PRINCE WILLIAM COUNTY

Lake Jackson Dam Modifications

March 12, 2020
Town Hall Meeting

Marc Aveni
Environmental Services

Dam Background

- 28’ high X 246’ long concrete dam **owned and operated** by Prince William County since the 1970s
- Located on the Occoquan River, dam creates Lake Jackson
- Dam was constructed in 1928 (**92 years old**), no as-built plans exist
- Used to generate electric power until late 1950s
- 25’ wide gate in the middle of the dam operated by County staff via catwalk during weather events when water levels exceed thresholds per **State approved Dam Operation Plan**
- Large watershed, ~350 square miles coming to this one point

Lake Jackson Drainage Area

Lake Jackson Aerial

View From Downstream

Another View From Downstream

View From Catwalk

Dam During >10 Year Storm

Storm of record Hurricane Agnes 1972

Upstream Side of Dam w/Lake Drained

Debris Buildup Behind Dam

Background

- Gate operation during storm events protects 35 homes total (**upstream**) from mainly yard flooding (some house flooding)
- Issues to consider:
  - safety of County staff
  - large cost for gate replacement
  - continued, increasing, large operation and maintenance costs
  - limited number of homes benefit from gate operation
  - this is a recreational lake, not a stormwater management facility

Present Realities

- Replacing gate (with new one) and adding remote gate operation capabilities estimated to be ~$2.5M
- County staff must walk narrow catwalk during rain/snow/ice weather events – often in the middle of the night – to operate gate; repeated concerns expressed for risks and safety of staff
- **$368,441** spent solely on **gate operation** last 3.5 years, **maintenance is additional**
  - $44,147 FY20 YTD
  - $176,118 FY19
  - $104,392 FY18
  - $43,784 FY17

