LAKESIDE IMPROVEMENT ASSOCIATION, INC.

COMMONWEALTH ENGINEERS, INC.
A wealth of resources to master a common goal.

Traders Point Lake Dam Inspection

July 2020 Dam Inspection and Repair Report

December 2020

A Wealth of Resources to Master a Common Goal.

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IDNR INSPECTION FORMS

July 2020

Print Form

SUGGESTED DAM INSPECTION REPORT (Refer to pages 5 and 6 for instructions.)

Name of Professional Conducting Inspection	Professional License No. (Indiana)
Roger M. Kottlowski, P.E.	PE60020374
Business Address	**Phone: (day) 317 - 888 - 1177**
7256 Company Dr., Indianapolis, IN 46237	(evening) 317 - 752 - 3858

Company Name: Commonwealth Engineers, Inc.

INSPECTION PREPARATION: Reviewed all pertinent technical documentation related to this dam and site in the State's and the Owner's files: Yes ☒ No ☐ Comment: Provided by the Owner

MULTIDISCIPINARY:I am experienced in the technical disciplines or I am working with other professionals experienced in the technical disciplines to properly inspect this dam and appurtenant works. Technical disciplines, in additional to the general civil engineering, may include geotechnical, geological, hydrologic, structural, and mechanical. Yes ☒ No ☐ Comment: Included CE Solutions, Inc. for Structural Inspections

Dam Name	Quad.	Date of Inspection
Traders Point Lake Dam	Zionsville	7 / 14 / 2020

State Dam ID	Permit (if unapproved see pg. 6)	County	Sec.	T.		R.		Last Inspection
49-5	Not Approved	Marion	27	17	N	2	E	2 / 23 / 2020

Owners Name	Owner's Phone
Lakeside Improvement Association	(317) 797-2186

Address/Zip Code: 7365 Lakeside Dr, Indianapolis, IN 46278

Contact's Name	Contact's Phone	Spillway Width	Ft. FBD.
Derek Gray	(day) 317 - 797 - 2186 (evening) 317 - 797 - 2186	Top 30 Bot. 30	4.5

Hazard	Drainage Area	Surface Area	Height	Crest Length	Crest Width	Inlet Below Crest	Slope
Low	1.63 MI^2	15.3 AC	20 FT	375 FT	2-7 FT	4.25 FT	Up 1.5:1 Down 2:1 to 4:1

FIELD CONDITIONS OBSERVED

Water Level - Below Dam Crest 4.25 Ft.

Ground Moisture Condition: Dry ☒ Wet ☐ Snowcover ☐ Other

DRAWDOWN STRUCTURE

☐ Yes ☒ None

Comment

MONITORING ☐ Yes ☒ None [☐ Gage Rod ☐ Piezometers ☐ Seepage Weirs ☐ Survey Monuments ☐ Other]

Comments

A UPSTREAM SLOPE

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☒
POOR	☐

PROBLEMS NOTED: ☐ (A-1) None ☒ (A-2) Riprap - Missing, Sparse, Displaced, Weathered ☐ (A-3) Wave Erosion-with Scarps ☐ (A-4) Cracks-with Displacement ☐ (A-5) Sinkhole ☒ (A-6) Appears Too Steep ☐ (A-7) Depressions or Bulges ☐ (A-8) Slides ☒ (A-9) Animal Burrows ☒ (A-10) Trees, Brush, Briars ☐ (A-11) Other

Comments:

Clearing of brush and small trees needed. Riprap needs to be added in places.

B CREST

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☒
POOR	☐

PROBLEMS NOTED: ☐ (B-1) None ☐ (B-2) Ruts or Puddles ☐ (B-3) Erosion ☐ (B-4) Cracks with Displacement ☐ (B-5) Sinkholes ☒ (B-6) Not Wide Enough ☐ (B-7) Low Area ☐ (B-8) Misalignment ☐ (B-9) Inadequate Surface Drainage ☐ (B-10) Trees, Brush, Briars ☐ (B-11) Other

Comments:

Although the crest is only 2 ft. wide, the downstream slope and crest for the most part are traversable.

Spillway Width refers to the open channel (typically the emergency or auxiliary spillway) at the control section.
Ft. FBD. refers to the vertical distance from the emergency (auxiliary) spillway control section to the lowest point of the crest of the dam.
Inlet Below Crest refers to the vertical distance from the inlet of the principal spillway to the crest of the dam.

C DOWNSTREAM SLOPE

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☒
POOR	☐

PROBLEMS NOTED: ☐ (C-1) None ☐ (C-2) Livestock Damage ☐ (C-3) Erosion or Gullies ☐ (C-4) Cracks with Displacement ☐ (C-5) Sinkholes ☒ (C-6) Appears too Steep ☐ (C-7) Depression or Bulges ☐ (C-8) Slide ☐ (C-9) Soft Areas ☒ (C-10) Trees, Brush, Briars ☐ (C-11) Animal Burrows ☐ (C-12)Other_____
Comments:

The right half of the dam has been well maintained and is more gentle 4:1. The immediate slope right of the principle spillway is too steep and needs topsoil fill and reseeding. The area left of the principle spillway is steep and contains mostly weeds, woody vegetation and large trees.

D SEEPAGE

GOOD (NONE)	☐
ACCEPTABLE	☒
DEFICIENT	☐
POOR	☐

PROBLEMS NOTED: ☐ (D-1) None ☐ (D-2) Saturated Embankment Area ☐ (D-3) Seepage Exits on Embankment ☐ (D-4) Seepage Exits at Point Source ☒ (D-5) Seepage Area at Toe ☐ (D-6) Flow Adjacent to Outlet ☐ (D-7) Seepage Clear/Muddy
[**DRAIN OUTFALLS SEEN** ☒ No ____ Yes ☐ (D-8) Flow Clear/Muddy ☐ (D-9) Dry/Obstructed]
☐ (D-10) Other_____Describe location of drains and indicate amount and quality of discharge.
Comments:

Small seepage noted at right toe area at end of extended wing wall. Cattails are growing in the exit channel next to this wet area. Probed area and could not find a source; possibly coming from behind right wing wall area. Need to monitor.

E PRINCIPAL SPILLWAY

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☐
POOR	☒

DESCRIPTION: 30 Ft .Long x 2 Ft. Thick- 13'-9" Vertical Drop Concrete Weir ; 5'-9" High Side Walls

PROBLEMS NOTED: ☐ (E-1) None ☒ (E-2) Deterioration ☒ (E-3) Separation ☒ (E-4) Cracking ☐ (E-5) Inlet, Outlet Deficiency ☐ (E-6) Stilling Basin Inadequacies ☐ (E-7) Trash Rack ☐ (E-8) Other_____
Comments:

Refer to separate structural assessment. This 93-year old concrete spillway has become overstressed and is in various stages of deterioration and failure and needs to be temporarily supported immediately.

F AUXILIARY SPILLWAY

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☒
POOR	☐

DESCRIPTION: No Auxiliary Spillway Present

PROBLEMS NOTED: ☐ (F-1) None ☒ (F-2) No Auxiliary Spillway Found ☐ (F-3) Erosion-with Backcutting ☐ (F-4) Crack with Displacement ☐ (F-5) Appears to be Structurally Inadequate ☐ (F-6) Appears too Small ☐ (F-7) Inadequate Freeboard ☐ (F-8) Flow Obstructed ☐ (F-9) Concrete Deteriorated/Undermined ☒ (F-10) Other _____
Comments:

Some overflow may pass over a depressed area in a berm along 71st St. approx. 400 ft East of the Dam

G MAINTENANCE AND REPAIRS

GOOD	☐
ACCEPTABLE	☐
DEFICIENT	☒
POOR	☐

PROBLEMS NOTED: ☐ (G-1) None ☐ (G-2) Access Road Needs Maintenance ☐ (G-3) Cattle Damage ☐ (G-4) Spillway Obstruction ☒ (G-5) Brush, Weeds, Tall Grass, on Upstream Slope, Crest, Downstream Slope, Toe ☒ (G-6) Trees on Upstream Slope, Crest, Downstream Slope ☒ (G-7) Rodent Activity on Upstream Slope, Crest, Downstream Slope, Toe ☒ (G-8) Deteriorated Concrete-Facing, Outlet, Spillway ☐ (G-9) Gate and/or Drawdown Need Repair ☐ (G-10) Other _____
Comments:

Exist spillway has many cracks and is deteriorating. Trees woody vegetation on left DS Slope. US Slope has many weeds; small trees have been cut need herbicide. Right DS slope looks good, well maintained

H OVERALL CONDITIONS

Based on this inspection and recent file review, the overall surficial condition is determined to be: ☐ (H-1) Satisfactory ☐ (H-2) Fair ☐ (H-3) Conditionally Poor ☒ (H-4) Poor ☐ (H-5) Unsatisfactory

IMPORTANT: IF THIS RATING IS DIFFERENT THAN PREVIOUS IDNR RATING, PLEASE ATTACH EXPLANATION AND REASONS FOR CHANGE ON PAGE 4.

DAM NAME Traders Point Lake Dam STATE DAM I.D. 49-5 DATE 7 / 14 / 20

RECOMMENDATIONS AND ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

MAINTENANCE-MINOR REPAIR-MONITORING

☐ (1) Provide Additional Erosion Protection: _____

☒ (2) Mow: Minimum twice per year

☒ (3) Clear Trees and/or Brush From: Left DS slope

☒ (4) Initiate Rodent Control Program and Properly Backfill Existing Holes: US Slope

☒ (5) Repair: Primary Spillway

☐ (6) Provide Surface Drainage For: _____

☒ (7) Monitor: Seepage at right toe area just below right wing wall

☐ (8) Other: _____

☐ (9) Other: _____

ENGINEERING-EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO:

(Plans & Specifications must be approved by State prior to construction.)

☒ (10) Prepare Plans and Specifications for the Rehabilitation of the Dam: Plans for a new spillway are recommended

☐ (11) Prepare As-Built Drawings of: _____

☒ (12) Perform a Geotechnical Investigation to Evaluate the Stability of the Dam: This needs to be completed near the spillway immediately

☒ (13) Perform a Hydrologic Study to Determine Required Spillway Size: This is needed to confirm new spillway size

☒ (14) Prepare Plans and Specifications for an Adequate Spillway: See above

☐ (15) Set up a Monitoring Program: _____

☒ (16) Refer to Unapproved Status of Dam: Constructed in 1927 before the 1945 Flood Control Act; Rehab will be permitted

☒ (17) Develop an Emergency Action Plan: A breach analysis is needed to confirm impact downstream

☐ (18) Other: _____

☐ (19) Other: _____

Recommended schedule for upgrades/comments (Please prioritize and note importance of each item.)

Priority Items Est. Time to Complete

1 Meet with the IDNR to discuss action plan Immediately

2 Geotechnical Investigation Immediately

3 Final Structural Design of Temporary Supports and Contractor Quote Documents Immediately

4 Topographic survey of Spillway and Embankment 6 Months

5 Design of New Spillway Structure (includes H/H Eval and Permit Applications) 18 Months

6 Determine Funding Method for Replacement Spillway Immediately

7 Bidding and Construction of Replacement Spillway (includes time for obtaining permits) 2 Years

Secondary Items

1 Remove Trees from South (left) Embankment (at least to stump level and remaining stumps treated with a glyphosate herbicide designed for aquatic use that is safe for the environment and applied by a licensed applicator) 1 Year

2 Add fill to the left embankment to flatten the downstream slope 2 Years

3 Riprap is needed along the upstream shoreline for long-term erosion protection 2 Years

Lesser Priority or On-Going Maintenance

1Clear areas below the spillway in exit channel for floodwaters to pass 2 Years

2 Remove weeds, brush and small trees from upstream embankment 2 Years

3 Remove brush from north (right) abutment area 2 Years

Photographs ☒ Attachments ☒

ENGINEER'S INSTRUCTION Instructed owner on the safety concerns with the structure and how to monitor and inspect the dam and appurtenant works in the interim period between the regulatory two-year inspections. Yes ☒ No ☐

Comment

Professional Engineer's Signature Rognm Rotthowe Date 12/2/2020

Reviewed By _____ Date

Owner/Owner's Representative

EXPLANATION FOR CHANGE IN RATINGS (Describe all repairs, upgrades or improvements made if dam conditions and rating have improved since the last inspection. Describe deteriorating conditions if ratings have worsened.)

REASONS FOR RATING CHANGE:

Overall Rating has changed from Conditionally Poor to Poor. This is due to the seriousness of this 93-year old concrete spillway that has become overstressed and is in various stages of deterioration and failure and needs to be temporarily supported immediately.

PREVIOUS RECOMMENDATIONS FOR MAINTENANCE, REPAIRS, AND UPGRADES:

HAVE THEY BEEN PERFORMED ☒ YES ☐ NO (If no, please explain:)

The owner has contacted engineers to evaluate the dam, and this an important step that was recommended.
Some trees and brush have been removed by the owner, yet more work is needed to repair/replace the spillway and remove large trees on the left downstream slope

Supporting Documentation

Photographs ☒ Attachments ☐ Calculations ☐ Drawings ☐ Other ☒ See Structural Condition Assessment

Comments:

As plans are developed for improvements to the spillway, other recommendations noted in past inspection reports will be addressed.

INSTRUCTIONS FOR COMPLETING DAM VISUAL INSPECTION REPORT

1. Complete all items that are applicable; if not applicable, write in "N/A". For concrete dams, complete all applicable items and use "comments" section to cover items not included in the check boxes. Also indicate that the dam is concrete in the comments section.

2. Use page 6 to determine ratings of each dam component (items A through G) and for Overall Conditions (Item H).

3. Please write legibly and concisely.

4. Inspector must be knowledgeable with the type of dam, materials, and components being inspected. If not, qualified assistance shall be engaged.

5. The inspector shall review the dam owner's and IDNR project files prior to the inspection. Previous inspection reports shall be closely reviewed for previous problems and deficiencies.

6. If the ratings of the components (items A through G) or the Overall Conditions (item H) of the dam have changed since the last inspection, please complete page 4. If a rating has improved, dam repairs, improvements, analyses, or maintenance must have been performed and documented on page 4.

7. For a dam to have a satisfactory "Overall Conditions" rating, it must have no existing or potential dam safety deficiencies recognized. Safe performance is expected under all anticipated loading conditions, including infrequent hydrologic events (PMP for high hazard dams) and seismic events. The dam owner's project files must contain hydrologic and hydraulic analyses of the dam and its spillways to verify performance. The files must also contain slope stability analyses to verify embankment stability under full reservoir conditions and rapid-draw down conditions. The dam and all of its components must meet current IDNR and design standards. "Normal" deficiencies such as minor erosion, minor seepage, or normal concrete aging may not make a dam unsatisfactory or unacceptable. For a satisfactory "Overall Conditions" rating to be assigned, items A through G generally should all have a "good" rating; however, in some cases an "acceptable" rating may be satisfactory if the "Problems Noted" are minor, or "normal" conditions, such as minor erosion rills, small puddles on crest, or if grass needs mowed, but is in good condition.

8. An inspection report form must be submitted to IDNR along with a formal technical inspection report as described in Chapter 4.0 of Part 3 of the Indiana Dam Safety Inspection Manual.

9. Please sign and date this page in the space below to verify that you have read and understand these instructions.

Inspector's Signature: Roger Mottlowski Date: 12/2/2020

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, PRINCIPAL SPILLWAY, AUXILIARY SPILLWAY

GOOD	ACCEPTABLE	DEFICIENT	POOR
In general, this part of the structure has a good appearance, and conditions observed in this area do not appear to threaten the safety of the dam.	Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.	Continued deterioration and/or unusual loading may threaten the safety of the dam.	Conditions observed in this area appear to threaten the safety of the dam. Conditions observed in this area are unacceptable.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD (NONE)	ACCEPTABLE	DEFICIENT	POOR
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.	Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.	Excessive seepage exists at areas other than drain outfalls and other designed drains. Seepage needs to be evaluated. Increased flow and/or continued deterioration in seepage conditions may threaten the safety of the dam.	Excessive seepage conditions observed appear to threaten the safety of the dam and is unacceptable. Examples: 1) Designed drain or seepage flows have increased without increase in reservoir level. 2) Drain or seepage flows contain sediment. i.e., muddy water or particles in jar samples. 3) Widespread seepage, concentrated seepage or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD	ACCEPTABLE	DEFICIENT	POOR
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.	Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are required.	Level of maintenance of the dam needs significant improvement. Major repairs may be required. Continued neglect of maintenance may threaten the safety of the dam.	Dam does not receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam. Level of maintenance is unacceptable.

OVERALL CONDITIONS

SATISFACTORY - No existing or potential dam safety deficiencies recognized. Safe performance is expected under all anticipated loading conditions, including such events as infrequent hydrologic and/or seismic events. Project Files contain necessary hydrologic, and other engineering calculations to verify dam safety and performance.

FAIR - No existing dam safety deficiencies are recognized for normal loading conditions. Infrequent hydrologic and/or seismic events would probably result in a dam safety deficiency.

CONDITIONALLY POOR - A potential safety deficiency is recognized for unusual loading conditions which may realistically occur during the expected life of the structure. CONDITIONALLY POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency; further investigations and studies are necessary.

POOR - A potential dam safety deficiency is clearly recognized for normal loading conditions. Immediate actions to resolve the deficiency are recommended; reservoir restrictions may be necessary until problem resolution.

UNSATISFACTORY - A dam safety deficiency exists for normal conditions. Immediate remedial action is required for problem resolution.

HAZARD CLASSIFICATIONS OF DAMS (STRUCTURE)

LOW HAZARD- A structure the failure of which may damage farm buildings, agricultural land, or local roads

SIGNIFICANT HAZARD- A structure the failure of which may damage isolated homes and highways, or cause the temporary interruption of public utility services.

HIGH HAZARD-A structure the failure of which may cause the loss of life and serious damage to homes, industrial and commercial buildings, public utilities, major highways, or railroads.

UNAPPROVED STATUS OF DAM

A dam that has been given an unapproved status (see entry for permit) means that plans, construction specifications, hydraulic analyses, and/or a geotechnical investigation on your dam, proving the safety of the structure, have not been received and approved by the Indiana Department of Natural Resources (IDNR). IDNR records indicate that no progress has been made to secure this approval. The fact that the dam is inspected under the Regulation of Dams Act (IC 14-27-7.5) in no way alters the illegal status of the structures.

If your dam is indicated to be unapproved, it is requested that your engineer contact the Indiana Department of Natural Resources,

DAM SAFETY INSPECTION CHECKLIST

Complete all Portions of This Section (Pre-inspection)

Date of Inspection: July 14, 2020

Name of Dam: Traders Point Lake Dam File Number: 49-5/ Unapproved

EAP: ☐ yes ☒ no OM&I: ☐ yes ☒ no

Review Inventory – Highlight Missing Information (Pre-inspection)

Owner(s) Name(s): Lakeside Improvement Association

Address: 7365 Lakeside Dr.

City: Indianapolis State: IN Zip (+4) 46278

Telephone (Home): (317) 797-2186 Telephone (Work): ( )

Contact Person: Derek Gray Telephone: ( )

Designed By: No Design

Constructed By: George Gallacher Paton

Year Completed: 1927 Plans Available (~~Yes~~, No) (location): Non Plans

Purpose of Dam: Recreation

Interview with owner (at the site)

Owner/Representative present: (Yes, No) Name(s): o Derek Gray
o
o

Double check address, telephone #, purpose

How long have you owned dam – previous name/owner? N/A

EAP/OM&I: up-dated (~~yes~~, no) & location: N/A

Operate lake drain (times per year, accessibility): N/A

Mowing (times per year): Summer and Spring. See attached maintenance record from owner

Prior problems (wet areas, erosion, slides): Wet area/ seepage noted in lower right toe near north wing wall

Repair or modification (what & when): 1.North wing wall of dam reinforced and lengthened in 1992
2. North earthen dam had extensive lake soil placed on west slope 1993-1994

Failure/Incident/Breach (max. Pool): N/A

Downstream hazard status (recent changes): None

Do you know the in-depth details of the construction of your dam? (If yes – ask next three questions, if no – go to Field Information section

Core trench material and location: N/A

Volume of fill (earth or rock) in dam: N/A

Foundation (earth or rock) of dam: N/A

Field Information (while at site)

Pool Elevation (during inspection): At Crest of Spillway Time: 9:00 ☒ a.m. ☐ p.m.

Site Conditions (temp., weather, ground moisture): 50° F,

Inspection Party: Roger Kottlowski, P.E. and Dustin Jennings, P.E., and CE Solutions

Maximum Height: 20.25 ft (measured or)

Normal Pool Surface Area: Lake size 15.3 acres (DNR report states 10 acres) (measured or)

UPSTREAM SLOPE

Gradient: 1.6:1 to 2:1 (meas.) Horizontal: Vertical:

	None	Monitor	Maintenance	Engineer
			Required Action	
☒ ***VEGETATION*** [no problem]				
☒ Trees: Quantity: (<5, sparse, dense) Diameter: (<6", 6-12", >12") Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes: **Remove small trees**	☐	☐	☒	☐
☒ Brush: Quantity: (sparse, dense) Location: (adj. to structure, **entire slope**, lt end, rt end, middle, see dwg) Notes: **Remove brush**	☐	☐	☒	☐
☒ Ground Cover: Type: (grass, crown vetch) Other: Quantity: (bare, **sparse**, adequate, dense) Appearance: (too tall, too short, good Notes: **Need to eliminate weeds and plant grass seed with riprap**	☐	☐	☒	☐
☒ ***SLOPE PROTECTION*** [no problem, could not inspect thoroughly]				
☐ None	☐	☐	☐	☐
☒ Riprap: Average Diameter: (adequate, sparse, displaced, **weathered**, vegetation) (bedding/fabric noted – yes, **no**) Notes: **Additional riprap needed; minimal riprap found at waters edge and higher**	☐	☐	☒	☐
☐ Wave Berm: Vegetation: (adequate, bare, sparse, improper vegetation) Notes:	☒	☐	☐	☐
☐ Concrete Slabs: (cracked, settlement, undermined, voids, vegetation) Notes:	☒	☐	☐	☐
☐ Other: Notes:	☒	☐	☐	☐
☒ ***EROSION*** [no problem, could not inspect thoroughly]				
☐ Wave Erosion (Beaching): Scrap: Length: Height: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Runoff Erosion (Gullies): Quantity Depth: Width: Length: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐
☒ ***INSTABILITIES*** [no problem, could not inspect thoroughly]				
☐ Slides: Transverse Length: Longitudinal Length: Scrap: Width: Length: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Crack: Width: Depth: Notes/Causes:	☒	☐	☐	☐
☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other Quantity: Length: Width: Depth: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐
	None	Monitor	Maintenance	Engineer

{**Upstream Slope**, Crest, Downstream Slope, Seepage, Principal Spillway, Auxiliary Spillway, Lake Drain}

	Required Action			
	None	Monitor	Maintenance	Engineer
☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other Quantity: Length: Width: Depth: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐
☐ Bulges ☐ Depressions ☐ Hummocky Size: Height: Depth: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐
☐ Bulges ☐ Depressions ☐ Hummocky Size: Height: Depth: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐
☒ ***OTHER*** [no problem, could not inspect thoroughly]				
☐ Rodent Burrows: (few, numerous) Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes: **Some smaller rodent holes found; ongoing issue**	☐	☐	☒	☐
☐ Ruts: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Depth: Width: Length: Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):	☒	☐	☐	☐
☐ Other: Notes:	☒	☐	☐	☐

CREST

Length: 300Ft. Record; 375 meas. Width: min 2 Ft. (meas.)

