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TECHNICAL MEMORANDUM

City of Lathrop and City of Manteca ULDC Evaluation
Assessment of Existing Penetrations

Prepared for: City of Lathrop & City of Manteca *March 1, 2016*

Prepared by: Ryan P. Dunne, EIT

Reviewed by: Mike Rossiter, PE, CFM & Dave Peterson, PE

Introduction

The ULDC requires all levee penetrations to be assessed to determine if they pose a high hazard. Penetrations that are identified as high hazard must be removed or modified to restore reliability of the levee system. This report details the identification and hazard determination of all existing levee penetrations in the RD 17 levee system.

Failure of a pipe penetration can cause rapid levee breaching by providing a preferential seepage path or open conveyance for floodwaters to reach the interior of the levee system. It can also cause erosion of the surrounding levee material as fluid escapes the penetration and flows through the levee. Such a seepage path can take place over time and develop into a large breach.

Opening of such seepage paths can be prevented by regular maintenance and conditional assessments (video or pressure testing) of pipe penetrations. For gravity penetrations, water-side flap gates automatically shut off flow into a pipe penetration when the riverine stage increases above the water elevation in the levee's interior, but can be clogged by debris and prevented from fully closing. Positive closure devices such as sluice gates and gate valves provide additional assurances for all gravity and pressure pipe penetrations, and allow manual closure of pipelines. Air Relief Valves (ARVs) for all pressure penetrations also help to prevent siphoning of floodwater into the levee's interior.

Identification of Penetrations

Levee penetrations were identified using CVFPB permit records, a DWR Utility Inventory, as-built drawings, and field investigations. A full list of penetrations in the RD 17 levees is included as Attachment A. Geotechnical improvements projects that will soon be under construction require installation of slurry cutoff walls or seepage berms. Plans for these projects were used to identify "work reaches" where levee improvements would require removal and reconstruction of penetrations to full ULDC and Title 23 standards. The hazards of the remaining penetrations were assessed to determine if they also required modifications to meet ULDC.

Penetration Hazard Assessment

The hazard of each levee penetration outside of "work reaches" was assessed using a multi-step process detailed in a decision tree shown in Figure 1. Penetration characteristics were identified, including type of penetration, its location in the levee, and age. Conditions were not assessed for penetrations located in reaches where levee improvement projects are scheduled with the assumption that these penetrations will be removed and replaced as a necessary part of the overall levee improvement project.

Corrosion has caused failure of some steel pressure pipelines crossing the RD 17 levees that are approximately 30 years old. Pressure and gravity pipelines older than 30 years were identified as high hazard and were not inspected. Penetration hazard assessments were performed on the remaining penetrations in two stages:

Stage 1: Preliminary Assessment
If the penetration was not located within a "work reach" or initially deemed high hazard, field observations were made including condition of the penetration, the presence or absence of a positive closure device, potential status as abandoned, and consequences of failure**.** A levee penetration that did not pass this assessment was considered high hazard.

Stage 2: Condition Assessment Tests
Penetrations that passed the Preliminary Assessment underwent additional assessment by video inspection. When multiple penetrations with the same age, type, and material were identified for further inspection, a representative sample was inspected. Pipes of similar age, type, and location, and that appear to be in similar condition, were assumed to have similar structural conditions. Penetrations that showed excessive corrosion or degradation were considered high hazard.

Pipes that were determined to pose a high hazard will be removed and replaced to ULDC and Title 23 standards, or will have any deficiencies corrected for them to meet ULDC standards. Low hazard pipes that are not permitted will be included in a long-term penetration remediation plan to address future permitting or removal of these penetrations. Most of the low hazard levee penetrations outside of construction reaches have recent CVFPB permits, as shown in Figure 1. The remaining unpermitted penetrations must be included in the penetration remediation plan if not removed from the levee.

Results

Results of the condition assessments are listed in Table 1 for all penetrations that are not already identified for removal as part of the overall levee improvement project. Stage 2 video inspections were performed for a representative sample of penetrations that passed preliminary and Stage 1 assessments. Table 1 identifies pipes that have had video tests performed and the length of pipe inspected. The video surveys showed no structural deficiencies in any of these pipes. ARVs and/or positive closure devices will need to be installed on several of the levee penetrations, as listed in Table 1.

