

APPENDIX C

NAVIGATION DAM MODEL AND PROTOTYPE STUDY DATA

1. Introduction. The availability of data from Corps of Engineers hydraulic model and prototype investigations of navigation dams is summarized in Table C1. This information was obtained from a detailed review of 120 reports on model and prototype studies (1930 to 1984) by the St. Paul District, Bonneville Hydraulic Laboratory, and Waterways Experiment Station. These reports are listed in the accompanying bibliography. The organization and use of Table C1 are described in the following paragraphs. The data were not analyzed or evaluated with regard to quality, present design practice, etc.

2. Design and Operational Variables. A list of 221 hydraulic design and operational variables or significant features of navigation dams was derived from a review of such items in various designs of dams used at CE locks. This list is organized in an upstream-to-downstream order and has a numbering sequence for easier manipulation in a digital computer. The major divisions of the list include:

21000 UPSTREAM APPROACH
22000 CONTROL SILL
23000 GATES AND BULKHEADS
24000 STILLING BASIN (APRON)
25000 DOWNSTREAM CHANNEL

A listing of operational variables is included with each major division in Table C1 rather than in a separate division in order to group more closely the aspects of the dam operation with their related design features. The 20 "NOTED ITEMS" include special items peculiar to the specific projects and are identified in the notes at the end of Table C1.

3. Test Reports. Each column heading in Table C1 includes a very brief identification of the project and a brief notation of the report number (full title in the Bibliography to this Appendix). All of the 120 reports are available on loan from the WES Technical Library. The initial letter rather than number characters in the column numbers (A01 to B21) was used for easier identification in a digital configuration for computer file manipulation.

4. Types of Data in Reports. The types of performance data available in each report and pertaining specifically or generally to the various design and operational features investigated are indicated by the following letter symbols in Table C1:

T - time-related data

Q - discharge, including coefficients

U - stilling basin performance, flow regime, appearance

H - hawser force on tow

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- D - tow displacement, unrestrained by hawsers
- V - local velocities (surface, internal, bottom)
- C - surface currents, including vortices
- N - effects on navigation
- B - boils, or surface turbulence
- W - waves
- Y - water-surface elevation profile
- S - surges or oscillations
- I - internal flow pattern or flow distribution
- E - erosion pattern, profile or depth
- R - riprap performance (scour, stability)
- Z - local average piezometric pressures
- P - local transient or fluctuating pressures
- L - losses or differences (head, pressures)
- F - mechanical forces or torque
- A - vibration, bouncing
- X - other data (see last line of NOTED ITEMS at end of Table C1)

5. Comments. The following comments result from observations during the compilation of Table C1 and may be of interest and/or assistance to users searching for available test data pertinent to their design problems.

a. Consideration of both the design and operational variables of the feature under investigation, both more general and more specific identification of the variables, and related items or systems in Table C1 may aid in finding applicable data that might otherwise be missed.

b. The listing of operational variables at "division level" in Table C1 and the compilation process may have resulted in some inappropriate entries of types of data relative to design variables. This would most likely occur where a report table or illustration includes several kinds of design and operational variables.

c. Variables 24200 Apron, 25100 Channel, and 25121 Invert E1 were given data references for most of the citations involving spillway performance. Although there may not have been any design variations in the apron or

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channel, they are locations of primary interest for most aspects of spillway operation.

d. Studies of a few nonnavigation dams were included in the listings because of those projects' similarity to navigation dams in general design and/or operation. Some data on fishways and construction cofferdams were noted if such were included in the reports, but all available studies on these items were not reviewed.

6. Detailed Test Data Listings. The LINE NO'S correspond to those 221 numbers assigned to the design and operation variables. The TYPE OF DATA symbols correspond to those given in paragraph 4 above. The FORMAT symbols are :

T - numbered tables

P - numbered photographs

D - numbered drawings (plates)

F - numbered figures (covers all illustrations in St. Paul District reports)

W - text paragraphs (or pages if unnumbered paragraphs) containing information not indicated by the tables, photographs, drawings, or figures.

The LOCATION IN REPORT numbers and letters are those of the pertinent tables, photographs, drawings, figures, and/or paragraphs in that particular report.

7. In addition to the indicated tables, photographs, drawings, and/or figures having data pertinent to a specific design and/or operational variable, the user should refer to those parts of the text where these data items are discussed. The comment in subparagraph 5b above also applies to the detailed data listings. Also, variations in design and/or operational variables from table to table, photograph to photograph, etc., rather than in individual tables, photographs, etc., are covered by listings of all the related data item location numbers. The user should compare variables from item to item as well as in a single item.

8. A total of 20,067 location citations was derived from a total of 4,930 single- or combined-item references (tables, photographs, drawings, figures, text) in the 120 reports. The item location numbers are referenced in the Bibliography to Appendix C (A01, B01, etc.)

TABLE 1
 NAVIGATION DAM
 MODEL AND PROTOTYPE STUDY DATA

PAGE SEQUENCE FOR TABLE 1

DESIGN AND OPERATIONAL VARIABLES	TEST REPORT COLUMN NUMBERS					
	A01 TO A20	A21 TO A45	A46 TO A65	A66 TO A90	A91 TO B11	B12 TO B36
21000 TO 21990	1	2	3	4	5	6
22000 TO 22990	7	8	9	10	11	12
23000 TO 23990	13	14	15	16	17	18
24000 TO 24760	19	20	21	22	23	24
24900 TO 25400	25	26	27	28	29	30
25900 TO 25990 AND "NOTED ITEMS"	31	32	33	34	35	36
	FACING PAGES		FACING PAGES		FACING PAGES	

1. SELECT DESIGN AND/OR OPERATIONAL VARIABLE(S) OF INTEREST AND NOTE LINE NUMBER(S) (21000 TO 25990).
2. TRACE SELECTED LINE(S) ACROSS APPROPRIATE TABLES AND NOTE WHICH REPORTS (COLUMNS) CONTAIN TYPES OF DATA (T,Q,U, ETC.) OF INTEREST.
3. SEE LAST PAGES OF TABLE 1 FOR DESCRIPTIONS OF NOTED ITEMS AND X'S.
4. SEE BIBLIOGRAPHY FOR FULL TITLES OF REPORTS.
5. SEE WES MP HL _____ FOR DATA LOCATIONS WITHIN REPORTS.

EM 1110-2-1605
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DESIGN AND OPERATIONAL VARIABLES

① DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
21000 UPSTREAM APPROACH	Possum Kingdom Spillway TM 111-1	Possum Kingdom Submerged Bucket TM 111-2	Possum Kingdom Barries TM 111-3	St. Lucie Canal L&D TM 153-1	Sanlee River Spillway TM 168-1	Canton Spillway TM 190-1	Bluestone Barries TM 2-243	Memphis L&D TM 2-252	Morganza Floodway Concr. Structure TM 2-326	Jim Woodruff L&D TM 2-340	Cheatham Emergency Dam TM 2-358	Cheatham Spillway date TM 2-391	West Cumberland L&D TM 2-386	Gavin's Point Spillway TM 2-404	Old River L Sill Multi-Leaf Gates TR 2-447 Rpt 1	Old River L Sill Dmsr Ch Riprap TR 2-447 Rpt 2	Old River L Sill Spillway TR 2-447 Rpt 3	Old River O'bank Panel Gates TR 2-491	Old River Closure Dam TR 2-496	
21100 Channel				VC WE		QY				UVC WYI		QYL		QWCB WYI			IK BW			
21110 Direction						QUV CBY										UVB WER	VC			
21120 Shape						UVC BY		VC		VC										
21121 Invert El																				
21122 Width																				
21123 Side Slopes																				
21124 Bottom Slope																				
21130 Dikes										VC					VC BW					
21140 Noted Items																				
21200 Training Walls				C		QUV CBY			QWCB WYEZ					CB WY			UCB WY	C		
21300 Guide/Guard Walls									VC WH											
21400 Riprap																				
21410 Bottom																				
21420 Side																				
21430 Size																				R
21440 Thickness																				R
21450 Slope																				
21460 Noted Items																				
21500 Noted Items																				
21900 Operation																				
21910 Pool El				C		VCY	VC		VCN		QYL			VC BW			UCB WY	C		
21920 TW El				C					VCN								UCB WY			
21930 Type Flow																				
21931 Free/Submerged																				
21932 Gated/Uncontrolled																				
21933 Unit Discharge				C		VCY								VC BW						R
21940 Gate Schedule									VC											
21941 Single																		UC		
21942 Multiple																		UC BW UC		
21943 Locations																				
21950 Gate Opening									VCN											
21951 Uniform				C																
21952 Variable																				
21960 Gate Submergence																				
21970 Gate Speed																				
21980 Other Factors																				
21981 Ice/Debris																				
21982 Loose Barges																				
21983 Waves																				
21984 Power Discharge																				
21990 Noted Items																				

