Traders Point Lake Dam

Investigation Report

State ID 49-5

January 31, 2008

Submitted by

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Executive Summary

An investigation was performed on the Traders Point Lake dam on January 23, 2008. The dam is owned by Lakeside Improvement Association. It is classified by the DNR as a low hazard dam, but has several serious deficiencies as defined by the DNR. The dam is 18 feet high and 300 feet long with a crest width of 5 feet and impounds a 10 acre lake at normal pool.

On the date of the investigation, the weather was cold and dry. There had been a recent light snowfall preceding the inspection. The level of the lake was right at the crest of the principal spillway.

The embankment is generally in good condition and the investigation centered on the structural condition of the concrete spillway, which has serious concrete failure problems.

It is recommended that the Owner give consideration to upgrading this structure to comply with current DNR standards of dams of this size and repair or replace the spillway as funding permits. Several options are presented in the report.

Dam Investigation

Data Reviewed

Prior to the field investigation on January 23, 2008, the immediate past DNR inspection report was reviewed.

Scope of Investigation

This investigation was to evaluate the structural condition of the principal spillway of the Traders Point Lake. It was limited to a visual observation of the field conditions, and an office review of those observations in order to provide a preliminary estimate for the cost of repairs. Extensive concrete and foundation sampling was not performed. This evaluation does not provide any guarantee of future safety or integrity of the dam beyond the investigation date.

Investigation Conditions

The spillway was field inspected on January 23, 2008 at approximately 1:30 pm. The conditions were cold and dry. The temperature was approximately 20degrees. There had been a recent snowfall, but it did not obstruct a clear view of the spillway. The water level was slightly above the crest of the principal spillway. Ice was observed at the left side of the spillway, both at the crest and on the wall.

Description of Dam and Spillway

This dam is located in Marion County, Indiana at the Traders Point Lake near 71st Street and Lafayette Road. It is a private dam and serves as an amenity for the development surrounding the lake. It appears in Section 27, T17N, R2E of the Zionsville USGS Quadrangle Map. Descriptive data for the dam and spillway is taken from the DNR Earth Dam Visual Inspection Report.

The dam is an earth filled structure, not approved by the DNR. The earthen embankment is approximately 18 feet high, 300 feet long and has slopes of approximately 1.5V:1H upstream and 3V:1H downstream. The principal spillway is a broad crested weir 2 feet thick, 30 feet wide, and 13.5 feet high. It has abutment walls on both sides and a wing wall on the left side. A wing wall probably existed on the right side but failed and no longer exists. The discharge is to a concrete impact slab and then a discharge channel.

The dam has an upstream drainage area of approximately 1.63 square miles and the permanent pool surface area is approximately 10 acres. The normal pool is 4.5 feet below the dam crest. There is approximately 4.5 feet of freeboard between the crest elevation and the spillway elevation.

Summary of Investigation

The spillway is spalled on the crest and downstream face. This spalling is repairable by chipping the remaining material down to sound concrete and rebuilding the crest and wall to the original dimensions. The right side abutment wall has spalled areas that are repairable by chipping the remaining material down to sound concrete and rebuilding the wall to the original dimensions. Please note that in some situations, sound concrete is never found during the chipping process and walls may need to be replaced. The center divider wall is also spalled and eroded and can be repaired by removing the deteriorated concrete and reconstructing the wall to the original dimensions. The left side abutment wall is in serious structural condition.

The left side abutment wall has an extensive crack that is not repairable. This wall also has several leaks. These leaks were defined by the evidence of water leaking through the wall and freezing, leaving significant ice formations. This wall also probably had a downstream wing wall that failed and is no longer present. There was some evidence that the wing wall remains are partially buried in the downstream stream bank. While efforts to repair this wall could be made, total replacement is the only repair that will likely be permanent.

The impact slab also has deteriorated concrete as a result of years of wear, but this damage can be repaired by removing the spalled and weak material and constructing an overlay.

Cost of Repairs

An estimate of the cost of repairs as identified was made. The cost is approximately \$150,000, if no hidden defects are discovered during the excavation, spalled concrete repair, and demolition. The repair will also require the draining of the lake during construction. The lake will be lost for approximately one year. If there are fish in the lake, it will take another three years after restocking for fingerlings to reach a size that would allow them to be caught.

