

Town of Chapel Hill Legion Pond Dam

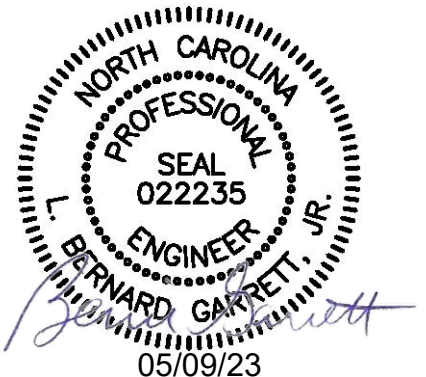
Preliminary Engineering Report

May 2023

Prepared By:



Raleigh, North Carolina 27603 • O: 919-792-1900 • F: 866-311-7206
NC FIRM C-2910



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Background and Purpose

The Town of Chapel Hill (Town) engaged Garrett & Moore to provide a preliminary evaluation of the condition of the dam and pond on the American Legion property located on Legion Road prior to property acquisition in 2017. The preliminary evaluation found that the dam is under the jurisdiction of the Dam Safety Law of 1967.

The purpose of this report is to provide an update regarding the following issues addressed herein:

- Existing Site Conditions
- NC Dam Safety Regulations
- Applicable Ordinances and Environmental Rules
- Construction Planning Cost Estimates

1.0 Existing Site Conditions

The American Legion property is located at 1714 Legion Road in Chapel Hill, NC. The Town owns an adjacent parcel immediately downstream of the dam. Figure 1 presents the project site vicinity.

The project site occurs on two separate parcels owned by the Town of Chapel Hill totaling 36.23 acres (PIN #9799555951, 33.64-ac; PIN #9799467392, 2.59-ac). The pond is approximately 2.7 acres. Figure 2 presents the existing project site conditions. Attachment 1 includes tax maps of the site highlighting both parcels.

The site is within Chapel Hill's town limits, is located within the Lower Booker Creek drainage basin, is within Chapel Hill's Watershed Protection District, and is within an area subject to Jordan Lake Watershed Riparian Buffer Rules. The pond is not located within the 100-year floodplain. The pond outfall forms an intermittent stream, which is hydraulically connected to the pond and which flows generally southwest as a tributary to Booker Creek.

The pond dam does not appear in the March 16, 2023 update to the October 12, 2020 North Carolina Dams Inventory.

Based on field observations made on March 7, 2023, the condition of the dam is generally characterized as follows:

- **Upstream:** The visible portion of the upstream face of the dam is generally regular with a slope of approximately 3:1. The upstream face of the dam exhibits extensive mature tree growth with trees up to 17-inches in diameter

between the dam crest and the normal pool. Freeboard at the normal pool elevation is between 2.5-ft and 3-ft based on field observation. Heavy brush and undergrowth obscure approximately $\frac{1}{4}$ of the upstream face of the dam at the western end, preventing further visual assessment.

- **Crest:** The width of the dam crest fluctuates slightly between 8-ft and 10-ft and is approximately flat. The crest is covered with pine straw with intermittent, isolated stands of grass. No trees are present, however roots spanning the crest are visible at the ground surface.
- **Downstream:** The maximum height of the dam, measured between the dam crest and the stream channel at the toe, is approximately 20-feet high according to 2015 bare-earth LiDAR data obtained from the North Carolina Emergency Management Spatial Data Download. Slopes are generally between approximately 1.5:1 and 2:1. Slopes are generally regular, with an erosion cavity beneath an outlet structure pipe joint. Tree growth is extensive end-to-end and top-to-toe, with mature trees up to 21-inches in diameter.
- **Outlet Structures:** Observed outlet structures include the original ductile iron pipe outlet, an 8-inch PVC pipe overflow device, and an approximate 10'-wide emergency spillway on the eastern abutment of the dam. The inlet of the original outlet structure was submerged and could not be observed. The downstream end of the original outlet structure includes a ductile iron butterfly valve that was closed at the time of observation. None of the observed outlet structures included energy dissipating structures. All outlets discharge to a well-defined drainage channel.
- **Toe:** The toe of the dam contains trees of varying size, up to 21-inches in diameter. No significant signs of erosion or seepage were observed.
- **Groins:** Trees cover the groins of the dam. There are no signs of erosion or seepage.
- **Downstream Channel:** The dam outlets discharge to well-defined drainage channel. Private residences are adjacent to the drainage channel ranging between 50 ft and 200 ft (measured horizontally) from the channel. The drainage channel enters a single 102-ft long 48" reinforced concrete pipe culvert under Clover Drive approximately 900 ft to the southwest of the dam. Clover Drive is classified as a local road maintained by the Town and is the only means of ingress and egress for The Meadows subdivision, which contains 54 residences. The channel then daylights for approximately 300 feet before entering a 509-ft long culvert underneath Ephesus Church Road. Ephesus Church Road is classified as an arterial road maintained by NCDOT.

Photographs from the site visit are included in Attachment 2.

2.0 NC Dam Safety Rules

The following rules were reviewed for applicability to the site:

- Dam Safety Law of 1967 (NCGS 143-215.23 through 37)
- Senate Bill 1004
- NCAC Title 15A Subchapter 2K: Dam Safety

Per Dam Safety Regulation 15A NCAC 02K .0302, Dam Safety Orders can be issued directing the owner of a dam to make, at the owner(s) expense, any maintenance, alteration, repairs, reconstruction, or change in construction upon a finding that the dam:

1. Is not sufficiently strong,
2. Is not maintained in good repair or operating condition,
3. Is dangerous to life or property, or
4. Does not satisfy minimum stream-flow requirements.

Preliminary visual assessment of the dam and downstream area indicates that several of these criteria apply to the dam in its current condition based on the extensive tree growth on the dam, condition of the outlet structures, and downstream characteristics.

The most specific concern is the extensive pine tree vegetation on the downstream face of the dam. If any of the large pine trees were to blow over and expose the root ball, a dam failure could become possible.

2.1 Classification of Dam

Dams are divided into three classes as defined in 15A NCAC 02K .0105 Classification of Dams. Based on the downstream characteristics of site, the dam should be classified as Class C, or High Hazard, which includes dams located where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads. Table 1 presents qualitative guidelines published by the North Carolina Division of Land Resources for assessing hazard classification.

Table 1. Dam Hazards Classification.

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	Less than 25 vehicles per day
	Economic damage	Less than \$30,000
Intermediate	Damage to highways, Interruption of service	25 to less than 250 vehicles per day
	Economic damage	\$30,000 to less than \$200,000
High	Loss of human life*	Probable loss of 1 or more human lives
	Economic damage	More than \$200,000
	*Probable loss of human life due to breached roadway or bridge on or below the dam.	250 or more vehicles per day

2.2 Permitting Procedures

Dam maintenance is required to bring the dam into compliance with the Dam Safety Rules. Based on the classification of the dam, Dam Safety permitting will be required to either 1) repair the dam, or 2) remove the dam. For the purpose of this report, the maintenance options are generally defined as follows:

Dam Repair: Dam repair will include dewatering the pond, riser barrel structure replacement, and a filter diaphragm, an outlet energy dissipater, and a drainage blanket will be added.

Dam Removal: Dam removal will consist of dewatering the pond, existing outlet structure removal, and excavation of dam embankment soils such that water will no longer be impounded.

Two flow charts that outline permitting procedures for the two options under consideration are included as Attachment 3 at the end of this report.

Based on our understanding of the Dam Safety Program, it is unlikely that the State would require that the Town take mitigating action to bring the dam into compliance with the law any time soon. However, the Town should consider the potential for damage downstream, and the liability associated with owning a high hazard dam.