(2)	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45
	W F George LAD TR 2-519	Jackson LAD TR 2-531	Madame LAD TR 2-568	Meridian Gates & Spillway TR 2-566	Greenup Gates & Spillway TR 2-572	Columbia Gates & Spillway TR 2-578	Marwell/Opokiska Gates & Basins TR 2-579	New Cumberland Gates Basin TR 2-585	Fluk Island Spillway Basin TR 2-586	CAS Florida Proj Spillway TR 2-633	Millers Ferry Gates & Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overlook Embank TR 2-650	Arkansas R Dams Spillway TR 2-652 & 2-653	Ochs Spillway TR 2-657	Belleville Stilling Basin TR 2-687	Barkley Spillway TR 2-689	Camelton Spillway & Gates TR 2-710	Hannibal Spillway TR 2-731	W.C. Coker LAD TR 2-745	Hugo Spillway TR H-69-15	Copan Spillway TR H-70-09	Oakley Spillway TR H-70-13 & 2-800	Arkansas R Dams Gate Vibration TR H-71-05	Arkansas R Dams Spillway Gates TR H-72-15
21000	VC																								
21100	VC MY		VC			V		C							VCW YI		VCN				UVCB WYH	VC WS		VCW	
21110																									
21120																									
21121	C		QY							QY		QYZ	E										VC WS		
21122																									
21123																									
21124																									
21130																									
21140																	VC					CW			
21200	VC MY																					VC WS		QUVC BWR	VC BW
21300			VC																		Y				
21400																									
21410													QE RL												
21420																								R	
21430													QE RL QE RL												
21440																									
21450																									
21460																									
21500			X																						
21900																							CW		
21910	VC												QE RL QE RL			VC				VCN	VC		UVC BWR		
21920	VC																					VC			
21930																									
21931													QRL												
21932																									
21933													QE RL												
21940																									
21941																									
21942			VCX																						
21943			VCX																						
21950																						VCN		UVC BWR	
21951	VCY																								
21952			X																						
21960																									
21970																									
21980																									
21981			X																						
21982																									
21983																									
21984	VCY																								
21990																									

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③ DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																					
	A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60	A61	A62	A63	A64	A65		
21000 UPSTREAM APPROACH	Aliceville Spillway TR H-74-10 Goliath Spillway TR H-74-11 Old River L Sill TR H-76-15 Proto Vibration Operation TR H-77-02 Ozark Proto Spillway TR H-77-06 Red River L&D 1 Spillway TR H-77-13 Fern-Tow Canal Spillways #4B TR H-78-21 Barkley Proto Gate Viber TR HL-78-08 Grays Landing Spillway TR HL-81-13 Barkley Gate & Bulkhead TR HL-83-12 Baffle Piers Caviation MP 2-154 Navigation Dam MP 2-158 Wellhead MP 2-168 Vibrating Gates MP 2-168 Overflow Embankment MP 2-552 Vert Lift Gates Discharge MP 2-606 Spuy Tow Curves Pressaures MP 2-625 Sounding Rock Weir MP 2-524 Propeller Wash MP 2-524 Hend L Sub Dam MP H-69-01 Hend L Sub Dam MP H-69-01 Design Trends MP H-69-01 Baffle Piers Drag Forces MP H-70-04																					
21100 Channel			UCB WY	VC		VCY	UC BW			CBW												
21110 Direction																						
21120 Shape	VC											QYL										
21121 Invert El			B			QT			QTZ													
21122 Width																						
21123 Side Slopes																						
21124 Bottom Slope																						
21130 Dikes																						
21140 Noted Items							VCY															
21200 Training Walls			UCB WYA																			
21300 Guide/Guard Walls																						
21400 Riprap																						
21410 Bottom						R																
21420 Side																						
21430 Size				R													R		R			
21440 Thickness																			R			
21450 Slope																						
21460 Noted Items																						
21500 Noted Items																						
21900 Operation																						
21910 Pool El			A	V			UC BW															
21920 TW El			A	V		R																
21930 Type Flow																						
21931 Free/Submerged				V																		
21932 Gated/Uncontrolled						VR	UC BW															
21933 Unit Discharge																						
21940 Gate Schedule																						
21941 Single																						
21942 Multiple																						
21943 Locations																						
21950 Gate Opening				V		VR	UC BW															
21951 Uniform																						
21952 Variable																						
21960 Gate Submergence			A																			
21970 Gate Speed																						
21980 Other Factors																						
21981 Ice/Debris																						
21982 Loose Barges																						
21983 Waves																						
21984 Power Discharge																						
21990 Noted Items																						

5	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
21000	UPSTREAM APPROACH	Miss R LAD 20 Stillling Basin STP 24	Miss R LAD 7 Spy Culverts STP 29	Chanoine Wicketa Discharge Coef STP 30	Miss R 5-5A-8 Tainter Ct Coef STP 22	Miss R LAD 22 Stillling Basin STP 33	Roller Gate Stillling Basins STP 36	Sub Tainter Gate Coef & Basin STP 37	App A to STP 13 Roller Gate Coef STP 38	Miss R LAD 4 Tainter Ct & Basin STP 43	Miss R LAD 1 Spillway Apron STP 63	SAF Lower LAD Tnt Ct & Basin STP 69	Roller Gates Pressures STP 77	Bonneville Spillway Press BHL 3-1	Wary CCL LAD & T-race BHL 20-1	Wahay Spillway & Gates BHL 21-1	Ice Harbor Cffrums & T-race BHL 22-1	Ice Harbor Spillway BHL 31-1	The Dalles Spillway & Basin BHL 32-1	Bonneville Rea Stilll Basin BHL 65-1	John Day Spy & Duran Gap BHL 97-1
21100	Channel		C			VC			QVC YIL	QY					DVC YN	W	QVC YI				UE
21110	Direction																				
21120	Shape																	YV			
21121	Invert El							QYL										VC YI	QUB MYZ		
21122	Width																				
21123	Side Slopes																				
21124	Bottom Slope																				
21130	Dikes																	VC YI			
21140	Noted Items																				
21200	Training Walls								E												
21300	Guide/Guard Walls														DVC N						
21400	Riprap																				
21410	Bottom																				
21420	Side																				
21430	Size																				
21440	Thickness																				
21450	Slope																				
21460	Noted Items																				
21500	Noted Items																				
21900	Operation																				
21910	Pool El								QC YL						VCY		QVC YI			YZ	
21920	TW El								QC YL						VCY		VC YI				
21930	Type Flow																				
21931	Free/Submerged																				
21932	Gated/Uncontrolled																			Z	
21933	Unit Discharge																				
21940	Gate Schedule								QC YL									VC YI		Z	
21941	Single																				
21942	Multiple														DV CN						
21943	Locations																				
21950	Gate Opening						VC		QC YL								VC YI			Z	
21951	Uniform																				
21952	Variable																				
21960	Gate Submergence						VC														
21970	Gate Speed																				
21980	Other Factors																				
21981	Ice/Debris						V														
21982	Loose Barges														DV CN						
21983	Waves																				
21984	Power Discharge														DV CN		VC YI				
21990	Noted Items																				

6	BL2	BL3	BL4	BL5	BL6	BL7	BL8	BL9	B20	B21
	Cover Monumenta Spillway & Basin BHL 104-	Little Goose Spillway & Basin BHL 114-	Bonneville Gate Lip Mod BHL 136-	Allegheny L&D 9 Spy & Channel CIT 449	Wicket Gate Operating Forces CIT 449	Bluestone Raffle Pier Cav CIT B57R	Bonneville Raffle Pier Cav CIT B6C	Tuscaloosa Stilling Basin CIT T8	Gallipolis Channel & Spwy CIT C35F	Gallipolis Lock Currents BDC35R
21000										
21100	CW	VCW YI		UDVC BWN					DV CN	VC NX
21110										
21120		VC WI								
21121										
21122										
21123										
21124										
21130				DV CN					DV CN	
21140									DV CN	
21200										
21300				DCN					DV CN	VC NX
21400										
21410										
21420										
21430										
21440										
21450										
21460										
21500		VC WI								
21900										
21910				VCN					DV CN	VC NX
21920				CN						VC NX
21930										
21931										
21932										
21933										
21940		VC WI								VC NX
21941										
21942										
21943										
21950									DV CN	VC NX
21951										
21952										
21960										
21970										
21980										
21981										
21982										
21983										
21984										VC NX
21990										

