

2.0 Key Dates in the History of the Hillsborough River Dam

Year	Date	Activity
1895	April	Consumers' Electric Light & Street Railroad Co. purchases site where current dam is located.
1896		Consumers' begins construction of dam (wood crib) and hydro-power facilities.
1897		Consumers' completes construction of hydro-electric dam facilities.
1898	Dec 13	Dam is partially destroyed in an act of sabotage thought to be executed by disgruntled cattlemen. Consumers' repairs damages.
1899	Oct 2	The Tampa Electric Co. purchases the assets of the Consumers' company, including the dam, related property, and the franchise to generate electricity.
1923		City begins construction of Water Works plant located about 1 ½ miles upstream of dam.
1924	Oct 23	Major flood event threatens integrity of dam.
1925		Tampa Electric undertakes significant improvements to the dam and hydro-electric facilities.
1926		City completes Water Works plant.
1933	Sep 7	Flood of record (Peak Flow = 16,500 cfs = 10.7 billion gallons/day) washes away south embankment. Tampa Electric suspends operations, subsequently abandons dam. Loss of water volume/decrease in reservoir stage significantly affects Water Works operations.
1944	Jan 3	Federal Works Agency commits \$ 106,000 to the City for proposed dam expansion (pending Congressional approval and ownership change).
	May 26	Tampa Electric deeds dam and related properties to the City for \$1 with proviso that if electricity is generated, City must compensate Tampa Electric in the amount \$42,222.
	Aug 30	City awards contract for dam expansion (\$ 148,000).
	Sep 8	City receives permit from Secretary of War for reconstruction of dam.
	Oct 4	Groundbreaking for dam reconstruction and expansion.
	Nov 28	War Department requires changes and additions to the dam, including second tainter gate.
1945	Oct	Dam re-construction and expansion is completed (sans hydro-electric component).
1960	Aug 2	High stream flow causes flash boards at crest of dam to fail resulting in significant urban flooding downstream of dam.
1961		Planning for the Four Rivers Flood Control project commences.
1962	Mar 7	Installation of crest superstructure, including walkway and fifteen crest gates is completed.
1978	Jan	Dam is first in Florida to be inspected by US Army Corps of Engineers as part of federal inspection program following deadly dam break near Toccoa Falls in Georgia in 1977.
	Nov	Tampa Bypass Canal system, a component of the Four Rivers project becomes operational.
1997		Decision made to replace the dam's crest gates and improve seepage abatement at the south abutment amid concerns about possible adverse effects of high stream flow arising from prolonged period of rainfall associated with so-called El Niño climatic condition.
1999		Crest gate replacement, south abutment core wall expansion, and south abutment soil stabilization improvements are completed.
2001	Oct	North and south tainter gates are replaced.
2013	June	Walkway rehabilitation and electrical system upgrades are completed.