3.0 Applicable Ordinances and Environmental Rules

The Town completed a wetland and stream jurisdictional determination addressing the pond and the stream located on the project site in 2019. The most relevant figures from the jurisdictional determination are included in Attachment 4. Our interpretation of how

the project may proceed based on a jurisdictional determination and applicable environmental regulations is described in the following sections.

Based on the preliminary design depicted on Figure 3 for the repair option, we estimate the following impacts will be necessary:

- Approximately 0.75 acres of fill in a Water of the US.
- Approximately 100 linear feet of intermittent stream.
- Approximately 1.5 acres of riparian buffer.
- Approximately 1.5 acres of resource conservation district.

For the removal option we estimate the following impacts will be necessary:

- Approximately 1.0 acres of riparian buffer.
- Approximately 1.0 acres of resource conservation district.

3.1 Section 404 Permitting

Repair Option

Dam maintenance is authorized under Section 404 of the Clean Water Act by Nationwide Permit 3 – Maintenance. However, total impacts to waters and streams for the repair option exceed the thresholds for applicability. Therefore, an individual 404 Permit will be required.

Regarding mitigation, please consider the following excerpt from NWP 3:

“The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.”

A subjective determination regarding mitigation will be made by the district engineer based on the final design of the repair option project.

Removal Option

Dam maintenance is authorized under Section 404 of the Clean Water Act by Nationwide Permit 3 – Maintenance. The dam removal project should be designed and executed to comply with the requirements of Nationwide Permit 3 – Maintenance.

Mitigation is not anticipated to be required for the removal option project; however, this should be confirmed during final design.

3.2 Section 401 Water Quality Certification

Repair Option

Water Quality General Certification No. 4239 is intended to cover activities that are eligible for Nationwide Permit 3. However, total impacts to waters and streams for the repair option exceed the thresholds for applicability. Therefore, an individual 401 Water Quality Certification will be required in accordance with 15A-NCAC-02H-.0500 – Water Quality Certification.

Removal Option

Water Quality General Certification No. 4239 is intended to cover activities that are eligible for Nationwide Permit 3. Since the total impact to waters and streams is less than the thresholds for applicability, the dam removal project should be completed in accordance with Water Quality General Certification No. 4239.

3.3 Riparian Buffers

Jordan Lake Riparian Buffer Rules, 15A NCAC 02B .0267.

Repair Option

Dam maintenance activities that **do cause additional buffer disturbance** beyond the footprint of the existing dam or those not covered under the U.S. Army Corps of Engineers Nationwide Permit No.3 are **allowable** under 15A NCAC 02B .0267.

The dam repair project should be completed in accordance with the requirements of an allowable activity under 15A NCAC 02B .0267.

Removal Option

Dam maintenance activities that **do not cause additional buffer disturbance** beyond the footprint of the existing dam or those covered under the U.S. Army Corps of Engineers Nationwide Permit No. 3 **are exempt** under 15A NCAC 02B .0267.

The dam repair project should be completed in accordance with the requirements of an exempt activity under 15A NCAC 02B .0267.

3.4 Resource Conservation District

The Town of Chapel Hill Resource Conservation District (RCD) is intended to be applied to areas within and along waterways within the Town's planning district. The RCD will apply to both the pond as a perennial waterbody as well as the intermittent stream downstream of the dam.

Repair Option

Repairing the dam is allowable under the RCD as described in table 3.6.3-2: Perennial use 34s within Resource Conservation District.

Removal Option

Removal of the pond is not an allowable activity in the RCD table of use, however, a modification to the RCD regulation can be granted after the NCDEQ and USCOE have approved the 401/404 permitting.

4.0 Planning Level Cost Estimates

Preliminary planning budget cost estimates for the construction and maintenance work anticipated for both pond options are presented in Tables 2 and 3. The cost estimates are limited to the work specifically required to bring the dam into compliance with dam safety regulations. Cost estimates do not address any mitigation costs associated with future projects that would include impacts to the pond or stream beyond the immediate dam repair.

In following the State's procedures for the work, both the Repair and the Removal options will require that the pond be drained, and the dam be breached.

Repair Option

Dam repair will include dewatering the pond, riser barrel structure replacement, and a filter diaphragm, an outlet energy dissipater, and a drainage blanket will be added. Figure 3 provides a preliminary conceptual plan for the repair option, which was the basis for the quantity estimates in the cost evaluations. The preliminary opinion of cost for the repair option is presented in Table 2.

Removal Option

Dam removal will consist of dewatering the pond, existing outlet structure removal, and excavation of dam embankment soils such that water will no longer be impounded.

The preliminary opinion of cost for the removal option is presented in Table 3.

5.0 Future Development Considerations

We recommend the Town proceed with the work required to mitigate the liability associated with owning a high hazard dam. We understand that potential future use of the property will be a factor in the Town's decision regarding the option that is implemented. Any potential waters, wetland, stream, or riparian buffer impacts that would be necessary for future development on the site, whether the dam is repaired or removed, should be evaluated independently based on the specific requirements of the future use.

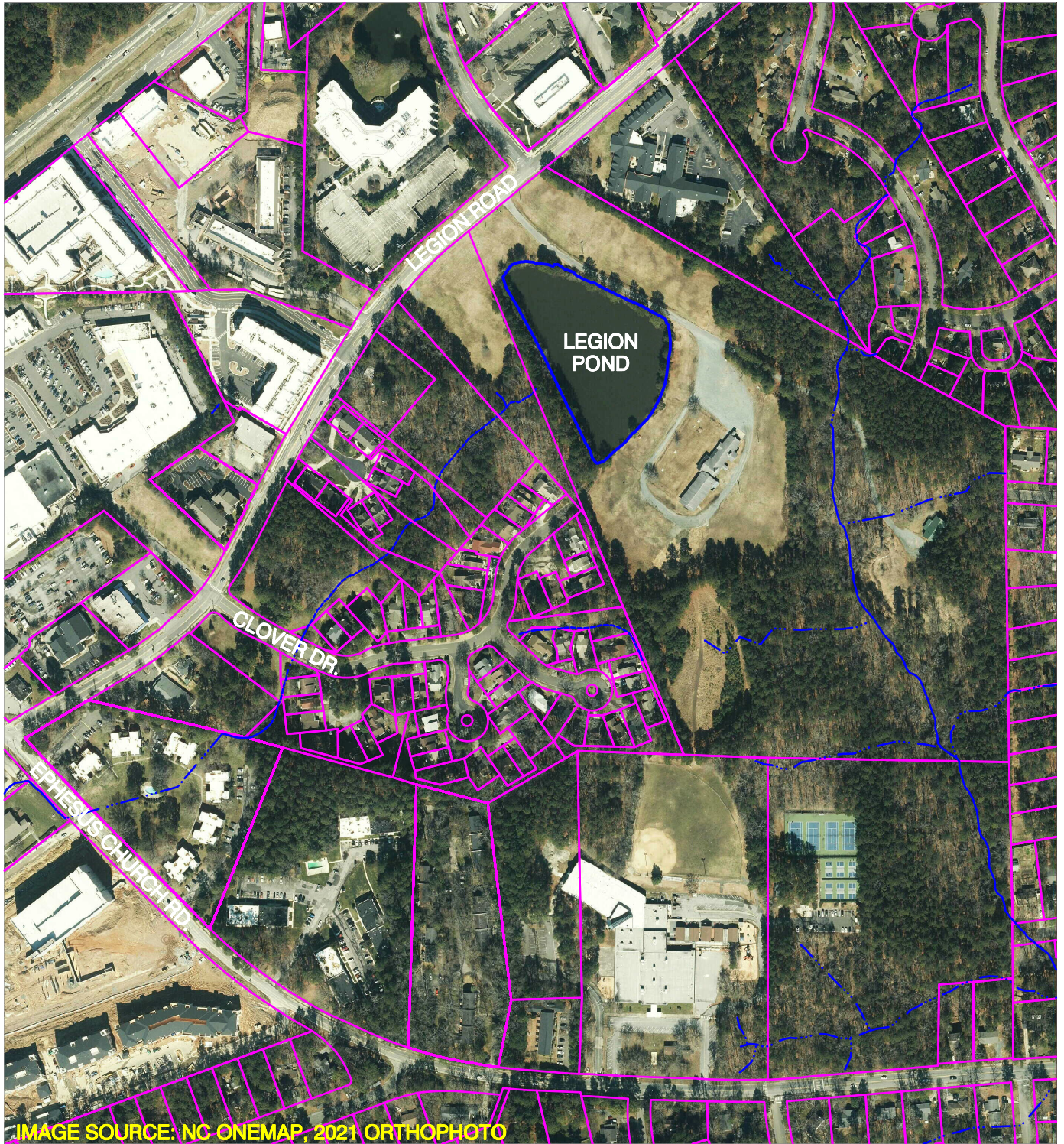
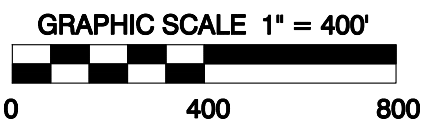