As the current DNR inspection report also requested a hydraulic evaluation, a preliminary hydraulic model was constructed. The results of this study are reported below and have an impact on repair costs.

The principal spillway system is capable of handling less than 20 percent of the PMF. As a low hazard structure, the DNR requires the spillway system to be capable of passing 50 percent. In order to accomplish this capability, the current 30 feet wide spillway need to be increased to 93 feet, or the dam needs to be raised approximately 15.5 feet. There are numerous combinations of these two dimensions that could be considered.

The cost of increasing the spillway to 93 feet is approximately \$650,000. The cost of raising the dam 15.5 feet is approximately \$1,000,000. Raising the dam by 15.5 feet must be carefully evaluated. Checking the relative elevations of home entry points in

comparison to a raised dam height was not part of this study. It is possible that an increased dam height could cause water to enter some homes during large storm events.

Another alternative is to repair the current spillway and armor the embankment to allow overtopping. The cost of armoring the embankment is approximately \$450,000.

Summary of Cost Alternatives and Recommendations

Cost to repair existing spillway - \$150,000 (Will not meet DNR 50% PMF criteria)

Cost to upgrade spillway by widening - \$650,000

Cost to upgrade system by raising the dam - \$1,000,000

Cost to upgrade the system by armoring the dam - \$600,000

All of the alternatives will result in a temporary loss of the lake for up to one year and loss of fishing, if allowed, for up to three years.

The Department of Natural Resources has taken an inconsistent approach to both public and private dam repairs in the past. Currently they are in the process of upgrading their dams, so at some point they most likely will take a more active approach to requiring private dams to be upgraded. However, low hazard dams most likely will remain a low priority as high and significant hazard dams pose a greater threat to the public.

Other factors to consider include the following:

The possibility that downstream development may some day cause a reclassification of your dam to a higher risk rating.

Choosing the do nothing alternative or the repair only alternative could subject you to future action by the DNR.

Electing one of the upgrades could become obsolete if the dam is reclassified in the future, requiring a higher spillway system rating.

The repair only cost estimate is based on what could be seen and hidden costs could increase the cost substantially. The repair only cost should be considered a minimum, not a maximum, cost.

Based on the visual investigation, the dam and spillway system do not appear to be in danger of imminent failure. However, that is no guarantee that failure could not happen immediately. Hidden defects or an intense storm event could result in failure.

We recommend that your organization begin a discussion with the DNR to determine

We recommend that your organization begin a discussion with the DNR to determine the extent of repairs or upgrading that are acceptable to them and a time frame for the work that meets the financial ability of your organization.

BASE RUN

EXISTING CONDITIONS

LINE	10.	1	2	3.	4	5.	6.	7.	8,	9.	10
1	10	HYDROL	LOGIC MOD	EL FOR 1	TRADERS PO	THE LAK	E				
2	10	USING	SCS METH	OD FOR I	OSS RATE	AND DIM	C ENSTANLE:	CC IMIT	HADBUCKY	bu	
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4	ID	****	ESTIMATI	NG % OF	PMP RUNOF	E DAU C	AM COMTO	ni watun	UT OVERT	202711244	
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11	JR	FLOW	.1	.2	.3	.4	.5	.6	-		
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13	KM		S POINT	LAKE R-H	OUR HYDRO	CDADU					
14	BA	1.63	0	Crate Offi	OON HIDRO	MBACII					
15	PB	27.05									
16	PC	0.0	.0280	.0660	.1170	.1813	.2699				
17	PC	.6786	.7219	.7652	.8017	.8381	.8724	.3585	.4440	.5294	.6040
18	PC	1.0		. 1 002	.0017	.0301	.0/24	.9067	.932B	.9589	.9795
19	LS	0	93								
20	UD	2.7									
21	KK	STA2									
22	KM		6-HR STO	HOOHT HE	CH LAKE						
23	AS	1	ELEV	100	OII LAKE						
24	SA	10	11	100	U						
25	SE	100	104.5			1.4					
26	SQ	0	32	87	153	207	005	***			
27	SE	100	100.5	101	101.5	227 102	305	385	465	544	619
28	SS	100	0	3.09		102	102.5	103	103.5	104	104.5
29	ST	104.5	300	3.09	1.5 1.5						
30	ZZ	104,5	300	5.03	1.5						