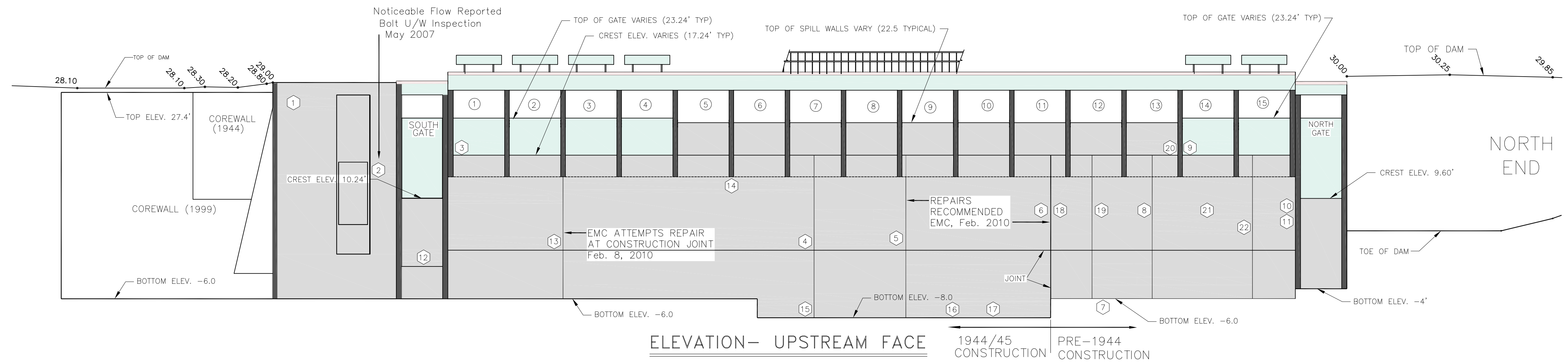




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SOUTH END

NORTH END



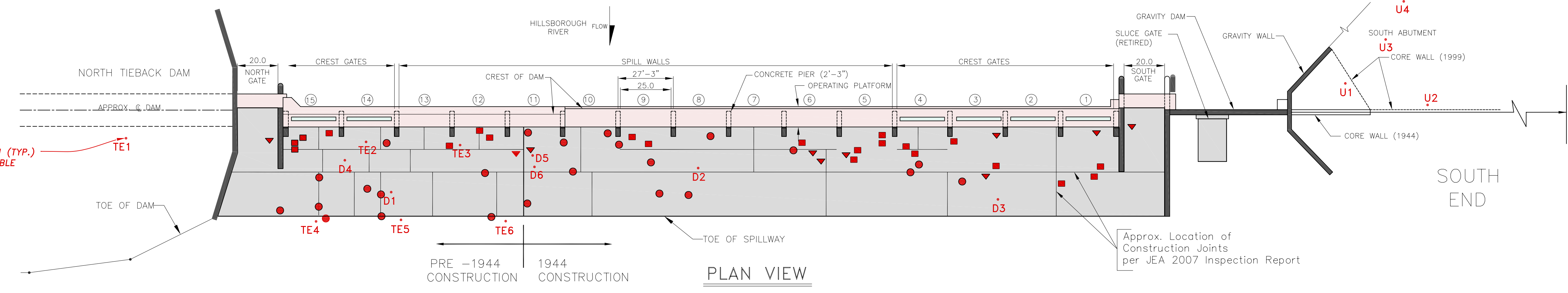
ELEVATION- UPSTREAM FACE
1944/45 CONSTRUCTION PRE-1944 CONSTRUCTION

KEYS TO SYMBOLS - U/S FACE ELEVATION VIEW
6 VOID, SPALL OR CRACK
LOCATION AND EXTENT SUBJECT TO INTERPRETATION REFER TO U/W INSPECTION SUMMARY TABLE

BORING LOCATION (TYP.) REFER TO TABLE

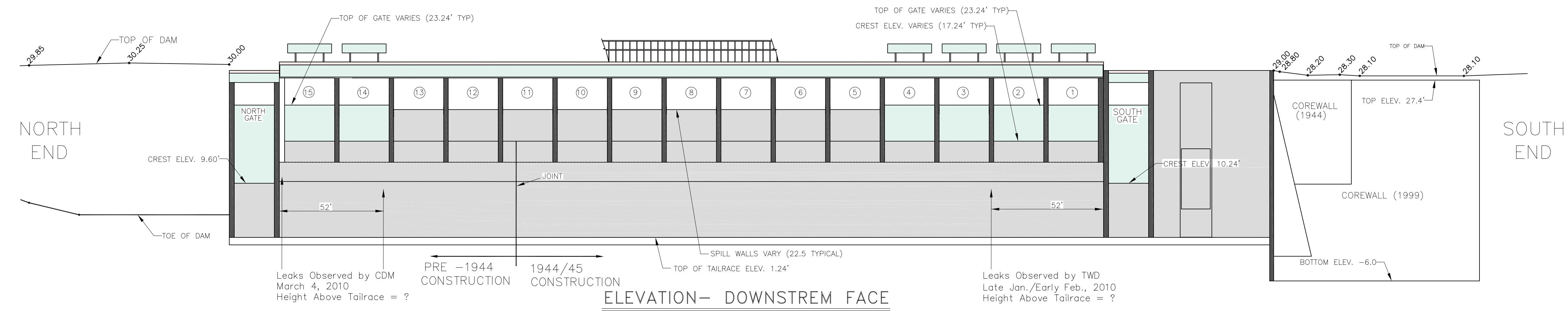
NORTH END

SOUTH END



PLAN VIEW

KEY TO SYMBOLS - PLAN VIEW
▼ LEAK
■ EXPOSED METAL
● SPALL OR HOLE
LOCATION PER JEA INSPECTION, 2007



ELEVATION- DOWNSTREAM FACE
PRE-1944 CONSTRUCTION 1944/45 CONSTRUCTION

Year	Date	Description
1978	January	USACE Inspection Report, National Dam Safety Program
1980	21-May	Law Geotechnical Evaluation, Downstream Slope No. Abutment
1981	3-Sep	Law Geotechnical Design Considerations, D/S Slope No. Abutment
1991	July	USACE Regulation Manual for Lower Hillsborough Flood Detention Area and Bypass Canal
1997	3-Oct	HDR Hillsborough River Inspection
1997	3-Oct	Law Geotechnical Exploration South Wing Wall
1998	10-Apr	Kisinger Campo Dam Inspection
1998	31-Jul	Dames & Moore Engineering Evaluation Report, Phase 1
1999	16-Sep	Dames & Moore Hydraulic Capacity Analysis
2000	28-Jan	Jones Edmunds Inspection
2003	5-Jul	Jones Edmunds Inspection
2003	3-May	Jones Edmunds Inspection
2007	16-May	Bolt Underwater Inspection
2007	6-Jun	PSI Geotechnical Inspection
2007	6-Aug	Jones Edmunds Inspection
2010	8-Feb	EMC Underwater Inspection
2010	4-Mar	CDM Inspection
2010	10-May	CDM Leak Limited Scope Evaluation Report
2010	13-Dec	EMC Underwater Inspection
2011	8-Aug	CDM Draft Leak Evaluation and Condition Assessment Report