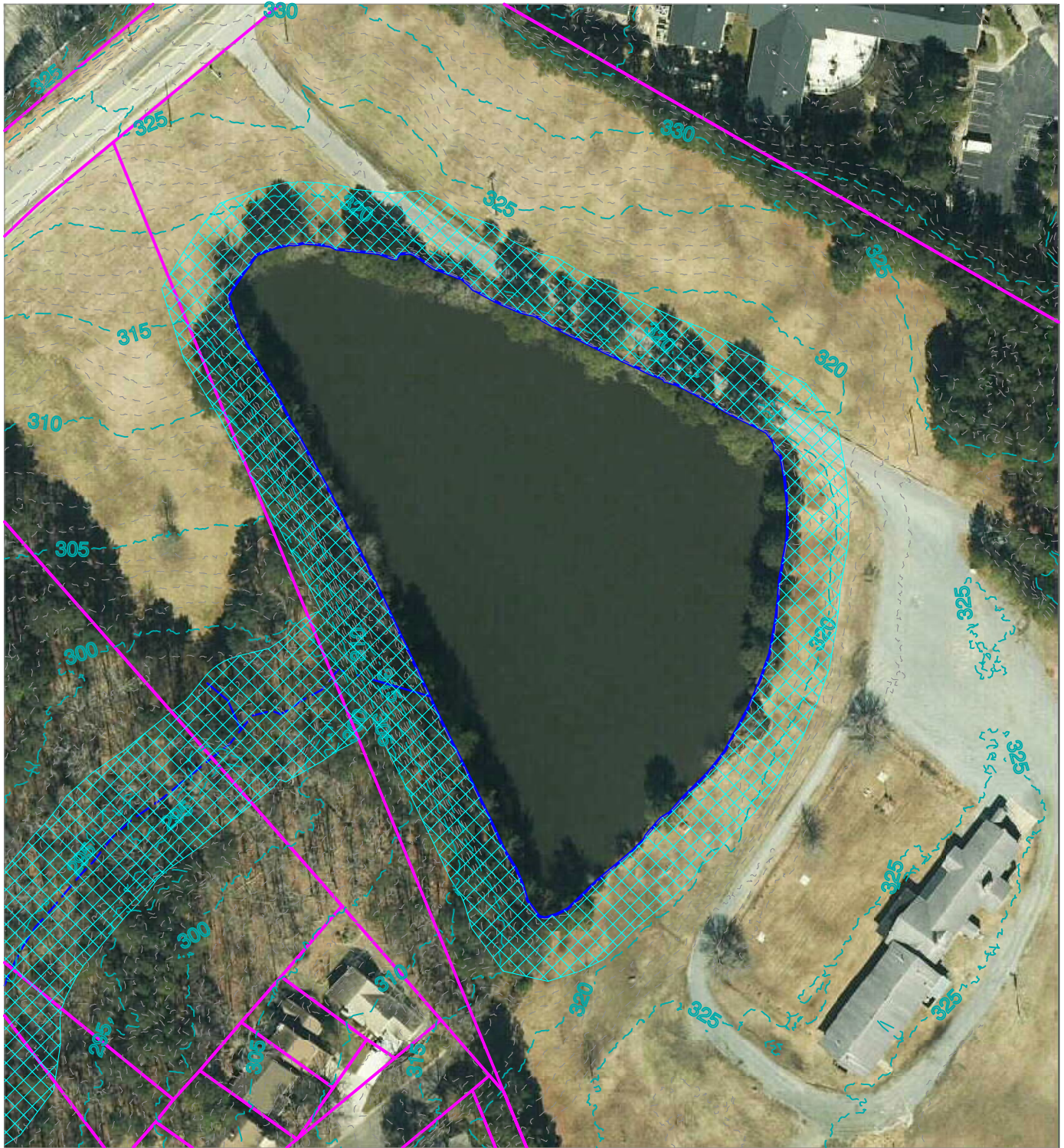
IMAGE SOURCE: NC ONEMAP, 2021 ORTHOPHOTO

PROJECT VICINITY



- PERENNIAL STREAM
- - - - - INTERMITTENT STREAM
- · - · - EPHEMERAL STREAM

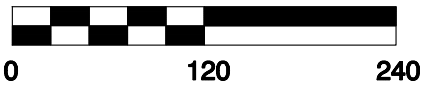
SOURCE: CHAPEL HILL
OPEN DATA, APRIL 2023
DATA SET

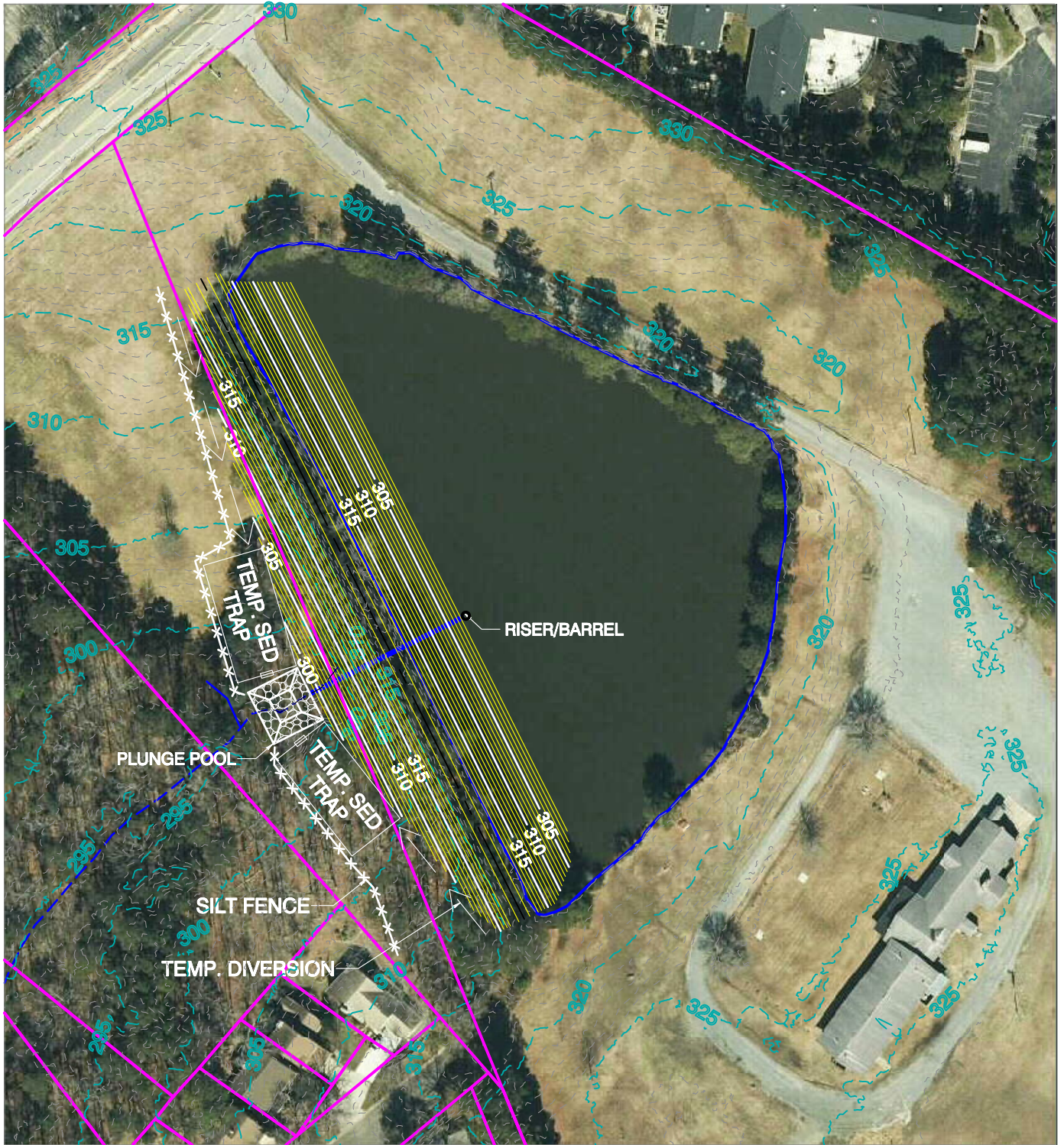


EXISTING CONDITIONS

 JORDAN LAKE RIPARIAN 50-FOOT BUFFER & RESOURCE CONSERVATION DISTRICT 50-FOOT BUFFER

GRAPHIC SCALE 1" = 120'





DAM REHABILITATION

GRAPHIC SCALE 1" = 120'

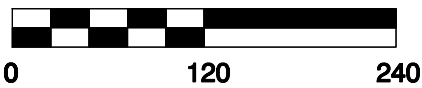


Table 2
 Engineer's Opinion of Probable Cost
 Town of Chapel Hill
 Legion Pond

Dam Repair Option

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Geotechnical Investigation/Drilling	1	LS	\$25,100	\$25,100
2	Surveying	1	LS	\$11,400	\$11,400
3	Dam Safety Permit	1	LS	\$20,700	\$20,700
4	Mitigation	1	LS	\$100,000	\$100,000
5	Erosion & Sediment Control Permit	1	LS	\$19,900	\$19,900
6	Bid/Construction Documents	1	LS	\$16,000	\$16,000
7	Bidding Services	1	LS	\$13,000	\$13,000
8	Mobilization/Demobilization	1	LS	\$26,000	\$26,000