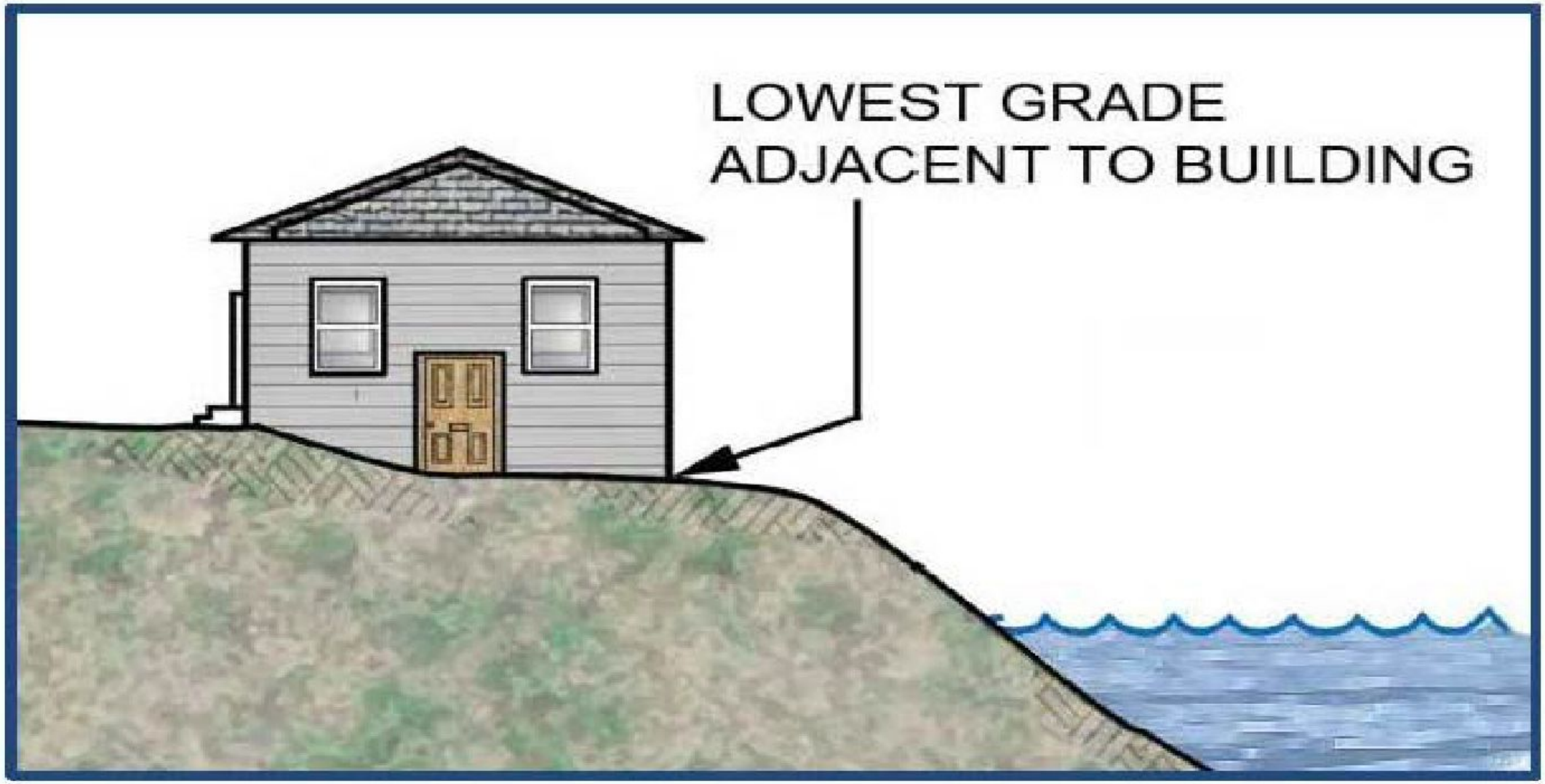
Present Realities Continued

- Increasing operation and maintenance costs for an old dam
- Source of funds is Storm Water Management Fee
- 35 properties benefit from gate operation, most for yard flooding only
- These homes are along a river and in a FEMA flood plain, flooding is expected to occur
- Due to these concerns, County contracted with Dam and Engineering Specialist Dewberry to explore options
- Dewberry report has been shared with Citizen Association

Dam Modification Scenarios From Dewberry Study

- ***Alt 1*** – Install new gate with computerized mechanism
- ***Alt 2*** – Don't operate gate during storm events, check function twice per year to ensure operation
- ***Alt 3A*** – Removing everything except the gate piers, construct weir in place of gate
- ***Alt 3B –*** **Removing everything including gate piers to create a uniform concrete spillway**
- ***Alt 4A*** – Replace gate with weir 1' lower than the crest
- ***Alt 5*** – Remove entire dam, lake becomes a river again