FLOOD HYDROGRAPH PACKAGE (HEC-1)
SEPTEMBER 1990
VERSION 4.0
RUN DATE 01/25/2008 TIME 13:30:39

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

HYDROLOGIC MODEL FOR TRADERS POINT LAKE USING SCS METHOD FOR LOSS RATE AND DIMENSIONLESS UNIT HYDROGRAPH

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HUFF 2ND QUARTILE DISTRIBUTION USED FOR 6 HOUR DURATION STORM
 10 IO
                 OUTPUT CONTROL VARIABLES
                       IPRNT
                                       4 PRINT CONTROL
0 PLOT CONTROL
                       IPLOT
                       OSCAL
                                      O. HYDROGRAPH PLOT SCALE
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                                      18 MINUTES IN COMPUTATION INTERVAL
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                                  1JAN 2
                                           STARTING DATE
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                                    0000
                                          STARTING TIME
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                      ICENT
                                      20
                                         CENTURY MARK
                  COMPUTATION INTERVAL
                                         74.70 HOURS
                        TOTAL TIME BASE
         ENGLISH UNITS
              DRAINAGE AREA
                                     SQUARE MILES
              PRECIPITATION DEPTH
              LENGTH, ELEVATION
                                     FEET
              FLOW
                                     CUBIC FEET PER SECOND
              STORAGE VOLUME
                                     ACRE-FEET
              SURFACE AREA
                                     ACRES
              TEMPERATURE
                                     DEGREES FAHRENHEIT
   JP
                MULTI-PLAN OPTION
                      NPLAN
                                       1 NUMBER OF PLANS
                MULTI-RATIO OPTION
                    RATIOS OF RUNOFF
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                                         .30
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                                                                                   .70
                                                                                              .80
                                                                                                        1.00
12 KK
                  STA1
                          TRADERS POINT LAKE 6-HOUR HYDROGRAPH
              SUBBASIN RUNOFF DATA
14 BA
                SUBBASIN CHARACTERISTICS
                       TAREA
                                    1.63 SUBBASIN AREA
                PRECIPITATION DATA
15 PB
                      STORM
                                   27.05 BASIN TOTAL PRECIPITATION
16 PI
                  INCREMENTAL PRECIPITATION PATTERN
                       -03
                                 .04
                                           . 05
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                                                                                                                     .02
19 LS
                SCS LOSS RATE
                                   .15 INITIAL ABSTRACTION
93.00 CURVE NUMBER
                      STRTL
                                     .00 PERCENT IMPERVIOUS AREA
                      RTIMP
20 UD
                SCS DIMENSIONLESS UNITGRAPH
                       TLAG
                                    2.70 LAG
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UNIT HYDROGRAPH
47 END-OF-PERIOD ORDINATES
144. 197. 238.
162. 132. 110.

						47 END-0	F-PERIOD	ORDINATES					
	5	9. 264.	30. 245.	58. 223.	95. 195.	144. 162.	197. 132.	238. 110.	264.	275.	275.		
	•	56.	48.	40.	34.	28.	24.	20.	92. 17.	77.	67. 12.		
		10.	9.	7.	6.	5.	4.	4.	3.	3.	2.		
		2.	2.	1.	1.	1.	0.	0.					
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21 KK	*	STA2											
	****	*******		E 6-HR STO	RM THROUGH	H LAKE							
	ŧ	IYDROGRAI	PH ROUTI	NG DATA									
23 AS		1	E ROUTIN VSTPS ITYP SVRIC X	1 ELEV 100.00	TYPE OF I	F SUBREACHE INITIAL CON CONDITION AND D COEF	DITION						
24 SA		Al	REA	10.0	11.0								
25 SE	45	ELEVAT	ton	100.00	104.50								
26 SQ		DISCHAF	RGE	0.	32.	87.	153.	227.	305.	385.	465.	544.	619.
27 SE		ELEVAT	NOI	100.00	100.50	101,00	101.50	102.00	102.50	103.00	103.50	104.00	104.50
28 SS		SPILLW/	CREL SPWID COOW EXPW	.00 .00	SPILLWAY SPILLWAY WEIR COEF EXPONENT	FICIENT	ATION						
29 ST			DAM FOPEL AMWID COOD EXPD	104.50 300.00 3.09 1.50	DAM WIDTH WEIR COEF	FICIENT	DAM						