9	Silt Fence	1500	LF	\$5.00 /LF	\$7,500
10	Temporary Diversion Ditch	400	LF	\$15.00 /LF	\$6,000
11	Sediment Trap	2	LS	\$30,000	\$60,000
12	Dewatering Pump	2.5	Mo	\$10,000 /Mo	\$25,000
13	Filter Bag	1	LS	\$2,000 LS	\$2,000
14	Tree Removal	2	AC	\$10,000 /AC	\$20,000
15	Grubbing	2	AC	\$10,000 /AC	\$20,000
16	Unsuitable Excavation	2500	CY	\$15 /CY	\$37,500
17	Excavation & Haul Offsite	0	CY	\$20 /CY	\$0
18	Backfill w/ Offsite Soils	8500	CY	\$20 /CY	\$170,000
19	Filter Diaphragm	2000	CY	\$25 /CY	\$50,000
20	Riser Structure	1	LS	\$30,000	\$30,000
21	Barrel Pipe	140	LF	\$300 /LF	\$42,000
22	Rip Rap Plunge Pool	1	LS	\$15,000	\$15,000
23	Erosion Control Matting	0	SY	\$7 /SY	\$0
24	Seeding & Mulching	2	AC	\$5,000 /AC	\$10,000
25	Miscellaneous Work & Cleanup	1	LS	\$25,000	\$25,000
26	Construction Administration	1	LS	\$19,600	\$19,600
27	Construction Quality Assurance	1	LS	\$35,200	\$35,200
Total					\$806,900

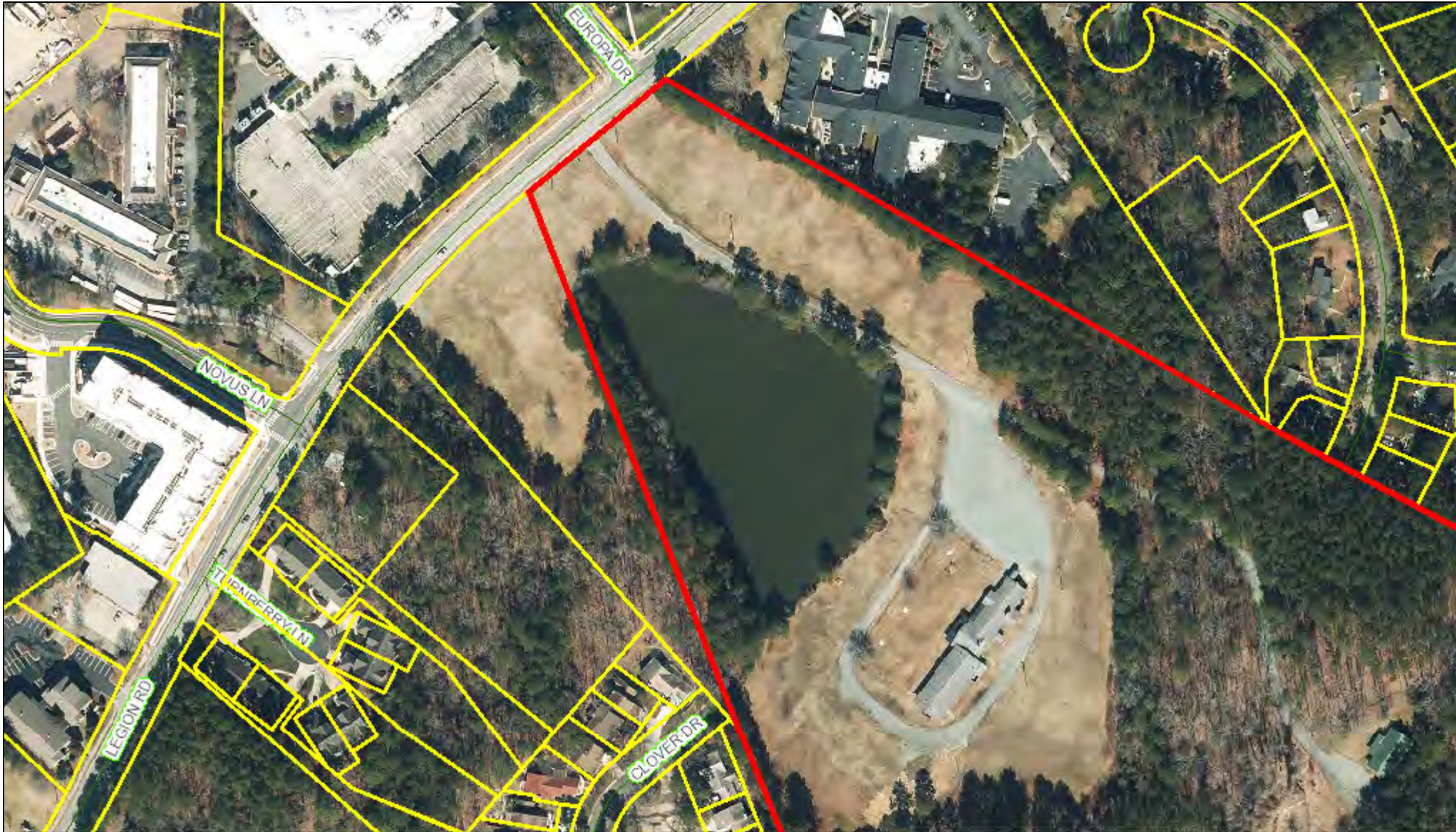
Table 3
 Engineer's Opinion of Probable Cost
 Town of Chapel Hill
 Legion Pond