7	PROJECT AND REPORT	DESIGN AND OPERATIONAL VARIABLES																			
		A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
22000	CONTROL SILL	Q																			
22100	Crest El					YZ															
22200	Sill Shape												QYL								
22210	Upstream Face																				
22211	Shape																				
22212	Slope																				
22220	Top Width																				
22230	Downstream Face																				
22231	Shape					VC															
22232	Slope					YE															
22233	Chute																				
22240	Noted Items																				
22300	Net Length																				
22400	Gate Bays					Y															
22410	Number																				
22420	Width																				
22500	Piers																				
22510	Width																				
22520	Height																				
22530	Upstream Length																				
22540	Nose Shape																				
22600	Navigable Pass																				
22700	Cofferdams																				
22800	Noted Items																				
22900	Operation																				
22910	Pool El	Q				YZ															
22920	TK El																				
22930	Type Flow																				
22931	Free/Submerged					Y															
22932	Gated/Uncontrolled																				
22933	Unit Discharge																				
22940	Gate Schedule																				
22941	Single																				
22942	Multiple					Y															
22943	Locations																				
22950	Gate Opening																				
22951	Uniform																				
22952	Variable																				
22960	Gate Submergence																				
22970	Gate Speed																				
22980	Other Factors																				
22981	Ice/Debris																				
22982	Loose Barges																				
22983	Waves																				
22984	Power Discharge																				
22990	Noted Items																				

	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	
22000	VC	W F George LAD TR 2-519	Jackson LAD TR 2-531	Dardanelle LAD TR 2-558	Markiano Gates & Spillway TR 2-560	Gates & Spillway TR 2-572	Columbia Gates & Spillway TR 2-578	Maxwell/Opekiska Gates & Basins TR 2-579	New Cumberland Gates & Basin TR 2-595	Pike Island Stilling Basin TR 2-598	US Florida Proj Stilling Basin TR 2-633	Millers Ferry Gates & Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overflow Embank TR 2-650	Arkansas R Dams Lo-Head Spillway TR 2-652 & App A	Belleville Stilling Basin TR 2-687	Barkley Spillway TR 2-689	Cannelton Spillway & Gates TR 2-710	Hannibal Spillway TR 2-731	Hugo Spillway TR 2-745	Copan Spillway TR H-70-09	Oakley Spillway TR H-70-13 & App	Arkansas R Dams Gate Vibration TR H-71-05	Miss R LAD 15 Spillway Gates TR H-72-05		
22100		QV YI	QB YI	UBV	UBW					QUB YI		QUB YI	QUB YI	QUB YI												
22200	QUVCW YIEZ		QUVM YIZ	QYL	QY	QUVBW YIZP	QY	UVB YI	QY				QUVM YERL	QUVM YERL							QY	QUV CY			QWY	
22210																										
22211																										
22212												QYZ														
22220																										
22230				UVZ PAX														QY								
22231						UVBW YIER		UV BW			QUV BY	QYZ		QUVBW YERL												
22232		US																								
22233																										
22240	QV CY	US		Z									QUVBW YERL								QY					
22300																										
22400																										
22410																										
22420																										
22500				QUVM YIZ								QYZ									QY	QUY ZP		QY		WY
22510	QY																									
22520																										
22530																										
22540				QB YI										Q												
22600																										
22700	QV CY																									
22800					VC																					
22900																										
22910	QUVCW YIEZ	QY	QUVM YIZ	QYL		QV YI				QY	QU YI	QYZ	QUVBW YERL	QUV YI	QY			QY	QY	QVC YZ	QUY ZP	QY	QY		QWY	
22920	QUVCW YIEZ	QY	QUVM YIZ	QYL		QV YI	QY	QY	QY	QY	QU YI		QUVBW YERL	QUV YI	QY			QY	QY	?	QUY ZP	QY				
22930																										
22931	QY	QY	QUVM YIZ	QYL		QV YI	QY	QY	QY	QY	QU YI		QUVBW YERL	QUV YI	QY			QY	QY	Z	QUY ZP				QY	
22932		QY	QUVM YIZ	QYL		QV YI	QY	QY	QY	QY	QU YI		QUVBW YERL	QUV YI	QY			QY	QY		QUY ZP					
22933	QUVM YIEZ		QY			QV YI	QY						QUVBW YERL	QUV YI	QY			QY	QY							
22940																										
22941																										
22942																										
22943																										
22950				Z		QY ZP	QY		QY	QY	QU YI	Z		QUV YI	QY			QY								
22951	QYZ	QY																								
22952																										
22960				Z																						
22970																										
22980																										
22981																										
22982																										
22983																										
22984																										

(10)	A56	A67	A68	A69	A70	A71	A72	A73	A74	A75	A76	A77	A78	A79	A80	A81	A82	A83	A84	A85	A86	A87	A88	A89	A90		
	Spillway Exit Ch Bottom Shape Tributaries CE Project Data MP H-72-07 Spillway Nappe Upper Surface MP H-73-04 Spillway Crest Design Profile MP H-73-05 Spillway Chute Flow Surface MP H-76-19 Old River O'bank Channel MP H-80-01 Low-Dee Crest Pressure Fluct CR H-71-01 Ohio R LAD 37 Spillway Paper D RR Embankment Flow Erosion Paper R St. Lucie Canal Spillways Paper H Spillway River Submerged Sills Paper 16 Hastings Spillway STP 01 Sand Dams Offlow Discharge STP 02 Kiskadehitas 2 Spillway & Chnl STP 03 Beardsley Dam Paper Siting STP 04 Marinet LAD STP 05 Miss R LAD 15 Dam & Spillway STP 07 App A to STP 07 Model vs Proto STP 09 Monongahela 4 Street & Basin STP 12 Roller Gates Discharge Coef STP 13 Montgomery 15 Channel & Spwy STP 14 Winfield Channel & Spwy STP 15 Miss R 5-5A-B Roller Ot Coef STP 17 Chute & Cofferdam STP 20 Prioravla Grange Wicket Discharge STP 23																										
22000																											
22100		X	Q	QY																							
22200	UB NE	X	Y		QY		QY	QY																			
22210		X																									
22211				QY																							
22212			Q	Y	QY																						
22220																											
22230		X						UBWY IZP																			
22231				Y																							
22232																											
22233				WY																							
22240		X		WY	QY																						
22300				QY				QY																			
22400																											
22410								QY																			
22420																											
22500																											
22510																											
22520																											
22530																											
22540																											
22550																											
22700																											
22800	TUB NE																										
22900																											
22910			QY		QWY	QY		QUBW YIZP	QY	TUVB WYR		VYL		QUB WYL	QYL		QVC YNL		QUVW YZLX		QYL				VC YL	QV YI	
22920								UBW YIP	QY	TUVB WYR		VYL		QUB WYL	QYL		QUB WYL		QUVW YZLX		QYL	Z			VC YL	QV YI	
22930																											
22931																											
22932																											
22933					WY	QY		QUBW YIZP				VYL		QUB WYL		UBWY				QUVW YZLX							
22940																											QV YI
22941																											
22942																											CE
22943																											
22950																											Z
22951																											
22952																											
22960																											
22970																											
22980																											
22981																											
22982																											
22983																											
22984																											
22990								P																			YL

(11)	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
22000	CONTROL SILL	QYL																			QYZ
22100	Crest El							QYL													UVBW YIE
22200	Sill Shape							QYL													
22210	Upstream Face																	YZ			
22211	Shape														QY ZP				QUB WYZ		
22212	Slope																				
22220	Top Width												YZ								
22230	Downstream Face																				
22231	Shape					FUVB WIE									QY ZP						
22232	Slope																				
22233	Chute																		QUB WYZ		
22240	Noted Items																				UVBW YIE
22300	Net Length									QVC YEL											
22400	Gate Bays														CB MY			UB MY			UVC WIE
22410	Number																				
22420	Width							QY	QY												QY
22500	Piers			QYL			Y								QCBW YEP			QY	YZ		CW
22510	Width																				
22520	Height																				
22530	Upstream Length				QY																QYZ
22540	Nose Shape							QYL											UBW YZ		QYZ
22600	Navigable Pass																				
22700	Cofferdams													VQY				QVCW YIE			
22800	Noted Items		QUB WYE				E			QVC YIL					Z						QYZ
22900	Operation																				
22910	Pool El	QYL	QY		QYL		Z	Z		QYL	QY	UWY	ZX		VY	QCB MYZ	VQW YI	QUB WYZ	QYZ		QUVY IEZ
22920	TW El	QYL	QY		QYL		QYZ	Z		QYL		UWY	ZX		VY	Z	VQW YI	YZ			UV IE
22930	Type Flow						Z	Z													
22931	Free/Submerged		QY																		
22932	Gated/Uncontrolled														CBW YZ			Z		QYZ	
22933	Unit Discharge																				
22940	Gate Schedule														CBW YZ	VC YI	YZ	Z			YZ
22941	Single																				
22942	Multiple																				
22943	Locations																				
22950	Gate Opening						VZ	Z				UWY ZX	ZX	YZ		CBW YZ		Z	Z		QYZ
22951	Uniform																				
22952	Variable																				
22960	Gate Submergence						VZ	Z				UM YZ	Z								
22970	Gate Speed																				
22980	Other Factors																				
22981	Ice/Debris						V														
22982	Loose Barges																				
22983	Waves																				
22984	Power Discharge																				VC YI
22990	Noted Items													YZX		CBW YZ					