	Required Action			
	None	Monitor	Maintenance	Engineer
☒ ***VEGETATION*** [no problem]				
☐ Trees: Quantity: (<5, sparse, dense) Diameter: (<6", 6-12", >12") Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Brush: Quantity: (sparse, dense) Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes:	☒	☐	☐	☐
☒ Ground Cover: Type: (**grass**, crown vetch) Other: Quantity: (bare, sparse, adequate, dense) Appearance: (too tall, too short, **good**) Notes: **Grass cover looks good**	☒	☐	☐	☐
☒ ***EROSION*** [no problem, could not inspect thoroughly] No Problems				
☐ Runoff Erosion (Gullies): Quantity: Depth: Width: Length: Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) Notes/Causes:	☒	☐	☐	☐

	Required Action			
	None	Monitor	Maintenance	Engineer
☒ ***ALIGNMENT*** [no problem, could not inspect thoroughly]				
☐ Vertical: ☐ Low Area:	☒	☐	☐	☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Elevation Difference: Length:				
Notes/Causes:				
☐ Horizontal	☒	☐	☐	☐
Notes/Causes: **Relatively straight**				
☒ ***WIDTH*** [no problem]				
☐ Too Narrow: **Min 2 ft. in places; DS Slope is relatively gentle/traversable**	☐	☐	☒	☐
Location: (adj. to structure, entire slope, lt end, rt end, **middle**, see dwg)				
Notes/Causes:				
☒ ***INSTABILITIES*** [no problem, could not inspect thoroughly]				
☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other	☒	☐	☐	☐
Quantity: Length: Width: Depth:				
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes/Causes:				
☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other	☒	☐	☐	☐
Quantity: Length: Width: Depth:				
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes/Causes:				
☐ Bulges ☐ Depressions ☐ Hummocky	☒	☐	☐	☐
Size: Height: Depth:				
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes/Causes:				
☐ Bulges ☐ Depressions ☐ Hummocky	☒	☐	☐	☐
Size: Height: Depth:				
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes/Causes:				
☒ ***OTHER*** [no problem, could not inspect thoroughly]				
☐ Rodent Burrows: (few, numerous)	☒	☐	☐	☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes:				
☐ Ruts:	☒	☐	☐	☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Depth: Width: Length:				
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
Notes:				
	None	Monitor	Maintenance	Engineer
{Upstream Slope, **Crest**, Downstream Slope, Seepage, Principal Spillway, Auxiliary Spillway, Lake Drain}	Required Action			

Gradient: Horizontal: Vertical: 10:1 to 4:1 Rt 1.66: 1 Lt (meas.)

Required Action: None | Monitor | Maintenance | Engineer

DOWNSTREAM SLOPE

☒ ***VEGETATION*** [no problem]

☐ Trees: Quantity: (<5, sparse, dense) — ☐ ☐ ☒ ☐
Diameter: (<6", 6-12", **>12")**
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes: **Cut existing trees on left embankment; apply an aquatic herbicide like Glyphosate on all stumps**

☐ Brush: Quantity: (sparse, dense) — ☒ ☐ ☐ ☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes:

☒ Ground Cover: Type: (grass, crown vetch) Other: — ☐ ☐ ☒ ☐
Quantity: (bare, **sparse**, adequate, dense)
Appearance: (too tall, too short, good) **Middle to right embankment has good grass cover**
Notes: **Ground cover on left embankment left (south) of spillway and an area approx. 58 ft. right (north) of the spillway down to the lower wing wall is in weeds and very difficult to observe ground conditions.**

☒ ***EROSION*** [no problem, could not inspect thoroughly]

☐ Runoff Erosion (Gullies): — ☐ ☐ ☒ ☐
Location: (**adj. to structure**, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes: **Concentrated flow along spillway walls has erosion**

☒ ***INSTABILITIES*** [no problem, could not inspect thoroughly]

☐ Slides: Transverse Length: Longitudinal Length: — ☒ ☐ ☐ ☐
Scrap: Width: Length:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Crack: Width: Depth:
Notes/Causes:

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other — ☒ ☐ ☐ ☐
Quantity: Length: Width: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other — ☒ ☐ ☐ ☐
Quantity: Length: Width: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky — ☒ ☐ ☐ ☐
Size: Height: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky — ☒ ☐ ☐ ☐
Size: Height: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

None | Monitor | Maintenance | Engineer

{Upstream Slope, Crest, **Downstream Slope**, Seepage, Principal Spillway, Auxiliary Spillway, Lake Drain}

Required Action

	Required Action			
	None	Monitor	Maintenance	Engineer
☒ ***OTHER*** [no problem, could not inspect thoroughly]				
☐ Rodent Burrows: (few, numerous)	☒	☐	☐	☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Notes:				
☐ Ruts:	☒	☐	☐	☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)				
Depth: Width: Length:				
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):	☒	☐	☐	☐
☒ Other:	☒	☐	☐	☐
Notes:				

☒ ***SEEPAGE*** [no problem, could not inspect thoroughly]				
☒ Wet Area ☐ Flow ☐ Boil ☐ Sinkhole	☐	☒	☐	☐
Flow Rate: 0 Size:				
Location:				
☐ Aquatic Vegetation ☐ None				
☐ Rust Colored Deposits ☐ None				
☐ Sediment in Flow ☐ None				
☐ Other:				
Notes/Causes: **A wet area noted below and Lt of newer Rt wingwall. Probing did not locate flow from toe; may be from embankment just Rt of spillway that has as poor ground cover and is very steep (approx. 2:1)**				
☐ Wet Area ☐ Flow ☐ Boil ☐ Sinkhole	☒	☐	☐	☐
Flow Rate: Size:				
Location:				
☐ Aquatic Vegetation ☐ None				
☐ Rust Colored Deposits ☐ None				
☐ Sediment in Flow ☐ None				
☐ Other:				
Notes/Causes:				
☒ ***EMBANKMENT DRAINS*** [none, **none found**, no problem, could not inspect thoroughly]				
Type: ☒ Toe Drain ☐ Relief Wells ☐ Other:	☒	☐	☐	☐
Flow Rate: Size: Number:				
Location:				
Notes:**.**				
☒ ***MONITORING INSTRUMENTATION*** [none, **none found**, no problem, could not inspect thoroughly]				
☒ None Found ☐ Piezometers ☐ Weirs/Flumes ☐ Other	☒	☐	☐	☐
☐ Periodic Inspections by:				
Notes:				

{Upstream Slope, Crest, **Downstream Slope**, **Seepage**, Principal Spillway, Auxiliary Spillway, Lake Drain}	Required Action			
	None	Monitor	Maintenance	Engineer

Required Action

PRINCIPAL SPILLWAY- 30 ft. Wide x 2ft. Vertical Concrete Spillway with 1'- 6"Abutment Walls

	None	Monitor	Maintenance	Engineer
☒ ***GENERAL INLET*** [no problem, could not inspect thoroughly]				
☐ Anti-Vortex Dimensions: (adequate, too small) Type: (steel, concrete, aluminum, stainless steel, corrugated metal wood, other): Deterioration: (missing sections, rusted, collapsed) New Notes:	☒	☐	☐	☐
☐ Trash Rack Type: (metal bars, fence, screen, concrete, baffle, other): Deterioration: (broken bars, missing sections, rusted, collapsed) Notes:	☒	☐	☐	☐
☒ ***INLET OBSTRUCTION*** [no problem, could not inspect thoroughly]				
☐ Debris: (leaves, trash, logs, branches, ice)	☒	☐	☐	☐
☐ Trees: (<5, sparse, dense) Diameter: (<6", 6-12", >12"): Location: (entire inlet, lt side, rt side, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Brush: Quantity: (sparse, dense) Location: (entire inlet, lt side, rt side, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Other: (beaver activity, trashrack opening too small, partially/completely blocked, i.e.) Notes:	☒	☐	☐	☐
☒ ***INLET MATRIALS*** [no problem, could not inspect thoroughly]				
☐ Metal: [loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation] Dimensions: Location: Notes/Causes:	☒	☐	☐	☐
☒ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(**spalling**, **popouts**, honeycombing, scaling, craze/map cracks)	☐	☐	☒	☒
(isolated crack, **exposed rebar**, **disintegration**, other) Dimensions/Location: **Lt wall of spillway is eroding** Notes/Causes: **Degrading Concrete and poor reinforcing** **See structural evaluation**	☐	☐	☒	☒
☐ Plastic: (deterioration, cracking, deformation) None Dimensions: Location: Notes/Causes:	☒	☐	☐	☐

None Monitor Maintenance Engineer

{Upstream Slope, Crest, Downstream Slope, Seepage, **Principal Spillway-Inlet**, Auxiliary Spillway, Lake Drain}

Required Action

	Required Action			
	None	Monitor	Maintenance	Engineer
☐ Earthen:				
☐ Ground Cover: Type: (grass, crown vetch) Other: Quantity: (bare, sparse, adequate, dense) Appearance: (too small, too short, good) Notes:	☐	☐	☐	☐
☐ Erosion: (wave, surface runoff) Description: (height/depth/length/i.e.) Notes:	☐	☐	☐	☐
☐ Ruts: Location: (entire inlet, lt side, rt side, middle, see dwg) Depth: Width: Length: Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):	☐	☐	☐	☐
☐ Riprap: Average Diameter: (adequate, sparse, weathered, vegetation) (bedding/fabric noted – yes, no) Notes:	☐	☐	☐	☐
☐ Rock-Cut: (weathered, erosion) Description: Notes:	☐	☐	☐	☐
☐ Other:	☐	☐	☐	☐
☒ ***OTHER INLET PROBLEMS*** [no problem, could not inspect thoroughly]				
☐ Misalignment: (pipe, chute, sidewall, headwall) ☐ Pipe Deformation: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Separated Joint: ☐ Loss of Joint Material: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
☒ ***OPEN CHANNEL CONTROL SECTION*** – Channel Downstream of Principle Outlet (est., meas.) (est., meas.) Notes:	☒	☐	☐	☐
☒ ***OUTLET OBSTRUCTION*** [no problem, could not inspect thoroughly]				
☐ Debris: (leaves, trash, logs, branches, ice)	☐	☒	☒	☐
☒ Trees: Quantity: (<5, sparse, **dense**)	☐	☐	☐	☐
Diameter: (<6", 6-12", >12") Location: (entire outlet, lt side, rt side, middle, see dwg) **Notes: Need to clear trees in channel below dam**				

{Upstream Slope, Crest, Downstream Slope, Seepage, **Principal Spillway-Inlet/Outlet**, Auxiliary Spillway, Lake Drain}	Required Action: None	Monitor	Maintenance	Engineer

	Required Action			
	None	Monitor	Maintenance	Engineer
☐ Brush: Quantity: (sparse, **dense**) Diameter: (<6", 6-12", >12") Location: (entire outlet, lt side, rt side, middle, see dwg) Notes: **Need to clear dense brush in channel below dam**	☐	☐	☒	☐
☐ Other: (beaver activity, partially/completely blocked,i.e.) Notes:	☒	☐	☐	☐
☒ ***OUTLET MATERIALS*** [no problem, could not inspect thoroughly] No Problems				
☐ Metal: [loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation] Dimensions: Location: Notes/Causes:	☒	☐	☐	☐
☒ Concrete: New Concrete Stilling Basin				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(**spalling, popouts**, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(**isolated crack, exposed rebar, disintegration**, other) Dimensions/Location: **Left and Right abutment walls are leaning; Left wall is worse; has serious cracking and eroding concrete and undermining** Notes/Causes: **Degrading concrete and poor reinforcing; See structural evaluation**	☐	☐	☒	☒
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: **Center buttress wall in spillway outlet has degrading concrete and poor reinforcing** Notes/Causes: **Poor concrete and reinforcing consists of thin stamped metal plates.**	☒	☐	☐	☐
☒ Earthen:				
☐ Ground Cover: Type: (grass, crown vetch) Other: Quantity: (bare, sparse, adequate, dense) Appearance: (too small, too short, good) Notes: **Brush and Trees**	☐	☐	☒	☐
☐ Erosion: (other, surface runoff) Description: (height/depth/length/i.e.) Notes:	☒	☐	☐	☐
☐ Riprap: Average Diameter: (adequate, **sparse**, **displaced**, weathered, vegetation) (bedding/fabric noted – yes, **no**) Notes: **Broken concrete in outlet channel**	☐	☐	☒	☐
	None	Monitor	Maintenance	Engineer

{Upstream Slope, Crest, Downstream Slope, Seepage, **Principal Spillway-Outlet**, Auxiliary Spillway, Lake Drain}

Required Action

	Required Action			
	None	Monitor	Maintenance	Engineer
☐ Rock-Cut: (weathered, erosion) Description/Notes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
☒ ***OTHER OUTLET PROBLEMS*** [no problem, could not inspect thoroughly] No Problems				
☐ Misalignment: (pipe, chute, sidewall, headwall) ☐ Pipe Deformation: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Separated Joint: ☐ Loss of Joint Material: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
☒ ***OUTLET EROSION CONTROL STRUCTURE*** [Stilling Basins]				
☐ None:	☒	☐	☐	☐
☐ (endwall/headwall, plunge pool, impact basis, flip bucket, USBR, baffled chute, rock lined channel) Notes: Components (baffle blocks, chute blocks, endsill)	☒	☐	☐	☐
☒ ***MATERIALS*** [no problem, could not inspect thoroughly] No Problems				
☐ Riprap: Average Diameter: (adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted – yes, no) Notes:	☒	☐	☐	☐
☐ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
☒ ***OTHER*** [no problem, could not inspect thoroughly]				
☐ Misalignment: (sidewall, headwall, entire struct.) Location: Description: Notes/Causes:	☒	☐	☐	☐

Required Action

	None	Monitor	Maintenance	Engineer
☐ Separated Joint: ☐ Loss of Joint Material: Location: Description: Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location: Description: Notes/Causes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐

☐ ***DRAINS*** [none, none found, no problem, could not inspect thoroughly] (see ***SEEPAGE*** Section for Toe Drains & Relief Wells)

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other Flow Rate: gpm Size: Number Location: Notes:	☒	☐	☐	☐
Type: ☐ Weep Holes ☐ Relief Drains ☐ Other Flow Rate: Size: Number Location: Notes:	☒	☐	☐	☐

AUXILIARY SPILLWAY – A Low Area On Berm South Of The Dam Along North Side of 71st Street – Probably Not an Intended Spillway

☐ ***GENERAL*** [no problem, could not inspect thoroughly]

☐ Anti-Vortex Plate [None] Dimensions: (adequate, too small) Type: (steel, concrete, aluminum, stainless steel, corrugated metal wood, other): Deterioration: (missing sections, rusted, collapsed) Notes:	☒	☐	☐	☐
☐ Trash Rack [None] Opening Size: (adequate, too small) Type: (metal bars, fence, screen, concrete, baffle, other): Deterioration: (broken bars, missing sections, rusted, collapsed) Notes:	☒	☐	☐	☐
☐ Other: (beaver activity, trash rack opening too small, partially/completely blocked, i.e.) Notes:	☒	☐	☐	☐

None Monitor Maintenance Engineer

	None	Monitor	Maintenance	Engineer
☐ ***MATERIALS*** [no problem, could not inspect thoroughly]				
☐ Metal: [loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation]	☒	☐	☐	☐
Dimensions/Location:				
Notes/Causes:				
☐ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other)	☒	☐	☐	☐
Dimensions/Location:				
☐ Plastic: (deterioration, cracking, deformation) None	☒	☐	☐	☐
Dimensions/Location:				
Notes/Causes:				
☒ Earthen:				
☒ Ground Cover: Type: (**grass**, crown vetch) Other:	☐	☐	☒	☐
Quantity: (bare, sparse, adequate, dense)				
Appearance: (too small, too short, **good**)				
Notes: **This is just an overflow area that dumps into a side ditch**				
☐ Erosion: (other, surface runoff)	☒	☐	☐	☐
Description: (height/depth/length/i.e.)				
Notes:				
☐ Ruts:	☒	☐	☐	☐
Location: (entire inlet, lt side, rt side, middle, see dwg)				
Depth: Width: Length:				
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):				
☐ Riprap: Average Diameter:				
(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted – yes, no)	☒	☐	☐	☐
Notes:				
☐ Rock-Cut: (weathered, erosion)	☒	☐	☐	☐
Description/Notes:				
☐ Other:	☒	☐	☐	☐

	None	Monitor	Maintenance	Engineer
	Required Action			

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Outlet Erosion Control Structure, **Auxiliary Spillway-Inlet**, Lake Drain}

	Required Action			
	None	Monitor	Maintenance	Engineer
☐ ***OTHER PROBLEMS*** [no problem, could not inspect thoroughly]				
☐ Misalignment: (channel, chute, sidewall, headwall) ☐ Pipe Deformation: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Separated Joint: ☐ Loss of Joint Material: Location:/Description Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
☐ ***OPEN CHANNEL CONTROL SECTION*** [no problem, could not inspect] (est.) est.) Notes:	☒	☐	☐	☐
☐ ***OUTLET OBSTRUCTION*** [no problem, could not inspect thoroughly]				
☐ Debris: (leaves, trash, logs, branches, ice)	☒	☐	☐	☐
☐ Trees: Quantity: (<5, sparse, dense) Diameter: (<6", 6-12", >12") Location: (entire outlet, lt side, rt side, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Brush: Quantity: (sparse, dense) Location: (entire outlet, lt side, rt side, middle, see dwg) Notes:	☒	☐	☐	☐
☐ Other: (beaver activity, partially/completely blocked, i.e.) Notes:	☒	☐	☐	☐
☐ ***OUTLET MATERIALS*** [no problem, could not inspect thoroughly] N/A				
☐ Metal: [loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation] Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
☐ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: Notes/Causes:	☒	☐	☐	☐

None Monitor Maintenance Engineer

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Outlet Erosion Control Structure, **Auxiliary Spillway-Inlet/Outlet**, Lake Drain}

Required Action

Required Action

	None	Monitor	Maintenance	Engineer
☐ Plastic: (deterioration, cracking, deformation) None Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
☐ Earthen:				
☐ Ground Cover: Type: (grass, ~~crown vetch~~) Other: Quantity: (bare, sparse, adequate, dense) Appearance: (too small, too short, good) Notes:	☒	☐	☐	☐
☐ Erosion: (other, surface runoff) Description: (height/depth/length/i.e.) Notes:	☒	☐	☐	☐
☐ Ruts: Location: (entire inlet, lt side, rt side, middle, see dwg) Depth: Width: Length: Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):	☒	☐	☐	☐
☒ Riprap: Average Diameter: (adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted – yes, no) Notes:	☒	☐	☐	☐
☐ Rock-Cut: (weathered, erosion) Description/Notes:	☒	☐	☐	☐
☐ Other:	☒	☐	☐	☐
☐ ***OTHER OUTLET PROBLEMS*** [no problem, could not inspect thoroughly]				
☐ Misalignment: (channel, chute, sidewall, headwall) ☐ Pipe Deformation: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Separated Joint: ☐ Loss of Joint Material: Location:/Description Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ ***OUTLET EROSION CONTROL STRUCTURE*** [Stilling Basins]				
☐ None:	☒	☐	☐	☐
☐ (endwall/headwall, plunge pool, impact basis, flip bucket, USBR, baffled chute, rock lined channel) Notes: Components (baffle blocks, chute blocks, endsill)	☒	☐	☐	☐
☐ ***MATERIALS*** [no problem, could not inspect thoroughly]				
☐ Riprap: Average Diameter: (adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted – yes, no) Notes:	☒	☐	☐	☐

	None	Monitor	Maintenance	Engineer
{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Outlet Erosion Control Structure, **Auxiliary Spillway-Inlet/Outlet Erosion Control Structure**, Lake Drain}		Required Action	Required Action	

	None	Monitor	Maintenance	Engineer
☐ Concrete:				
(bug holes, hairline crack, efflorescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other)	☒	☐	☐	☐
Dimensions/Location:				
Notes/Causes:				
☐ ***OTHER*** [no problem, could not inspect thoroughly] N/A				
☐ Misalignment: (sidewall, headwall)	☒	☐	☐	☐
Location:				
Description:				
Notes/Causes:				
☐ Separated Joint: ☐ Loss of Joint Material:	☒	☐	☐	☐
Location:				
Description:				
Notes/Causes:				
☐ Undermining:	☒	☐	☐	☐
Location:				
Description:				
Notes/Causes:				
☐ Other:	☒	☐	☐	☐
☐ ***DRAINS*** [none, none found, no problem, could not inspect thoroughly] (see ***SEEPAGE*** Section for Toe Drains & Relief Wells)				
Type: ☐ Weep Holes ☐ Relief Drains ☐ Other	☒	☐	☐	☐
Flow Rate: Size: Number				
Location:				
Notes:				
Type: ☐ Weep Holes ☐ Relief Drains ☐ Other	☒	☐	☐	☐
Flow Rate: Size: Number				
Location:				
Notes:				