How We Look at Flooding Potential

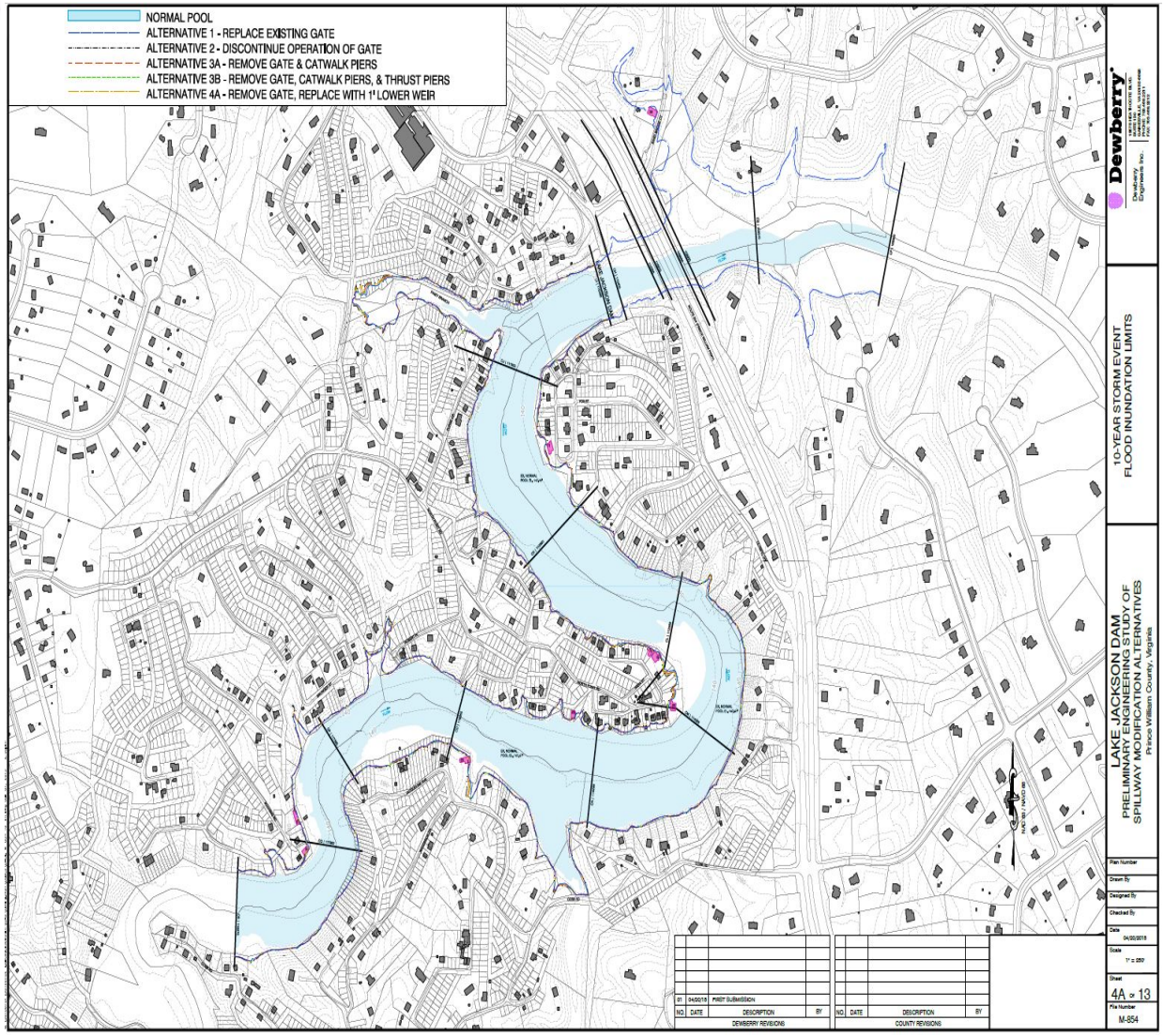


35 Properties Impacted With Any Scenario

PRINCE WILLIAM COUNTY

Table 2: Water surface elevations on impacted structures (RED numbers indicate water elevations above structure lowest adjacent grade; BLUE shows water below structure).