Area of Dam	May 14, 2007 Inspection - Bolt Underwater Services				December 13, 2010 - EMC Divers, Inc.			
	I.D.	Deficiency Type	Description	Flow or Suction Observed	I.D.	Deficiency Type	Description	Flow or Suction Observed
Gravity Dam Sluice Gate	1	Void	4"H x 10"L x 6" Deep w/exposed rebar	No				
	2	Void	7"H x 6" W x 6" Deep	Yes				
	3	Hole	11/2" H x 3/4" W	No				
South Tainter Gate	4	Joint @ Bay 7	Hairline crack	No	12	Cracks	Epoxy repaired, 6' of bottom & 2' below W.L.	No
	5	Joint @ Bay 9	Joint opens to 11/2" W x 3" Deep	No	14	Joint @ Bay 5	Vertical repair at North pier	No
	6	Joint @ Bay 11	Joint between Old and New Dam sections	No	15	Joint @ Bay 7	Vertical joint 1"W x 2" Deep	No
	7	Pipe @ Bay 12	3" dia pipe extending 1' out at ground line	No	16	Crack @ Bay 9	At apron approximately 4" Deep	No
	8	Repair @ Bay 12	Bags filled with cement	No	17	Crack @ Bay 10	Vertical repair in apron	No
	9	Gap @ Bay 12	At river bottom, probed to 25"	No	18	Joint @ Bay 11	Large crack/void inside transition joint	No
	10	Joint @ Bay 13	Hairline at top to 1/4" at river bottom	No	19	Joint @ Bay 12	Joint repair	No
	11	South void - 9"H x 6"W x 3" Deep		No	20	Pipe @ Bay 12	Pipe, 4" dia, penetrates 6' into concrete	No
	12	North void - 12"H x 7"W x 3" Deep		No	21	Hole @ Bay 14	Hole is 6" Deep x 5" Dia	No
	13	22"W x 12"H x 32" Deep - partial patch		No	22	Joint @ Bay 15	Vertical repair on apron	No
	14	Exposed Steel	1st Piece - 9" L	No				
		2nd Piece - 2" L	No					

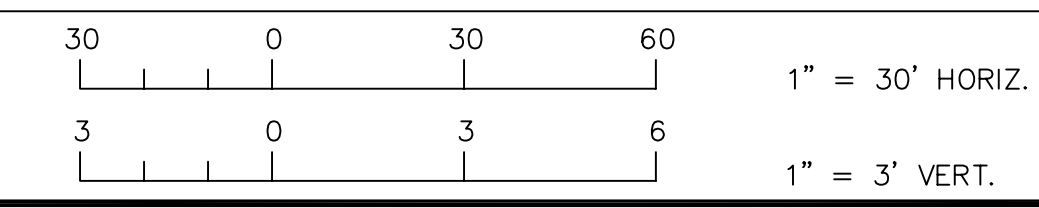
Year	By	Record of Sub-surface Explorations				Test Results
		Identification	Report I.D. Desig.	Bot. Elev. of Boring (Ft)	Test Results	
1925	Tampa Electric (See Note 1)	TE1	A1	-23.8	Hard Limestone @ Elev. -9.0 +/-	
		TE2	A4	-23.8	Hard Limestone @ Elev. -11.0 +/-	
		TE3	A6	-23.8	Hard Limestone @ Elev. -8.5 +/-	
		TE4	B6	-23.8	Hard Limestone @ Elev. -12.0 +/-	
		TE5	B8	-23.8	Extra Hard Limestone Elev. @ -9.0 +/-	
		TE6	B10	-23.8	Hard Limestone @ Elev. -5.0 +/-	
2001	URS (See Note 2)	U1	DB-5		Standard Penetration Tests	
		U2	DB-11		Max Blows per Ft	
		U3	B-2		At Elev. (Ft)	
		U4	B-1		Material	
2010	Diggers (See Note 3)	D1	TB-1	-13.5	100 -8.5 V. Stiff Clay	
		D2	TB-2	-13.0	100 -6.5 V. Stiff Clay	
		D3	TB-3	-14.7	100 -2.5 Hard Green Clay	
		D4	P-1	-5.5	N/A Conc., clay, clayey limestone	
		D5	P-2	-9.9	N/A Concrete, clay	
		D6	P-3	-4.5	N/A Concrete, sand	

Notes:
1. Elevation cited is level below which there was little or no clay reported.
2. As-built record drawing in City's possession is not legible; therefore test results unclear.
3. Surface assumed to be at Elev. 1.0 +/- (actual elevation not given on boring log).