					CO	MPUTED STO	RAGE - ELEV	ATION DATA	i				
	STOR ELEVAT		100.00	47.23 104.50									
					СОМРИТ	ED STORAGE	-OUTFLOW-	ELEVATION	DATA				
						(INCLUDING	FLOW OVE	R DAM)					
	STOR OUTF ELEVAT	LOW	.00 .00 100.00	5.03 32.00 100.50	10.11 87.00 101.00	15.25 153.00 101.50	20.44 227.00 102.00	305.00	385.00	36.35 465.00 103.50	544.00	47.23 619.00 104.50	

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIO t		APPLIED T RATIO 3		RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9 1.00
HYDROGRAPH AT	STA1	1.63	1	FLOW TIME	495. 5.10	991. 5.10	1486. 5.10	1981. 5.10	2477. 5.10	2972. 5.10	3467, 5.10	3963. 5.10	4953. 5.10
ROUTED TO	STA2	1.63	1	FLOW TIME	462. 6.00	988. 5.40	14B3 ₊ 5,40	1977. 5.40	2471. 5.40	2965. 5.40	3459. 5.40	3954. 5.10	4943. 5.10
			1	PEAK STAGE STAGE TIME	S IN FEET 103.48 6.00	104.97 5.40	105.36 5.40	105.68 5.40	105,96 5,40	106.22 5.40	106.46 5.40	106.69 5.10	107.12 5.10

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION STA2 (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL 100		SPILLWAY CRE 100.00 0.		OF DAM 104.50 47. 619.	
DITAR	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF	RESERVOIR	DEPTH	STORAGE	OUTFLOW	OVER TOP	MAX OUTFLOW	FAILURE
PMF	W.S.ELEV	OVER DAM	AC-FT	CFS	HOURS	HOURS	HOURS
.10	103.48	.00	36.	462.	.00	6.00	.00
,20	104.97	. 47	52+	989.	3.60	5.40	.00
.30	105.36	.86	57.	1483.	5.10	5.40	.00
.40	105.68	1.18	60.	1977.	6.30	5.40	.00
→ .50	105.96	1.46	64.	2471.	6.90	5.40	.00
.60	106.22	1.72	66.	2965.	7.50	5.40	.00
.70	106.46	1.96	69.	3459.	7.80	5.40	.00
.80	106.69	2.19	72.	3954.	8.10	5.10	.00
1,00	107.12	2.62	77.	4943.	8.70	5.10	.00

^{***} NORMAL END OF HEC-1 ***

EXPANDED SPILLWAY

LINE	10.	15	2 .	a.,	4.	5	6	7.	8	9	10
1	ID			EL FOR TE							
2	ID	USING :	SCS METH	IOD FOR LO	DSS RATE	AND DIME	NSIONLES	is unit f	(YDROGRAF	PH.	
3	ID										
4	ID			ING & OF F				OF MITHOR	IT OVERTO	OPPING***	***
. 5	ID	CHECKI	NG ONLY	6-HOUR ST	CORM WHI	CH CONTRO)LS				
6	10								_		
7	1D	HUFF 2	ND QUART	TILE DISTE	RIBUTION	USED FOR	6-HOUR	DURATION	STORM		
8	1D										
*** FREE ***											
9	11	18 (20/AL10	0	250			2000			
10	10	4									
11 ***	JR	FLOW	-52	.2	-3	.4	.5	.6	.7	.8	1.0
12	KK	STA1									
13	KM			LAKE 6-H	DUR HYDRO	DGRAPH					
14	BA	1.63	0								
15	PB	27.05									
16	PC	0.0	.0280	.0660	.1170	.1813	.2699	.3585	.4440	.5294	.6040
17	PC	.6786	.7219	.7652	.8017	.8381	.8724	.9067	.9328	.9589	.9795
18	PC	1.0									
19	LS	0	93								
20	UD	2.7									
21	кк	STA2									
22	KM	ROUTE (5-HA STO	ORM THROUG	SH LAKE						
23	RS	1	ELEV	100	0						
24	SA	10	11								
% 25	SE	100	104,5								
25	SQ	0	100	281	511	778	1075	1397	1740	2101	2478
27	SE	100	100.5	101	101.5	102	102.5	103	103.5	104	104.5
28	SS	100	0	3.09	1.5						
29	ST	104.5	300	3.09	1.5						
30	ZZ	,,,,,	000	2100	110						