13	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
	23000 GATES AND BULKHEADS	Possum Kingdom Spillway TM 111-1	Possum Kingdom Submerged Bucket TM 111-2	Possum Kingdom Baffles TM 111-3	St. Lucie Canal LAD TM 153-1	Santee River Spillway TM 168-1	Canton Spillway TM 190-1	Buiesstone TM 198	DeWapolls LAD TM 2-252	Morganza Floodway Contr. Structure TM 2-326	Jim Woodruff LAD TM 2-340	Cheatham Emergency Dam TM 2-556	Cheatham Spillway Gate TM 2-387	New Cumberland LAD TM 2-386	Gavin's Point Spillway TM 2-404	Old River L. Sill Multi-Leaf Gates TR 2-447 Bpt 1	Old River L. Sill Instr. Ch Riprap TR 2-447 Bpt 2	Old River L. Sill Control Structure TR 2-447 Bpt 3	Warrior Spillway TR 2-485	Old River O bank Panel Gates TR 2-491	Old River Closure Dam TR 2-496
	23100 Type				Q						QUW YIX			QYV		UBW			QUW YIF		
	23200 Shape											CB MF	QUBW EZF			I					
	23210 Height															FA					
	23220 Radius						QY														
	23230 Tilt																				
	23240 Lip						QY									FA					
	23300 Location on Sill																				
	23400 Weight																				
	23500 Hoist												F			FA				F	
	23600 Emergency Closure										CB MF					FA			YV		
	23700 Noted Items			Q									FX			FA					
	23900 Operation																				
	23910 Pool El			Q		QY							F	QY		FA				F	
	23920 TW El									QUW YIX QUX	F	QE ZF	QY		FA				QUW YIF	F	
	23930 Type Flow								CBW	UW YI		QE FX	QY		FA				QY	UP	
	23931 Free/Submerged														FA						
	23932 Gated/Uncontrolled														FA						
	23933 Unit Discharge									UW YI QUX			QY								
	23940 Gate Schedule																				
	23941 Single														FA					F	
	23942 Multiple			Q											FA					F	
	23943 Locations										F				FA					F	
	23950 Gate Opening									QUW YIX		QEZ FX	QY		I				QUW YIF		
	23951 Uniform			Q		QY									FA						
	23952 Variable																				
	23960 Gate Submergence														QEZ FX		FA		YV		
	23970 Gate Speed																				
	23980 Other Factors																				
	23981 Ice/Debris																				
	23982 Loose Barges																				
	23983 Waves																				
	23984 Power Discharge																				
	23990 Noted Items																				

(14)	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45
	V George LAD TR 2-519	JACKSON LAD TR 2-531	Bardanelle LAD TR 2-558	Markland Gates & Spillway TR 2-566	Greenup Gates & Spillway TR 2-572	Columbia Spillway TR 2-578	Maxwell/Cockins Gates & Basins TR 2-579	New Cumberland Gates & Basin TR 2-585	Pike Island Stilling Basin TR 2-586	CAS Florida Pro Spillway TR 2-593	Hilberg Ferry Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overflow Embank TR 2-650	Arkansas R Dams Lo-Head Spillway TR 2-655 & App. A	Dane Spillway TR 2-657	Reynolds Spilling Basin TR 2-688	Bankley Spillway TR 2-689	Cannellor Spillway & Gates TR 2-710	Hambel Spillway TR 2-731	Holt LAD TR 2-745	Copan Spillway TR H-69-5	Copan Spillway TR H-70-9	Oakley Spillway TR H-70-3 & App	Arkansas R Dams Gate Vibration TR H-71-05	Mass R LAD 15 Spillway & Gates TR H-72-13-15
23100	QYZ	QYV	QUVW XIZ	UBW	QY	QY		QYV YFA	QY	QUB WY	QY			QYV				UB WX YV							
23100				QUVYZ PFAX F	QY FA																				
23200							QY																		
23210																									
23220																									QUW YFA
23230																									
23240				ZP AX	F																				A
23300																									
23400																									
23500				FA	FA			FA																	
23600					FA			CF																	
23700				AX	F																				UW FA
23900																			QU VY						
23910	QYZ	QY	UVW YI	ZFA	FA	QY		FA		QUB WY	QY			QUY				QY			QUY		QY	A	QY
23920	QY	QUV WYI	QYZ FA	QY FA	QY	QY	QY	QY FA	QY	QUB WY	QY			QUY				QY	QY		QUY		W	A	UW FAX
23930																									
23931	QYV	QUV WYI	QYZ PFA		QY	QY	QY	QY	QY	QUB WY	QY			QUY				QY	QY		QUY				
23932	QY	UVW YI	QY							QUB WY	QY							QY	QY						
23933	Z	QY											W YR												
23940	V																								
23941																									
23942					F			F																	
23943								F																	
23950	V		QYZP FAX	QY FA	QYX	QY	QY	QCY FA	QY	QUB WY	QY			QUY				QY			QUY		QY	A	QUY FAX
23951	QYZ	QY																							
23952																									
23960			QYZP FAX	QY FA				QCY FA																	
23970																									
23980																									
23981						X																			X
23982																									
23983																									
23984																									
23990				F																					

15 DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																					
	A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60	A61	A62	A63	A64	A65		
23000 GATES AND BULKHEADS	Altoeville Spillway TR H-74-10	Columbus Spillway TR H-74-11	Old River L Sill Proto Vibration TR H-76-15	Old River L Sill One-Water L Sill TR H-77-02	Orank Proto Spillway TR H-77-06	Red River L&D 1 Spillway TR H-77-13	Tenn-Tom Canal Spillways A&B TR H-78-2	Barkley Proto Gate, Vibration TR H-78-08	Grading TR H-78-09	Spillway TR H-81-13	Barkley Gate & Bulkhead TR H-83-2	Baffle Piers Cavitation MP 2-154	Navigation Dam Sweelhead TR H-83-2	Spillway Gates Vibration MP 2-188	Overflow Embankment Riprap MP 2-552	Vert. Lift Gates Discharge MP 2-506	Slopy Tow Curves Pressures MP 2-525	Somergo Rock Weir MP 2-525	Rocky Wash MP 2-521	Rock L Sub Dams Riprap Cover MP H-68-01	Baffled Basins Design Trends MP H-59-01	Baffle Piers Drag Forces MP H-70-01
23100 Type																						
23200 Shape							QUC BMY							ZPA								
23210 Height						V	UBW															
23220 Radius																						
23230 Tilt																						
23240 Lip								PA		SF					Q							
23300 Location on Sill																QT						
23400 Weight																						
23500 Hoist			PX	F						SFA												
23600 Emergency Closure										CBW FA				A								
23700 Noted Items		PX	QUV MYZ							SF				IA								
23900 Operation																						
23910 Pool El			FA	QYF		QY	QUC BMY			CBW FA				A		QY						
23920 TW El			FA	QYF		QY	UC SW			CBW SFA				A								
23930 Type Flow																						
23931 Free/Submerged				QYF	Q	QY				CBW SFA												
23932 Gated/Uncontrolled				QY	Q		UC BW								Y							
23933 Unit Discharge																						
23940 Gate Schedule																						
23941 Single							QCY															
23942 Multiple																						
23943 Locations																						
23950 Gate Opening			FA	QYF	Q	QY	QUC BMY	FA		SFA				ZPA		QY						
23951 Uniform																						
23952 Variable																						
23960 Gate Submergence			FA	F				PA		CBW SFA				I2P AX								
23970 Gate Speed										FA												
23980 Other Factors																						
23981 Ice/Debris																						
23982 Loose Barges																						
23983 Waves																						
23984 Power Discharge																						
23990 Noted Items										FA												