LAKE DRAIN

	None	Monitor	Maintenance	Engineer
☒ ***GENERAL*** [no problem, could not inspect thoroughly]				
☒ None found ☐ Does not have one	☒	☐	☐	☐
☐ Type of Lake Drain: (isolated control/intake tower, valve vault w/outlet conduit valve in riser-drop inlet, siphon)	☒	☐	☐	☐
Notes:				

	None	Monitor	Maintenance	Engineer
		Required Action		

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Outlet Erosion Control Structure, **Auxiliary Spillway-Inlet/Outlet Erosion Control Structure**, **Lake Drain**}

Required Action

	None	Monitor	Maintenance	Engineer
☐ Operated During inspection (~~yes~~ no) Notes: Gates not operated. No visible signs of damage or corrosion.	☒	☐	☐	☐
☐ ***ACCESS TO VALVE/SLUICE GATE*** [no problem, could not inspect thoroughly]				
☐ Type: (not accessible, from shore, boat, walkway, ~~other~~) Notes:	☒	☐	☐	☐
☐ Walkway/Platform:				
☐ Concrete Deterioration ☐ Cracks: (platform, piers, end supports, railing) Location: Notes:	☒	☐	☐	☐
☐ Wood Deterioration: Notes:	☒	☐	☐	☐
☐ Metal Deterioration: (minor, moderate, extensive, other) Notes:	☒	☐	☐	☐
☐ ***LAKE DRAIN COMPONENTS*** [no problem, could not inspect thoroughly]				
☐ Concrete Structure Location: Description: (deterioration, misalignment, cracks) Notes/Causes	☒	☐	☐	☐
☐ Valve Control (Operating Device):				
☐ No Operating Device ☐ No Stem ☐ Bent/Broken Stem ☐ Other Notes/Operability:	☒	☐	☐	☐
☐ Valve / Sluice Gate				
☐ Metal Deterioration: (surface rust, minor, moderate, extensive, other) None Location: Flow Rate: Notes/Causes:	☒	☐	☐	☐
☐ Misalignment: Notes/Causes:	☒	☐	☐	☐
☐ Leakage – Flow Rate: Notes/Causes:	☒	☐	☐	☐
☐ Outlet Conduit				
☐ Metal: [loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out] Location:. Notes/Causes:	☒	☐	☐	☐
☐ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
☐ Plastic: (deterioration, cracking) Location: Notes/Causes:	☒	☐	☐	☐
☐ Conduit Deformation: ☐ Misalignment: Location: Notes/Causes:	☒	☐	☐	☐

	None	Monitor	Maintenance	Engineer

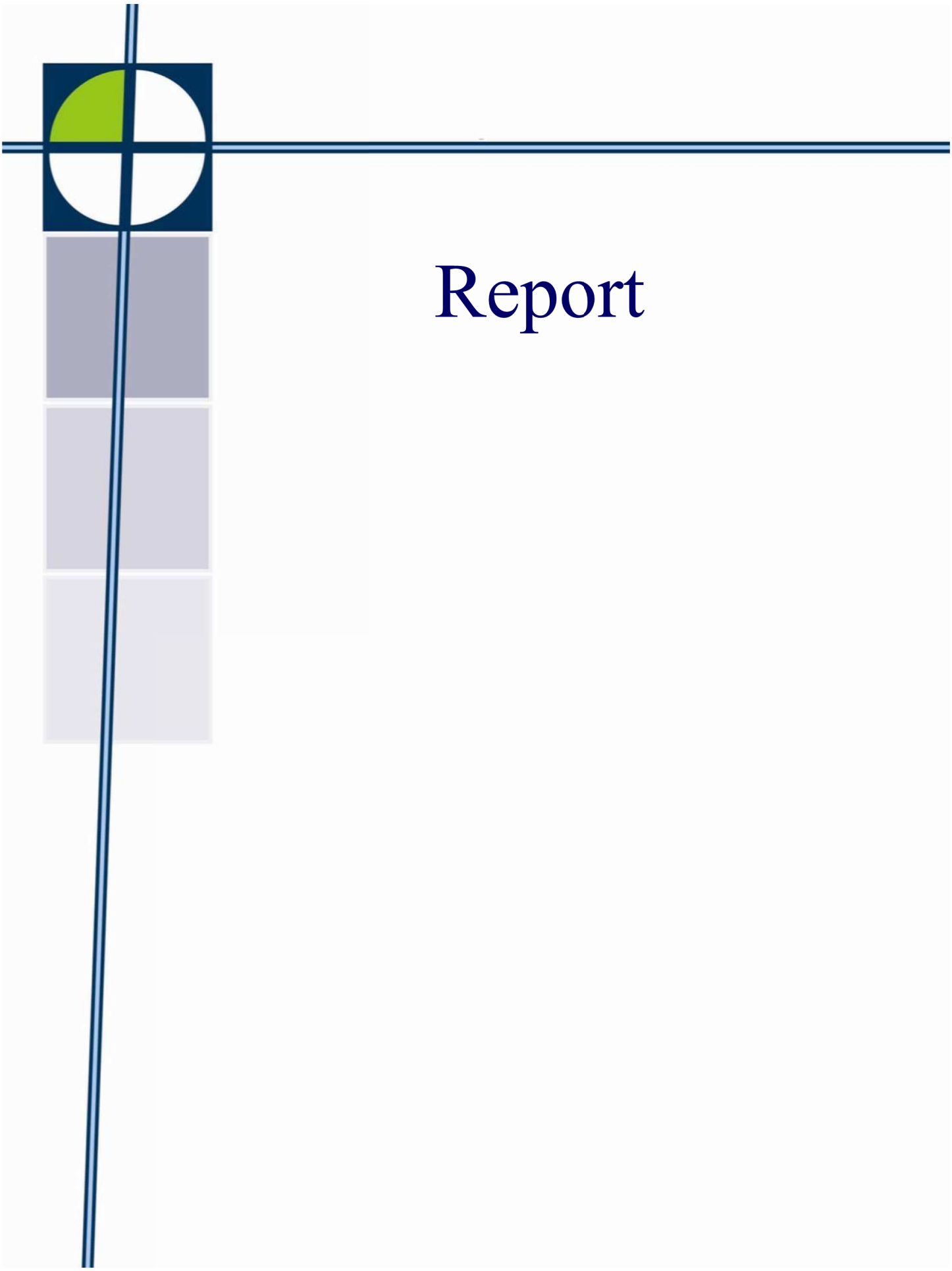
Required Action

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway, Auxiliary Spillway, **Lake Drain**}

Required Action

	None	Monitor	Maintenance	Engineer
☐ Separated Joint: ☐ Loss of Joint Material: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Vegetation: (trees, brush) Notes:	☒	☐	☐	☐
☐ Other: Notes:	☒	☐	☐	☐
☐ Energy Dissipator:				
☐ Type: (endwall, plunge pool, impact basin, stilling basin, rock-lined channel, none) Notes	☒	☐	☐	☐
☐ Riprap: Average Diameter: (adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted – yes, no) Notes	☒	☐	☐	☐
☐ Concrete:				
(bug holes, hairline crack, efforescence)	☒	☐	☐	☐
(spalling, popouts, honeycombing, scaling, craze/map cracks)	☒	☐	☐	☐
(isolated crack, exposed rebar, disintegration, other) Dimensions/Location: Notes/Causes:	☒	☐	☐	☐
☐ Misalignment: Dimensions/Location: Notes/Causes:				
☐ Separated Joint: ☐ Loss of Joint Material: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Undermining: Location/Description: Notes/Causes:	☒	☐	☐	☐
☐ Other: Notes:	☒	☐	☐	☐

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway, Auxiliary Spillway, **Lake Drain**}	None	Monitor	Maintenance	Engineer
	Required Action			



Report

1.0 Executive Summary

A. General

The Traders Point Lake Dam was inspected by Commonwealth Engineers, Inc. (CEI) staff on July 14, 2020 as a special visual inspection. The Dam is located about 1,000 feet Southeast of the intersection of Lafayette Road and W. 71st Street, in Pike Township, Indianapolis, IN. The Dam is located on Bushs Run and is owned and operated by the Lakeside Improvement Association. Derek Gray is its current President.

The dam impounds approximately 15 acres of lake area, is approximately 20 feet high and 375 feet long. The Indiana Department of Natural Resources (IDNR) classifies dams by their hazard potential and has classified this dam as having a low hazard potential.

As noted in the IDNR's General Guidelines For New Dams And Improvements To Existing Dams In Indiana a spillway system must be capable of safely passing the runoff from the design storm event without the embankment overtopping and failing. The magnitude of the design storm depends on the hazard classification. A hydrologic analysis of the watershed and a hydraulic evaluation of the spillways are required to design an appropriate spillway system and determine the minimum crest elevation of the embankment.

Based on this criterion, the dam is required to pass a 50% Probable Maximum Precipitation (PMP) storm (ie.13.525 inches in 6 hours) and not breach or otherwise fail.

Since this dam Is classified as a low hazard dam, it is normally inspected by the Indiana Department of Natural Resources (IDNR). CEI was asked by the owner, the Lakeside Improvement Association, Inc. to make this inspection together with a structural condition assessment by its subconsultant, CE Solutions Structural Engineers of Carmel, IN. Refer to inspection notes and photos in this report.

The purpose of this most recent inspection and report was to complete an initial engineering evaluation of the dam focused primarily on evaluation of the concrete structure and develop a multi-year plan for improvements to the dam and concrete structure, lead an initial meeting with the Indiana Department of Natural Resources (DNR) and other required agencies to agree on an implementation plan and the timing for work needed, and provide guidance on completing (past) recommended Year 1 maintenance activities.

B. Conclusions and Recommendations

Based on our July 2020 inspection of the Traders Point Lake Dam with CE Solutions engineers, the 93-year old concrete spillway has become overstressed and is in various stages of deterioration and failure. Most of the earthen embankment portion of the dam was found to be in an overall good condition with a few needed maintenance items and others to monitor. But the concrete spillway structure is the most pressing matter to address. Please refer to the report by CE Solutions and the attached inspection checklists for detailed recommendations.

Our recommendations are to shore the existing spillway with a system of structural steel bracing until a full replacement of the structure can be designed and funded. Also, add concrete patching where needed to fill in areas along the spillway walls and along the bottom of the walls where loss of material was noted during the inspection.

We have looked at an alternative option to infill the spillway structure with concrete but this will be contingent on a geotechnical evaluation confirming the soil below the existing concrete foundation slab can support the additional load of concrete infill. We also believe that placing a significant amount of concrete without having a more complete design for a replacement structure may result of having to later remove that concrete at a greater expense. Again, please refer to the referenced CE Solutions report.

Due to the unknown condition of the concrete base slab and the earth next to the spillway, we can only guess what those consist of. We recommend that a geotechnical investigation be made for the following:

1. The existing base slab below the spillway. This would consist of coring the concrete to see how thick it is, if there is any reinforcing and also what is below the slab. Cores would be taken and sent to a laboratory to test for strength and composition.
2. Soils boring are needed on each side of the spillway to determine what type of soil is present for possible anchorage systems to support the existing, leaning abutment walls. Soils information is also needed to design any wall that will need to retain that soil and perhaps the existing abutment walls.
3. Soils borings may be made now on the rest of the earthen dam or at a later date. That information will be used to determine internal strength and composition of the dam and its factor of safety to keep from sliding or other instabilities during floods and earthquake type loadings.

We also looked at the earthen dam areas and believe that the past comments by the IDNR are still generally consistent with what we found.

1. The upstream side slope needs to have weeds, brush and small trees removed.
2. Riprap is needed along the upstream shoreline for long-term erosion protection.
3. The north (right when looking downstream), embankment appears to be well maintained and has some gentle slopes that should provide some good stability.
4. The north (right) abutment of the dam needs to have much of the brush cleared so that the contact point of the dam and the abutment can be more easily inspected and monitored by the association.
5. The south (left) abutment area of the dam is much steeper with slopes 2 horizontal:1 vertical or greater. We also noted large trees which normally should be kept off of dams within 25 ft. of the downstream toe. Considerations need to be made to at least cut those trees to stump height. The primary risk with these trees is that they may fall during severe storms and could pull large amounts of the dam away with its root balls. The left downstream embankment will ultimately need to be made flatter if possible.
6. Areas below the spillway also need to be kept clear for floodwaters to pass.

A multi-year improvement plan is recommended for this dam. This includes the following task items:

Priority Items		Est. Time to Complete
1	Meet with the IDNR to discuss action plan	Immediately
2	Geotechnical Investigation	Immediately
3	Final Structural Design of Temporary Supports and Contractor Quote Documents	Immediately
4	Topographic survey of Spillway and Embankment	6 Months
5	Design of New Spillway Structure (includes H/H Eval and Permit Applications)	18 Months
6	Determine Funding Method for Replacement Spillway	Immediately
7	Bidding and Construction of Replacement Spillway (includes time for obtaining permits)	2 Years
Secondary Items		
1	Remove Trees from South (left) Embankment (at least to stump level and remaining stumps treated with a glyphosate herbicide designed for aquatic use that is safe for the environment and applied by a licensed applicator)	1 Year
2	Add fill to the left embankment to flatten the downstream slope	2 Years
3	Riprap is needed along the upstream shoreline for long-term erosion protection	2 Years
Lesser Priority or On-Going Maintenance		
1	Clear areas below the spillway in exit channel for floodwaters to pass	2 Years
2	Remove weeds, brush and small trees from upstream embankment	2 Years
3	Remove brush from north (right) abutment area	2 Years

2.0 Background Information

A. Summary

The Traders Point Lake Dam was originally constructed in 1927 as an earthen embankment dam with a 30-foot wide vertical concrete principal spillway with perpendicular wingwalls. Water passes over a 24-inch thick spillway wall and drops 13.75 feet onto a horizontal concrete floor before dropping another 2.25 ft. and continuing west into an trapezoidal exit channel. The dam runs north and south from a point 25 ft. north of the edge of W. 71st Street and terminates in a rising earthen abutment. The total length of the dam has been estimated to be 375 ft (300 ft. in previous inspections). The height of the dam was reported previously as being 18 ft. high, but that appears to be only from the crest of the dam down to the concrete floor in the spillway. A 20 ft height also appears to be consistent with current contour mapping showing the crest at elevation 834 ft. mean sea level (msl) and a bottom channel elevation of 816 msl.

There is no emergency spillway for this dam, although a small berm runs east of the dam along the south shoreline of the lake. It has a small depression that will provide some minimal relieve in higher flows into a ditch along W. 71st St. but it will not provide sufficient capacity as an emergency spillway.

According to records provided by the Owner, a retaining wall was added to extend the right (north) wingwall in 1992. The Owner also notes that the north, earthen portion of the dam had "extensive lake soil" placed on the west slope. A steel footbridge was added a number of years ago across the spillway and has recently been repaired by the owner, although it is intended for limited foot traffic. A bathymetric survey was also completed by a national lake mapping company in 2018. That information suggests the lake is a maximum 9-10 ft deep near the dam.

The Owner has provided records indicating they have removed several trees on the dam and acknowledge that more trees still need to be cut/removed, particularly along the left downstream portion of the embankment between the spillway and 71st St.

CEI was provided the following information from the Owner for this report.

1. Record pictures of the dam including
    a. 3 photos from 1927
    b. Photos from 2008, 2019 and 2019
2. 2019 Table of Work Completed in recent years
3. Copy of 2008 Hydrological study
    a. A 2008 "Investigation Report" prepared by Fink Roberts & Petrie, Inc. included a brief hydrologic and hydraulic analysis of this dam and showed that the structure will pass less than 20% of the required storm event.
4. 2017 Indiana DNR dam inspection report.
5. 2018 Bathymetric Survey
6. No original/record construction documents were available for this dam.

B. Original Dam Construction/Design

According to the Owner, the dam was constructed in 1927 (93 years ago). A record photo of the dam has a caption that states it was built using a steam shovel and horse drawn scoops. See photo below.

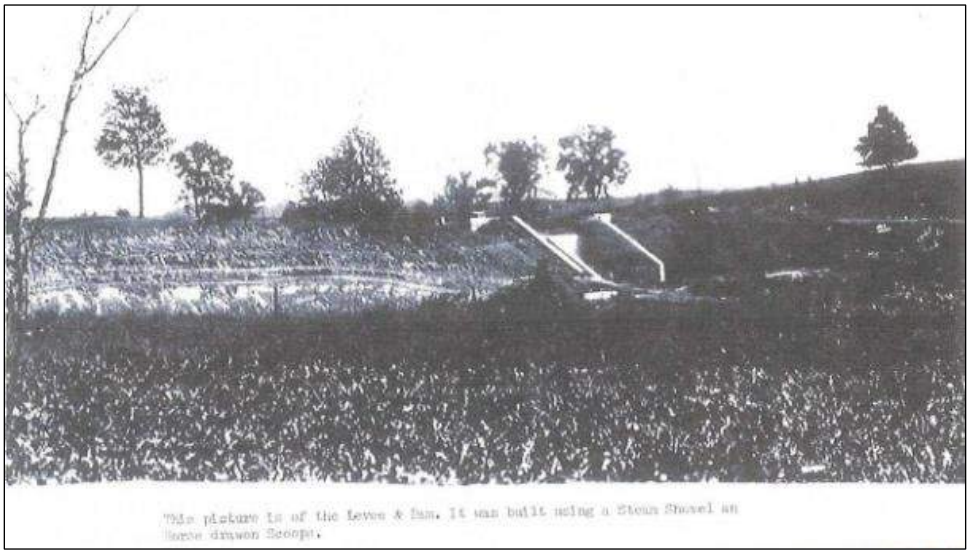


Figure No. 1 1927 Construction Photo

Another photo from the Owner is of a man named George Gallacher Paton, assumed to be the builder of this dam. See photo below. No designs or plans are known to have been prepared for this dam.

Figure No. 2 1927 Construction Photo

3.0 Project Information

A. Physical Setting

The Traders Point Lake Dam is located about 1,000 feet Southeast of the intersection of Lafayette Road and W. 71st Street, in the SE Quarter of Section 27, 17N, R 2 E, Pike Township, Indianapolis, IN. The Dam is owned and operated by the Lakeside Improvement Association, Inc. of Indianapolis, Indiana. Derek Gray is its current President. See **Figure No. 3** below.

Figure No. 3 - Aerial of Dam and Spillway

B. Geologic Setting

The "geologic setting in the vicinity of Traders Point Dam is characterized by soils that are either exposed or capped by a thin layer of Wisconsinan glacial till.

According to the Indiana Geological & Water Survey (IGS), "Marion County, Indiana, is in the physiographic province known as the Central Till Plain Region and is underlain in most places by thick deposits of pre-Wisconsin and Wisconsin glacial materials. These unconsolidated glacial sediments overlie bedrock units composed of limestone, dolostone, shale, siltstone, and sandstone ranging in age from the Silurian through the lower Mississippian. The character of these glacial and bedrock materials affects a wide variety of environmental conditions, including the availability of drinking water and building materials and the character of the landscape we live on and its response to different land uses."

By reviewing the IGS online geological Map of Marion County, we find that the Traders Point Lake area consists of Alluvium underlain by till-like sediment. The mapping states "Valleys whose courses were in part determined by crevasse locations in disintegrating latest Wisconsin ice. These valleys may owe most of their depth to postglacial incision."

C. Seismicity

According to regional geotechnical studies, the site is located in an area not known to be seismically active. The IGS site does state, “More recently, in 2008, Indiana felt the effects of a moderate earthquake centered near Mt. Carmel, Illinois, just west of Vincennes.” IGS mapping also notes some activity that occurred December 30, 2010 southeast of Kokomo.

D. Structural Features

The dam is a combination of an earthen embankment with a vertical concrete spillway with a horizontal floor and perpendicular wing walls. An exposed wall 18-inches wide and 18-inches above the earthen crest extends in each direction from the wing walls for approximately 25 ft. The vertical spillway wall may extend in each direction within the embankment for some unknown distance or may terminate at each wing wall.

The location of the principal spillway has not changed since the dam was originally constructed in 1927.

The existing 30 ft. wide concrete spillway is currently experiencing deterioration of concrete to its own vertical wall and the abutment walls that are serious enough to warrant a temporary steel shoring system or perhaps filling in a large part of the area below the spillway with concrete. We note that the surface of the center buttress wall is so fragile that the concrete can be pulled apart with bare hands.

The wing walls have also tilted inward from the top down and show undermining of its foundation along the horizontal floor

E. Principal Spillway

The Principal Spillway as noted above is a 30-foot wide by 24-inch thick vertical concrete principal spillway with 18-inch thick perpendicular wingwalls. A retaining wall was added to extend the right (north) wingwall in 1992. The top of the wingwalls are approximately 18-inches above the crest of the dam. The 24-inch concrete spillway is 30 ft. wide and terminates on each end with 18-inch high abutment walls that connect to the wingwalls and also run 25 ft.in each direction north-south from the spillway. It is not known how deep these abutment walls are founded within the earthen embankment.

Water from the spillway wall drops 13.75 feet onto a horizontal concrete floor/foundation slab before continuing west to an earthen exit channel. The foundation slab appears to be over 2.25 ft thick at the end before dropping onto the exit channel. Probing during the inspection did not detect any undermining or “head-cutting” under this slab, so it may extend lower into foundation soils. The vertical spillway wall is also supported in the center of the wall by a buttress (counterfort) wall 18-inches thick.

The dam runs north and south from a point 25 ft. north of the edge of W. 71st Street and terminates in a rising earthen abutment. The total length of the dam has been estimated to be 375 ft (300 ft. in previous inspections).

Flows from the principal outlet channel run southeast to Eagle Creek.

F. Spillway Adequacy/Hydraulic/IDF Assessment

The dam impounds approximately 15 acres (10 ac. in previous reports) of lake area and is 20 feet high and 375 feet long and is classified as having a low hazard potential. Therefore, the dam is required to pass 50% of the Probable Maximum Precipitation (PMP) storm of 13.525 inches in 6 hours.

CEI evaluated the previous hydrologic study that was made for this dam in 2008. The 50% Possible Maximum Precipitation rate of just under 2,500 cubic feet per second was presented in that earlier model. We prepared a hydraulic model of the existing dam and spillway and included a small, depressed area we noted along 71st Street for some emergency spillway use. Based on our model we were very close to what was presented in the 2008 report.

Upon further review of the 2008 hydrologic model we did not find any calibration or IDNR acceptance for the flows that were used in that model, so we could not base any recommendations on that model without a review of other accepted flows by the IDNR.