All high hazard deficiencies will be addressed by the improvements plan in this ULDC report. All low-hazard deficiencies will be permitted or removed by 2025.

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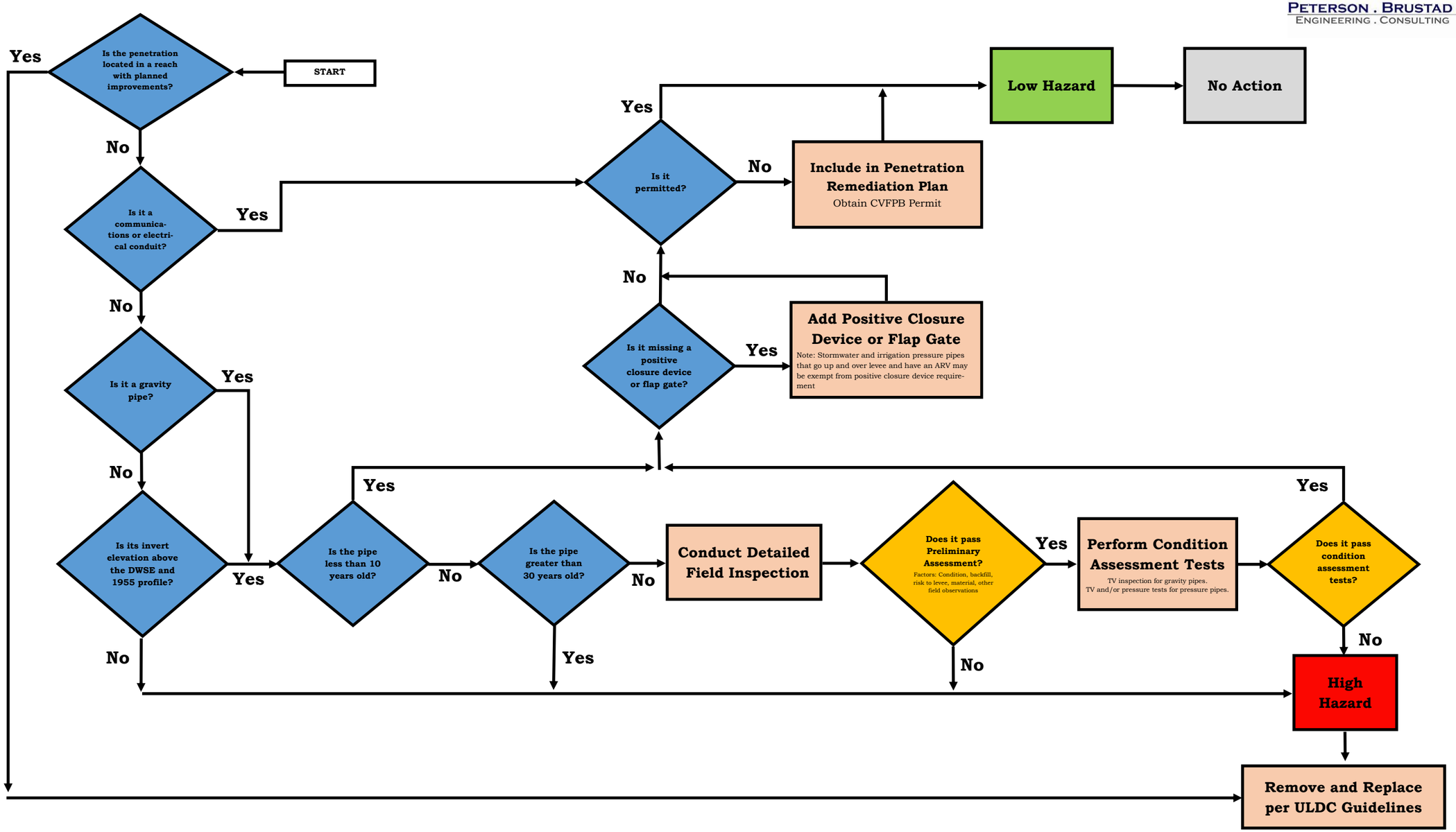

Figure 1: ULDC Penetration Assessment Decision Tree

Table 1: Inventory of penetrations outside of work reaches that passed preliminary assessment