**************************** FLOOD HYDROGRAPH PACKAGE (HEC-1) U.S. ARMY CORPS OF ENGINEERS SEPTEMBER 1990 HYDROLOGIC ENGINEERING CENTER VERSION 4.0 609 SECOND STREET DAVIS, CALIFORNIA 95616 RUN DATE 01/25/2008 TIME 13:37:10 * (916) 756-1104 ********* HYDROLOGIC MODEL FOR TRADERS POINT LAKE USING SCS METHOD FOR LOSS RATE AND DIMENSIONLESS UNIT HYDROGRAPH *****ESTIMATING % OF PMP RUNOFF DAM CAN CONTROL WITHOUT OVERTOPPING***** CHECKING ONLY 6-HOUR STORM WHICH CONTROLS HUFF 2ND QUARTILE DISTRIBUTION USED FOR 6-HOUR DURATION STORM 10 IO OUTPUT CONTROL VARIABLES 4 PRINT CONTROL O PLOT CONTROL IPANT IPLOT OSCAL O. HYDROGRAPH PLOT SCALE HYDROGRAPH TIME DATA IT MINUTES IN COMPUTATION INTERVAL NMIN 18 IDATE 1JAN 2 STARTING DATE ITIME 0000 STARTING TIME NUMBER OF HYDROGRAPH ORDINATES 250 NQ NDDATE ENDING DATE 4JAN 2 **NDTIME** 0242 ENDING TIME ICENT 20 CENTURY MARK COMPUTATION INTERVAL .30 HOURS 74.70 HOURS TOTAL TIME BASE ENGLISH UNITS DRAINAGE AREA PRECIPITATION DEPTH SQUARE MILES INCHES LENGTH, ELEVATION FEET FLOW CUBIC FEET PER SECOND STORAGE VOLUME ACRE-FEET SURFACE AREA ACRES TEMPERATURE DEGREES FAHRENHEIT JP MULTI-PLAN OPTION 1 NUMBER OF PLANS NPLAN JB MULTI-RATIO OPTION RATIOS OF RUNOFF .10 .20 .30 .40 .50 .60 1.00 .70 .80 *** *** *** *** *** *** *** *** *** *** *** *** *** 12 KK STA1 • TRADERS POINT LAKE 6-HOUR HYDROGRAPH SUBBASIN RUNOFF DATA 14 BA SUBBASIN CHARACTERISTICS 1.63 SUBBASIN AREA TAREA PRECIPITATION DATA 15 PB 27:05 BASIN TOTAL PRECIPITATION 16 PI INCREMENTAL PRECIPITATION PATTERN .07 .07 .03 .05 -06 .09 .09 .09 .09 .04 .04 .02 .04 .03 .03 .02 .03 .04 -03 19 LS SCS LOSS RATE STRTL .15 INITIAL ABSTRACTION CRVNBR 93.00 CURVE NUMBER RTIMP .00 PERCENT IMPERVIOUS AREA 20 UD SCS DIMENSIONLESS UNITGRAPH

**

TLAG

2.70 LAG

UNIT HYDROGRAPH

				47 END-0	F-PERIOD C	RDINATES					
	9. 30.	58,	95.	144.	197.	238.	264.	275.	275.		
	264. 245.	223.	195.	162.	132.	110.	92.	77.	67.		
	56. 48.	40.	34.	28.	24.	20.	17.	14.	12.		
	10. 9,	7.	6.	5.	4.	4,	Э.	3.	2.		
	2. 2.	1.	1.	1.	0.	0,-					
*** *** *** **		*** *** *	** *** ***	*** *** *	** *** ***	*** *** *		*** *** *		*** *** *	*** *** ***