A review of the IDNR's Online Research Center database was made, and a Feb. 24, 2020 Floodplain Analysis and Regulatory Assessment (FARA) was found for the channel below the dam at the I-65 north ramp off of W. 71st St. It shows that for a drainage area of 1.84 sq. miles, the 100-year discharge is estimated to be 1,180 cfs. We noted an IDNR Online StreamStats model was used to provide the compilation of coordinated discharges for this location and the resulting discharge used in the FARA. CEI used the same StreamStats model to determine the similar 100-year discharge at the dam for a drainage area of 1.63 sq. miles and determined this to be 1,090 cfs. We note the StreamStats watershed delineation computed 1.62 sq. mi. but 1.63 sq. mi. will be used in final summaries.

CEI completed a separate hydrologic analysis (although not originally in the scope), in order to estimate a similar 100-year peak discharge of 1,090 cfs using a hydrograph method. Based on this approach, CEI determined that the 50% PMP discharge will be 4,314 cfs, not 2,500 cfs as originally presented in 2008.

A separate analysis was also made to evaluate the impact of an existing culvert located under I-465 east of the lake. Our StreamStats model computed a drainage area of 0.92 sq. mile, or 56% of the total watershed draining to Traders Point Lake.

The watershed immediately above I-465 consists of large commercial office buildings with large surface parking areas. For our analysis we roughly estimated that the surface area that might impound water behind the noted culvert was 50 acres excluding any buildings; essentially parking and grass areas. This was done to account for the fact that in larger storm events like a 50% PMP event will create a large impoundment. Most local drainage structures are not designed for such high peak discharges for more than the 100-year event.

Calculations for PMP events oftentimes result in significant flows that will ultimately pass over public roadways. Estimating these large flows downstream at a dam structure will normally be based on the direct discharge calculated with no

assumption of large storage areas. We note, however, that I-465 in this particular area is at elevation 860 with a culvert invert of 837 (ie. 23 ft.). A (45-inch high) concrete roadside barrier wall was also reconstructed along both sides of this portion of the interstate highway, making it less likely for a major road overflow in extreme flood events.

Indianapolis Dept. of Public Works GIS mapping records indicate the culvert under I-465 to be a 10 ft. diameter corrugated metal pipe. We took field measurements and confirmed that the original culvert was a 10 ft. diameter corrugated metal culvert that had recently been relined using a smaller 8 ft. diameter High Density Polyethylene (HDPE) pipe. The rationale for relining with a smaller diameter pipe is normally due to cost of replacement and the assumption that the smoother interior of an HDPE will provide a similar hydraulic capacity since it reduces the resistance of flow through the pipe compared to one with corrugations.

We computed the 100-year capacity of the existing 10 ft. diameter corrugated pipe vs. an 8 ft. diameter smooth interior pipe and determined that the capacity of each pipe is essentially the same (ie. within 7 cfs and 0.1 ft. water depth behind each pipe). For the 100-year event we estimated the capacity of each size/type of culvert and noted the following:

- Q100 Inflow: 619 cfs
- 10 ft. CMP Pipe: 351 cfs @ 7.4 ft. depth (15.6 ft. below I-465)
- 8 ft. HDPE Pipe: 343 cfs @ 7.5 ft. depth (15.5 ft. below I-465)

We also computed the 50% PMP capacity of each size/type of culvert and noted the following:

- 50% PMP Inflow: 2,450 cfs
- 10 ft. CMP Pipe: 983 cfs @ 16.3 ft depth (6.7 ft. below I-465)
- 8 ft. HDPE Pipe: 845 cfs @ 16.8 ft depth (6.2 ft. below I-465)

The difference between the inflow and the discharge shown above indicates a large amount of surface storage will need to take place above (east of) the interstate highway. Since the flood depth is well below the road, the existing 45-inch concrete barrier wall along the highway will have no influence on this storage.

The calculations made for the area east of I-465 suggest that the culvert under the highway may not be adequately sized for a 100-year event. This area does not appear to have been modeled for FEMA Flood Insurance Rate Map (FIRM) mapping. We would recommend that any analysis for the 100-year peak flows into Traders Point Lake should not include any upstream storage for the 100-year event. However, storms above the 100-year event may be considered to be reduced by the presence of the limiting culvert under I-465.

Based on our hydrologic and hydraulic calculations including modeling flows through the noted I-465 culvert, we estimate the following flows will need to be considered for the Traders Point Lake Dam rehabilitation.

- Peak 100-year Inflow: 1,090 cfs
  - Consistent with StreamStats and recent FARA

- Peak 50% PMP Inflow: 2,560 cfs
  - Assumes original 10 ft. culvert size controls
  - 2,470 cfs would be used if 8 ft. culvert size controls
  - 4,314 cfs is the estimate peak inflow assuming no upstream storage

CEI looked at some possible solutions for a new spillway that might have more long-term outcomes. In a brief preliminary report provided to the Owner in September 2019 CEI looked at a possible unique solution to construct a more efficient spillway within the existing spillway footprint. We wanted to minimize the amount of demolition and lake draw-down that would otherwise be needed for a new spillway located somewhere else in the dam embankment or within the lake.

The plan would include constructing a V-shaped labyrinth type spillway that would be constructed within and below the existing spillway structure. Our initial sizing of the (single) labyrinth was based on the 2,500 cfs used in the previous hydrologic study that was made for this dam in 2008.

CEI estimated that a labyrinth 27 ft. wide at the existing 30 ft. wide spillway would have to extend approximately 44 ft. below the existing spillway wall, or 13.75 ft. beyond the ends of the existing abutment walls. Two new abutment walls would need to be constructed adjacent to the existing abutment walls, and a base slab would also be needed. See **Figure No. 4** below.

Figure No. 4 - Single Labyrinth Spillway Option

Based on our most recent analysis presented above, we would still recommend a similar single labyrinth as a replacement structure for the current spillway for the Traders Point Lake Dam.

G. Operational Status

The 30 ft. wide principal spillway controls the lake level. There is no gate present to lower the lake. If the lake needs to be lowered, a high capacity pump or a muli-pipe siphon may be used. Should the lake need to be lowered for any reason, we would caution lake lot owners to be prepared for possible back pressures behind any retaining/sea walls. Movements of these walls may be expected when the lake level is lowered multiple times; that condition is most likely when lake lowering efforts are being made during cyclical rainfall events that will tend to push the lake level back up quickly.

A summary of the operation of the lake is as follows (ft- assumed msl; based on contour mapping data and field measurements on the spillway walls; no field survey has been completed to verify actual elevations):

Normal Lake Elevation:	829.75 +/-	
Principal Spillway Elevation	829.75 +/-	
Top of Dam	834.0 +/-	4.25 feet of freeboard
100-Year Flood Elevation	834.2 +/-	2-Inches Overtopping
50% PMP Flood	834.9 +/-	11-Inches Overtopping Over 5 hours

4.0 File Review

A. Data Reviewed/ Compiled

The following data has been reviewed for this dam:

- Background information
- Downstream Land Use Changes
- Reports and Studies
- Hydrologic and Hydraulic Information
- Reservoir Information
- Other Maps, Photographs and Exhibits

5.0 Dam Safety Inspection *(Photos located in Appendix A)*

Please refer to **Appendix A** for a compilation of photos. Also refer to a structural condition assessment by CE Solutions Structural Engineers in **Appendix B**.

6.0 Emergency Preparedness and Security

The Traders Point Lake Dam has been classified as a low hazard dam. The area around the dam and lake are open to the general public, so security will be very minimal.

Regarding the hazard classification, the IDNR defines a low hazard dam as follows: “If an uncontrolled release of the structure's contents due to a failure of the structure …and damage is limited to either farm buildings, agricultural land, or local roads, the dam shall be classified as **low hazard**”. The hazard classification may be classified higher for the following conditions from 312 IAC 10.5-3-1:

(1) If an uncontrolled release of the structure's contents due to a failure of the structure may result in any of the following, the dam shall be considered **high hazard**:
  (A) The loss of human life.
  (B) Serious damage to:
    (i) homes;
    (ii) industrial and commercial buildings; or
    (iii) public utilities.
  (C) Interruption of service for more than one (1) day on any of the following:
    (i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.
    (ii) A multilane divided state or U.S. highway, including an interstate highway.
  (D) Interruption of service for more than one (1) day on an operating railroad. (E) Interruption of service to an interstate or intrastate utility, power or communication line serving a town, community, or significant military and commercial facility, in which disruption of power and communication would adversely affect the economy, safety, and general well-being of the area for more than one (1) day.

(2) If an uncontrolled release of the structure's contents due to a failure of the structure may result in any of the following, the dam shall be considered **significant hazard**:
  (A) Damage to isolated homes.
  (B) Interruption of service for not more than one (1) day on any of the following:
    (i) A county road, state two-lane highway, or U.S. highway serving as the only access to a community.
    (ii) A multilane divided state or U.S. highway, including an interstate highway.
  (C) Interruption of service for not more than one (1) day on an operating railroad.
  (D) Damage to important utilities where service would be interrupted for not more than one (1) day, but either of the following may occur:
    (i) Buried lines can be exposed by erosion.
    (ii) Towers, poles, and aboveground lines can be damaged by undermining or debris loading.

Land use below the Traders Point Lake Dam along Bushs Run consists of large residential lots with homes at or above the crest of the dam up to Lafayette Road. From there west Bushs Run flows under I-65 and associated ramps to W 71st St. and then into Eagle Creek Park and finally its confluence with the Eagle Creek Reservoir for a total distance of approximately 4,600 ft.

Since a dam breach analysis has not been completed, a breach analysis may need to be run to estimate the impact of a breach for this dam on downstream properties. A review of the bathymetric survey data indicates a lake depth of 9-10 ft. near the dam. Based on some preliminary HH modeling, the 50% PMP event will create a water depth close to 15 ft. of water. If we assume, for preliminary purposes only, that a breach will develop a flood wave of 40% of the peak flood depth, a flood wave might have a depth of 6 ft. just below the breach. Again, further breach analysis is warranted for this dam especially due to the condition of the spillway.

7.0 Conclusions

Based on our July 2020 inspection of the Traders Point Lake Dam with CE Solutions engineers, the 93-year old concrete spillway has become overstressed and is in various stages of deterioration and failure. Most of the earthen embankment portion of the dam was found to be in an overall good condition with a few needed maintenance items and others to monitor. But the concrete spillway structure is the most pressing matter to address. Please refer to the report by CE Solutions and the attached inspection checklists for detailed recommendations.

8.0 Recommendations

Our recommendations are to shore the existing spillway with a system of structural steel bracing until a full replacement of the structure can be designed and funded. Also, add concrete patching where needed to fill in areas along the spillway walls and along the bottom of the walls where loss of material was noted during the inspection.

We have looked at an alternative option to infill the spillway structure with concrete, but this will be contingent on a geotechnical evaluation confirming the soil below the existing concrete foundation slab can support the additional load of concrete infill. We also believe that placing a significant amount of concrete without having a more complete design for a replacement structure may result of having to later remove that concrete at a greater expense. Again, please refer to the referenced CE Solutions report.

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3. The north (right when looking downstream), embankment appears to be well maintained and has some gentle slopes that should provide some good stability.

4. The north (right) abutment of the dam needs to have much of the brush cleared so that the contact point of the dam and the abutment can be more easily inspected and monitored by the association.

5. The south (left) abutment area of the dam is much steeper with slopes 2 horizontal:1 vertical or greater. We also noted large trees which normally should be kept off of dams within 25 ft. of the downstream toe. Considerations need to be made to at least cut those trees to stump height. The primary risk with these trees is that they may fall during severe storms and could pull large amounts of the dam away with its root balls. The left downstream embankment will ultimately need to be made flatter if possible.

Areas below the spillway also need to be kept clear for floodwaters to pass.

A multi-year improvement plan has been prepared for this dam and includes recommendations for a number of critical and less critical task items. Based on the inspection and condition of this dam the following maintenance, ongoing repairs and monitoring is warranted in order of priority followed by an estimate of time needed to implement them.

Figure No. 5 - 2019 Photo of Existing Spillway looking South

A. Major and Minor Repairs-Monitoring

A multi-year improvement plan is recommended for this dam. This includes the following task items:

Priority Items		Est. Time to Complete
1	Meet with the IDNR to discuss action plan	Immediately
2	Geotechnical Investigation	Immediately
3	Final Structural Design of Temporary Supports and Contractor Quote Documents	Immediately
4	Topographic survey of Spillway and Embankment	6 Months
5	Design of New Spillway Structure (includes H/H Eval and Permit Applications)	18 Months
6	Determine Funding Method for Replacement Spillway	Immediately
7	Bidding and Construction of Replacement Spillway (includes time for obtaining permits)	2 Years
Secondary Items		
1	Remove Trees from South (left) Embankment (at least to stump level and remaining stumps treated with a glyphosate herbicide designed for aquatic use that is safe for the environment and applied by a licensed applicator)	1 Year
2	Add fill to the left embankment to flatten the downstream slope	2 Years
3	Riprap is needed along the upstream shoreline for long-term erosion protection	2 Years
Lesser Priority or On-Going Maintenance		
1	Clear areas below the spillway in exit channel for floodwaters to pass	2 Years
2	Remove weeds, brush and small trees from upstream embankment	2 Years
3	Remove brush from north (right) abutment area	2 Years

Mitigation Plans (tree replanting or wetland restoration) are not anticipated.

B. Recommended Planning / Engineering

As a result of the above findings further planning and engineering is recommended as noted in the above table and in the inspection reports.

Proposed fees for this work will be provided separately from this report.

9.0 Appendices

A. Inspection Photos – July 2020

B. Structural Condition Assessment - CE Solutions Structural Engineers

10.0 References

A. Indiana Dam Safety Inspection Manual, 2007 Edition

B. General Guidelines for New Dams & Improvements to Existing Dams in Indiana, 2010 Edition

C. IC 14-27-7.5 Regulation of Dams

D. 312 IAC Article 10.5 Regulation of Dams

Appendices

A. Inspection Photos – July 2020
B. Structural Condition Assessment-CE Solutions

Appendix A

Inspection Photos
July 2020

Appendix A – Inspection Photos – July 14, 2020

Photo A1: View of bridge over the spillway looking North. Note poured concrete on the upstream corners of the connection from the concrete spillway to the upstream embankment. This concrete has voids under the concrete.

Photo A2: Full view of the downstream side of the spillway looking NE.

Appendix A – Inspection Photos – July 14, 2020

Photo A3: View looking East at the downstream Rt spillway abutment wall and additional retaining wall.

Photo A4: View looking South at the downstream LT spillway abutment wall and the center buttress wall.

Appendix A – Inspection Photos – July 14, 2020

Photo A5: View of a measurement of the LT spillway abutment wall tilt.

Appendix A – Inspection Photos – July 14, 2020

Photo A6: View of the lower portion of the LT spillway abutment wall looking South.

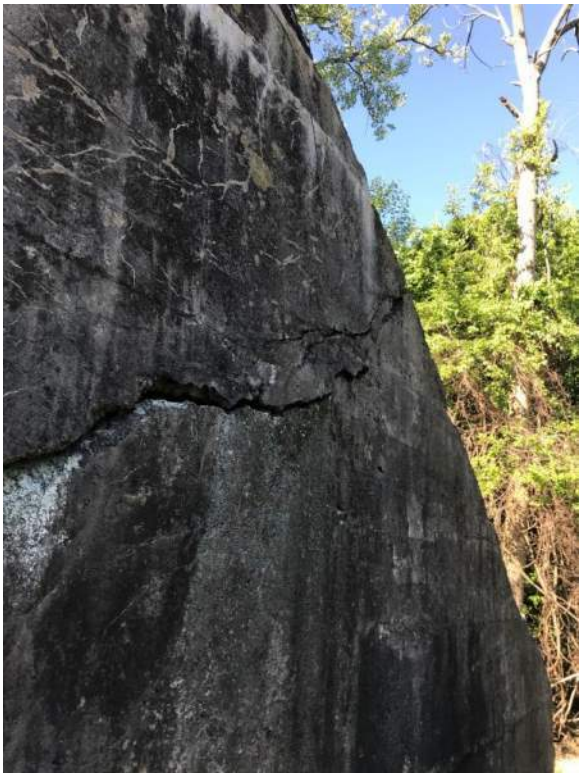

Photo A7: View of the lower portion of the LT spillway abutment wall; crack noted.

Appendix A – Inspection Photos – July 14, 2020

Photo A8: View of the lower portion of the LT spillway abutment wall; widening crack noted.

Photo A9: View of the lower portion of the LT spillway abutment wall; large crack noted.

Appendix A – Inspection Photos – July 14, 2020

Photo A10: View of the connection of the spillway wall and the LT spillway abutment wall. Note spillway wall shows erosion of the concrete, exposing horizontal reinforcing (plates)

Photo A11: View of a measurement of the RT spillway abutment wall tilt.

Appendix A – Inspection Photos – July 14, 2020

Photo A12: View of the connection of the spillway wall looking down at the LT spillway abutment wall. Note spillway wall shows erosion of the concrete.

Photo A13: View of the connection of the spillway wall looking up at the LT spillway abutment wall. Note spillway wall shows erosion of the concrete.

Appendix A – Inspection Photos – July 14, 2020

Photo A14: Close-up view lower portion of the LT spillway abutment wall; crack noted.

Photo A15: View of what appears to be stamped metal plates that were used as reinforcing.

Appendix A – Inspection Photos – July 14, 2020

Photo A16: Close-up view of what appears to be stamped metal plates that were used as reinforcing.

Photo A17: View of the spillway looking north. Note the buttress wall in the center of the spillway.

Appendix A – Inspection Photos – July 14, 2020

Photo A18: View of the upstream and crest area of the spillway structure. Note the concrete abutment walls

Photo A19: View looking north along the upstream embankment slope from a point closer to the RT abutment area.

Appendix A – Inspection Photos – July 14, 2020

Photo A20: View looking South along the upstream embankment slope.

Photo A21: View looking north along the upstream embankment slope.

Appendix A – Inspection Photos – July 14, 2020

Photo A22: View looking South at the downstream embankment toe area east of the spillway.

Photo A23: View looking South at the downstream embankment east of the spillway. Note the downstream sideslope has a gentle slope.

Appendix A – Inspection Photos – July 14, 2020

Photo A24: View looking South, at upstream embankment east of the spillway where the crest width is only 2 ft wide. Note the downstream sideslope is flat enough to be drivable.

Photo A25: View looking north, at upstream embankment east of the spillway where the crest width is only 2 ft wide. Note the downstream sideslope is flat enough to be drivable.

Appendix A – Inspection Photos – July 14, 2020

Photo A26: View of the RT downstream embankment toe area just below the end of the retaining wall just beyond the RT spillway abutment wall. Note probe is where some soft wet soil was found. Adjacent plants in the channel.

Appendix A – Inspection Photos – July 14, 2020

Photo A27: View of the end of the retaining wall below the RT spillway abutment wall. Note probe is where some soft wet soil was found. Adjacent plants in the channel.

Photo A28: View of the RT downstream embankment just RT of the RT spillway abutment

Appendix A – Inspection Photos – July 14, 2020

Photo A29: View of the RT abutment wall and toe area below the spillway

Photo A30: View of the toe area of the concrete toe area of the spillway

Photo A31: View of the left end of spillway abutment wall.

Appendix A – Inspection Photos – July 14, 2020

Photo A32: View of the left, downstream embankment just left of the spillway abutment wall.

Photo A33: Another view

Appendix A – Inspection Photos – July 14, 2020

Photo A34: View of the left, downstream embankment just left of the spillway abutment wall. This area is very steep and has trees that need to be removed.

Photo A35: View of the left, downstream embankment. Note trees need to be removed.

Appendix A – Inspection Photos – July 14, 2020

Photo A36: View of the left, downstream embankment. Note trees need to be removed.

Photo A37: View of the toe area left of the spillway.

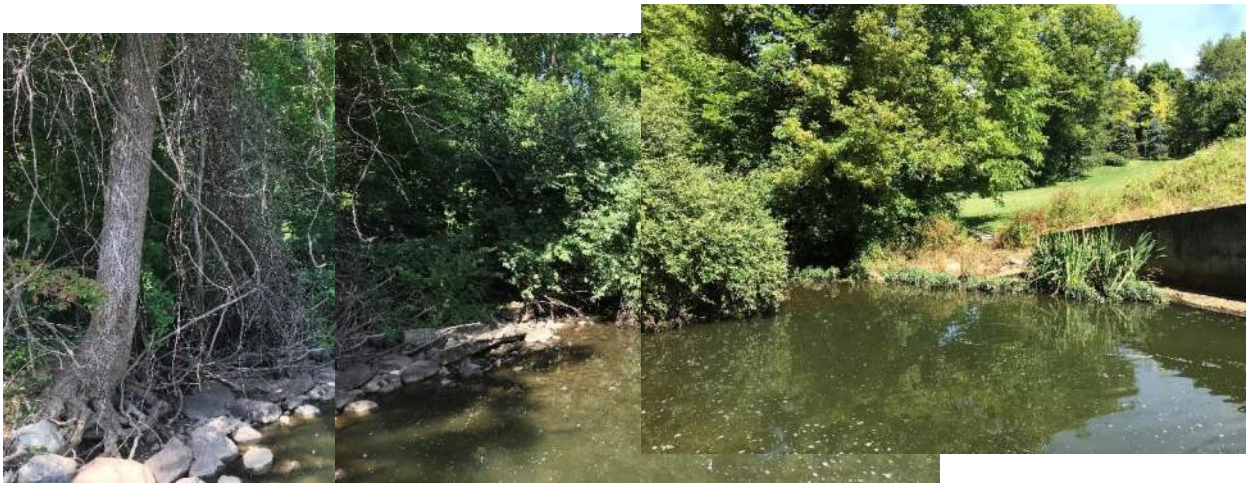

Photo A38: Compiled photo view of the channel area below the dam.

Appendix A – Inspection Photos – July 14, 2020

Photo A39: View of the crest at the North abutment of the dam. This is also the access to the dam.

Photo A40: View of a home west of the dam and above the crest

Appendix A – Inspection Photos – July 14, 2020

Photo A41: View of the North/RT earthen abutment

Photo A42: View of the North/RT earthen abutment.

Appendix A – Inspection Photos – July 14, 2020

Photo A43: View looking east from the crest; 71st St. ditch is to the right of the bushes.