17	PROJECT AND REPORT	DESIGN AND OPERATIONAL VARIABLES																			
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
23000	GATES AND BULKHEADS	Miss R LID 20 Stilling Basin STP 24 UY	Miss R LID 7 Spwy Culverts STP 29 WYX	Chanoine Wickets Discharge Coef STP 30 QV	Miss R 5-5A-8 Water Ct Coef STP 31 YL	Miss R LID 22 Stilling Basin STP 33 UBW	Roller Gate Stilling Basins STP 36 TQY	Sub Tainter Gate Coef & Basin STP 37 QYL	APP A to STP 13 Roller Gate Coef STP 39 QUB	Miss R LID 4 Stilling Basin STP 53 QYL	Miss R LID 1 Spillway Apron STP 63 WYX	SAF Lower L&D Tnter Ct & Basin STP 69 QUB	Roller Gates Pressures STP 77 ZFX	Bonneville Spillway Press BHL 3-1 Z	McNary Ct Race & T-race BHL 20-1 W	Spillway & Gates BHL 21-1 CBW	Ice Harbor Ctforms & T-race BHL 22-1 QY	Ice Harbor Spillway BHL 31-1 QY	The Dalles Spillway & Basin BHL 32-1 QY	Beav Spillway Rev Stilling Basin BHL 65-1 QY	John Day Spwy & Overan Gap BHL 97-1
23100	Type																				
23200	Shape						QYZ	QYV WYXZL					ZFX								
23210	Height																				
23220	Radius				E			QV													
23230	Tilt							QYL													
23240	Lip															YI					
23300	Location on Sill												YZ			QY					
23400	Weight																				
23500	Moist				ZF	TE ZF	ZF		VZF							F					
23600	Emergency Closure																				
23700	Noted Items			QUB WYX				TUVY EZF				Z			QY						
23900	Operation																				
23910	Pool El	QU YL	QYX	QV YL	UY ZL	UYZ	QY ZL	QUBW YLX	Y		QU WY	ZX					QY	QY	QY		
23920	TW El	QUT	QYX	QV YL	UBW YZL	QYZ	QZ LP	QYV LX	ZF		UBW YZ	ZX									
23930	Type Flow																				
23931	Free/Submerged	QYL		QYL	UBW YZL	ZF	QYZ LP	U	QYV ZF												
23932	Gated/Uncontrolled																				
23933	Unit Discharge																				
23940	Gate Schedule														W		QY	X	QY		
23941	Single																				
23942	Multiple		QYX																		
23943	Locations																				
23950	Gate Opening	QU YL	QYX	QUVB WYL	ZF	QY ZF	QUY ZLP	QU YL	QYV ZF		QUW YZ	ZFX	YZ		QF		QY	QYX	QY		
23951	Uniform																				
23952	Variable																				
23960	Gate Submergence			QUB WY	ZF	QY ZF	QUY ZLP	QUY LX	Y		QUW YZ	Z									
23970	Gate Speed																				
23980	Other Factors																				
23981	Ice/Debris				ZF		ZF											X			
23982	Loose Barges																				
23983	Waves																				
23984	Power Discharge				ZF		ZF						YZ		QWF						
23990	Noted Items																				

19	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
	24000 STILLING BASIN (APRON)	U																			
	24100 Type		UB WE																		
	24120																				
	24140																				
	24200 Apron				UVCB WYE	TUVCB WYIEZ	VE	QUVBW YIEZP		CBW	UVB WYI		UBW EF	UVB WYE	TUVCB WYIEZ	UBW	UBW	UC BW	UWV YI	U	
	24210 Invert El	UVBW IE					QUVBW YIEZ		UVB WYI					E	VIR				VE	UWV YIE	
	24220 Length	UVBW IE		VC YE			QUVBW YIEZ		UVB WYI	V	UVW YI		QUVY IEZP	UVW YE	VIE				VE		
	24230 Width																				
	24240 Slope	UVBW IE					QVY IEZ				QUVB WYI										
	24250 Noted Items																				
	24300 End Sill	UVBW IE		E	UVCB WYE	TUVCB WYIEZ	QUVBW YIEZP	QUVBW YIEZP		CBW				UVB WYE	V						
	24310 Shape																				
	24320 Height			E					UVB WYI				QUVY IEZP		UVB WIE		ER	VE			
	24330 Noted Items							UVBW YI	UB WY												
	24400 Baffles			YBW IE	UVCB WYE	TUVCB WYIEZ	QUVBW YIEZP	QUVBW YIEZP		VCB WE				UVB WYE	VIE					UWV YI	
	24410 Shape																			VE	
	24411 Height																			UWV YIE	
	24412 Width																			VE	
	24413 Spacing			BWB																UWV YIE	
	24420 Row(s)																			VE	
	24421 Number																			UWV YIE	UV BW
	24422 Location														VIE					UWV YIE	UV BW
	24430 Noted Items							Z													
	24500 Pier Extensions					UVCB WYIEZ			VCN				QZP				UBW				
	24510 Height																				
	24520 Length																				
	24530 Noted Items																				
	24600 Training Walls	UVBW IE		VBW IE		VIE	VE			QVCB WYE				URW				UCB WY	VE		
	24610 Height																			C	
	24620 Length																				
	24630 Noted Items																				
	24700 Riprap																				
	24710 Bottom					UVCB WIE											ER				
	24720 Side																				
	24730 Size																				R
	24740 Thickness																				
	24750 Slope																				R
	24760 Noted Items																				
	(Continued)																				

(20)	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45
	W F George LAD TR 2-515	Jackson LAD	Dardanelle LAD TR 2-531	Parkland Spillway TR 2-556	Gates & Spillway Gates & Spillway TR 2-572	Columbia Gates & Spillway TR 2-578	Maxwell/Opakiska Gates & Basins TR 2-579	New Cumberland Gates & Basin TR 2-585	Wake Island Stilling Basin TR 2-586	CAS Florida Proj Spillway TR 2-633	Millers Ferry Gates & Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overflow Embank TR 2-650	Arkansas R Dams Lock Spillway TR 2-655 & APP A	Opakiska Spillway TR 2-657	Belleville Stilling Basin TR 2-687	Barkley Spillway TR 2-689	Cannelton Spillway & Gates TR 2-710	Samibal Spillway TR 2-731	Holt LAD TR 2-745	Hugo Spillway TR H-69-15	Copan Spillway TR H-70-09	Oakley Spillway TR H-70-13 & APP B	Miss R 146-15 Spillway & Gates TR H-73-15	
24000																									
24100		UWV YI																							
24120																									
24140																									
24200	UWVY IEZ	UWV YIE	UVB WYI	UVB WE	UV BW	UVB WYI	UVB WY	UVB WY	UV BW	UBW	UBW		UBW	UVB YERZ	QUV WYI	UVB WYR	UWV YI	UVB WY	UV BW	UVCP WYI	UVCB WYI	UVB WYI	QUVC BWY		VI
24210	UWVY IEZ	UWV YIE	UVB WYI	UV						QY	UV			QUVB WRZ	UV BW					UV WYI	UVB WYI				UBW
24220	UWVY IEZ										UV			UVB YERZ	UV	U	ER	UV				UVW YI	QUVC BWYR		UB WY
24230											UV														
24240																									
24250																									
24300			UWV YI	UVE	UV	ZP	UVB WY	UVB WY	V					UBW YER	QUV WYI	UVB WYR	U	UVB WE		UBW	UVW YI	UVW YI	UBW YR		UB WY
24310			UVB WYI																						
24320		U	UVB WYI	UE							UV			UV BW											
24330																									
24400				UVE	UV		UVB WY	UVB WY	V					UBW YER	QUV WYI	UVB WYR		UVB WE				UVW YI	UB WY		UBW
24410																									
24411				VB				U															QUVC BWYR		
24412																									
24413																									
24420																									
24421				VB																					
24422				VB				U	UBW																
24430																									
24500		U												UBW ER				X		UB WR					
24510																									
24520																									UB WY
24530																									
24600															UWV YI		C			UB WR	UBW				
24610	VI																					VCY			
24620	YY																						UWV YI		
24630																						VCY			
24700						VR									UBWR										
24710														QUVBW YERL		R			UB WR	UB WR		R			R
24720																									
24730														QVWY ERL	UBR									R	R
24740														QVWY ERL											R
24750														R										R	
24760																									R
(Continued)																									