MAP ID	GPIN	ADDRESS	OWNER	SURVEYED OR (GIS APPROX) LOWEST ADJACENT GRADE [FT]	2-YR (APPROX. WSE, FT)					10-YR (APPROX. WSE, FT)					50-YR (APPROX. WSE, FT)					100-YR (APPROX. WSE, FT)				
					ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A
1	7894-21-5748	8379 HIGHVIEW ST MANASSAS, VA 20112	PERRY JODI E	(159)	149.7	151.3	150.8	150.8	150.9	155.1	156.8	155.8	155.6	156.1	159.3	160.5	159.3	159.1	159.8	161.3	162.0	160.8	160.5	161.4
2	7894-21-4945	8389 HIGHVIEW ST MANASSAS, VA 20112	CLARK RAYMOND RUSSELL & KATHERINE L SURV	(158.9)	149.7	151.3	150.8	150.8	150.9	155.1	156.77	155.8	155.6	156.2	159.3	160.5	159.4	159.1	159.9	161.4	162.1	160.9	160.6	161.4
3	7894-21-4045	8403 HIGHVIEW ST MANASSAS, VA 20112	[UNKNOWN]	(161.5)	149.7	151.3	150.8	150.8	150.9	155.2	156.8	155.9	155.7	156.2	159.4	160.5	159.4	159.1	159.9	161.4	162.1	160.9	160.6	161.5
4	7894-21-2220	11581 PURSE DR MANASSAS, VA 20112	KOTECHA VINOD	(158.8)	149.7	151.4	150.8	150.8	150.9	155.2	156.8	155.9	155.7	156.2	159.5	160.6	159.5	159.2	160.0	161.5	162.2	161.0	160.7	161.6
5	7894-21-3217	11583 PURSE DR MANASSAS, VA 20112	MAROVELLI FORREST & ERIN R SURV	(159.4)	149.7	151.4	150.8	150.8	150.9	155.2	156.8	155.9	155.7	156.2	159.5	160.6	159.5	159.2	160.0	161.5	162.2	161.0	160.8	161.6
6	7894-21-2401	11595 PURSE DR MANASSAS, VA 20112	PIERCE WILLIAM & BERNADETT SURV	(159.6)	149.7	151.4	150.9	150.8	150.9	155.3	156.9	156.0	155.8	156.3	159.7	160.8	159.7	159.4	160.2	161.7	162.4	161.3	161.0	161.8
7	7894-20-2196	11599 PURSE DR MANASSAS, VA 20112	RAYFIELD STEVEN C	(157)	149.7	151.4	150.9	150.8	150.9	155.4	156.9	156.0	155.8	156.3	159.7	160.8	159.7	159.5	160.2	161.8	162.4	161.3	161.0	161.9
8	7894-21-7200	11610 TEMPLE LOOP MANASSAS, VA 20112	STALKER ROBERT J	(161.1)	149.7	151.4	150.8	150.8	150.9	155.2	156.8	155.9	155.7	156.2	159.5	160.6	159.5	159.2	160.0	161.5	162.2	161.0	160.8	161.6
9	7894-20-7376	11640 TEMPLE LOOP MANASSAS, VA 20112	SQUIRES DONALD C & SHARRON W ET AL	(162.1)	149.7	151.4	150.9	150.8	150.9	155.3	156.9	156.0	155.8	156.3	159.7	160.8	159.7	159.4	160.2	161.8	162.4	161.3	161.0	161.8
10	7894-20-7371	11650 TEMPLE LOOP MANASSAS, VA 20112	CANNON CRAIG W & CLAIRE E	(159)	149.7	151.4	150.9	150.8	150.9	155.3	156.9	156.0	155.8	156.3	159.7	160.8	159.7	159.5	160.2	161.8	162.5	161.3	161.0	161.9
11	7894-20-7363	11676 TEMPLE LOOP MANASSAS, VA 20112	BASSETT CHRISTY ANNE	155.97	149.7	151.4	150.9	150.8	150.9	155.3	156.9	156.0	155.8	156.3	159.7	160.9	159.7	159.5	160.3	161.8	162.5	161.3	161.1	161.9
12	7894-20-9941	8351 DEPOT PL MANASSAS, VA 20112	BITTINGER SAMUEL D 3RD & BETHANY A	(157.5)	149.7	151.4	150.9	150.8	150.9	155.5	157.0	156.1	155.9	156.4	159.9	161.0	160.0	159.7	160.4	162.1	162.7	161.6	161.3	162.1
13	7893-29-9462	8280 LAKE SHORE DR MANASSAS, VA 20112	TRAMONTE ROBERT C & LAURA M	(162.4)	149.8	151.4	150.9	150.8	151.0	155.8	157.3	156.5	156.3	156.8	160.6	161.6	160.6	160.3	161.0	162.7	163.3	162.3	162.1	162.8
14	7893-39-0857	8258 LAKE SHORE DR MANASSAS, VA 20112	HENEGAR HAROLD H JR	(160.2)	149.8	151.4	150.9	150.8	151.0	155.7	157.2	156.3	156.2	156.7	160.3	161.4	160.4	160.1	160.8	162.5	163.1	162.1	161.8	162.6
15	7893-39-1655	8250 LAKE SHORE DR MANASSAS, VA 20112	KIM SONNY	(159.4)	149.7	151.4	150.9	150.8	151.0	155.6	157.2	156.3	156.1	156.6	160.2	161.3	160.3	160.0	160.7	162.4	163.0	161.9	161.7	162.5
16	7893-39-2451	8240 LAKE SHORE DR MANASSAS, VA 20112	FUGATE BRYON & TANYA FUGATE SURV	(157.3)	149.7	151.4	150.9	150.8	151.0	155.6	157.1	156.2	156.1	156.5	160.2	161.2	160.2	159.9	160.6	162.3	162.9	161.8	161.6	162.4
17	7893-39-3350	8220 LAKE SHORE DR MANASSAS, VA 20112	JONES STEPHEN O	(160.1)	149.7	151.4	150.9	150.8	151.0	155.5	157.1	156.2	156.0	156.5	160.1	161.1	160.1	159.8	160.6	162.2	162.8	161.7	161.5	162.3
18	7893-39-5148	8214 LAKE SHORE DR MANASSAS, VA 20112	JESSEL ESTHER L	155.8	149.7	151.4	150.9	150.8	151.0	155.5	157.1	156.2	156.0	156.5	160.1	161.1	160.1	159.8	160.6	162.2	162.8	161.7	161.5	162.3
19	7893-39-5742	8200 LAKE SHORE DR MANASSAS, VA 20112	FUW LLC	152.67	149.7	151.4	150.9	150.8	151.0	155.5	157.1	156.2	156.0	156.5	160.1	161.1	160.1	159.8	160.6	162.2	162.8	161.7	161.5	162.3
20	7893-39-6821	8151 NORTH POINT RD MANASSAS, VA 20112	BERGSTRESER LEE T & ELEANORA R	150.89	149.8	151.5	151.0	150.9	151.0	156.0	157.5	156.6	156.5	156.9	160.8	161.8	160.8	160.6	161.3	163.0	163.6	162.6	162.4	163.1
21	7893-39-6311	8159 NORTH POINT RD MANASSAS, VA 20112	BORDNER NANCY G & LYNNE A BEAHM	(157.7)	149.8	151.5	151.0	150.9	151.0	156.0	157.5	156.6	156.5	156.9	160.9	161.8	160.9	160.7	161.3	163.0	163.6	162.6	162.4	163.1