Station	Type	Age (years)	Equipped with Positive closure	Equipped with ARV	Permitted	Crosses above levee prism	Improvements Required to become Low Hazard	Video inspection results
161+58	8" Steel irrigation pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
267+39	10" Steel drainage pressure pipe	26	No	Vault filled with debris	Yes	Yes	Fix ARV and install positive closure	
571+35	16" Steel drainage pressure pipe	26	No	Vault filled with debris	Yes	Yes	Fix ARV and install positive closure	
800+75	36" Sanitary Sewer gravity effluent	29	Yes	No (gravity)	Yes	Undercrossing	None	Inspected to land side toe - no structural deficiencies
Crossroads Pump Station								
740+95	48" Steel drainage pressure pipe	23	No	No	Yes	Yes	Install ARV and positive closure	Inspected 37' of water side slope - no structural deficiencies
740+99	12" Steel drainage pressure pipe	23	No	No	Yes	Yes	Install ARV and positive closure	
Oakwood Lake Water District Drainage Pumps								
800+35	18" Steel drainage pressure pipe	29	No	Yes	Yes	Yes	Install positive closure	
801+00	18" Steel drainage pressure pipe	-	No	Yes	No	Unknown	Install positive closure	Inspected 28' of water side slope - no structural deficiencies
Weston Ranch Pump Station								
142+71	42" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
142+80	42" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
142+89	42" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
142+97	8" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
143+07	8" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
143+16	42" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	
143+25	42" Steel drainage pressure pipe	26	No	Yes	Yes	Yes	Install positive closure	Inspected to ARV at land side levee crest - no structural deficiencies

Penetration selected for video testing

ATTACHMENT A

RD 17 LEVEE PENETRATIONS INVENTORY

Station	Function	Type	Material	Over or Under Levee	Nominal Diameter (inches)	Current Owner	Date of Installation	ULDC Geotechnical work scheduled	Is levee prism being degraded as part of other improvement activities? RD17 Phase III	ULDC Compliance	Is it a communications or electrical conduit?	Gravity pipe?	Is the pipe invert above the DWSE?	Is the pipe older than 30 years?	Does it pass preliminary assessment?	Does it have a ARV?	Does it have a positive closure device?	Does it have a CVFPB permit?	Hazard Determination	Required Remediation	Hazard after remediation
PENETRATIONS IN NON-WORK REACHES																					
142+71	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
142+80	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
142+89	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
142+97	DRAINAGE	PRESSURE	STEEL	OVER	8	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
142+99	DRAINAGE	PRESSURE	STEEL	OVER	8	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
143+07	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
143+16	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
143+25	DRAINAGE	PRESSURE	STEEL	OVER	42	CITY OF STOCKTON	1989	None	No	No	No	No	Yes	No	Yes	Yes	No	Yes	High	Install positive closure device	Low
161+58	IRRIGATION	PRESSURE	STEEL	OVER	8	HIDENORI ASANO	1989	None	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Low		Low
267+39	DRAINAGE	PRESSURE	STEEL	OVER	10	LONG BROTHERS	1989	None	No	No	No	No	Yes	No	Yes	No	Yes	Yes	High	Install ARV	Low
516+40	?	PRESSURE	?	OVER	12	LATHROP LAND ACQUISITION	?	None	No	No	No	No	Yes	?	No Abandoned	→			High	Remove abandoned pipe	N/A
571+35	DRAINAGE	PRESSURE	STEEL	OVER	16	LATHROP LAND ACQUISITION	1989	None	No	No	No	No	Yes	No	Yes	No	Yes	Yes	High	Install ARV	Low
574+47	DRAINAGE	PRESSURE	STEEL	OVER	12	CITY OF LATHROP	1989	None	No	No	No	No	Yes	No	No Abandoned	→			High	Remove abandoned pipe	N/A
574+50	DRAINAGE	PRESSURE	STEEL	OVER	12	CITY OF LATHROP	1989	None	No	No	No	No	Yes	No	No Abandoned	→			High	Remove abandoned pipe	N/A
740+78	DRAINAGE	PRESSURE	STEEL	OVER	20	?	1961	None	No	No	No	No	Yes	Yes	→				High	Remove and reconstruct	Low
740+95	DRAINAGE	PRESSURE	STEEL	OVER	48	?	1992	None	No	No	No	No	Yes	No	Yes	No	No	Yes	High	Install positive closure device and ARV	Low
740+99	DRAINAGE	PRESSURE	STEEL	OVER	12	?	1992	None	No	No	No	No	Yes	No	Yes	No	No	Yes	High	Install positive closure device and ARV	Low
769+57	DRAINAGE	PRESSURE	STEEL	OVER	18	CALTRANS	1956	None	No	No	No	No	Yes	Yes	→				High	Remove and reconstruct	Low
800+31	DRAINAGE	PRESSURE	STEEL	OVER	18	OAKWOOD LAKE WATER	1986	None	No	No	No	No	Yes	No	No Abandoned	→			High	Remove abandoned pipe	N/A
800+35	DRAINAGE	PRESSURE	STEEL	OVER	18	OAKWOOD LAKE WATER	1986	None	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Low		Low
801+00	DRAINAGE	PRESSURE	STEEL	OVER	18	OAKWOOD LAKE WATER	1986	None	No	No	No	No	Yes	?	Yes	Yes	No	No	High	Install positive closure device	Low
PIPELINES CROSSING UNDER LEVEE IN NON-WORK REACHES																					
76+73	SANITARY SEWER	PRESSURE	HDPE	UNDER	30	CITY OF STOCKTON	1988	None	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Low		Low
76+75	SANITARY SEWER	PRESSURE	PVC	UNDER	12	CITY OF STOCKTON	1988	None	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Low		Low
76+77	SANITARY SEWER	PRESSURE	HDPE	UNDER	30	CITY OF STOCKTON	1988	None	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Low		Low
800+75	SEWER EFFLUENT	GRAVITY	RCP	UNDER	36	CITY OF MANTECA	1986	None	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Low		Low