Dam Removal Option

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Geotechnical Investigation/Drilling	0	LS	\$25,100	\$0
2	Surveying	1	LS	\$11,400	\$11,400
3	Dam Safety Permit	1	LS	\$20,700	\$20,700
4	Mitigation	1	LS	\$25,000	\$25,000
5	Erosion & Sediment Control Permit	1	LS	\$19,900	\$19,900
6	Bid/Construction Documents	1	LS	\$16,000	\$16,000
7	Bidding Services	1	LS	\$13,000	\$13,000
8	Mobilization/Demobilization	1	LS	\$20,775	\$20,775
9	Silt Fence	1500	LF	\$5.00 /LF	\$7,500
10	Temporary Diversion Ditch	400	LF	\$15.00 /LF	\$6,000
11	Sediment Trap	2	LS	\$30,000	\$60,000
12	Dewatering Pump	2.5	Mo	\$10,000 /Mo	\$25,000
13	Filter Bag	1	LS	\$2,000 LS	\$2,000
14	Tree Removal	2	AC	\$10,000 /AC	\$20,000
15	Grubbing	2	AC	\$10,000 /AC	\$20,000
16	Unsuitable Excavation	0	CY	\$15 /CY	\$0
17	Excavation & Haul Offsite	12000	CY	\$20 /CY	\$240,000
18	Backfill w/ Offsite Soils	0	CY	\$20 /CY	\$0
19	Filter Diaphragm	0	CY	\$25 /CY	\$0
20	Riser Structure	0	LS	\$30,000	\$0
21	Barrel Pipe	0	LF	\$300 /LF	\$0
22	Rip Rap Plunge Pool	0	LS	\$15,000	\$0
23	Erosion Control Matting	0	SY	\$7 /SY	\$0
24	Seeding & Mulching	2	AC	\$5,000 /AC	\$10,000
25	Miscellaneous Work & Cleanup	1	LS	\$25,000	\$25,000
26	Construction Administration	0.7	LS	\$19,600	\$13,720
27	Construction Quality Assurance	0.7	LS	\$35,200	\$24,640
Total					\$580,635

Attachment 1 – Parcel Maps

Orange County



March 22, 2023

This map contains parcels prepared for the inventory of real property within Orange County, and is compiled from recorded deed, plats, and other public records and data. Users of this map are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information contained on this map.

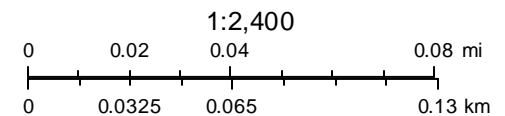
The county and its mapping companies assume no legal responsibility for the information on this map.

PIN: 9799555951

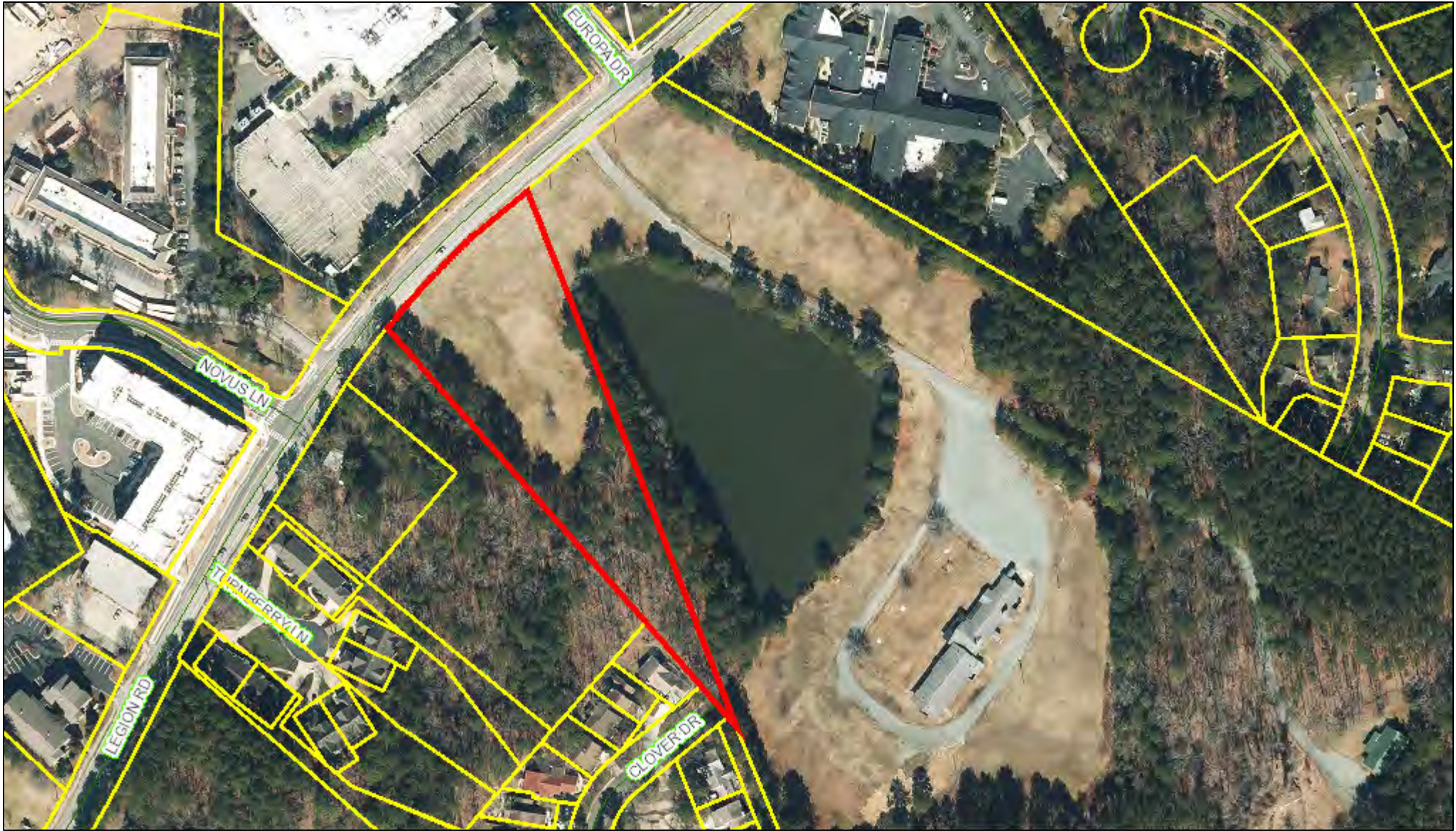
OWNER 1: TOWN OF CHAPEL HILL
 OWNER 2:
 ADDRESS 1: 405 MARTIN LUTHER KING JR BLVD
 ADDRESS 2:
 CITY: CHAPEL HILL
 STATE, ZIP: NC 27516
 LEGAL DESC: E/S AMERICAN LEGION RD

SIZE: 33.2 A
 DEED REF: 6282/545
 PARCELCODE: 22
 TOWNSHIP: CHAPEL HILL
 BLDG SQFT: 10618
 YEAR BUILT: 1985

BUILDING COUNT: 2
 LAND VALUE:
 BLDG_VALUE:
 USE VALUE:
 TOTAL VALUE:
 DATE SOLD: 3/30/2017
 TAX STAMPS:



Orange County



March 22, 2023

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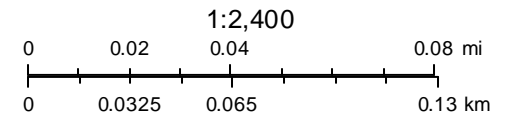
The county and its mapping companies assume no legal responsibility for the information on this map.