Photo A44: View looking East from the crest along 71st St.
Note the berm between the road and the lake.

Appendix A – Inspection Photos – July 14, 2020

Photo A45: View looking north along the crest from the RT. spillway abutment wall. Note width of crest varies.

Appendix B

Structural Condition Assessment-CE Solutions

CE Solutions
structural engineers

November 17, 2020

Mr. Roger Kottlowski, PE
Commonwealth Engineers, Inc.
7256 Company Drive
Indianapolis, IN 46237

Re: Trader's Point Lake Concrete Spillway Structural Condition Assessment
Trader's Point Lake Improvement Association
Indianapolis, Indiana

CE Solutions Project No: 20-116

Dear Roger:

We have completed our structural condition assessment of the above captioned structure. The purpose of this condition assessment was to determine the structural condition of the existing spillway and provide structural recommendations. Site observations were made on July 14, 2020 by Carrie L. Walden, PE and Augustus Raymond, EI, both of our office. No destructive investigation or testing was performed. Our investigation is based solely on visual observations.

The following is a description of our findings and recommendations:

EXISTING CONDITIONS

Trader's Point Lake is located on the northwest side of Indianapolis, Indiana, east of I-65, west of I-465 and just north of W 71st Street; approximately 1000' east of the intersection of W 71st Street and Lafayette Road. Trader's Point Lake is formed by the dam on Bush's Run. Downstream of the spillway, Bush's Run feeds into Eagle Creek reservoir. See Appendix A.

The concrete spillway was constructed along with the dam circa 1927. Existing construction documents of the spillway are not available. The spillway consists of an approximately 30'-0" long spillway wall with sloping abutment walls on each end and a sloping counterfort wall at midspan. There is an additional sloping wingwall extending from the north abutment wall and an existing steel pedestrian bridge over the spillway. See Appendix B.

OBSERVATIONS AND ASSESSMENT

The building code that governs is the Indiana Building Code, 2014 Edition (2012 International Building Code, first printing, with Indiana Amendments). Concrete has been analyzed in accordance with the latest editions of the Building Code Requirements for Reinforced Concrete (ACI 318) and Environmental Engineering Concrete Structures (ACI 350R) by the American Concrete Institute (ACI).

SPILLWAY WALL

The concrete spillway wall is approximately 30'-0" long x 2'-0" thick x 13'-9" tall from base slab to top of wall. The abutment walls at each end and the counterfort wall at approximately mid-span

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support the spillway wall. The wall is severely deteriorated. See Appendix C. Hammer sounding revealed delaminated concrete over much of the surface area. Previous patches on the north half of the wall were deep and delaminated. Water is coming through the construction joint near the top of the wall, leaking is very heavy in some areas. Water is coming through the base of the wall in at least one location. What appear to be steel punched plates are protruding from the spillway wall near the south end; see photos in Appendix D. The plates are severely corroded and inconsistent in size, spacing, and depth. The plates are discontinuous (the end of the plates are sticking out of the concrete) and horizontal only (no vertical steel was observed). A rapid rate of deterioration was observed in comparing photographs of the spillway wall from August of 2019 to the condition at the time of our assessment in July of 2020. See Appendix D.

For structural analysis, the concrete compressive strength (f'c) was assumed to be 2,500 psf due to age and condition of the existing structure. The walls were analyzed as plain unreinforced concrete. No vertical reinforcement was observed at the deteriorated areas. The walls have horizontal punched plates; however, these were ignored for the structural analysis since they appear to be discontinuous. The walls were checked with code prescribed factors of 1.6 live load factor and 1.3 environmental factor. The concrete strength is reduced by a factor of 0.6 for plain concrete for flexure and shear per ACI code requirements. The earth/water pressure behind the spillway wall is assumed to be 62.4 pcf. The spillway wall was checked for two cases: spanning vertically and horizontally.

With the wall spanning vertically as a retaining wall, the ultimate moment (including 1.6 and 1.3 load factors) is 56 ft-k. The moment capacity of the wall is 14.4 ft-k (including 0.6 strength reduction factor). For this condition, the wall is overstressed by 288% in flexure. Without the 1.6 and 1.3 load factors, the wall is still overstressed by 87% in flexure. The ultimate shear load at the base is 9.4 k and the shear capacity of the wall is 11.5 k; shear is within the allowable limit.

With the wall spanning horizontally, the ultimate moment (including 1.6 and 1.3 load factors) is 38.5 ft-k. The moment capacity of the wall is 14.4 ft-k (including 0.6 strength reduction factor). For this condition, the wall is overstressed by 167% in flexure. Without the 1.6 and 1.3 load factors, the wall is still overstressed by 28% in flexure. The ultimate shear load near the base is 10.7 k and the shear capacity of the wall is 11.5 k; shear is within the allowable limit.

NORTH ABUTMENT WALL

The north abutment wall is approximately 25'-0" long x 1'-6" thick. The top of wall starts approximately 5'-9" above the spillway wall and slopes along the grade; the height varies from approximately 19'-6" to 4'-0". See Appendix B. The abutment wall frames into the spillway wall and the north wing wall. The wall contains localized areas of significant deterioration and is in generally fair condition elsewhere. Concrete deterioration consists of significant spalling adjacent the spillway wall and foundation slab as well as cracking throughout. See Appendix C and Appendix D.

Assumptions for concrete strength, plain unreinforced concrete, and load factors are the same as for the spillway wall, see above. Earth lateral pressure behind the abutment walls is assumed to be 50 pcf. Since the 18" thick abutment walls are sloping with the grade, they were analyzed for an average height of 12'. The abutment walls were checked spanning vertically in the region away from the corner of the Spillway wall. With the wall spanning vertically, the ultimate moment (including 1.6 and 1.3 load factors) is 30 ft-k. The moment capacity of the wall is 8.1 ft-k (including 0.6 strength reduction factor). For this condition, the wall is overstressed by 270% in flexure.

Without the 1.6 and 1.3 load factors, the wall is still overstressed by 77% in flexure. The ultimate shear load at the base is 5.8 k and the shear capacity of the wall is 8.6 k; shear is within the allowable limit.

NORTH WING WALL

The north wing wall appears to have been built at a more recent date. No deterioration was noted for this piece of the structure. See Appendix C and Appendix D. Analysis of the wing wall was not performed.

SOUTH ABUTMENT WALL

The south abutment wall is approximately 25'-0" long x 1'-6" thick. The top of wall starts approximately 5'-9" above the spillway wall and slopes along the grade; the height varies from approximately 19'-6" to 4'-0". See Appendix B. The abutment wall frames into the spillway wall at one end. The south abutment wall is severely deteriorated and in a state of structural failure. The wall is moving laterally along a significant crack (i.e. pushing inward toward the spillway) and has full depth deterioration. Much of the accessible wall sounded delaminated when hammer sounded. In additional to delamination and spalling, the wall contains several cracks of significant width. See Appendix C and Appendix D.

The analysis of the south abutment wall is the same as the north abutment wall; please see above.

Flexural overstress in the walls is worse than calculated in some areas due to concrete deterioration. Our analysis used the overall wall thickness, not the reduced thickness due to deterioration. The walls are overstressed even with the full wall thickness; therefore, a more refined analysis was not required.

COUNTERFORT WALL

The counterfort wall is approximately 20'-0" long x 1'-6" thick. The top of wall starts approximately 1'-6" below the spillway wall and slopes down to the foundation slab; the height varies from approximately 12'-2" to 0'. See Appendix B and Appendix D. The counterfort wall braces the spillway wall against the foundation slab. The wall contains severe deterioration including spalling, delamination and cracking. Spalling is deep in some locations; significant cracks are up to 1" wide.

The counterfort wall is in compression bracing the spillway wall. The counterfort wall has adequate size and is in fair condition to provide bracing for the spillway wall short-term.

FOUNDATION SLAB

The foundation slab is assumed to be a consistent thickness of approximately 1'-6" with a turn down at the downstream side. The approximate slab footprint used in our analysis 23'-0" x 33'-0". The foundation slab appears to be generally in fair condition. There is localized erosion of the concrete resulting in spalling and delamination where the water flows over the slab edge. See Appendix C and Appendix D.

OVERALL SPILLWAY STRUCTURE

The overall condition of the spillway structure varies greatly as described previously by component. For the purposes of performing overturning and sliding calculations, the following assumptions were made: lateral pressure behind the spillway wall is assumed to be 62.4 pcf, coefficient of friction at the base slab is assumed to be 0.5, the allowable soil pressure under the base slab is assumed to be 1,500 psf. No passive pressure was used at the toe side (downstream side) since the base slab downturn into the soil is unknown.

The overall structure was found to have an overturning safety factor of 5.3, a sliding safety factor of 0.91 (not considering any passive pressure, only friction between the base slab and soil due to the weight of the structure), and soil pressure under the base slab of 650 psf. At the middle counterfort wall area, the safety factor for overturning is 4.6, safety factor for sliding is 0.77 (friction only), and soil pressure under the base slab is 550 psf. A safety factor greater than 2.0 for overturning and greater than 1.5 for sliding are typically considered adequate. An allowable soil pressure under the base slab less than 1,500 psf is assumed to be adequate for this location.

PEDESTRIAN BRIDGE

The pedestrian bridge consists of steel beams, grating and handrail. The bridge spans between the north and south abutment walls and a center support column bearing on the top of the spillway wall. The post bearing on the spillway wall has been recently repaired. The lower rail on the east handrail is missing. A portion of the lower rail on the west handrail is missing. The steel, albeit corroded, does not appear to show any signs of overstress. The concrete abutment walls supporting the pedestrian bridge have significant cracks and movement in the vicinity of the pedestrian bridge bearing. Structural analysis and code compliance review of the walkway is beyond the scope of this report.

RECOMMENDATIONS

The components of the spillway structure are overstressed and in various stages of deterioration and failure. We recommend one of two options:

1. Shore the existing spillway structure with structural steel bracing until full replacement can be designed and funded. See Appendix E for schematic sketches of bracing.
    a. Structural steel bracing is a short-term solution to stabilize the spillway structure. We recommend implementation of the bracing system immediately.
    b. Some structural capacity of the concrete is required for the bracing system to function. When the concrete is no longer viable, replacement of the spillway structure is recommended.
    c. The structural opinion of probable construction cost of the steel shoring system is $145,000.
        i. This is the material and installation of the structural steel and selective concrete patching and epoxy injection at the steel frames. Design and Construction Documents to implement this recommendation and draining of the lake or redirection of water flow to facilitate construction would be an additional cost.
    d. The structural opinion of probable construction cost of replacement of the spillway structure will be developed with the design of the replacement structure. The replacement structure may include a labyrinth system, see more information in

Commonwealth Engineers' report.

2. Infill the existing spillway structure with concrete. See Appendix F for schematic sketch of infill.
    a. Infill of the spillway structure would be a long-term solution. We recommend implementation of the infill immediately.
    b. Infill of the spillway structure will be contingent on a Geotechnical evaluation confirming the soil below the existing foundation slab can adequately support the load of the concrete infill.
    c. The structural opinion of probable construction cost of concrete infill is $325,000.
        i. This is the preparation of the existing concrete, dowels into the existing concrete, and material/installation of the concrete infill only. Design and Construction Documents to implement this recommendation, draining of the lake and redirection of water flow to facilitate construction would be an additional cost.

We recommend routine evaluation, maintenance, and repairs of the spillway structure with either of the above options.

We recommend closing the pedestrian bridge to public use. Replacement of the bridge may be necessary to meet current code requirements; further evaluation is recommended.

CLOSING

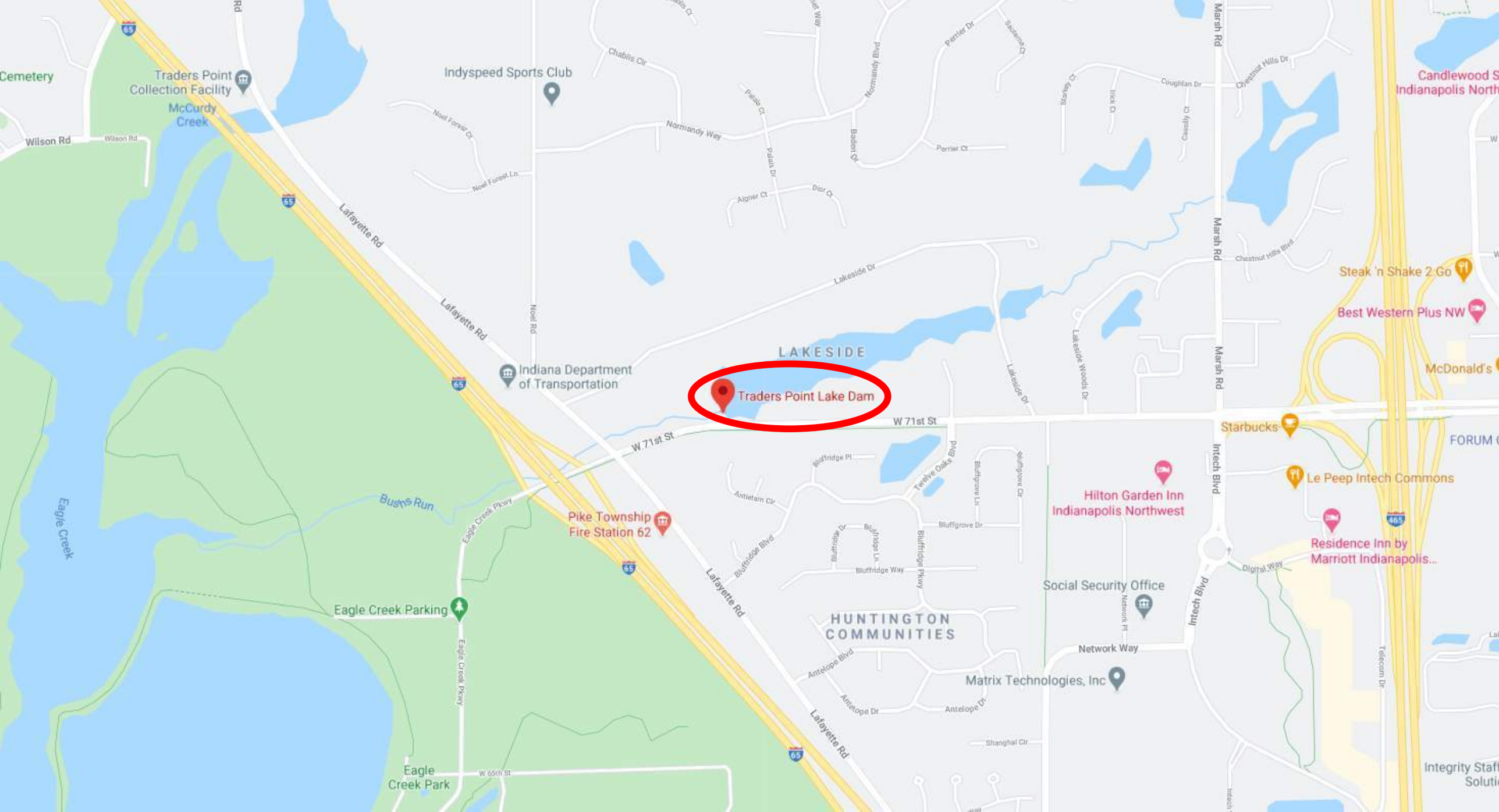
Our investigation of this structure was limited strictly to those items identified in this report and to the extent noted. Should unforeseen deficiencies exist (structural or non-structural); they are beyond the scope of this condition assessment. Should you have any questions or wish to discuss this matter further please don't hesitate to contact the undersigned. Thank you for choosing CE Solutions for your structural engineering needs.

Very truly yours,

Carrie L. Walden, PE
Senior Project Manager

Attachments: Appendix A – Trader's Point Lake location map
Appendix B – Spillway layout
Appendix C – Condition sketches
Appendix D – Photographs
Appendix E – Shoring schematic sketches
Appendix F – Infill schematic sketch
Appendix G – Opinion of Probable Construction Cost

APPENDIX A
Trader's Point Lake location map


Traders Point Lake Dam
Traders Point Collection Facility
Indyspeed Sports Club
McCurdy Creek
Wilson Rd
Lafayette Rd
Noel Rd
Indiana Department of Transportation
LAKESIDE
Lakeside Dr
W 71st St
Marsh Rd
Steak 'n Shake 2 Go
Best Western Plus NW
McDonald's
Starbucks
Le Peep Intech Commons
Hilton Garden Inn Indianapolis Northwest
Residence Inn by Marriott Indianapolis...
Intech Blvd
Social Security Office
Matrix Technologies, Inc
Network Way
Digital Way
Pike Township Fire Station 62
Bluffridge Blvd
Bluffridge Pkwy
Bluffridge Way
Bluffgrove Dr
Twelve Oaks Pass
HUNTINGTON COMMUNITIES
Antelope Blvd
Antelope Dr
Shanghai Cir
Eagle Creek Parkway
Eagle Creek Parking
Eagle Creek Park
Eagle Creek
Busse Run
W 65th St
Normandy Way
Chabris Clr
Noel Forest Ct
Noel Forest Ln
Perrier Dr
Perrier Ct
Baden Dr
Palais Ct
Palais Dr
Aigner Ct
Dior Ct
Coughlan Dr
Chestnut Hills Dr
Chestnut Hills Blvd
Lakeside Woods Dr
Telecom Dr
Cemetery

Traders Point Lake Dam
Traders Point Lake
W 71st St
Lakeside Dr
Lafayette Rd
Noel Rd
Indyspeed Sports Club
Indiana Department of Transportation
Westport Homes - Woods at Traders Point
Marsh Rd
Chestnut Hills Dr
Chestnut Hills Blvd
Hydro-Gear
Jill R Stanton
Starbucks
Hilton Garden Inn Indianapolis Northwest
Intech Blvd
Jack's Donuts at Intech Park
Le Peep Intech Commons
WXIN - Fox 59/ WTTV - CBS4
Residence Inn by Marriott Indianapolis...
Indiana Wesleyan University...
Social Security Office
US Customs and Border Protection
Matrix Technologies, Inc
Purdue University Technical
Ashfield Meetings & Events
Pike Township Fire Station 62
Bushs Run
Eagle Creek Parking
Eagle Creek Park
Eagle Creek Pkwy
W 69th St
W 65th St
Bluffridge Blvd
Bluffridge Way
Bluffridge Ct
Bluffridge Pkwy
Bluffgrove Dr
Antelope Blvd
Antelope Dr
Shanghai Cir
Shanghai Rd
Network Way
Speights Dr
Hunters Green Way
Normandy Way
Noel Forest Ln
Noel Forest Ct
Chablis Cir
Palais Ct
Palais Dr
Baden Dr
Perrier Dr
Perrier Ct
Dior Ct
Aigner Ct
Lakeside Woods Dr
Yearling Run
Twelve Oaks Blvd
Bluffgrove Ln
Bluffridge Dr
Caribou Dr
Big Pine Dr
Acre Ln
Telecom Dr
Intech Way
Cardinal H
Steak 'n Shake
FlexPAC
Natural Resource Conservation
Herron Associates – The Idea Center
Sterici ExpertSOLUTIO

APPENDIX B
Spillway layout

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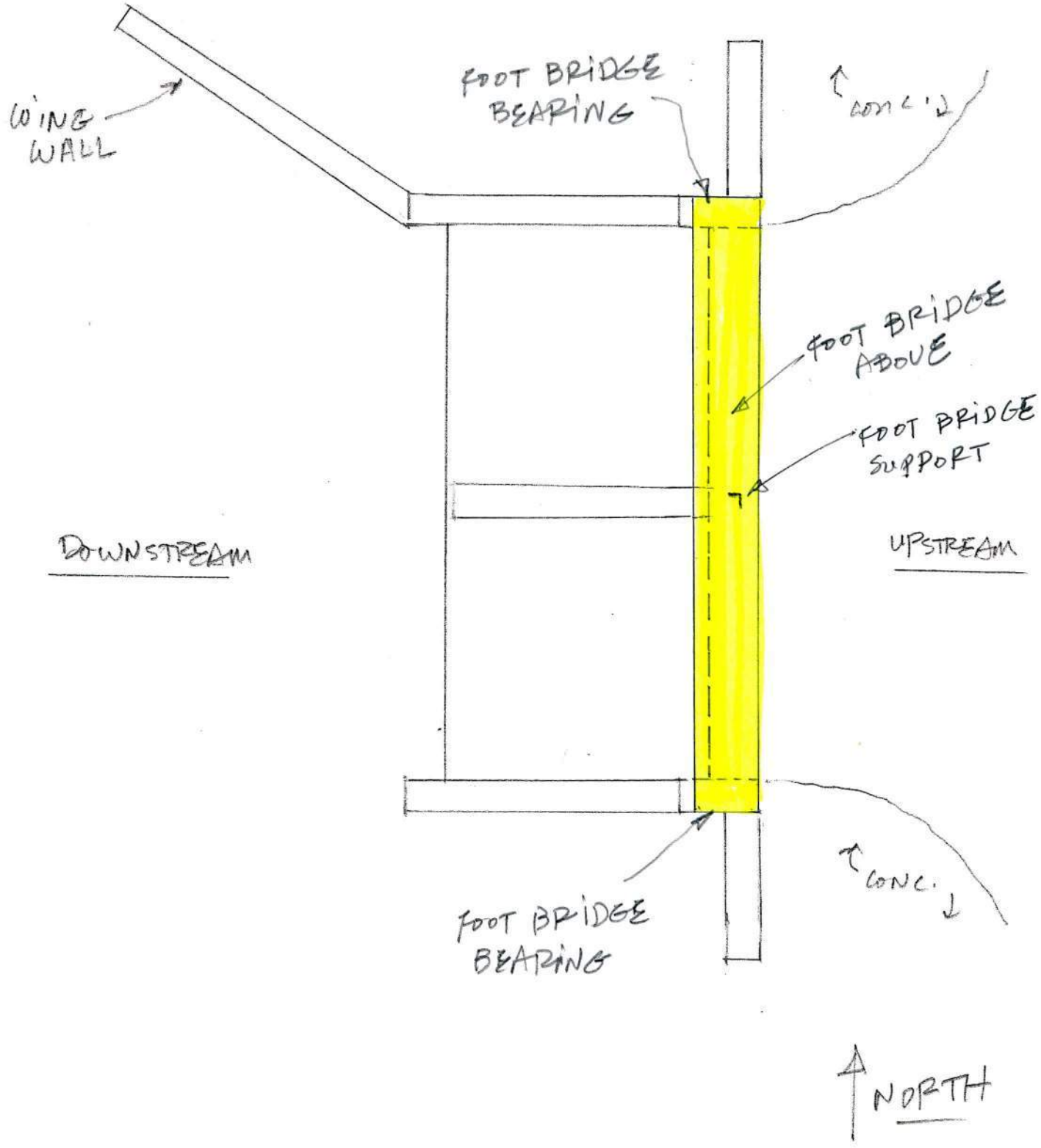

