	$7,798	$10,901	$9,907	$13,302
Total	**$113,727**	**$96,017**	**$147,925**	**$164,383**

FY00 O&M Summary (Based on Job #'s)

	Pardee Center	Pardee Rec Area	CASS	CANS
Labor	$71,786	$73,781	$128,168	$102,002
Chemical/Lab Supplies	$27,222	$19,059	$21,218	$15,625
Energy	$0	$3,353	$0	$395
Materials/Equip/Fees	$11,871	$5,368	$18,079	$6,197
Total	**$110,879**	**$101,561**	**$167,465**	**$124,219**