HILLSBOROUGH RIVER DAM

Compilation of Dam Inspection and Evaluation Information 2011



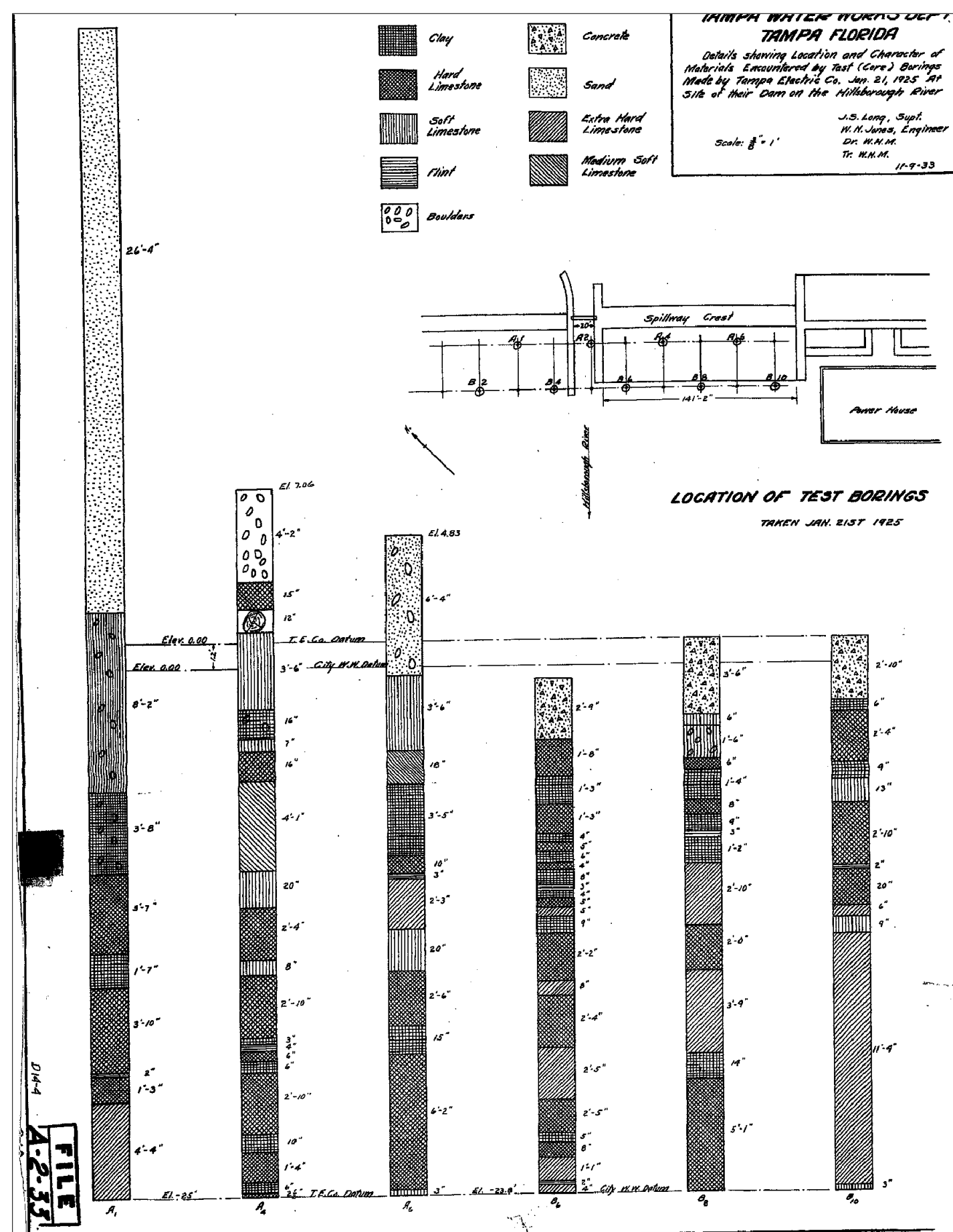
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No.	Date	REVISION	By

Approved Date: Dec. 6, 2011

W.O.	X	FILE NUMBER	File: H.R.D.AM

SHEET 1 OF 2 SHEETS



TE1 TE2 TE3 TE4 TE5 TE6

TAMPA ELECTRIC - 1925

Project No. DES 106663 BORING NO. TB-1
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/7/10 Depth To Water ** Time Date 12/7/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 2'-8-1/2" Concrete Apron		
2.5		2-1/2" Void below Concrete Apron - 100% loss of circulation at depth 3.0'		
3.7		Very stiff green CLAY with cream colored calcareous CLAY and SILT (CH/LM/L)	3/7/11	
3.6		limestone fragments at depth 6.0'	3/6/10	
7.1		Very stiff to hard green CLAY (CH) to (CL)	7/7/11	
7.1		limestone fragments at depth 6.0'	7/7/8	
31.5		Cream colored to gray LIMESTONE BK Core Run: 9.7' to 13.5' Recovery: 18.25" 5 Rec.: 87% RQ: 45%	31/50*	*0.3' Penetration
11.1		BK Core Run: 11.5' to 13.0' Recovery: 9.0" 5 Rec.: 50% RQ: 50%	11/12/22	
15		trace of green CLAY at depth 13.0' Cream colored clayey LIMESTONE with trace of green sandy CLAY Hard green sandy CLAY with trace of cream colored LIMESTONE (CL)		
		Run: Time: 9.7-10.5 1:49 11.5-12.0 1:14 10.0-11.0 3:27 12.0-13.0 2:54		