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PENETRATIONS IN WORK REACHES																					
368+17	IRRIGATION	PRESSURE	STEEL	OVER	14	JIAN & YANHUI WANG	1989	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
386+01	IRRIGATION	PRESSURE	STEEL	OVER	16	ROI DESERT PARTNERS	1989	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
683+30	IRRIGATION	PRESSURE	STEEL	OVER	16	J.W. & B.O. SILVEIRA	?	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
692+06	DRAINAGE	PRESSURE	STEEL	OVER	18	J.W. & B.O. SILVEIRA	1989	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
697+12	IRRIGATION	PRESSURE	STEEL	OVER	16	CITY OF LATHROP	1989	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
698+96	DRAINAGE	PRESSURE	STEEL	OVER	30	CITY OF LATHROP	2005	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
699+02	DRAINAGE	PRESSURE	STEEL	OVER	30	CITY OF LATHROP	2005	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
699+08	DRAINAGE	PRESSURE	STEEL	OVER	30	CITY OF LATHROP	2005	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
699+14	DRAINAGE	PRESSURE	STEEL	OVER	30	CITY OF LATHROP	2005	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
699+20	DRAINAGE	PRESSURE	STEEL	OVER	30	CITY OF LATHROP	2005	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
750+29	IRRIGATION	PRESSURE	STEEL	OVER	6	ANGELO QUEIROLO	1989	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
± 762+82	FIBER OPTIC	CONDUIT	GIP	OVER	4	SPRINT	1986	None	Yes	No	→									Remove and reconstruct as part of construction activities	Low
176+88	DRAINAGE	PRESSURE	STEEL	OVER	8	WILLIAM LONG	1977	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
179+56	IRRIGATION	PRESSURE	STEEL	OVER	16	WILLIAM LONG	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
188+98	DRAINAGE	PRESSURE	STEEL	OVER	12	WILLIAM LONG	1983	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
207+44	DRAINAGE	PRESSURE	STEEL	OVER	10	BARRAY PARTNERS	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
208+63	IRRIGATION	PRESSURE	STEEL	OVER	16	BARRAY PARTNERS	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
218+42	IRRIGATION	PRESSURE	STEEL	OVER	20	BARRAY PARTNERS	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
232+05	IRRIGATION	PRESSURE	STEEL	OVER	8	MELVIN YOUNG	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
240+95	IRRIGATION	PRESSURE	STEEL	OVER	8	MELVIN YOUNG	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
241+31	IRRIGATION	PRESSURE	STEEL	OVER	8	ROBERT CALCAGNO	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
241+46	DRAINAGE	PRESSURE	STEEL	OVER	8	ROBERT CALCAGNO	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
246+25	IRRIGATION	PRESSURE	STEEL	OVER	10	ROBERT CALCAGNO	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
258+70	IRRIGATION	PRESSURE	STEEL	OVER	10	LONG BROTHERS	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
283+60	GAS	PRESSURE	STEEL	OVER	8	PG&E	1963	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
916+50	GAS	PRESSURE	?	?	?	PG&E ?	1963	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
280+59	IRRIGATION	PRESSURE	STEEL	OVER	16	RICHARD & MIKKI RIELLA	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
291+91	DRAINAGE	PRESSURE	STEEL	OVER	12	RICHARD & MIKKI RIELLA	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
297+44	IRRIGATION	PRESSURE	STEEL	OVER	12	CECIL & S.J. RODGERS	1989	Seepage Berm	Yes	No	→									Remove and reconstruct as part of construction activities	Low
325+17	IRRIGATION	PRESSURE	STEEL	OVER	10	JAMES & JUNE SILVERIA	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
331+60	IRRIGATION	PRESSURE	STEEL	OVER	6	PETE & PATRICIA	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
413+28	IRRIGATION	PRESSURE	STEEL	OVER	6	JIMMY ROBINSON	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
424+38	IRRIGATION	PRESSURE	STEEL	OVER	12	STAGECOACH	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
424+56	DRAINAGE	PRESSURE	STEEL	OVER	10	STAGECOACH	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
447+68	DRAINAGE	PRESSURE	STEEL	OVER	14	ALICE WIDMER	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
447+81	DRAINAGE	PRESSURE	STEEL	OVER	12	ALICE WIDMER	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
458+81	IRRIGATION	PRESSURE	STEEL	OVER	16	ALICE WIDMER	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low