21 KK	STA2										
£1. hh	JIMZ .										
**	*********										
	ROUT	E 6-HR STO	RM THROUGH	LAKE							
	HYDROGRAPH ROUTI	NG DATA									
		_									
23 AS	STORAGE ROUTIN				_						
	ITYP		NUMBER OF TYPE OF I								
	RSVRIC		INITIAL C		DITION						
	X		WORKING R		FICIENT						
24 SA	AREA	10.0	11.0								
05.05.4											
25 SE 🥌	ELEVATION	100.00	104.50								
26 SQ	DISCHARGE	0	100,	281.	511	778.	4075	1207	4740	5101	0.470
20 00	ptoniving	0.	100.	201.	311	775.	1075.	1397.	1740.	2101.	2478.
27 SE	ELEVATION	100.00	100.50	101.00	101.50	102.00	102.50	103.00	103.50	104,00	104.50
28 S S	SPILLWAY				. ====:						
	CREL SPWID		SPILLWAY		ATION						
	COOM		SPILLWAY WEIR COEF								
	EXPW		EXPONENT								
	EAT II	1.50	EXI OILEIT	OF BEAD							
29 ST	TOP OF DAM										
	TOPEL	104.50	ELEVATION	AT TOP OF	DAM						
	DAMWID	300.00	DAM WIDTH								
	COOD		WEIR COEF								
	EXPO	1.50	EXPONENT	OF HEAD							
			CO	APUTED STO	RAGE-ELEVA	TION DATA					
	RAGE .00	47.23									
ELEV	TION 100.00	104.50									
			0000017								
			COMPUT	EU STORAGE	-OUTPLOW-E	LEVATION D	AfA				
				(INCLUDING	FLOW DVER	DAMI					
						_, ,,,					
	RAGE .00	5.03	10.11	15.25	20.44	25.68	30.99	36.35	41.76	47.23	
	FLOW .00	100.00	281.00	511.00	778.00	1075.00	1397.00	1740.00	2101.00	2478.00	
ELEV	TION 100.00	100.50	101.00	101.50	102.00	102.50	103.00	103,50	104.00	104,50	

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	A	ATIO 1	RATIOS RATIO 2 .20	APPLIED T RATIO 3 .30		RATIO 5	RATIO 6	RATIO 7	B OITAR	RATIO 9 1.00
HYDROGRAPH AT +	STA1	1,63	;	FLOW TIME	495. 5.10	991. 5.10	1486. 5.10	1981. 5.10	2477. 5.10	2972. 5.10	3467. 5.10	3963. 5.10	4953. 5.10
ROUTED TO	STA2	1.63	1	FLOW TIME	490. 5.40	986. 5,40	1481.	1975. 5.40	2463. 5,40	2966. 5.40	3460. 5.40	3953. 5.40	4943. 5.10
			1	PEAK STAGES STAGE TIME	IN FEET 101.46 5.40	102.35 5.40	103.12 5.40	103.83 5.40	104.48 5.40	104.87 5.40	105.15 5.40	105.40 5.40	105.85 5.10

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION STA2 (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAH 1	ELEVATION STORAGE	INITIAL 100	.00	SPILLWAY CRI	EST TOP	OF DAM 104.50	
	OUTFLOW		0.	0.		47. 2478.	
OITAR	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF PMF	RESERVOIR W.S.ELEV	DEPTH OVER DAM	STORAGE AC-FT	OUTFLOW CFS	OVER TOP HOURS	MAX OUTFLOW HOURS	FAILURE HOURS
.10	101.46	.00	15.	490.	.00	5,40	.00
.20	102.35	.00	24.	986.	.00	5.40	.00
.30	103.12	.00	32.	1481.	.00	5.40	.00
.40	103.83	.00	40.	1975.	.00	5.40	.00
→.50	104.48	.00	47.	2463.	.00	5.40	.00
.60	104.87	.37	51.	2966.	2.40	5.40	.00
.70	105.15	-65	54.	3460.	3.60	5.40	.00
.80	105 + 40	.90	57.	3953.	4.50	5.40	.00
1.00	105.85	1.35	62.	4943.	5.40	5.10	,00