PIN: 9799467392

OWNER 1: TOWN OF CHAPEL HILL
 OWNER 2:
 ADDRESS 1: 405 MARTIN LUTHER KING JR BLVD
 ADDRESS 2:
 CITY: CHAPEL HILL
 STATE, ZIP: NC 27516
 LEGAL DESC: E/S AMERICAN LEGION RD

SIZE: 2.33 A
 DEED REF: 6282/545
 PARCELCODE: 22
 TOWNSHIP: CHAPEL HILL
 BLDG SQFT:
 YEAR BUILT:

BUILDING COUNT:
 LAND VALUE: \$20,300
 BLDG_VALUE: \$0
 USE VALUE: \$0
 TOTAL VALUE: \$20,300
 DATE SOLD: 3/30/2017
 TAX STAMPS: 15800



Attachment 2 – Photographs from March 7, 2023



Photograph 1 – Impoundment Area and Upstream Dam Face from East Shore



Photograph 2 – Dam Crest Facing East from West Abutment



Photograph 3 – Downstream Face, Facing East from Western Groin



Photograph 4 – PVC Overflow Device Inlet



Photograph 5 – Overflow Outlet and Primary Outlet Valve from Dam Crest



Photograph 6 – Overflow Device Outlet, Erosion Cavity Below Repaired Joint, Erosion Cavity at Outlet



Photograph 7 – Butterfly Valve at Downstream End of Primary Outlet

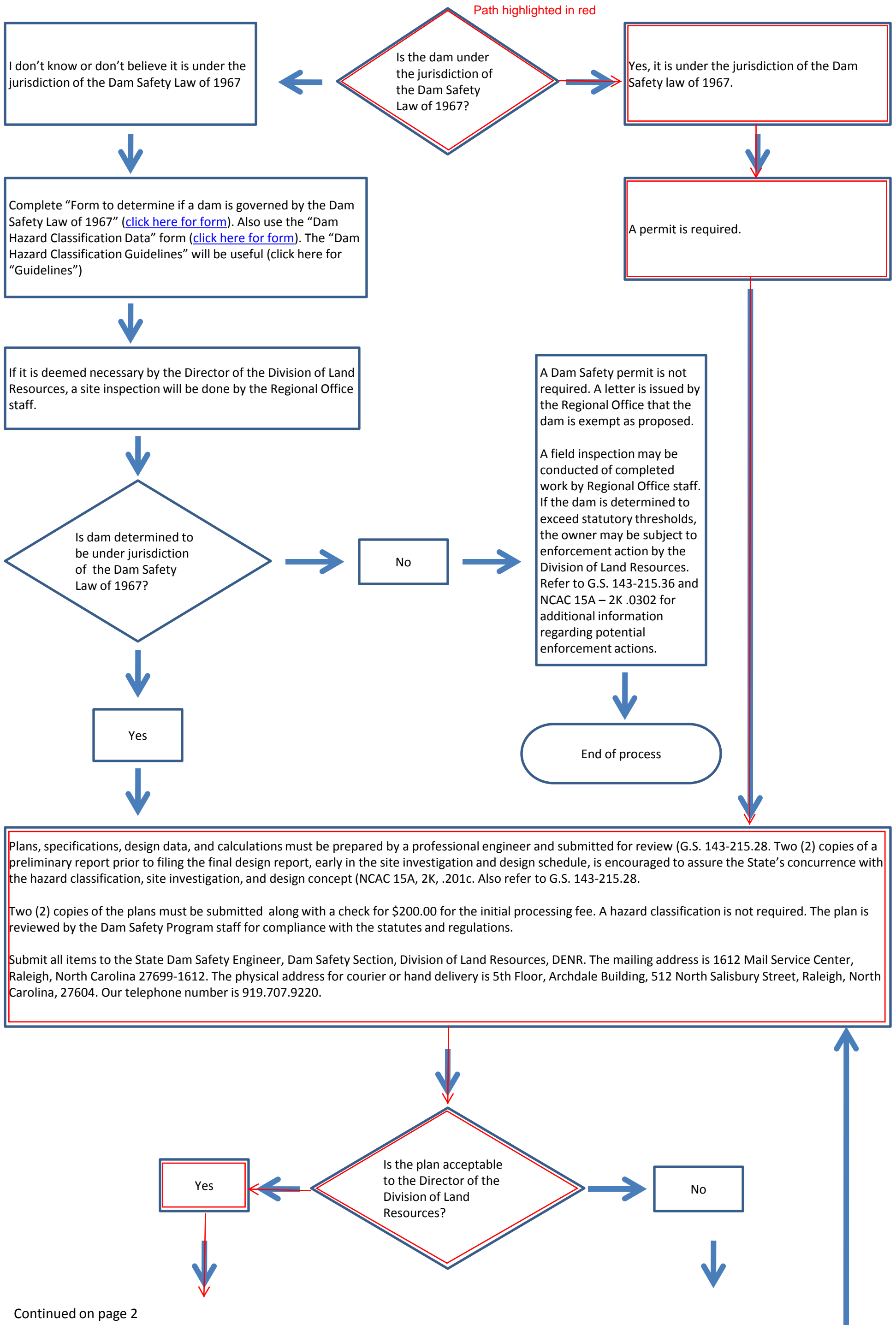


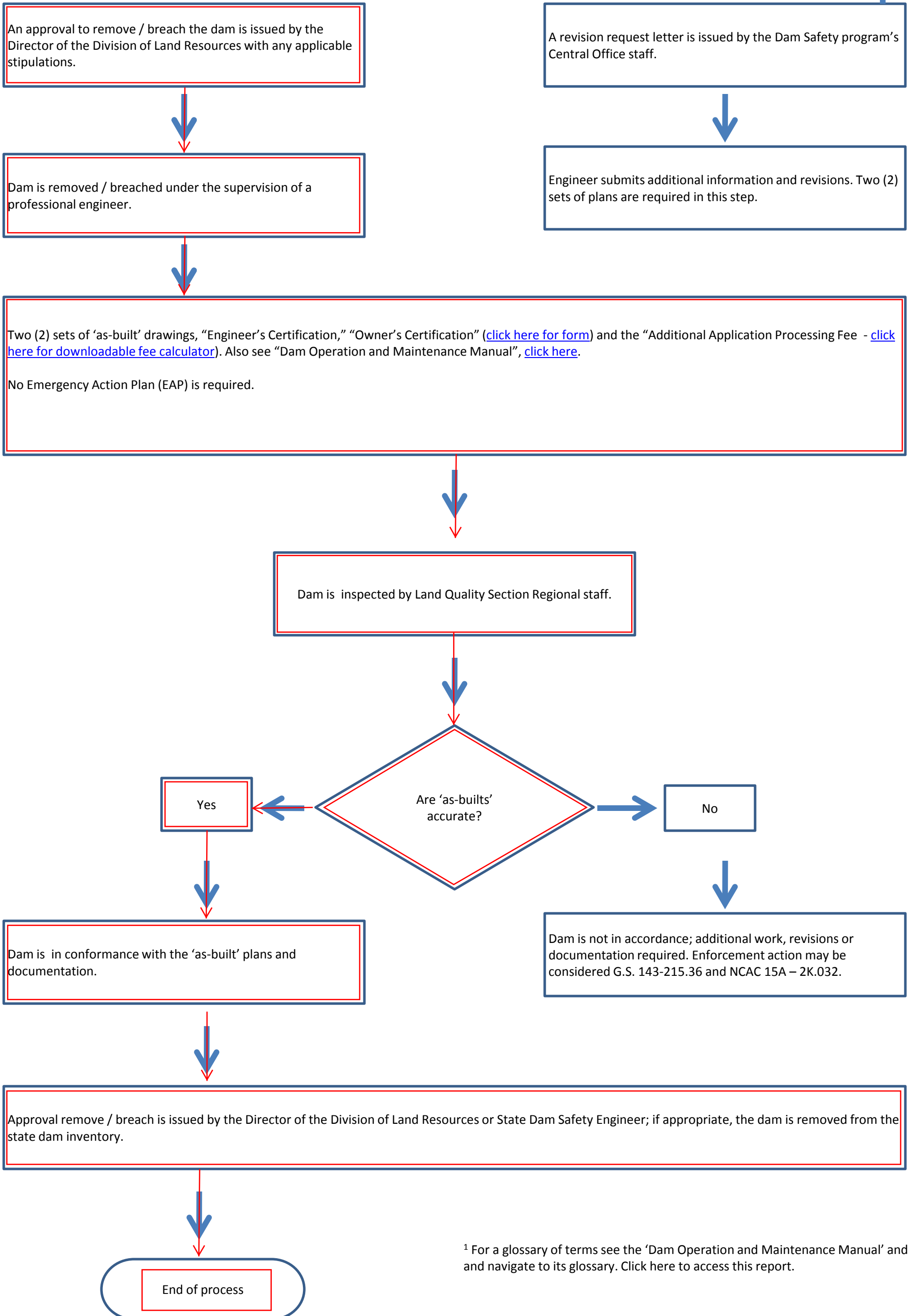
Photograph 8 – Pipe Culvert Outlet at Clover Drive