Remarks ** Water Table recorded at 0.3' below Top of Apron (same level as river)
 Borehole Grouted Casing Length 5.0'

D1

Project No. DES 106663 BORING NO. TB-2
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/8/10 Depth To Water ** Time Date 12/8/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 2'-8" Concrete Apron		
3.2		Soft green sandy CLAY with grayish-brown silty clayey Fine SAND and trace of limestone gravel (CH/SM-SC)	3/2/2	
3.3		Concrete in top of spoon Loose green clayey Fine SAND (SC)	3/3/2	
3.6		limestone fragments at depth 5.5'	3/6/15	
15.1		Very loose green clayey Fine SAND grading to cream colored to gray clayey LIMESTONE (SC)	15/15/50*	*0.1' Penetration
50		Very stiff green calcareous CLAY with cream colored calcareous CLAY and SILT and limestone fragments (CL/M/L)	50*	*0.3' Penetration
50		Hard green calcareous, cemented, sandy CLAY (CL)	50*	*0.4' Penetration
50		Green cemented CLAY (CL) BK Core Run: 10.6' to 11.5' Recovery: 10.0" 5 Rec.: 54% RQ: 25%	50*	*0.3' Penetration
12.5		Gray dolomitic LIMESTONE Green CLAY (CH) Hard grayish-green calcareous, cemented CLAY (CL)	12/50*	*0.5' Penetration
		Run: Time: 10.0-10.5 8:29 11.5-12.0 1:01 10.0-11.0 3:25 12.0-12.5 1:45 11.0-11.5 3:29 12.5-13.0 9:36		

Remarks ** Water Table recorded at 0.2' below Top of Apron
 Borehole Grouted Casing Length

D2

Project No. DES 106663 BORING NO. TB-3
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/8/10 Depth To Water ** Time Date 12/8/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 3'-7" Concrete Apron		
3.5		Hard green CLAY and cream colored LIMESTONE (CL) - trace of green CLAY at depth 4.4' Cream colored LIMESTONE	35/50*	*0.3' Penetration
8.1		Green CLAY (CH) Very stiff green sandy CLAY (CH) Hard green cemented, sandy CLAY with seams of cream colored LIMESTONE (CL)	8/15/16	
22.3		Hard green sandy CLAY and cream colored LIMESTONE (CL)	22/30/32	
14.4		Very stiff green sandy CLAY with trace of cream colored LIMESTONE (CL) Hard green sandy CLAY and cream colored LIMESTONE (CL)	14/40/41	
9.1		Very stiff to hard green sandy CLAY (CH) - trace of cream colored LIMESTONE at depth 10.5' - trace of cream colored LIMESTONE below depth 11.5'	9/12/17	
13.5		Hard green cemented, sandy CLAY with trace of cream colored LIMESTONE (CL) Green CLAY (CH) Gray dolomitic LIMESTONE Green cemented CLAY (CL) Dense green weakly cemented, clayey Fine SAND (SC)	13/50*	*0.2' Penetration
13.2		BK Core Run: 12.7' to 14.2' Recovery: 14.0" 5 Rec.: 78% RQ: 0%	13/24/12	
		Run: Time: 12.7-13.2 0:48 13.2-13.7 0:47 13.7-14.2 1:57		

Remarks ** Water Table recorded at 0.6' below Top of Apron
 Borehole Grouted Casing Length

D3

Project No. DES 106663 BORING NO. P-1
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/7/10 Depth To Water ** Time Date 12/7/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 2'-10" Concrete Apron		
2.7		100% loss of circulation at depth 2.5'		
2.7		Very stiff to stiff green CLAY with cream colored calcareous CLAY and SILT (CH/M/L)	2/7/13	
5.6		Cream colored clayey LIMESTONE with some green CLAY Very stiff green CLAY with cream colored calcareous CLAY and SILT (CH/M/L)	5/6/8	
7.5		Note: Set Piezometer at depth 5.0'. (See Piezometer Detail Sheet)		

Remarks ** Water Table recorded at 0.3' below Top of Apron (same level as river)
 Borehole Grouted Casing Length

D4

Project No. DES 106663 BORING NO. P-2
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/7/10 Depth To Water ** Time Date 12/7/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 8'-0" Concrete Apron		
5.0		6" Gravel or Broken Concrete Very loose green silty, clayey Fine SAND (SM-SC)		
5.0			50*	*0.1' Penetration
4.4		Hard green cemented, sandy CLAY (CL)	44/50*	*0.3' Penetration
4.2			42/50*	*0.4' Penetration
10.0		Note: Set Piezometer at depth 10.0'. (See Piezometer Detail Sheet)		

Remarks ** Water Table recorded at 2.2' above Top of Apron in casing
 Borehole Grouted Casing Length