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PENETRATIONS IN WORK REACHES (CONTINUED)																					
476+58	IRRIGATION	PRESSURE	STEEL	OVER	12	GENOVEVA LEAL	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
478+73	IRRIGATION	PRESSURE	STEEL	OVER	12	GENOVEVA LEAL	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
480+31	IRRIGATION	PRESSURE	STEEL	OVER	4	S. & F. AURELIO	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
492+51	IRRIGATION	PRESSURE	STEEL	OVER	14	SAN JOAQUIN COUNTY PARKS	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
492+72	DRAINAGE	PRESSURE	STEEL	OVER	36	CITY OF LATHROP	2005	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
493+44	IRRIGATION	PRESSURE	STEEL	OVER	10	CARROLL & MARIA STANLEY	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
499+98	IRRIGATION	PRESSURE	STEEL	OVER	6	CARROLL & MARIA STANLEY	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
507+37	IRRIGATION	PRESSURE	STEEL	OVER	16	LATHROP LAND ACQUISITION	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
509+14	IRRIGATION	PRESSURE	STEEL	OVER	20	LATHROP LAND ACQUISITION	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
509+24	IRRIGATION	PRESSURE	STEEL	OVER	16	LATHROP LAND ACQUISITION	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
334+97	IRRIGATION	PRESSURE	STEEL	OVER	10	PETE & PATRICIA	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
343+18	IRRIGATION	PRESSURE	STEEL	OVER	8	WARM SPRINGS INVESTMENTS	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
353+76	IRRIGATION	PRESSURE	STEEL	OVER	14	RIO BLANCO RANCH	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
361+43	DRAINAGE	PRESSURE	STEEL	OVER	10	RIO BLANCO RANCH	1989	Cutoff Wall	No	Yes	→									Remove and reconstruct as part of construction activities	Low
878+14	IRRIGATION	LOW PRESSURE	RCP	UNDER	36	BAIRD LANDS	?	Seepage Berm	No	Yes	→									Remove and reconstruct as part of construction activities	Low
972+13	IRRIGATION	LOW PRESSURE	RCP	UNDER	36	SSJID	?	Seepage Berm	No	Yes	→									Remove and reconstruct as part of construction activities	Low
972+41	IRRIGATION	LOW PRESSURE	RCP	UNDER	36	SSJID	?	Seepage Berm	No	Yes	→									Remove and reconstruct as part of construction activities	Low