Attachment 3 – Dam Safety Permitting Flow Charts

Procedure to breach a dam ¹

Rev. 3.0 – 25 February 2013

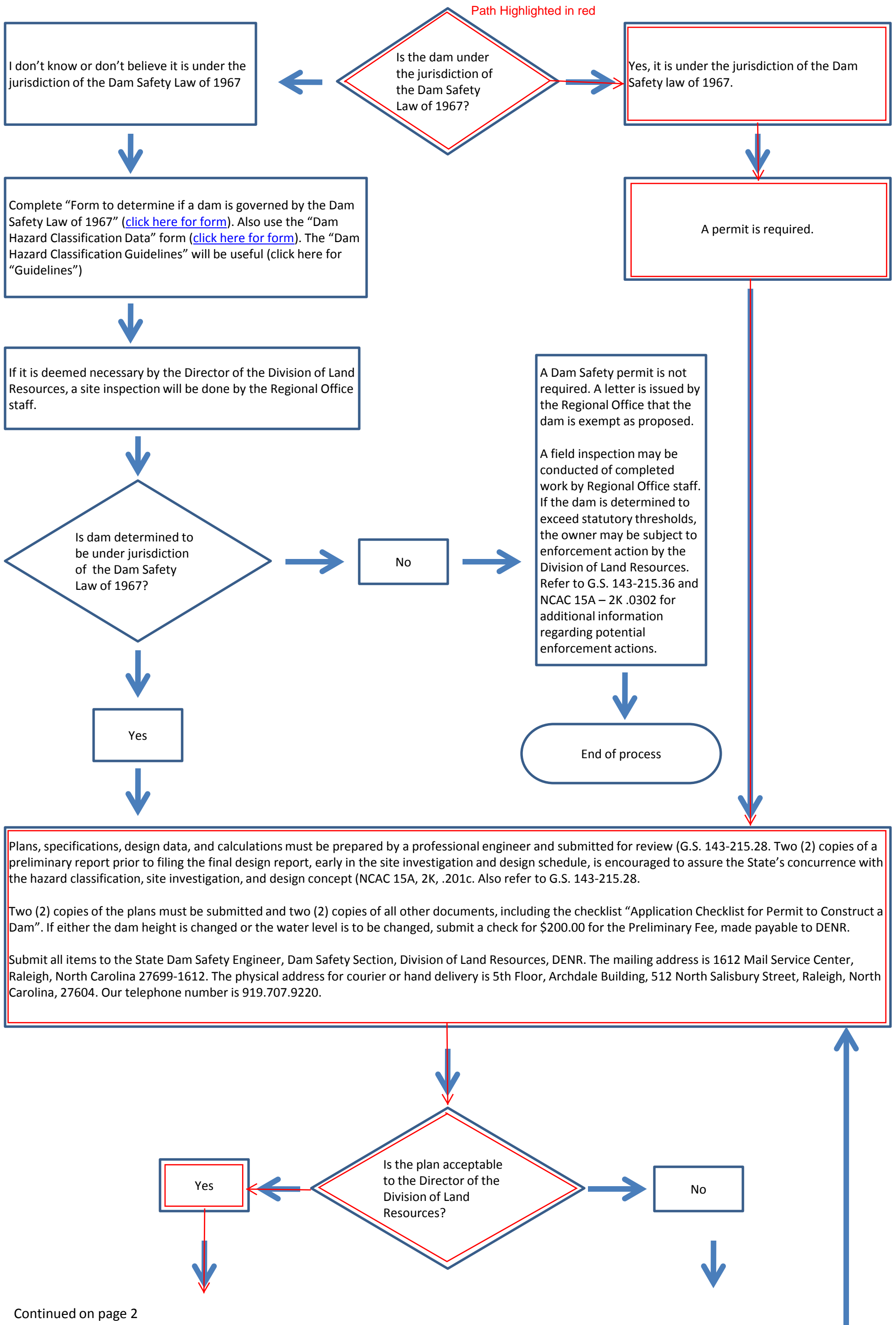


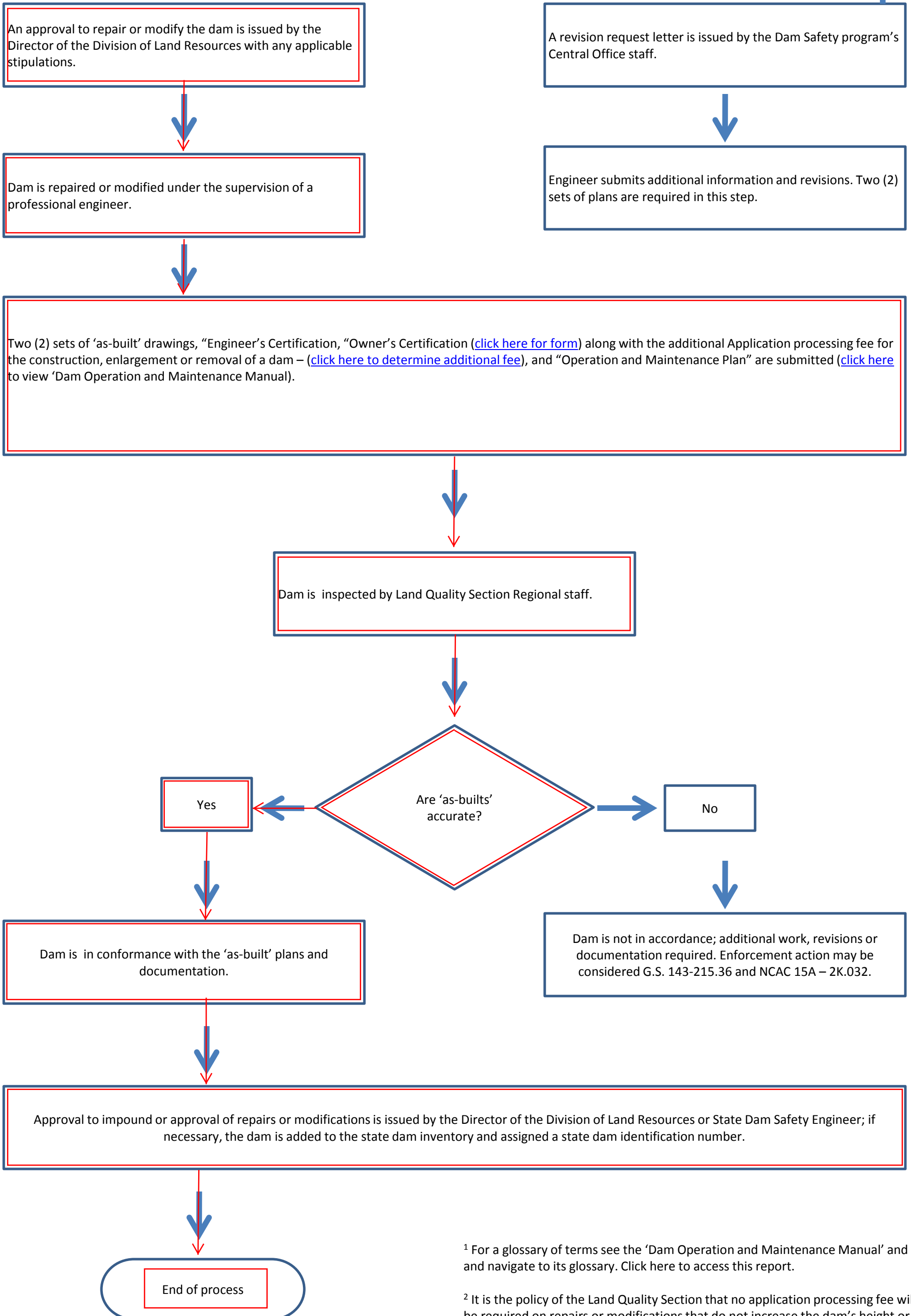


¹ For a glossary of terms see the 'Dam Operation and Maintenance Manual' and and navigate to its glossary. Click here to access this report.

Procedure to repair or to modify a dam

Rev. 3.0 – 25 February 2013





¹ For a glossary of terms see the 'Dam Operation and Maintenance Manual' and navigate to its glossary. Click here to access this report.

² It is the policy of the Land Quality Section that no application processing fee will be required on repairs or modifications that do not increase the dam's height or the impoundment's normal pool.

**Attachment 4 – Preliminary Jurisdictional Determination
and Stream Determination Area Map**

AMERICAN LEGION AQUATIC RESOURCES MAP

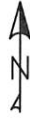
WITH AERIAL

PROPERTY PIN 9799-55-5951

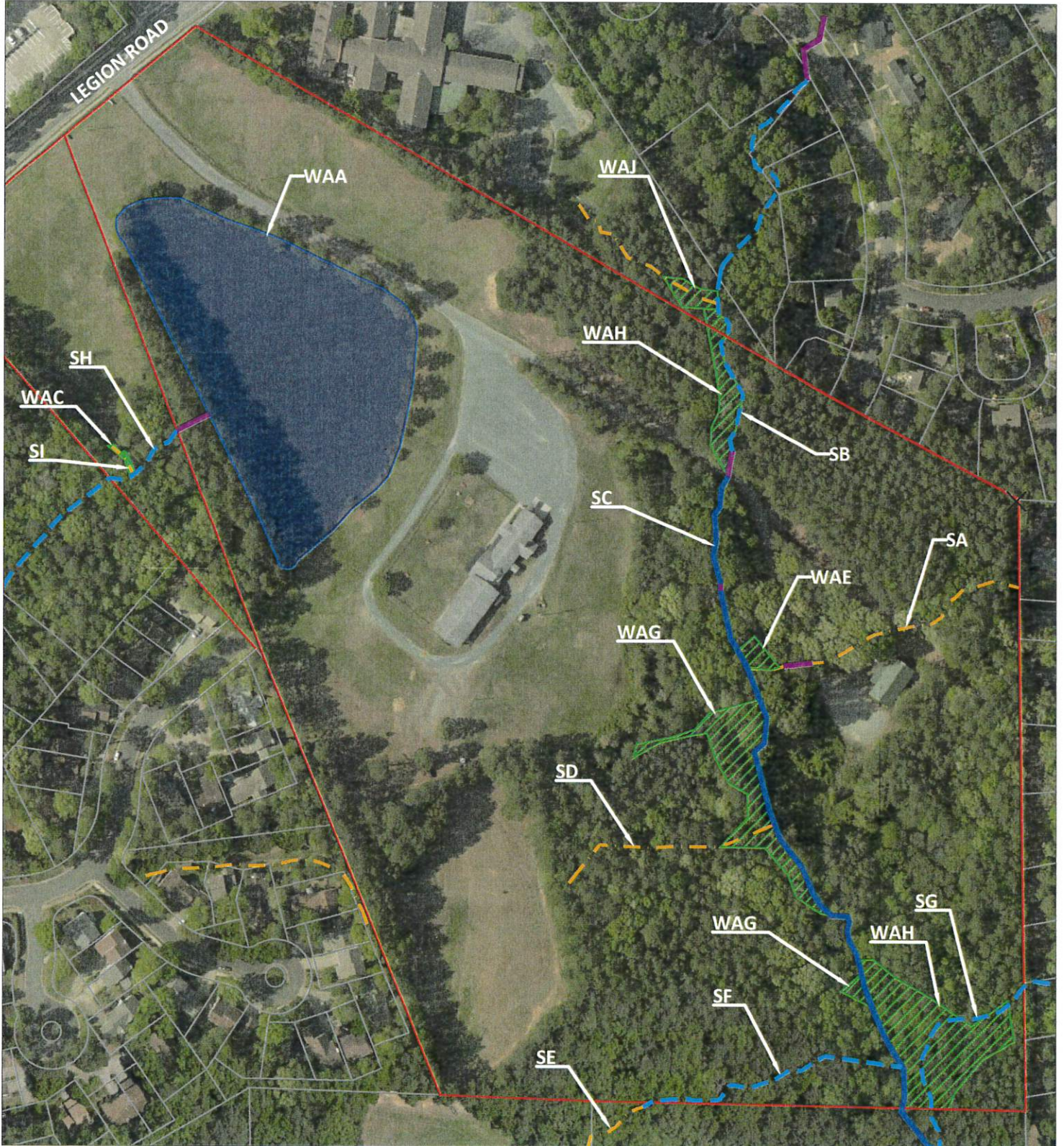
CREATED BY TOWN OF CHAPEL HILL STORMWATER DIVISION

FEBRUARY 7, 2020