D5

Project No. DES 106663 BORING NO. P-3
 Project Hillsborough River Dam, Hillsborough County, Florida
 Location See Plate I Foreman J.R.
 Completion Date 12/7/10 Depth To Water ** Time Date 12/7/10

DEPTH, FT	SYMBOL	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
0		SURF. EL.: 2'-6" Concrete Apron		
1.1		6" Gravel or Broken Concrete		
1.1		Very loose green silty, clayey Fine SAND (SM-SC)	1/12	
4.0		Note: Set Piezometer at depth 4.0'. (See Piezometer Detail Sheet)		

Remarks ** Water Table recorded at 0.2' below Top of Apron in casing
 Borehole Grouted Casing Length

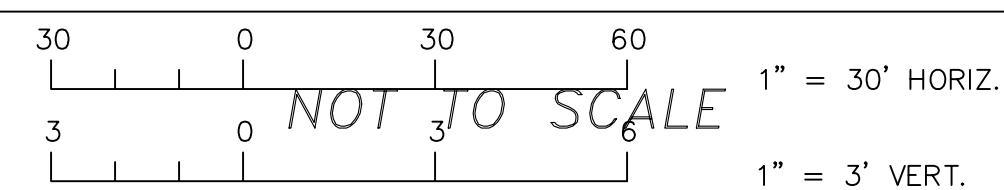
D6

DRIGGERS 2010



HILLSBOROUGH RIVER DAM

Compilation of Dam Inspection and Evaluation Information 2011



Atlas Page Des: JAR Dwn: JDM Ckd: Approved Date Dec. 6, 2011

No. Date REVISION By Approved Date Dec. 6, 2011

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Figure 5: Hillsborough River Dam Cross Section – Concrete Gravity Dam through crest gate