(22)	A66	A67	A68	A69	A70	A71	A72	A73	A74	A75	A76	A77	A78	A79	A80	A81	A82	A83	A84	A85	A86	A87	A88	A89	A90
	Spillway Exit Ch Bottom Shape MP H-71-05	Tainter Gates CE Project Data MP H-72-07	Spillway Nappe Upper Surface MP H-73-04	Spillway Crest Design Profile MP H-73-05	Spillway Chute Profile MP H-76-19	Old River O/bank Outlet Channel MP HL-80-05	Low-Ogee Crest Pressure Fluct CR H-71-01	Ohio R LAD 37 Spillway Paper D	RR Embankment O Flow Erosion Spillways Paper 14	Upper R. Canal Spillways Paper 14	St. Clair River Submerged Sills Paper 16	Haatings Spillway STP 01	Sand Dams O Flow Discharge STP 02	Kiskimintas 2 Spillway & Chnu. STP 03	Beasap Dam Chamber Siltling STP 04	Marmet LAD STP 05	Miss R LAD 15 Dam & Spillway STP 07	App A to STP 07 Model vs Photo STP 09	Pomonaquia 4 Cops & Basin STP 12	Roller Gates Discharge Coef STP 13	Montgomery Is Channel & Spwy STP 14	Winfield Channel & Spwy STP 15	Miss R 5-5A-8 Roller CC Coef STP 16	Miss R LAD 26 Chnl & Cofferdam STP 20	Peoria La Grange Micket Discharge STP 23
24000																									
24100	TUB WE	X								TUB WER															
24120																									
24140																									
24200	UBW	X					UBWY IZP		TUVB WYER			UVVY IER				UBW YIE	UB WY	QVVB WYIEZ X	UC BW			UBW FR	QVW WYE	UVVB WYIE	UBW
24210												UVW YI				UBW YE						TUB WE	QVW WYE	TUVB WYIE	
24220										TUB WER						UBW YE									
24230																									
24240																									
24250																									
24300		X								TUB WER		VI				UBW YE						QVW WYIEZ X			
24310																									
24320																									
24330																									
24400		X														UBW YE						QVVB WYIEZ X			UE
24410																									
24411																									
24412																									
24413																									
24420																									
24421																									
24422																							TUB WE		UB WY
24430																									
24500												U				UBW YE									UBW
24510																									
24520																									
24530																									
24600		X																							CE
24610																									
24620																									
24630																									
24700																									
24710	ER									TUVV YER													ER	QUY	UVE
24720																									
24730										TUVV YER															
24740																									
24750	ER																								
24760																									
(Continued)																									

(23)	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
	24000 STILLING BASIN (APRON)																				
	24100 Type																				UV YZ
	24120																				
	24140																				
	24200 Apron	QUBW YEX	UB WY	UBW	UBW	TUBW YEZL	TUVB WYIE	TUV BWE	UBW	TQUBW WYER	UBW YER	UBW YER	Z		UVC NL	QUV WYI	VC YI	QUYBW YIZX	QUVB WYIZ	UVBW YIZX	UVBW YIEZ
	24210 Invert El	UBW				TUVB WIE	TE	QYL		QUY									QUVB WYIZ		UB WY
	24220 Length	UB WX				TUVB WIE	E	QYL		QY					UB WY				QUVB WYIZ		UB WY
	24230 Width									QV YE											
	24240 Slope																				
	24250 Noted Items									TQUBW WYIE											UVBW YIZX
	24300 End Sill	UYX				VIE	TE			TQUBW WYIE	UBW YE							QUVB WYIZ	QUVB WYIEZ	UVBW YIZ	UVBW YIEZ
	24310 Shape					TUVB WIE	E														Z
	24320 Height	UBW				TUVB WIE											UC		QUVB WYIZ		
	24330 Noted Items																				
	24400 Baffles	QUBW YIX	QYE				TE	TQU YEL		TQUBW WYIE	TUBW YER	UBW YE			UZ	Z		QUVB WYIZ	UYZ	TQUBW WYIEZ	UVBW YIZ
	24410 Shape					TUVB WIE	E													UV YZ	Z
	24411 Height					TU VE						UWY									
	24412 Width																				
	24413 Spacing																				
	24420 Row(s)					TU VE	E	TE											QUVB WYIZ	UV YZ	
	24421 Number					E			UER												
	24422 Location					TUVB WIE	UB WE										UB WY	Z			
	24430 Noted Items																				
	24500 Pier Extensions						TE			TQUB WYE											
	24510 Height																				
	24520 Length					UR WE										UC					Z
	24530 Noted Items																				
	24600 Training Walls									E								YL			
	24610 Height																				
	24620 Length																				
	24630 Noted Items														UVC INL		UVC YI	UVB WIZ			
	24700 Riprap						TUB WE														
	24710 Bottom	UBX	E							UER	UBW YER										
	24720 Side																				
	24730 Size																				
	24740 Thickness																				
	24750 Slope																				
	24760 Noted Items																				
	(Continued)																				

(25) DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
24000 STILLING BASIN (CONTINUED)																				
24900 Operation																				
24910 Pool El	UVBW IE		VBW IE	UVB WYE	TQVVC WYIE	QVY IEZ	QVVBW YIEZP	UVB WYI		UVB WYI			UVW YE	UVB WI			UCB WY	UVW YI		
24920 TW El	UVBW IE		VBW IE	UVB WYE	TQVVC WYIE	QVVBW YIEZ	QVVBW YIEZP	UVB WYI		UVB WYI		UB WE	UVB WYE	UVB WI			UVCB WYE	UVW YI	UV RW	
24930 Type Flow																				
24931 Free/Submerged								UVBW YIH	CBW	UVB WYI		UBW	UVB WYE						UVW YIE	U
24932 Gated/Uncontrolled														UVB WYE					UVW YIE	
24933 Unit Discharge	UVBW IE		VBW IE	UVB WYE	TUVCB WYIEZ	QVVBW YIEZ	QVVBW YIEZP	UVB WYI		UVW YI			UVB WYE	UVB WI						R
24940 Gate Schedule	UBW																			
24941 Single						CE								E	UBW			UC		
24942 Multiple				UBW	TUVCB WYIEZ									UBW			UVC BWE	UVW YIE		
24943 Locations				UBW													UC			
24950 Gate Opening	U																		UVW YI	
24951 Uniform				UVB WYE																
24952 Variable					CE														UVW YIE	
24960 Gate Submergence				U															UVW YIE	VE
24970 Gate Speed																				
24980 Other Factors																				
24981 Ice/Debris																				
24982 Loose Barges																				
24983 Waves																				
24984 Power Discharge																				
24990 Noted Items						YYI EZ														
25000 DOWNSTREAM CHANNEL																				
25100 Channel	UVB YI	UBW	BW	UVC BW	UCB WY	VCY IEZ		UVB WYI	VE	UVC WYI		QVVBW YIEZ	UV WY	UVC BMY		UVB WR	UC BW	UV WY	UV ER	
25110 Direction						VC														
25120 Shape								VC												
25121 Invert El	E	E	VIE	VE	TUVCB WYIE	VE		VE	E				TE			ER		UVW YIE		
25122 Width																				
25123 Side Slopes																				
25124 Bottom Slope																				
25130 Dikes																				
25140 Noted Items																				
25200 Guide/Guard Walls																				
25300 Riprap																				
25310 Bottom																				ER
25320 Side																				ER
25330 Size																				VR
25340 Thickness																				VR
25350 Slope																				
25360 Noted Items																				VER
25400 Noted Items																				C
(Continued)																				