DRAWING SCALE: 1" = 200'



LEGEND	
PROPERTY LINE	WETLAND AREA
PERENNIAL STREAM	POND
INTERMITTENT STREAM	CULVERT
EPHEMERAL STREAM	



WETLANDS DELINEATED BY HART & HICKMAN 2/14/2019. STREAMS CLASSIFIED BY TOWN OF CHAPEL HILL 2/26/2019.

Stream Determination Area Map

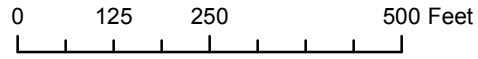
- Unclassified Stream
- - - Ephemeral Stream
- - - Intermittent Stream
- Perennial Stream
- ▭ Culverts
- 2-foot Contours
- 10-foot Contours
- Buildings
- Parcels
- ★ Addresses
- Approximate Jordan Buffer
- ▭ Subject Property

- Possible Jurisdictional Wetlands
- ▨ Non-perennial Waterbody
- Wide Perennial Stream
- Perennial Waterbody

- Flood Zones**
- ▨ 100-year floodplain
 - ⊗ Ephemeral Breakpoint
 - ⊙ Intermittent Breakpoint
 - ⊕ Perennial Breakpoint

Address: 1714 Legion Road, Chapel Hill, NC

Parcel ID: 9799-55-5951 & 9799-46-7392



1 inch = 250 feet

Stream and wetland locations are approximate and must be verified by survey.
 Buffers are measured from top of bank. RCD buffers may apply.
 Please contact the Town of Chapel Hill Planning Department to verify.