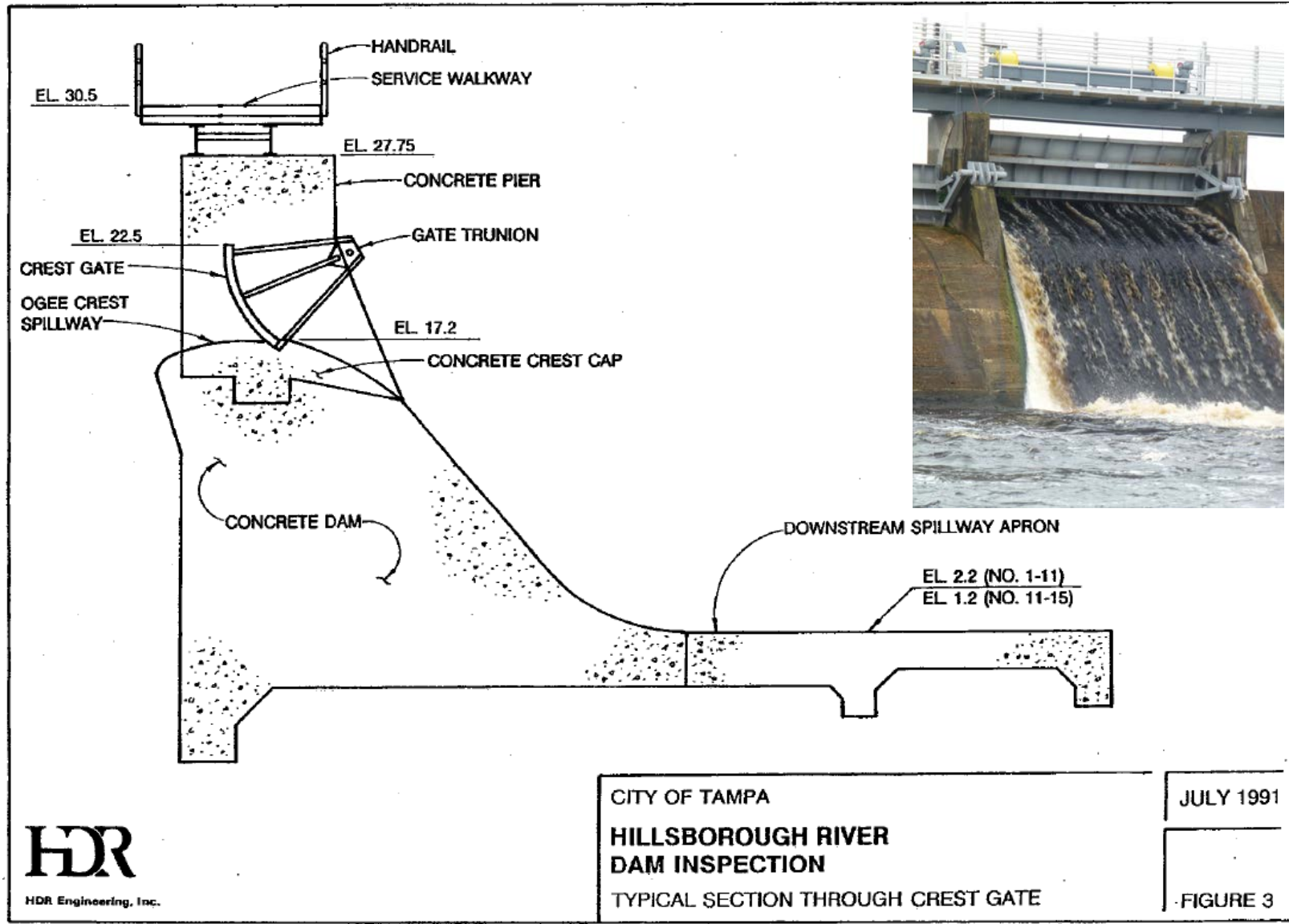
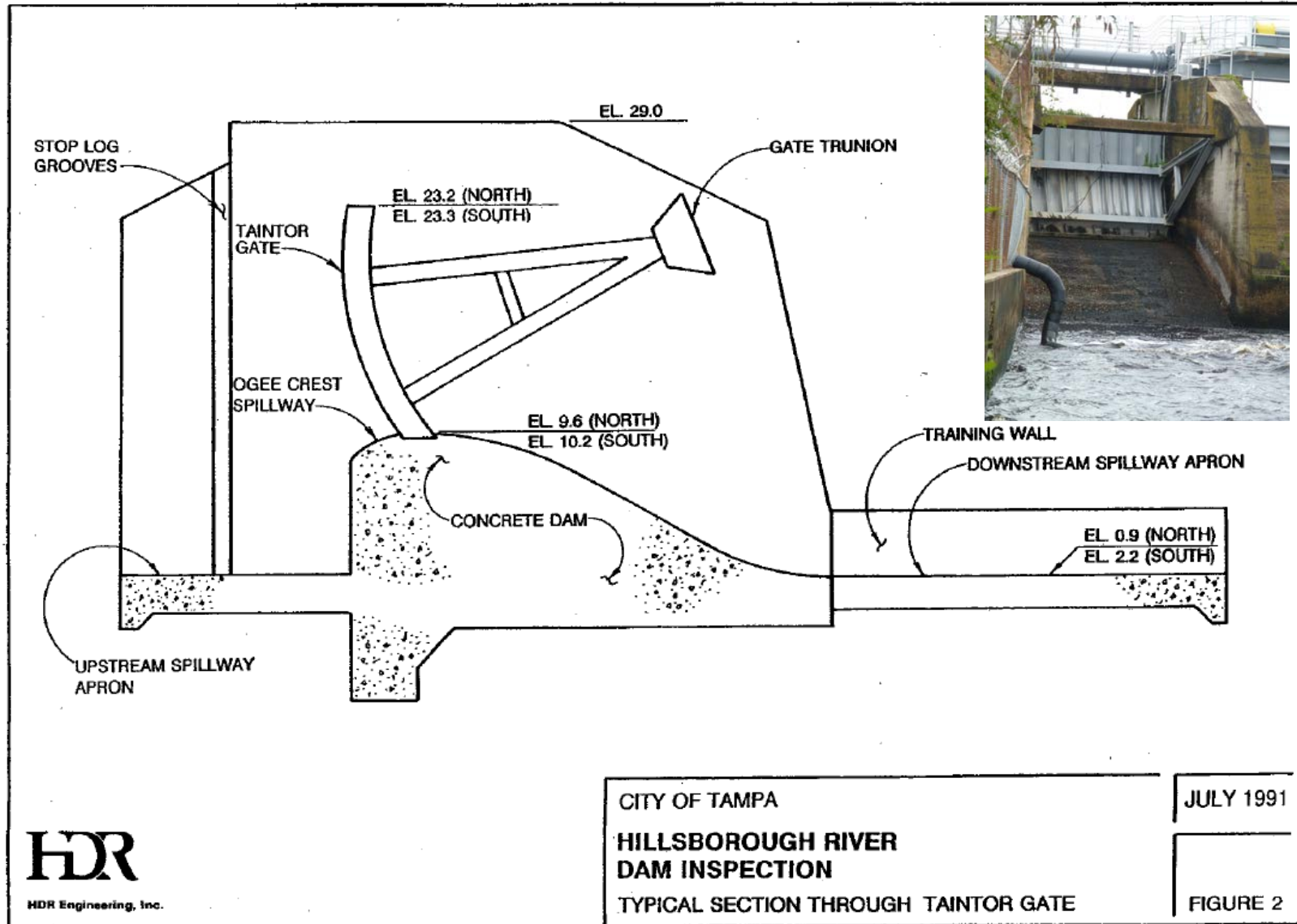
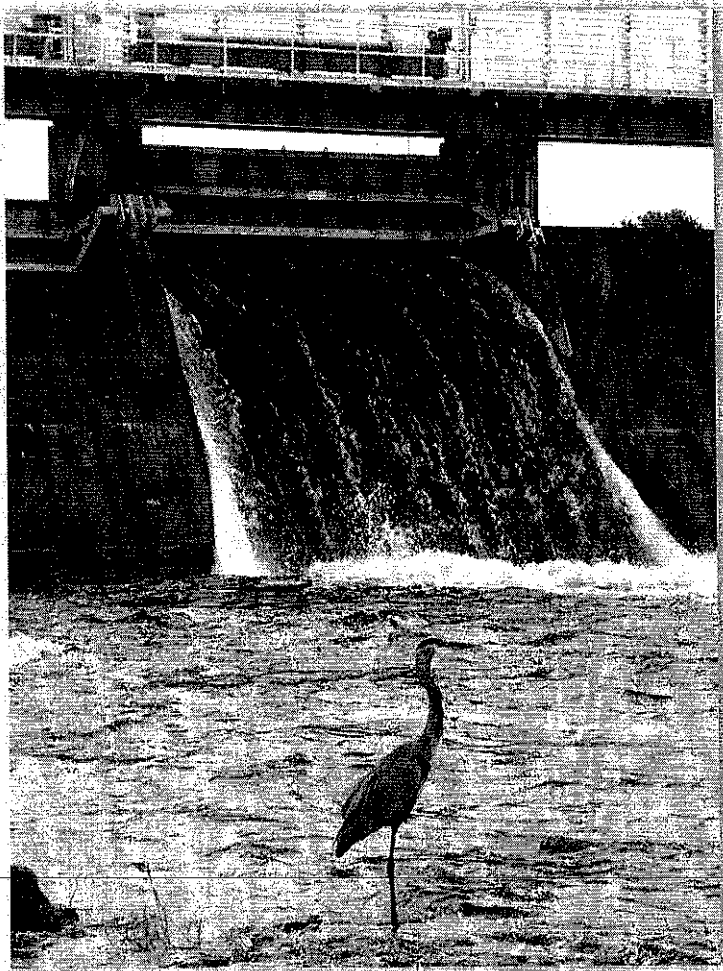