35 Properties Impacted With Any Scenario

PRINCE WILLIAM COUNTY

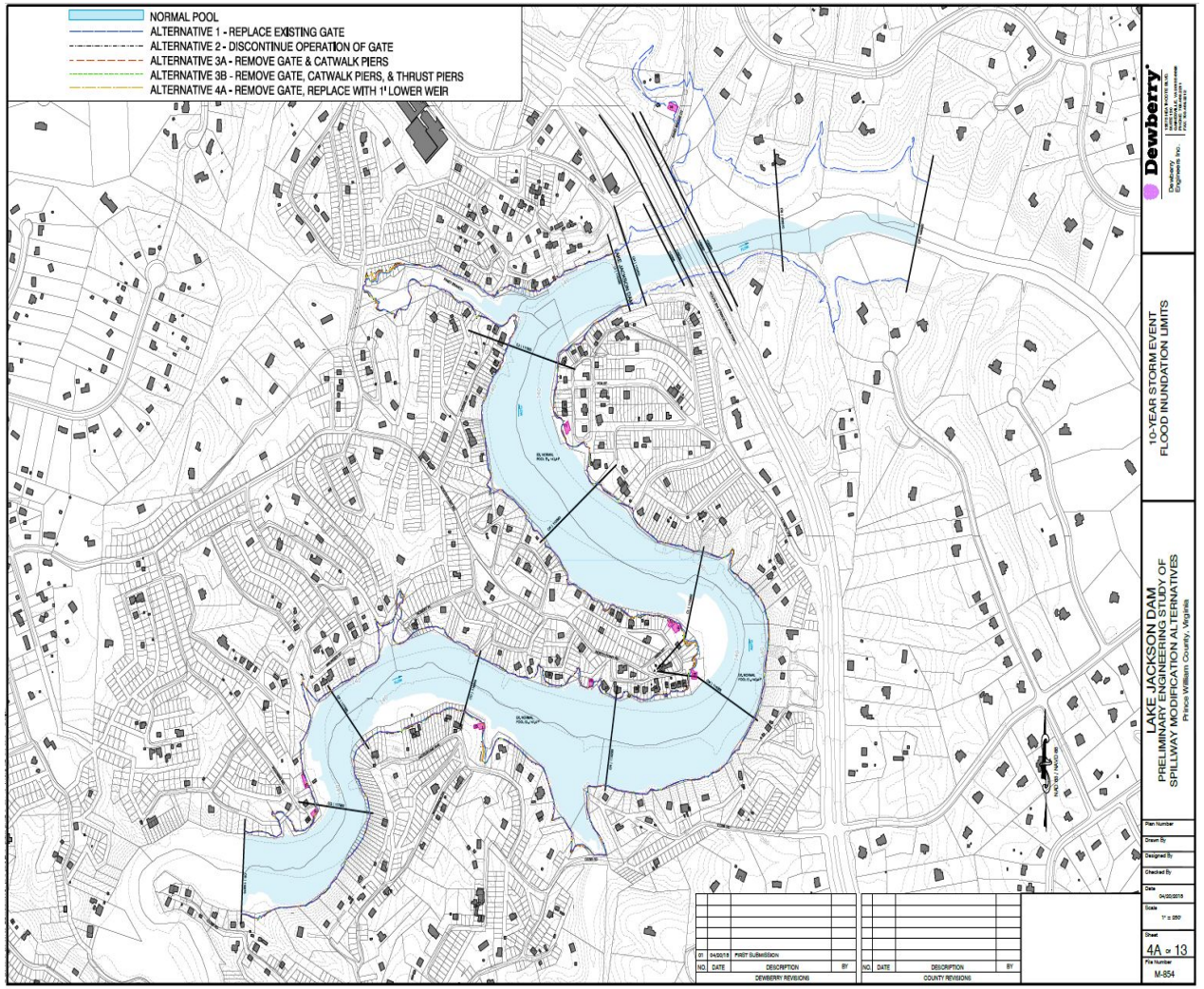
MAP ID	GPIN	ADDRESS	OWNER	SURVEYED OR (GIS APPROX) LOWEST ADJACENT GRADE (FT)	2-YR (APPROX. WSE, FT)					10-YR (APPROX. WSE, FT)					50-YR (APPROX. WSE, FT)					100-YR (APPROX. WSE, FT)				
					ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4A
22	7893-39-5811	8161 NORTH POINT RD MANASSAS, VA 20112	BORDNER NANCY G & LYNNE A BEAHM	(160)	149.8	151.5	151.0	150.9	151.0	156.0	157.5	156.6	156.5	156.9	160.9	161.8	160.9	160.7	161.3	163.1	163.6	162.6	162.4	163.1
23	7893-39-5310	8171 NORTH POINT RD MANASSAS, VA 20112	TEPPER MARTIN SAMUEL JR & BARBARA ANN	(160)	149.8	151.5	151.0	150.9	151.0	156.0	157.5	156.6	156.5	156.9	160.9	161.8	160.9	160.7	161.3	163.1	163.6	162.7	162.4	163.1
24	7893-39-5010	8181 NORTH POINT RD MANASSAS, VA 20112	TURNER WILLIAM P & JULIA E TURNER SURV	(160)	149.8	151.5	151.0	150.9	151.0	156.1	157.5	156.7	156.5	156.9	160.9	161.9	160.9	160.7	161.3	163.1	163.6	162.7	162.4	163.1
25	7893-39-4006	8191 NORTH POINT RD MANASSAS, VA 20112	VAN KIRK ROBERT	(160.9)	149.8	151.5	151.0	150.9	151.0	156.1	157.5	156.7	156.5	156.9	160.9	161.9	160.9	160.7	161.3	163.1	163.7	162.7	162.5	163.1