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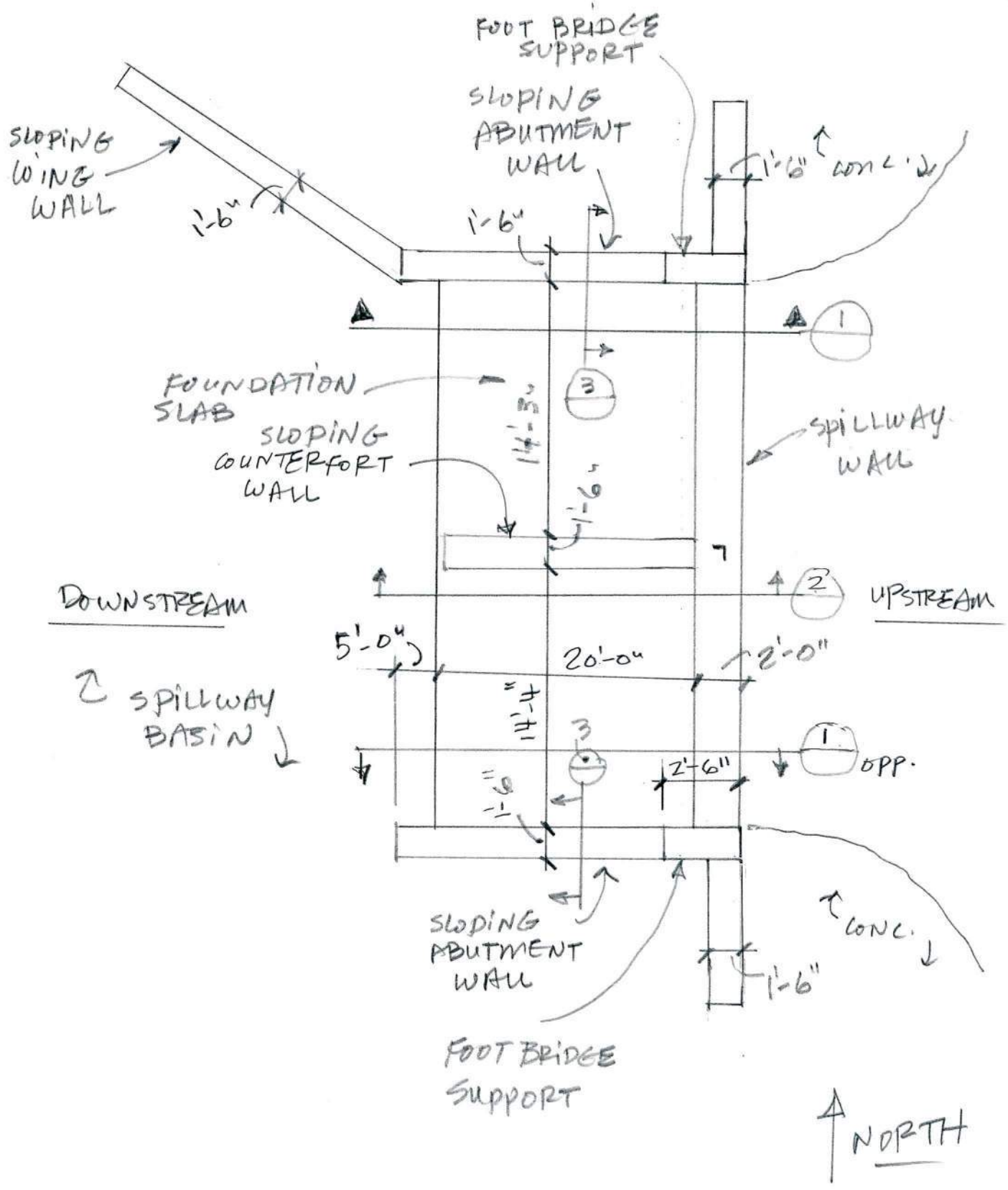

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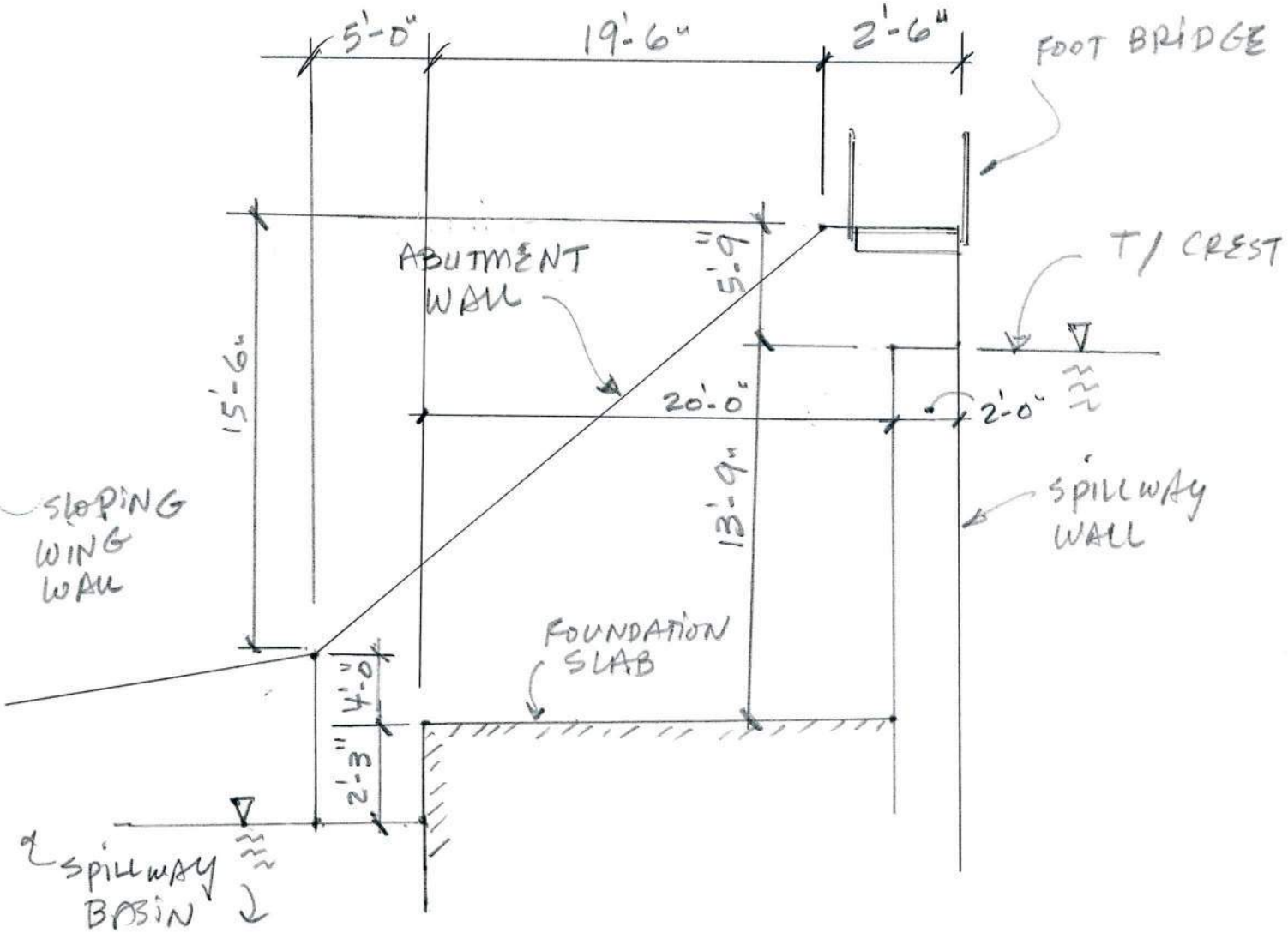

1 SECTION

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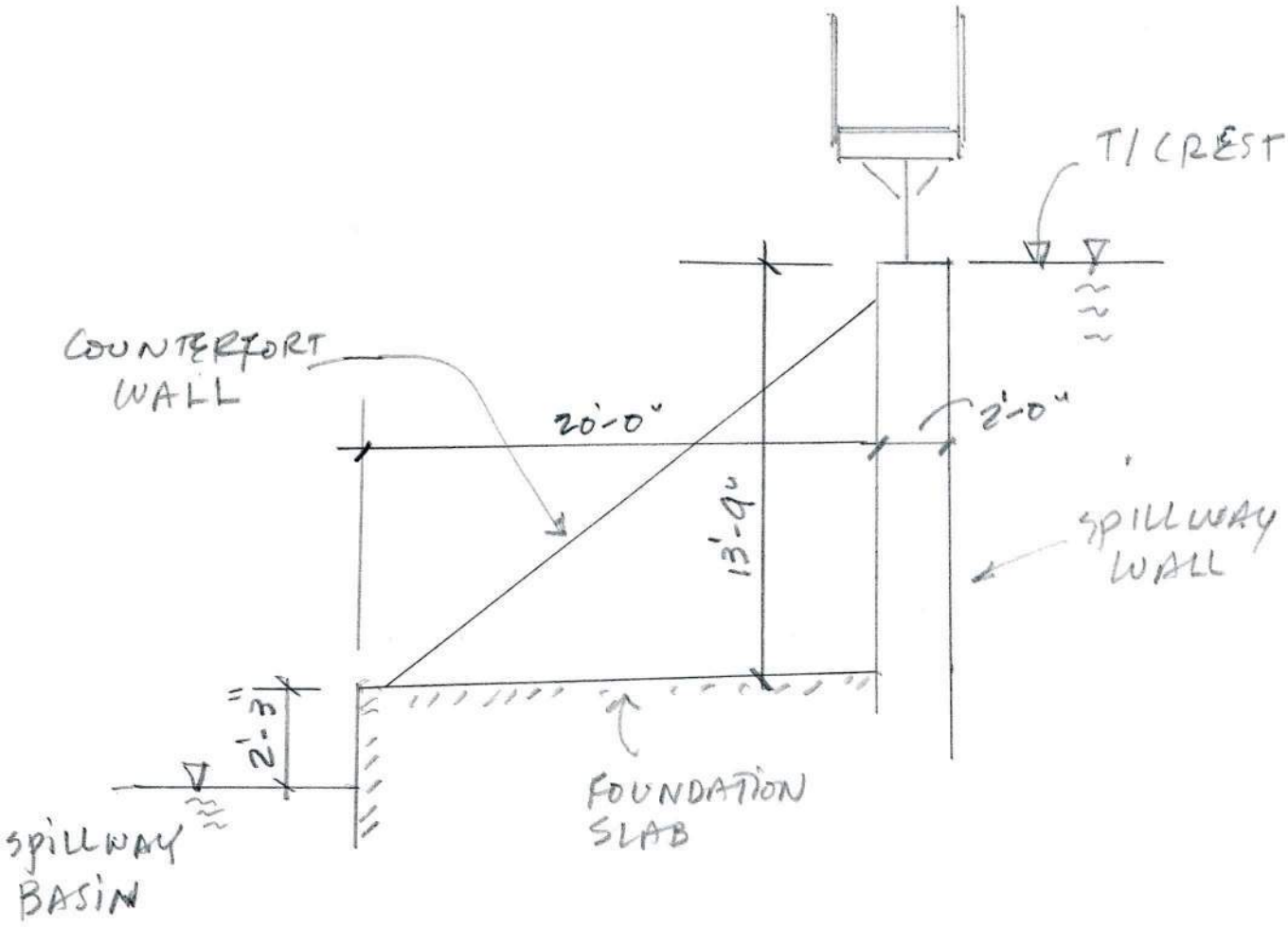

(2) SECTION

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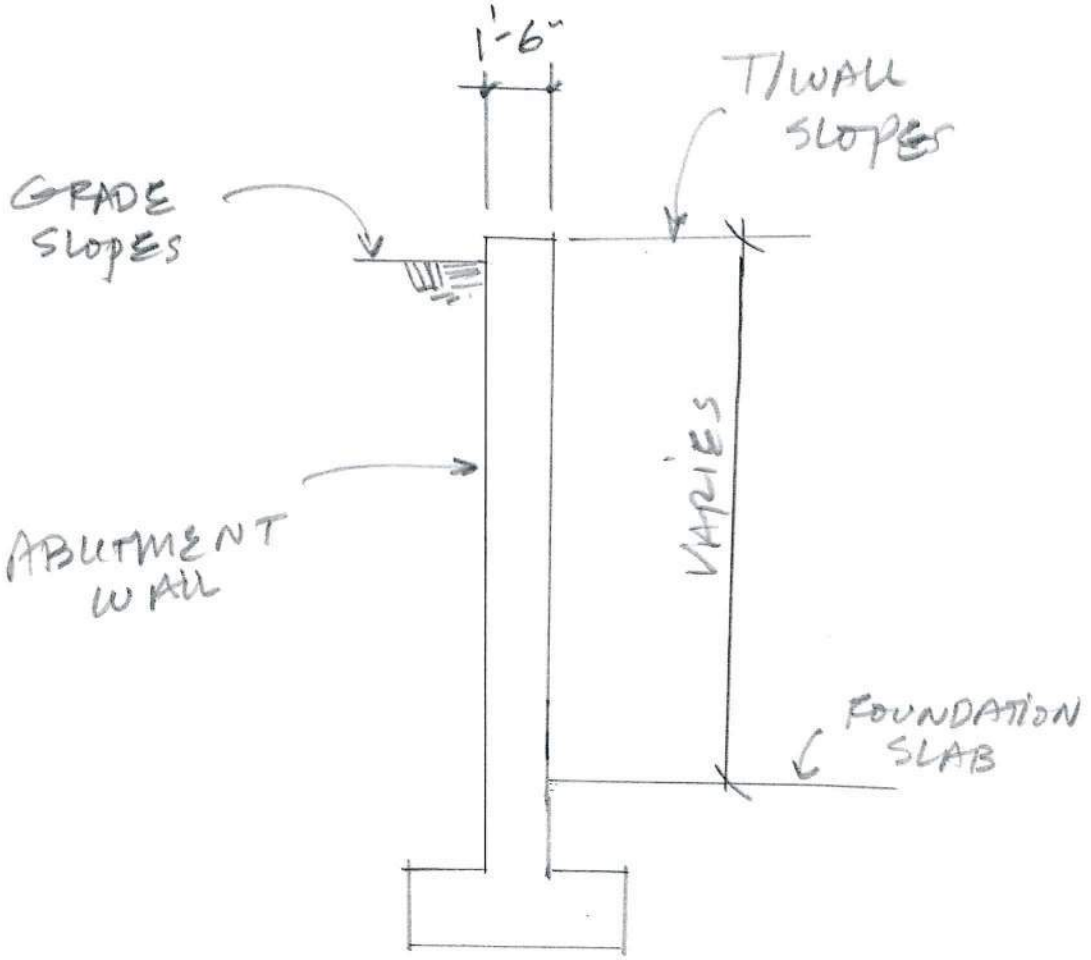

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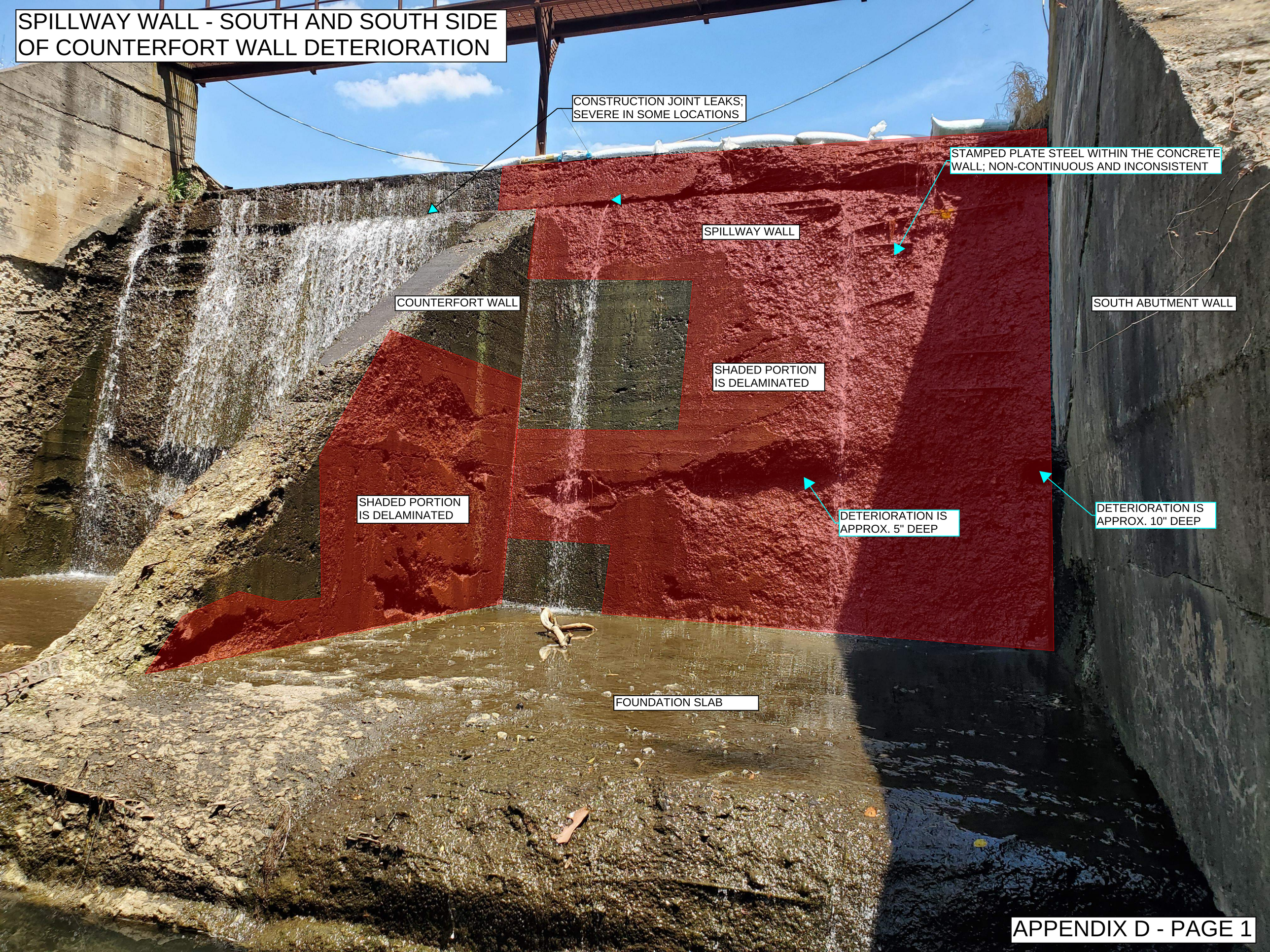
APPENDIX C
Condition sketches