(26)	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	
	H.F. George L&D TR 2-519	Jackson L&D TR 2-531	Mardanele L&D TR 2-558	Markland Gates & Spillway TR 2-566	Greenup Gates & Spillway TR 2-572	Column & Spillway TR 2-578	Nowell/Opekiska Gates & Basins TR 2-579	New Lumberland Gates & Basin TR 2-585	Pike Island Stalling Basin TR 2-586	OKS Florida Pro Spillway TR 2-587	W.T. Perry Gates & Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overflow Embank TR 2-650	Arkansas R Dams Lo-Head Spillway TR 2-655 & App A	Osage Spillway TR 2-657	Stalling Basin TR 2-667	Bankley Spillway TR 2-689	Cannellton Spillway & Gates TR 2-710	Hannibal Spillway TR 2-731	Holt TR 2-745	Hugo TR 2-745	Copan Spillway TR H-69-15	TR H-70-09	Oakley Spillway TR H-70-13 & App	Arkansas R Dams Gate Vibration TR H-71-05	Arkansas R Dams Spillway Gates TR H-73-5
24900																										
24900																										
24910	UVWY IEZ	UVW YI	UVB WYI			UVBW YIR		U		UBW	UV	QUB WY	QUVB YERL	UVBW YERZ				U	R	UVW YI	UVCB WYI	UBW	QUVC BWYR		WY	
24920	UVWY IEZ	UVW YIE	UVB WYI	UVB WE	UV BW	UVBW IEZP	UVB WY	UVB WY	UV BW	UBW	UV BW	QUB WY	QUVB YERL	UVBW YERZ	UVW	UVB WYR	UVW YI	UVB WRX	UVB WR	UVW YI	UVCB WYI	UBW	QUVC BWYR			
24930																										
24931		UVW YI	UVW YI	UBW	UBW	UVBW IEZP	UBW WY	UVB WY	UV BW	UBW	UV BW		QUVB YERL	UVBW YERZ	UVW	UVB WYR	UVW YI	UV BW	UVB WY	UVW YI						
24932		UVW YI	UVW YI							UBW	UV			WYZ	V			UVW YI		UV	UVW YI					
24933	UVWY IEZ	UVW YI				UVW YI							QUVB YERL	UV												
24940																		UV BW								
24941															UVW	UVB WYR									UVB WYR	
24942															UVW	UVB WYR									R	
24943																										
24950			UBW	UVE	UV	UVBW IEZP	UVB WY	UVB WY	V		UV			UVBW YERZ		UB WY	UVW YI	UVB WR					UVCB WYR		UVB WI	
24951	YY	UVW YI													UVW						UV					
24952															UVW											
24960				UVE				U																UB WY		
24970																										
24980																										
24981																	UVB WYR		UB WY							
24982																										
24983																										
24984	YY																					VCR				
24990																										
25000																										
25100	UVWY IEMZH	UVW YI	UVCB WYI			UVBW YIE		V	UBW	UV BW			UVB WYR	VW YI			TUVC WYI				UVCB WYIN	UVW YI	TUVC BWIR	UVCB WYR	VI	
25110																										
25120			VC			UVBWY IR								QY								VCR				
25121	UVWY IEZ	UB	UVW YI	UVE					QY			MY ER	UBW ER					E			UVW YI					
25122																										
25123														UVW YI												
25124																										
25130																						VCR				
25140														QUV WYI									TUVC BWYR			
25200																		TVC WY				CR				
25300														UVW				VC								
25310																									VER	
25320																						TR				
25330																							R		ER	
25340																									ER	
25350																									ER	
25360																									R	
25400																					CBW		UVC BWR			
(Continued)																										

(27)	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																				
		A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60	A61	A62	A63	A64	A65	
	24000 STILLING BASIN (CONTINUED)																					
	24900 Operation																					
	24910 Pool El				UV WZ			UBW		UVB WYX							Z		UB VI	QVX		
	24920 TW El	UBW	UBW		UVW YZ		UVC BW	UVB WYI		UVB WYX	UB WS	X						UB WR	UB VI	QV YX	UVBWX I2FX	
	24930 Type Flow																					
	24931 Free/Submerged				UVW YZ		UVC BW			UVB WYX	UB WS							UB WR				
	24932 Gated/Uncontrolled	UB WY	UBW		UV YZ		UVC BW	UVCB WYI														
	24933 Unit Discharge											X						UB WR	Z		TQ VX	VY IX
	24940 Gate Schedule																					
	24941 Single	UB WY	UBW				TUVC BWER	UVC BWI														
	24942 Multiple	UBW					UVC BW															
	24943 Locations		UBW				UC BW															
	24950 Gate Opening	UB WY			UV WZ		UVC BWR	UVCB WYI		UB WS				X								
	24951 Uniform																					
	24952 Variable																					
	24960 Gate Submergence																					
	24970 Gate Speed																					
	24980 Other Factors																					
	24981 Ice/Debris									UBW YX												
	24982 Loose Barges																					
	24983 Waves																					
	24984 Power Discharge																					
	24990 Noted Items											X									VYX	UVBWX I2FPX
	25000 DOWNSTREAM CHANNEL																					
	25100 Channel	VC YN			UV CW		V	UVCB WYI		UVB WYX												
	25110 Direction																					
	25120 Shape	C											QYL									
	25121 Invert El	C																				
	25122 Width																					
	25123 Side Slopes																					
	25124 Bottom Slope																					
	25130 Dikes	VCE WR																				
	25140 Noted Items																					
	25200 Guide/Guard Walls																					
	25300 Riprap	TR	R																			
	25310 Bottom		VR					TV ER		R												
	25320 Side		VR																			
	25330 Size		VR					TV ER		R												
	25340 Thickness		VR					TV ER														
	25350 Slope																					
	25360 Noted Items																					
	25400 Noted Items																					
	(Continued)																					

(29)	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																				
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	
24000 STILLING BASIN (CONTINUED)																						
24900	Operation																					
24910	Pool El	QUB YEX			UBW	UVYI E2L		UBW		TQUB WYE	UBW YER	UWY			Z	VC YI	UB WX	QUVB WYIZ	UVBW YIZ	UVBW YIEZ		
24920	TW El	QUB YEX			UBW	UVBW IEZL	TUV YE	TUB WE		UBW	TQUB WYER	UB WY	Z		UZ	QUVBW YIZL	VC YI	QUVB WYIZ	UVBW YIZ	UVBW YIEZ		
24930	Type Flow																					
24931	Free/Submerged		UB WY			UVBWT IEZL		UBW	UBW	TQUB WYE											U	
24932	Gated/Uncontrolled															QU ZY			QUVB WYIZ			
24933	Unit Discharge									QUY												
24940	Gate Schedule														UVC NZL	YZ PL	VC YI	QUVB WYIZ	QUVB WYIZ	Z	Z	
24941	Single																					CW
24942	Multiple																					
24943	Locations																					
24950	Gate Opening	QUB YEX			UBW	UVB WIE	TUV YE	TUB WE		TQUB WYER	UB WY	Z		UCN ZL	UBWY ZPL	VC YI	QUVBW YIZX	QUVB WYIZ	UVBW YIZ	Z		
24951	Uniform																					
24952	Variable																					
24960	Gate Submergence					VIE	TU YE	TUB WE		TQUB WYE	UB WY	Z		UZ								
24970	Gate Speed																					
24980	Other Factors																					
24981	Ice/Debris						TU VE											UX			UBW YIE	
24982	Loose Barges																					
24983	Waves																					
24984	Power Discharge														UVC NL		VC YI					V
24990	Noted Items									UBW						UVWY IZP						
25000 DOWNSTREAM CHANNEL																						
25100	Channel	UY EX				UVB WIE				TQUB WYIE	QUBW YER			VC YN		TUVC WYSI	UB WY			UVB WYI	UVB YIE	
25110	Direction																					
25120	Shape														VC YN		VY					
25121	Invert El	E				TUVB WIE	TU VE	VE		TQUB WYER	TUBW YER	E				QUVB YIZ	VCY IE	QUVB WYIZ	QUVB WYIZ	TE	UVBW YIZ	
25122	Width																					
25123	Side Slopes																					
25124	Bottom Slope																					
25130	Dikes																					
25140	Noted Items														UVC YIN VCH		VC YI					
25200	Guide/Guard Walls																					
25300	Riprap																					
25310	Bottom																					
25320	Side																					
25330	Size																					
25340	Thickness																					
25350	Slope																					
25360	Noted Items																					
25400	Noted Items														UV CI		TUCW YSI					
(Continued)																						