*** NORMAL END OF HEC-1 ***

RAISED DAM HEIGHT

LINE	10.	1.	2 .	3.	4	5	6	7	8.	9.	10
1	ID					INT LAKE					
2	ID	USING !	SCS METH	OD FOR L	DSS RATE	AND DIME	NSTONLES	S UNII E	TYDHUGHA	rH	
3	ID								e aucar		
4	10					F DAM CA		NT MILHOR	11 OAFHI	DPPING"	
5	ID	CHECKI	NG ONLY	6-HOUR S	LOUN MHT	CH CONTRO	LS				
6	IO										
7	ID	HUFF 2	ND QUART	ILE DIST	HIBUTION	USED FOR	6.HOUH	DUHATION	STORM		
8	ID										
*** FREE ***				_				0000			
9	IT		20NAL10	0	250			2000			
10	10	4		_	_				.7	.8	1.0
11	JA	FLOW	.1	.2	.3	.4	.5	.6	. /	.0	1.0
12	KK	STA1									
13	KM	TRADER	S POINT	LAKE 6-H	OUR HYDR	DGRAPH					
14	BA	1,63	0								
15	PB	27,05									
16	PC	0.0	.0280	.0660	.1170	.1813	.2699	.3585	.4440	.5294	-6040
17	PC	.6786	.7219	.7652	.8017	.8381	.8724	.9067	.9328	.9589	.9795
18	PC	1.0									
19	LS	0	93								
20	QU	2.7									
21	KK	STA2									
22	KM	ROUTE	6-HR STO	RM THROU	GH LAKE						
23	RS	1	ELEV	100	0						
24	SA	10	- 11	13	14						
25	SE	100	104.5	110	115						
26	SQ	0	32	87	153	227	305	385	465	544	619
27	SE	100	100.5	101	101.5	102	102.5	103	103.5	104	104.5
28	SS	100	0	3.09	1.5						
29	ST	116.5	300	3.09	1.5						
30	ZZ										

*************************** FLOOD HYDROGRAPH PACKAGE (HEC-1) U.S. ARMY CORPS OF ENGINEERS HYDROLOGIC ENGINEERING CENTER SEPTEMBER 1990 VERSION 4.0 609 SECOND STREET DAVIS, CALIFORNIA 95616 RUN DATE 01/25/2008 TIME 13:55:18 * (916) 756-1104 *********************** HYDROLOGIC MODEL FOR TRADERS POINT LAKE USING SCS METHOD FOR LOSS RATE AND DIMENSIONLESS UNIT HYDROGRAPH ******ESTIMATING % OF PMP RUNOFF DAM CAN CONTROL WITHOUT OVERTOPPING***** CHECKING ONLY 6-HOUR STORM WHICH CONTROLS HUFF 2ND QUARTILE DISTRIBUTION USED FOR 6-HOUR DURATION STORM 10 IO OUTPUT CONTROL VARIABLES 4 PRINT CONTROL
0 PLOT CONTROL IPRNT **IPLOT** O. HYDROGRAPH PLOT SCALE **OSCAL** HYDROGRAPH TIME DATA 17 NIMIN 18 MINUTES IN COMPUTATION INTERVAL IDATE IJAN 2 STARTING DATE STARTING TIME NUMBER OF HYDROGRAPH ORDINATES ITIME 0000 NO 250 NDDATE 4JAN 2 ENDING DATE NDTIME ENDING TIME **ICENT** 20 CENTURY MARK COMPUTATION INTERVAL .30 HOURS TOTAL TIME BASE 74.70 HOURS ENGLISH UNITS ORAINAGE AREA SQUARE MILES PRECIPITATION DEPTH INCHES LENGTH, ELEVATION FEET CUBIC FEET PER SECOND STORAGE VOLUME SURFACE AREA ACRE-FEET ACRES TEMPERATURE DEGREES FAHRENHEIT MULTI-PLAN OPTION JP 1 NUMBER OF PLANS NPLAN JR MULTI-RATIO OPTION RATIOS OF RUNOFF . 10 .20 .30 .40 .50 .60 .70 .80 1.00 12 KK STA1 TRADERS POINT LAKE 6-HOUR HYDROGRAPH SUBBASIN RUNOFF DATA SUBBASIN CHARACTERISTICS
TAREA 1.63 SUBBASIN AREA 14 BA

PRECIPITATION DATA

15 PB STORM 27.05 BASIN TOTAL PRECIPITATION

16 PI INCREMENTAL PRECIPITATION PATTERN

.07 .07 .03 .04 .05 .06 .09 .09 .09 .09 .04 .04 .04 .03 .03 .02 .02 .04 .03

19 LS SCS LOSS RATE

STRTL .15 INITIAL ABSTRACTION CRVNBR

93.00 CURVE NUMBER

.00 PERCENT IMPERVIOUS AREA RTIMP

20 UD SCS DIMENSIONLESS UNITGRAPH TLAG 2.70 LAG

UNIT HYDROGRAPH 47 END-OF-PERIOD ORDINATES

			9. 264. 56. 10. 2.	30. 245. 48. 9. 2.	58. 223. 40. 7.	95. 195. 34. 6.	144. 162. 28. 5.	197. 132. 24. 4. 0.	238. 110. 20. 4. 0.	264. 92. 17. 3.	275. 77. 14. 3.	275. 67. 12. 2.		
•••	•••	•••	***	*** *** ***	*** *** *	** *** **		** *** **		*** *** ***	*** *** *	** *** ***	*** *** **	