SPILLWAY WALL - SOUTH AND SOUTH SIDE OF COUNTERFORT WALL DETERIORATION

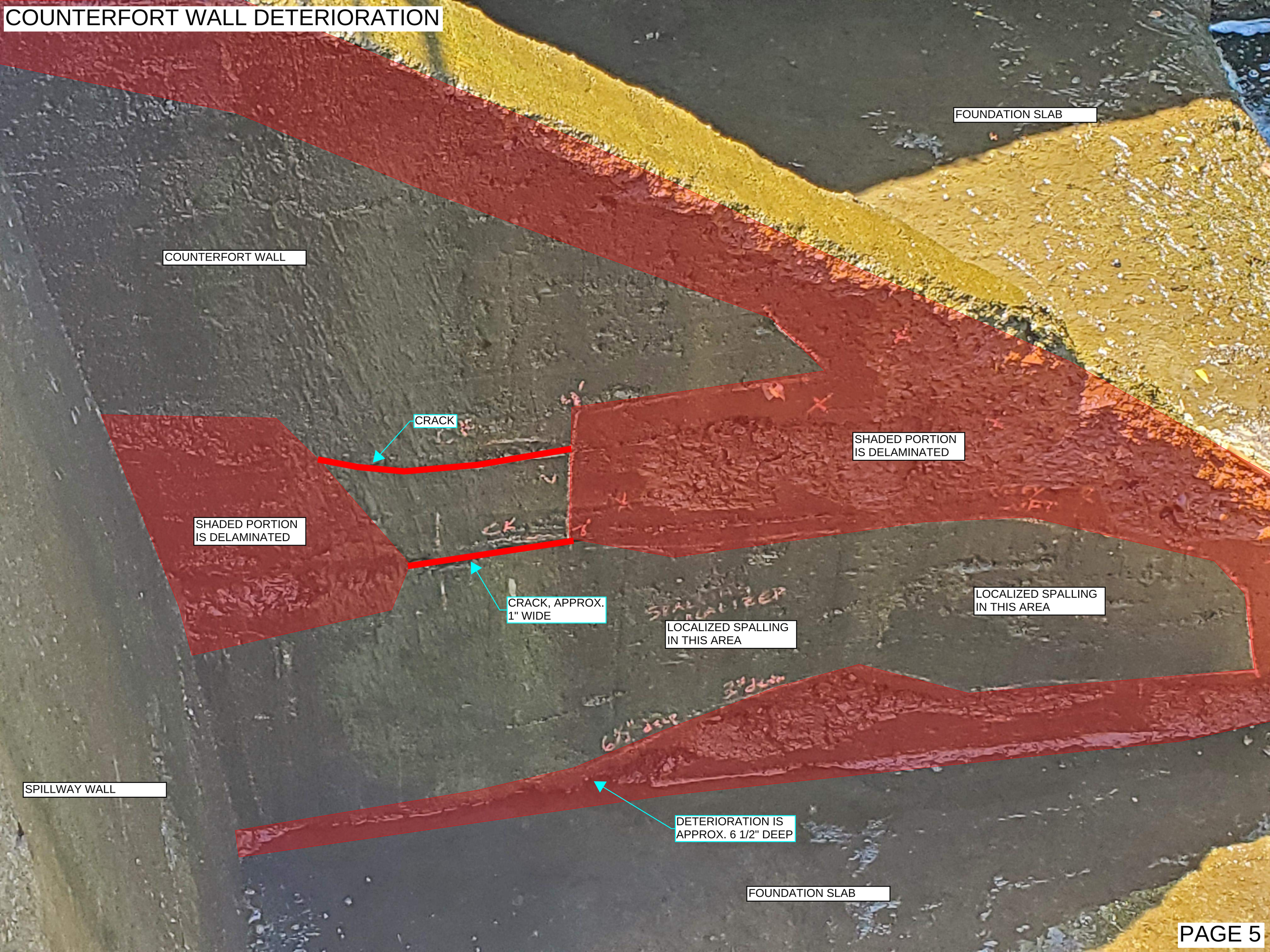


NORTH ABUTMENT WALL AND NORTH WING WALL DETERIORATION

SOUTH ABUTMENT WALL DETERIORATION

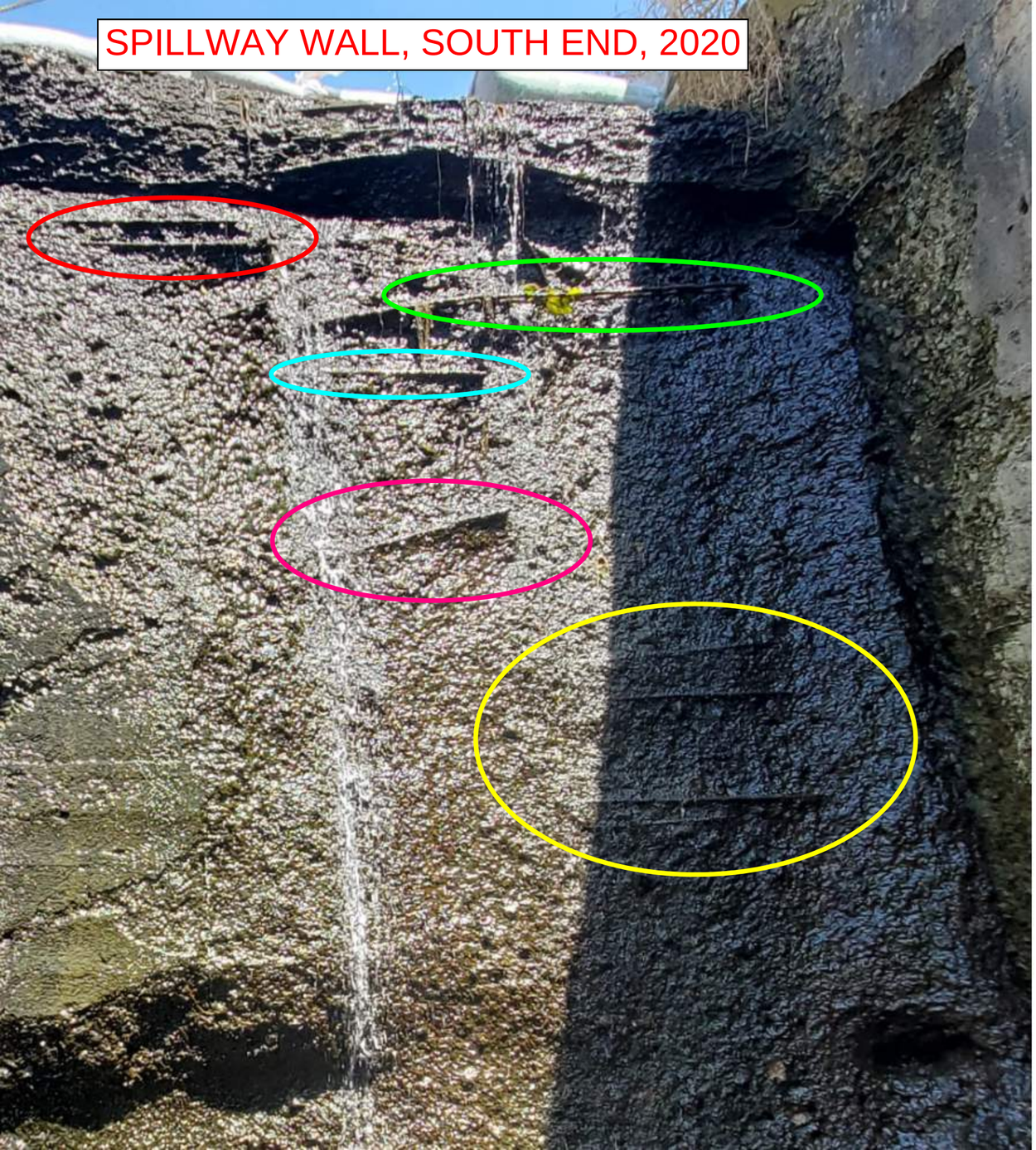
COUNTERFORT WALL DETERIORATION

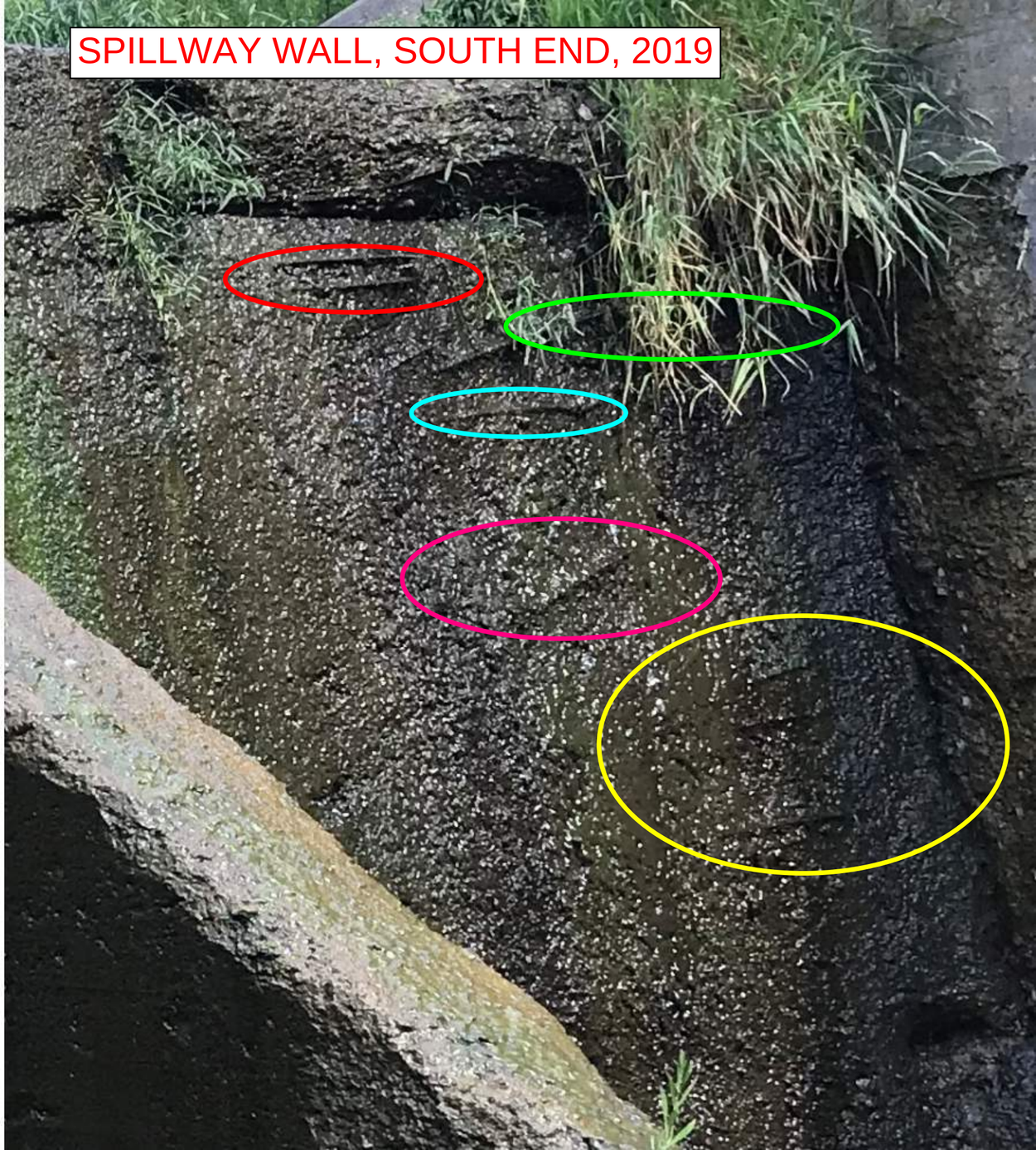
COUNTERFORT WALL DETERIORATION



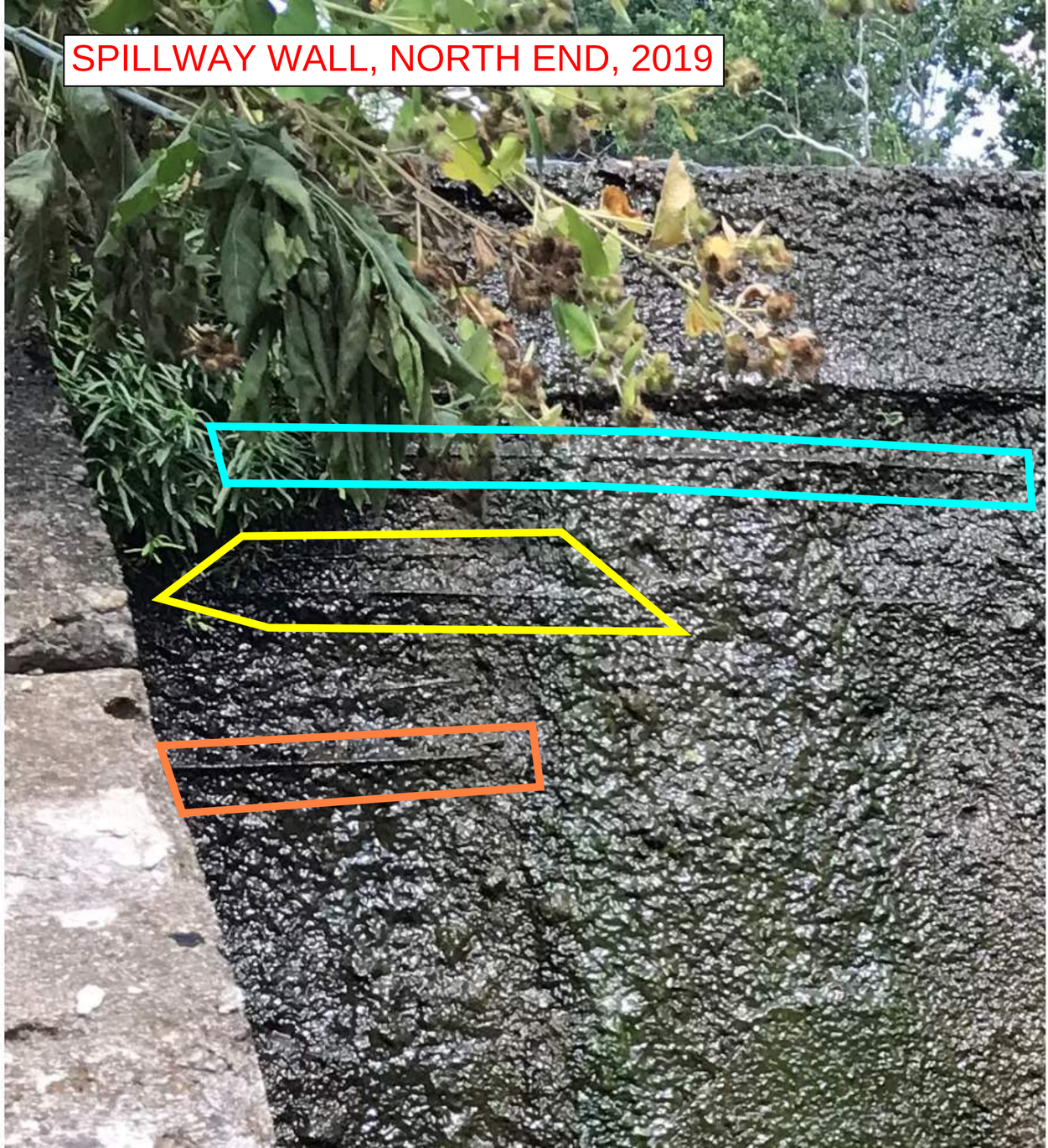
FOUNDATION SLAB DETERIORATION

APPENDIX D
Photographs


SPILLWAY WALL, SOUTH END, 2020


SPILLWAY WALL, SOUTH END, 2019


SPILLWAY WALL, NORTH END, 2020


SPILLWAY WALL, NORTH END, 2019

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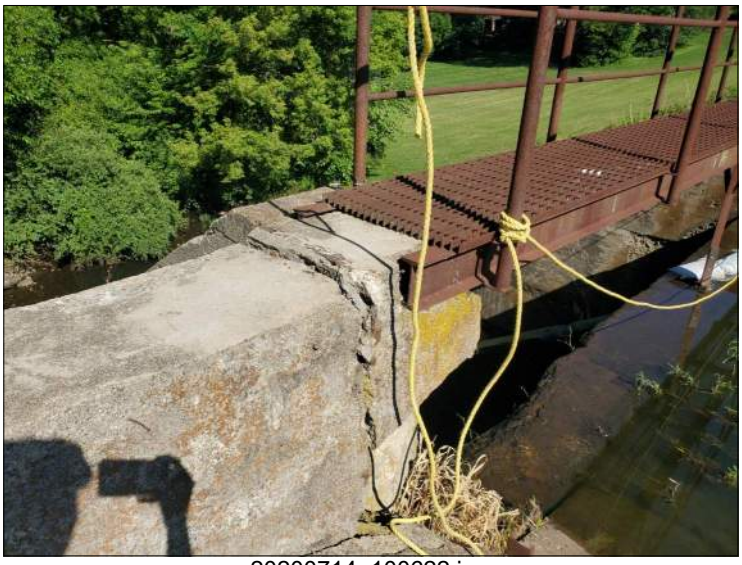

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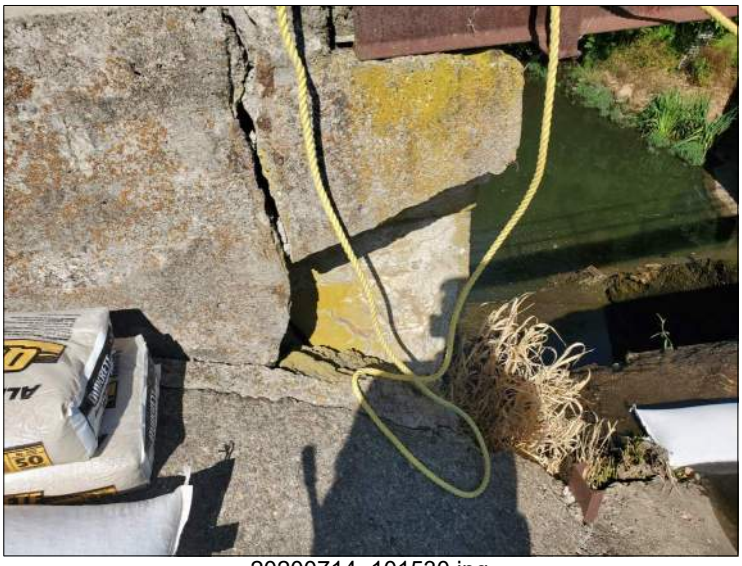

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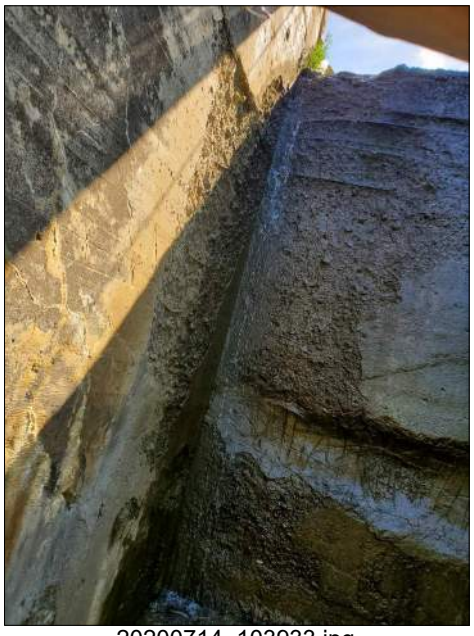

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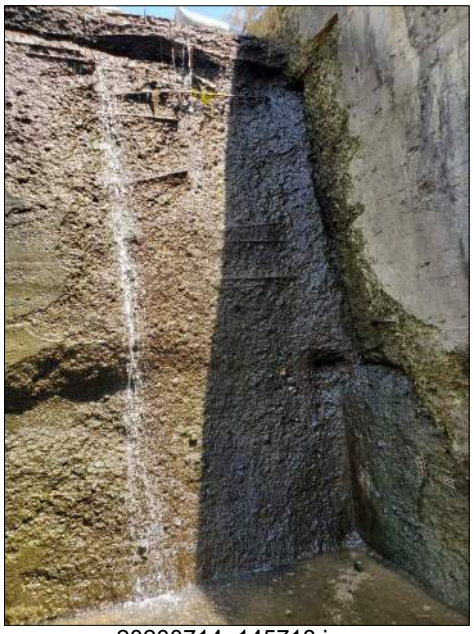

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APPENDIX E
Shoring schematic design

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structural engineers

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Carmel, IN 46032

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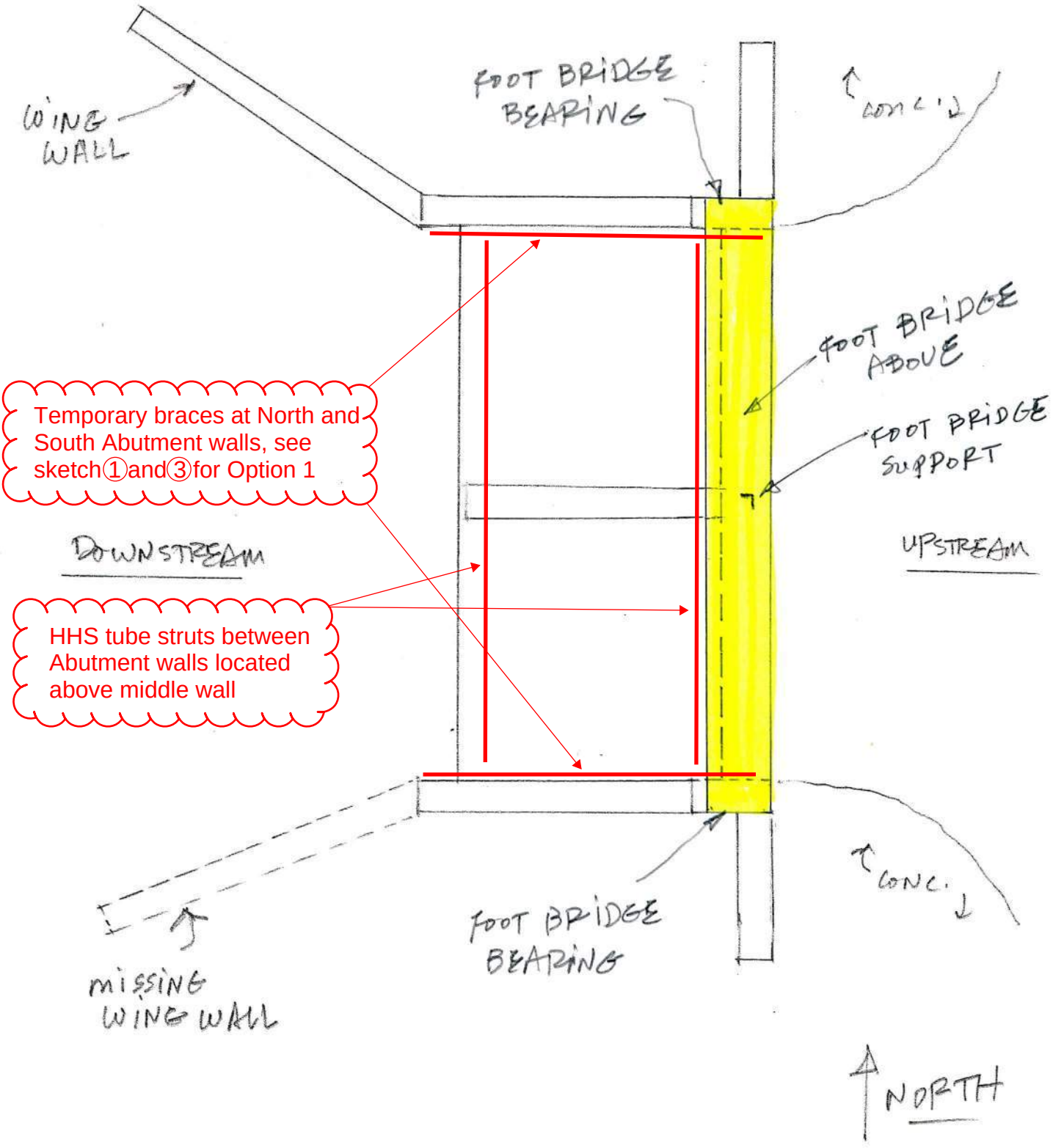
cesolutionsinc.com

By AS Date 8/5/20 Project Name TRADERS POINT DAM Project No 20-116
Ck'd by Date Subject Sheet No of