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(31) DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
	Possam Kingdom Spillway TM 111-1	Possam Kingdom Submerged Bucket TM 111-2	Possam Kingdom Barries TM 111-3	Lucie Canal LAD TM 153-1	Sante River Spillway TM 168-1	Canton Spillway TM 190-1	Bluestone Barries TM 2-243	Demopolis LAD TM 2-252	Noted Floody Contr. Structure TM 2-326	Jim Woodhuff LAD TM 2-340	Cheatham Emergency Dam TM 2-355	Cheatham Spillway Gate TM 2-381	New Cumberland TM 2-386	Gavin's Point Spillway TM 2-404	Old River L. Sill Multi-Leaf Gates TM 2-447, Bkt. 1	Old River L. Sill Distr. Ch Riprap TM 2-447, Bkt. 2	Old River L. Sill Control Struct TM 2-447, Bkt. 3	Spillway TM 2-485	Old River O'bank Panel Gates TM 2-491	Old River Closure Dam TM 2-495
25000 DOWNSTREAM CHANNEL (CONT'D)																				
25900 Operation																				
25910 Pool El	VIE	E	VIE	VCE	TUVBW YIEZ	VP			VE	UVW YIE				TCE		ER	UC BW	UW		
25920 TW El	VIE	E	VIE	VCE	TUVBW YIEZ	VE		VC	VE	UVC WYI		QYL		TCE		VER	UC BW	UW		
25930 Type Flow																				
25931 Free/Submerged					TUVBW YIEZ				V	UVW YI										
25932 Gated/Uncontrolled																				
25933 Unit Discharge	VIE	E	VIE	VCE	TUVBW YIEZ	VC	VE		VE	UVW YI				TE		VER		VR		
25940 Gate Schedule																				
25941 Single					CE												UC			
25942 Multiple					TUVCB WYIEZ												UC BW	UC		
25943 Location																				
25950 Gate Opening											VCE									
25951 Uniform				VCE																
25952 Variable					TCE															
25960 Gate Submergence																				
25970 Gate Speed																				
25980 Other Factors																				
25981 Ice/Debris																				
25982 Loose Barges																				
25983 Waves																				
25984 Power Discharge																				C
25990 Noted Items							VE													
NOTED ITEMS																				
21140 Upstream approach channel																				
21460 Upstream approach riprap																				
21500 Upstream approach misc.																				
21990 Upstream approach operation																				
22240 Control sill shape		Submerged bucket				Sluice outlet				Dike section										Rock dam
22800 Control sill misc.				Lock chamber		Pier extension														Seal cover
22990 Control sill operation				Flow thru lock		Sluice flow														Const. procedure
23700 Gates & bulkheads misc.				Orifice gates								Seals & vents			Air vents					
23990 Gates & bulkhead operation																				
24250 Still basin apron										Flip bucket										
24330 Still basin end sill										Scndry Notched weir sill Location in row										
24430 Still basin baffles																				
24530 Still basin pier ext																				
24630 Still basin tr walls																				
24760 Still basin riprap																				
24990 Still basin operation						Sluice flow														
25140 Downstream channel geometry																				
25360 Downstream channel riprap																				Filter blanket
25400 Downstream channel misc.																				Pvrhs tailrace
25990 Downstream channel operation						Sluice flow														
X OTHER TYPES OF DATA										Gate operation schedule		Air demand								Seepage flow

(32)	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	
	V.F. George LAD TR 2-519	Jackson LAD TR 2-531	Mardianelle LAD TR 2-558	Markland Gates & Spillway TR 2-566	Greenup Gates & Spillway TR 2-572	Greenup Gates & Spillway TR 2-578	Maxwell/Opekiska Gates & Basins TR 2-579	New Cumberland Gates & Basin TR 2-585	Fike Island Stilling Basin TR 2-586	645 Florida Proj Spillway TR 2-593	W.L. Perry Gates & Basin TR 2-643	Proctor Spillway TR 2-645	Arkansas R Dams Overflow Embank TR 2-650	Arkansas R Dams Lo-Head Spillway TR 2-655 & App A	Gate Spillway TR 2-657	Stilling Basin TR 2-687	Barkley Spillway TR 2-689	Cannelton Spillway & Gates TR 2-710	Hannibal Spillway TR 2-731	Holt TR 2-745	Spillway TR H-69-15	Copan Spillway TR H-70-99	Oakley Spillway TR H-70-13 & App	Arkansas R Dams Gate Vibration TR H-71-05	Arkansas R Dams Gate Vibration TR H-71-15	Arkansas R Dams Gate Vibration TR H-71-15
25000																										
25900																										
25910	UVVWY IENZ	UVV YI	UVW YI			YR					UV		MY ER	UVB WVR						UVW YI	TUVC BWYR	UVC BMR				
25920	UVVWY IENZ	UVV YI	UVW YI			UVW YIE		V			UV BW		MY ER	UVB WVR	QY		TUVC WYI			UVW YI	TUVC BWYR	UVC BMR	VCB WR			
25930																										
25931		UVV YI	UVW YI			UVW YIE		V			UV BW		MY ER	UVB WVR			UVW YI			UVW YI						
25932		UVV YI	UVW YI								UV						UVW YI			UVW YI						
25933	UVVWY IENZ	UVV YI											MY ER													
25940																									VI ER	
25941																									VER	
25942	VCH		VC												UVW											
25943	VCH		VC																							
25950						UVW YI		V	UBW	UV				UVB WVR			TUVC WYI						UVC BMR		VI	
25951	VCH	UVV YI													UVW											
25952														UVW												
25960																										
25970																										
25980																										
25981																									VR	
25982																										
25983																										
25984	VC RH		VC														TVC			VC						
25990			VC														TVC			C						
21140																	Railroad embankment				Abutment shape		Abutment shape			
21460																										
21500			Guide booms																							
21990																										
22240	Divres notch	Air vents		Cheatham mill									Riprap cover								Diversion weir					
22800			Project layout																							
22990																										
23700				Gate seals	Air vents													Trunnion elevation							Gate struct	
23990																										
24250																										
24330																										
24430																								Chute blocks		
24530																										
24630																										
24760																		Blanket length				Berm elev			Cover blocks	
24990																										
25140														Channel roughness												
25360																										
25400																									Cover blocks	
25990			Lock discharge															Lock discharge			Frib inflow					
X			Debris accumulation	Seal pressure		Debris accumulation												Debris removal							Ice/debris removal	

35	DESIGN AND OPERATIONAL VARIABLES	PROJECT AND REPORT																			
		A91	A92	A93	A94	A95	A96	A97	A98	A99	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
	25000 DOWNSTREAM CHANNEL (CONT'D)	Miss R LAD 20 Stilling Basin STP 24	Miss R LAD 7 Spwy Culverts STP 29	Chanoine Wickets Discharge Coef STP 28	Miss R LAD 8 Tainter Ct Coef STP 31	Miss R LAD 22 Stilling Basin STP 33	Roller Gate Stilling Basins STP 36	Sub Tainter Gate Coef & Basin STP 37	Roller Gate Coef STP 13	Miss R LAD 11 Gates & Basin STP 63	Miss R LAD 1 Spillway Apron STP 63	SAF Lower LAD Tntr Ct & Basin STP 69	Roller Gates Pressures STP 77	Bonneville Spillway Press STP 77	BHL 3-1 Mary Ct Race & T-race BHL 20-1 McKays	Spillway & Gates BHL 21-1	Ice Harbor YI Cffrms & T-race BHL 22-1	Ice Harbor Spillway BHL 31-1	The Dalles Spillway & Basin BHL 55-1	Bonneville WYE BHL 65-1	Spwy & Durcan Gap John Day BHL 97-1
	25900 Operation																				
	25910 Pool EL					TUVB WIE											VCT				
	25920 TW EL					TUVB WIE	TU VE	TU VE										UVC YNL			
	25930 Type Flow																				
	25931 Free/Submerged					TUVB WIE	TE	TVE													
	25932 Gated/Uncontrolled																				
	25933 Unit Discharge																				
	25940 Gate Schedule																				
	25941 Single																				
	25942 Multiple																				
	25943 Location																				
	25950 Gate Opening					TUVB WIE	TU VE	TU VE													
	25951 Uniform																				
	25952 Variable																				
	25960 Gate Submergence					TUVB WIE	TU VE	TU VE													
	25970 Gate Speed																				
	25980 Other Factors																				
	25981 Ice/Debris																				UE
	25982 Loose Barges																				
	25983 Waves																				
	25984 Power Discharge																				
	25990 Noted Items																				
	NOTED ITEMS																				
	21140 Upstream approach channel																				
	21460 Upstream approach riprap																				
	21500 Upstream approach misc.																				
	21990 Upstream approach operation																				
	22240 Control sill shape																				Dvrsn gap
	22800 Control sill misc.		Cul- verts				Gate recess														Stod- log slots
	22990 Control sill operation																				
	23700 Gates & bulkheads misc.			Wicket gap				End & trash shields													
	23990 Gates & bulkhead operation				Water level inside gate		Water level inside gate														
	24250 Still basin apron								Profile shape												Bucket
	24330 Still basin end sill																				
	24430 Still basin baffles																				
	24530 Still basin pier ext																				
	24630 Still basin tr walls																				
	24760 Still basin riprap																				
	24990 Still basin operation																				
	25140 Downstream channel geometry																				
	25360 Downstream channel riprap																				
	25400 Downstream channel misc.																				
	25990 Downstream channel operation																				
	X OTHER TYPES OF DATA	Hydr ump location & depth		Leakage					Leakage			Air de- mand	Water level inside gate	Prototype crest inside gate	Pump intake	Pump flow	Lock outlet	Lock operation	Debris in basin	Debris bas- in	Prototype cavitation

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