Figure 4: Hillsborough River Dam Cross Section – Concrete Gravity Dam through end gate



HILLSBOROUGH RIVER DAM
DIAGNOSTIC ASSESSMENT WORKSHOP PROCEEDINGS
24 and 25 September 2013



Prepared for: City of Tampa Water Department



**Water
Department**

Prepared by: Francisco Silva - Tulla, Sc.D., P.E.
Consulting Civil Engineer
GeoEngineering & Environment



24 February 2014

IV. DIAGNOSTIC ASSESSMENT CONCLUSIONS AND RECOMMENDATIONS

The Hillsborough River Dam assessment team reached the following conclusions and recommendations during the diagnostic assessment of the facility:

- 1. Dam Safety Program** – Implement a Dam Safety Program to improve the quality and adequacy of maintenance, surveillance, and methods of project operations. The Dam Safety Program should address both

the Concrete Gravity Dam and the North Embankment Dam. Appendix C outlines a type of program that has proven successful in the past for earth dams. Operational tasks that merit a high priority include updating the facility's O&M manual and EAP, and scheduling EAP tabletop and field exercises.

2. **North Embankment Dam Assessment** – Perform a thorough assessment of the North Embankment Dam to provide this important component of the structure with the same level of scrutiny currently given to the Concrete Gravity Dam.
3. **Sub-surface Conditions Assessment** – Determine the need and scope for an assessment of sub-surface conditions for the following components:
 - a. North Embankment Dam
 - b. Concrete Dam
 - c. South Abutment.
4. **Concrete Dam Assessment** – Perform a thorough assessment of the following features:
 - a. Composition, to provide a better understanding of the unit weight and compressive strength characteristics of mass concrete, including Cyclopean concrete if indeed it exists within the concrete dam,
 - b. Stability under normal, flood, and seismic loading conditions,
 - c. Effective reduction in uplift pressure from the half-drains beneath the structure,
 - d. Effect of uplift on stability.
5. **Maintenance** – Priority maintenance items include:
 - a. **North Embankment Dam** – Remove all trees, including their roots, from the dam.

- b. **South Abutment** – Remove overgrown vegetation near the retaining wall to facilitate visual inspections. A well maintained vegetation cover provides desirable surface erosion protection.
 - c. **Concrete Dam** – Remove vegetation from cracks and construction joints. This task requires continual maintenance.
6. **South Abutment Retaining Wall** – Assess the performance of the following features:
- a. Weep holes and
 - b. Wall verticality.
7. **North Abutment Retaining Wall** – investigate a possible movement detected during the field inspection.
8. **Non Issues** – The following tasks under consideration by the Tampa Water Department were deemed not necessary by the Assessment Team:
- a. **Geo-membrane** – Installation of a polymer membrane on the upstream face of the concrete dam to prevent water leakage through the construction joints during cold weather periods. The assessment team considers this occasional leakage normal performance that does not reflect a dam safety hazard.
 - b. **Concrete Spalling** – Repair of spalled concrete along the concrete gravity dam. The assessment team concluded that the surface spalling did not present a performance issue for the massive concrete dam and any decision regarding future repairs should be based on aesthetic considerations.