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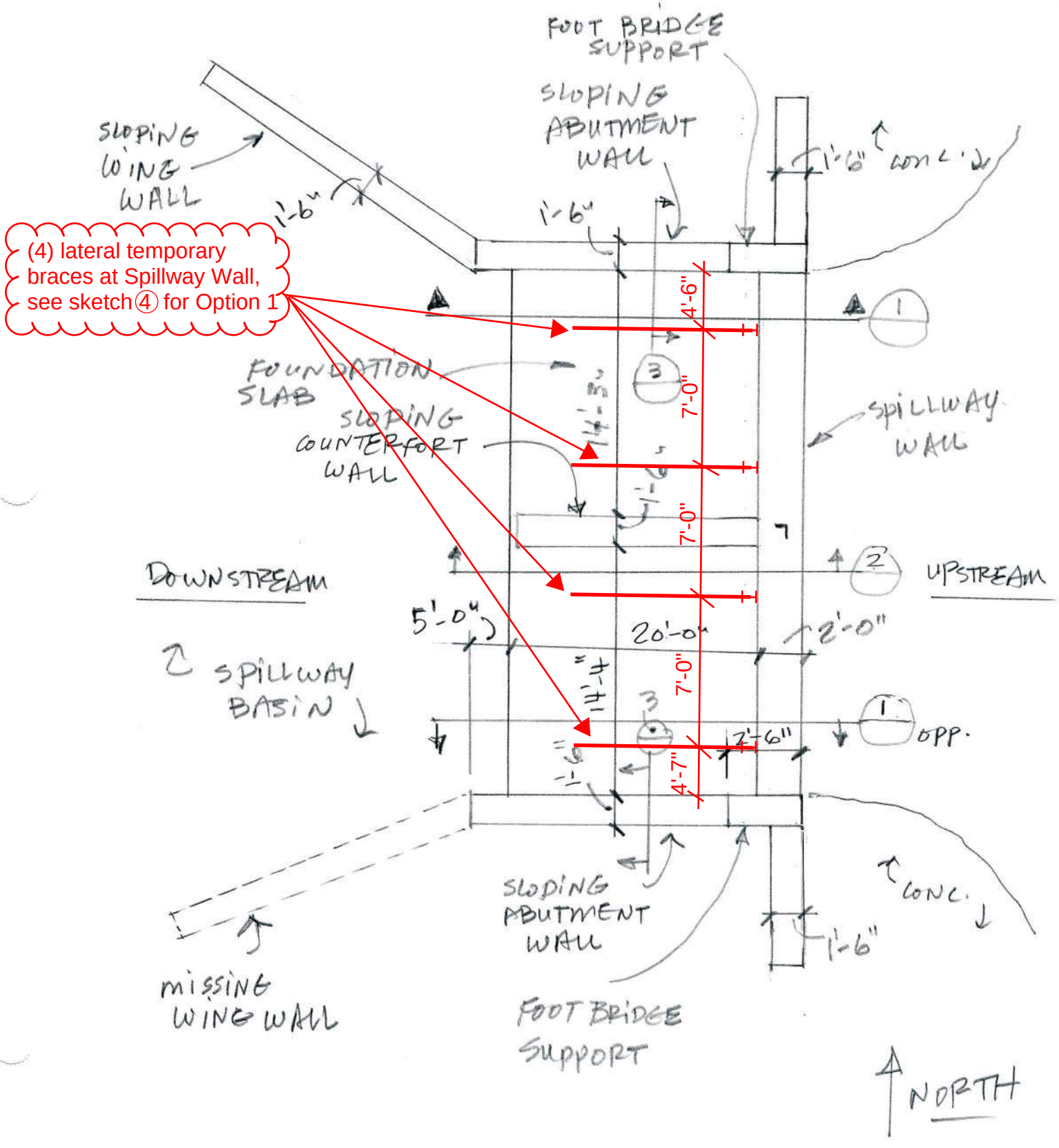

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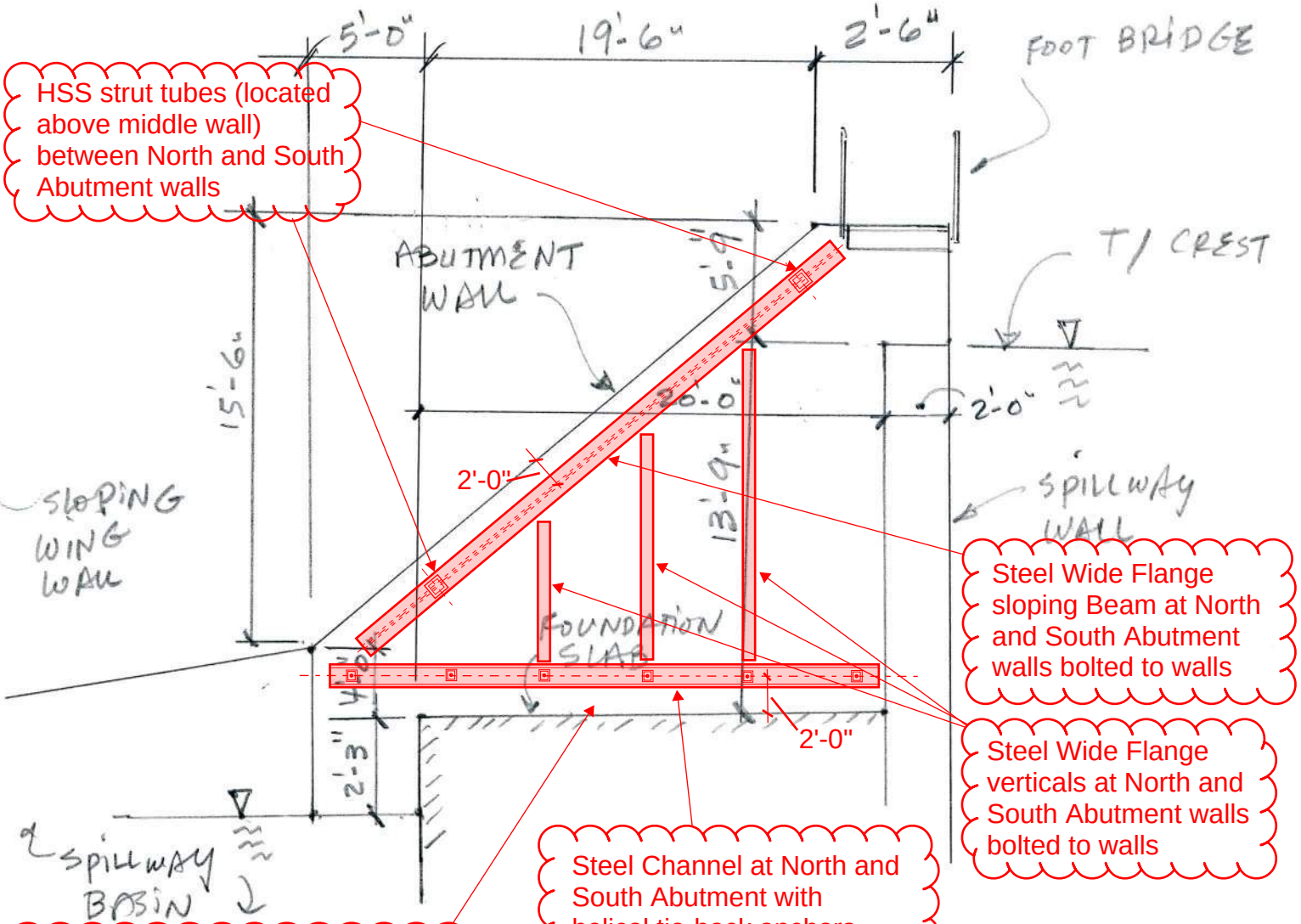

HSS strut tubes (located above middle wall) between North and South Abutment walls

Steel Wide Flange sloping Beam at North and South Abutment walls bolted to walls

Steel Wide Flange verticals at North and South Abutment walls bolted to walls

Steel Channel at North and South Abutment with helical tie-back anchors into existing soil

Preparation of the existing concrete surfaces is required where bracing connects to the existing concrete

See detail ③ for cross section

1 SECTION AT TEMPORARY SHORING (OPTION 1)

AT NORTH & SOUTH ABUTMENT WALLS

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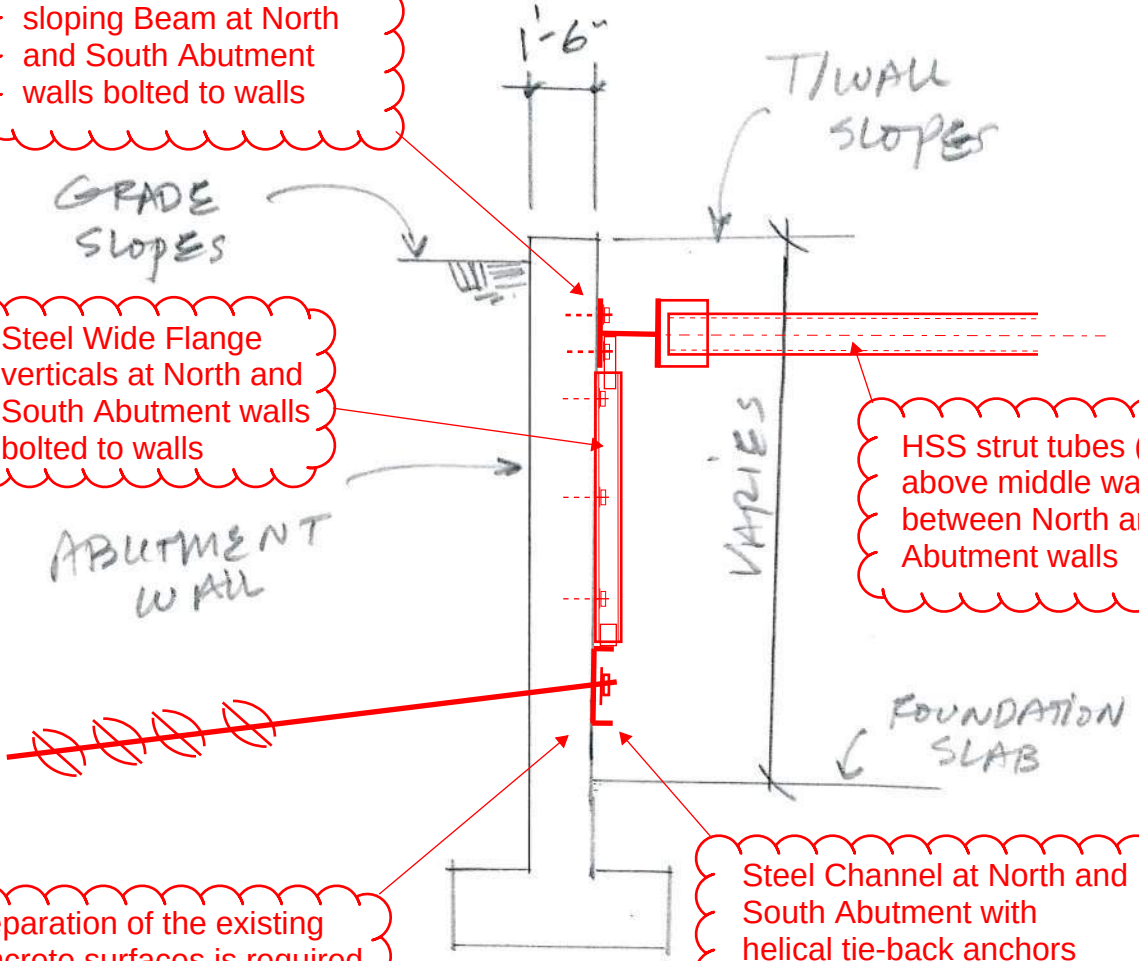
Ck'd by Date Subject Sheet No of



3 SECTION AT TEMPORARY SHORING (OPTION 1)

AT NORTH & SOUTH ABUTMENT WALLS

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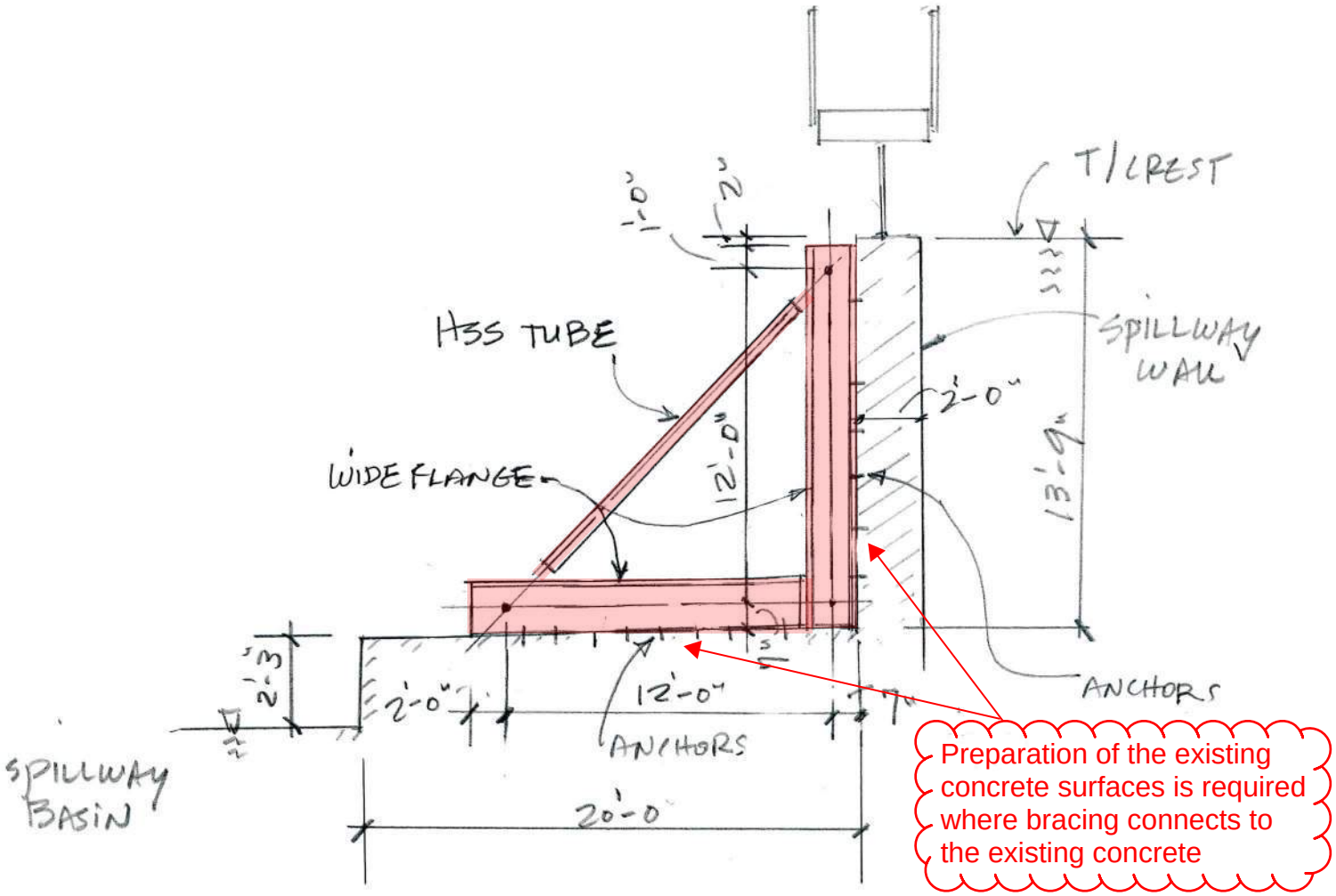

4 SECTION AT TEMPORARY SHORING (OPTION 1)

(4) TEMPORARY BRACES, SEE PLAN

- ALL EXPOSED STEEL SHALL BE HOT DIPPED GALVANIZED OR PAINTED
- 50 KSI STEEL

APPENDIX F
Infill schematic sketch

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Carmel, IN 46032

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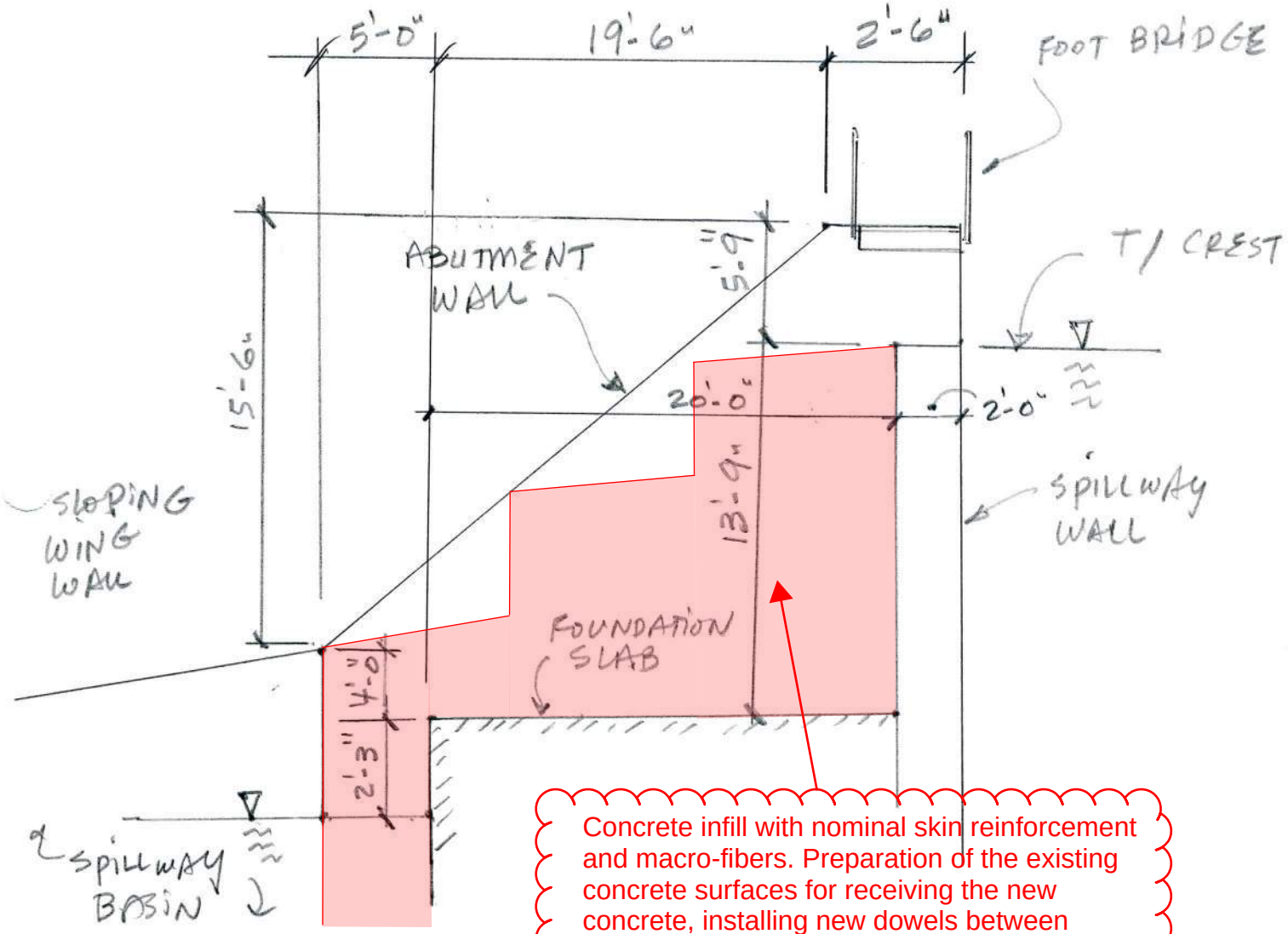
Ck'd by Date Subject Sheet No of



Concrete infill with nominal skin reinforcement and macro-fibers. Preparation of the existing concrete surfaces for receiving the new concrete, installing new dowels between existing and new concrete and joints sealant are also required.

5 SECTION AT CONCRETE INFILL (OPTION 2)

APPENDIX G
Structural Opinion of Probable Construction Cost

CE Solutions
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cesolutionsinc.com

Traders Point Dam
Indianapolis, IN

CES Project No.: **20-116**
Date: **11/17/2020**

Opinion of Probable Construction Cost - Option 1

WORK ITEM	QUANTITY	UNIT	UNIT COST	TOTAL
Option 1: Temporary Structural Steel Bracing and Replacement Cost				
1. Temporary Structural Steel Bracing to stabilize the spillway structure				
Spillway Walls: Steel bracing frames	4,800	LB	$3.00	$14,400
Spillway Walls: Steel bracing anchorage to existing concrete	144	EA	$25.00	$3,600
Spillway Walls: Concrete patching at frames to prior to anchorage	112	SF	$100.00	$11,200
Spillway Walls: Concrete epoxy injection of cracks	100	LF	$75.00	$7,500
North and South Abutment Walls: Steel bracing frames	8,870	LB	$3.00	$26,610
North and South Abutment Walls: Steel bracing anchorage to existing concrete	88	EA	$25.00	$2,200
North and South Abutment Walls: Helical tie-backs at bottom channel	12	EA	$1,000.00	$12,000
North and South Abutment Walls: Concrete epoxy injection of cracks	150	LF	$75.00	$11,250
North and South Abutment Walls: Concrete patching prior to anchorage	144	SF	$100.00	$14,400
Temporary Structural Steel Bracing Subtotal				$103,160
General Conditions	20	%		$20,632
Mobilization & Demobilization	5	%		$5,158
Design Contingency	15	%		$15,474
GRAND TOTAL				**$144,424**

Notes:
1. All costs are current as of the time of the report (November 2020)
2. Cost opinion does not include water redirection and draining of the lake to facilitate construction.
3. Cost opinion does not include construction contingencies, design fees, geotechincal evaluation, and other project soft costs.

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Traders Point Dam
Indianapolis, IN

CES Project No.: **20-116**
Date: **9/4/2020**

Opinion of Probable Construction Cost - Option 2

WORK ITEM	QUANTITY	UNIT	UNIT COST	TOTAL
Option 2: Concrete Repair and New Infill				
Demo existing pedestrian bridge	1	LS	$1,000.00	$1,000
Concrete patching and crack injection at walls and base slab	1,000	SF	$100.00	$100,000
Concrete repairs at bridge bearing	2	LS	$1,000.00	$2,000
Dowels between existing and new concrete	1,620	EA	$10.00	$16,200
New concrete infill with skin reinforcement and macro fibers	250	CY	$400.00	$100,000
Concrete Sealer	1,600	SF	$5.00	$8,000
New Pedestrian bridge	1	EA	$3,000.00	$3,000
New Concrete Infill Subtotal				**$230,200**
General Conditions	20	%		$46,040
Mobilization & Demobilization	5	%		$11,510
Design Contingency	15	%		$34,530
GRAND TOTAL				**$322,280**

Notes:
1. All costs are current as of the time of the report (September 2020)
2. Cost opinion does not include water redirection and draining of the lake to facilitate construction.
3. Cost opinion does not include construction contingencies, design fees, geotechincal evaluation, and other project soft costs.