			•	*										
21	KK		* S	TA2 •										

				ROUT	E 6-HR STO	ORM THROUG	H LAKE							
			HYDRO	GRAPH ROUTI	NG DATA									
23	RS		STO	RAGE ROUTIN NSTPS ITYP RSVRIC X	1 ELEV 100.00	TYPE OF INITIAL	F SUBREACHE INITIAL CON CONDITION AND D COEF	DITION						
24	SA			AREA	10.0	11.0	13.0	14.0						
25	SE	$q^{\frac{1}{2}}$	ELE'	/ATION	100.00	104.50	110.00	115.00						
26	SQ		DIS	CHARGE	٥.	32.	87,	153.	227.	305.	385.	465.	544.	619.
27	SE		ELE	/ATION	100.00	100.50	101,00	101.50	102.00	102.50	103.00	103.50	104.00	104.50
28	SS		SPI	LLWAY CREL SPWID COOW EXPW	100.00 .00 .00	SPILLWAY	FFICIENT	'ATION						
29	ST		ТОР	OF DAM TOPEL DAMWID COOD EXPD	300.00 3.09	ELEVATIO DAM WIDT WEIR COE EXPONENT	FFICIENT	DAM						

						С	OMPUTED STO	RAGE - ELEV	ATION DATA	4				
		E	STORAGE LEVATION	.00 100 .00	47.23 104.50	113.16 110.00								
						сомри	TED STORAGE	-OUTFLOW-	ELEVATION	DATA				
							(INCLUDING	FLOW OVE	R DAM)					
		E	STORAGE OUTFLOW ELEVATION	.00 .00 100.00	5.03 32.00 100.50		153.00	20.44 227.00 102.00	305.00	385.00	36.35 465.00 103.50	544.00	47.23 619.00 104.50	
		E	STORAGE OUTFLOW ELEVATION	113.16 1444.00 110.00	180.64 2194.00 115.00									

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIO 1	RATIOS RATIO 2 .20	APPLIED T RATIO 3 .30	O FLOWS RATIO 4 -40	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9 1.00
HYDROGRAPH AT	STA1	1.63	1	FLOW TIME	495. 5.10	991. 5.10	1486. 5.10	1981. 5.10	2477. 5.10	2972. 5.10	3467. 5.10	3963. 5.10	4953. 5.10
AOUTED TO	STA2	1.63	1	FLOW TIME	462. 6.00	914. 6.00	1359. 6.30	1800. 6.30	2236. 6.30	2904. 5.70	3492. 5.10	3956. 5.40	4942. 5.40
			1	PEAK STAGE STAGE TIME	IN FEET 103.48 6.00	106.46 6.00	109.43 6.30	112.37 6.30	115.28 6.30	117.07 5.70	117.50 5.10	117.78 5.40	118.31 5.40

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION STA2 (PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1		ELEVATION STORAGE OUTFLOW	INITIAL 100	VALUE .00 D.	SPILLWAY CRE 100.00 0. 0.		OF DAM 116.50 202. 2419.	
	RATIO OF	MAXIMUM	MAXIMUM	MUMIXAM	MAXIMUM	DURATION	TIME OF	TIME OF
	PMF	RESERVOIR W.S.ELEV	DEPTH OVER DAM	STORAGE AC+FT	OUTFLOW CFS	OVER TOP HOURS	MAX OUTFLOW HOURS	FAILURE HOURS
	.10	103.48	.00	36.	462.	.00	6.00	.00
	.20	106.46	.00	70.	914,	.00	6.00	.00
	.30	109.43	.00	106.	1359.	.00	6.30	.00
	.40	112.37	.00	145,	1800.	.00	6.30	.00
	→ .50	115.28	.00	185.	2236.	.00	6.30	.00
	.60	117.07	.57	210.	2904.	1.80	5.70	.00
	.70	117.50	1,00	216.	3492.	3.00	5.10	.00
	.80	117.78	1.28	220.	3956.	3,60	5.40	.00
	1,00	118,31	1.81	228.	4942.	4.50	5.40	.00

*** NORMAL END OF HEC-1 ***