26	7893-39-2608	8201 ABBIE LN MANASSAS, VA 20112	KELLER JOSEPH F JR	(163.4)	149.8	151.5	151.0	150.9	151.0	156.1	157.5	156.7	156.5	157.0	160.9	161.9	161.0	160.7	161.4	163.1	163.7	162.7	162.5	163.2
27	7893-39-0517	8247 ABBIE LN MANASSAS, VA 20112	FENLASON NORMAN & JANICE SURV	(159.3)	149.8	151.5	151.0	150.9	151.0	156.2	157.6	156.8	156.6	157.0	161.0	162.0	161.1	160.8	161.5	163.3	163.8	162.9	162.6	163.3
28	7893-29-9716	8255 SUNDERMAN PL MANASSAS, VA 20112	LILJENQUIST THOMAS R & ERIN N KILDAY T-C	154.76***	149.8	151.5	151.0	150.9	151.0	156.2	157.6	156.8	156.6	157.0	161.1	162.0	161.1	160.9	161.5	163.3	163.8	162.9	162.6	163.3
29	7893-29-6117	11851 MULLEN ST MANASSAS, VA 20112	CHARLES JOEL P & MARY ANNE SURV	(161.5)	149.9	151.5	151.0	150.9	151.1	156.2	157.6	156.8	156.6	157.1	161.1	162.0	161.1	160.9	161.5	163.2	163.8	162.9	162.6	163.3
30	7893-19-6748	8371 ROBERT PL MANASSAS, VA 20112	CASEY ASHTON E	(162.8)	149.9	151.5	151.0	151.0	151.1	156.5	157.8	157.0	156.9	157.3	161.4	162.3	161.5	161.3	161.9	163.7	164.2	163.3	163.1	163.7
31	7893-08-8357	11891 MANNING RD MANASSAS, VA 20112	CORBLEY JAMES G & G A WEB CORBLEY	155.83	150.1	151.6	151.1	151.1	151.2	157.1	158.3	157.6	157.5	157.8	162.4	163.2	162.4	162.2	162.7	164.7	165.2	164.4	164.2	164.7
32	7893-08-9240	11911 MANNING RD MANASSAS, VA 20112	WILSON JEFFREY A & ALVIN TRUESDALE SURV	157.08***	150.1	151.6	151.2	151.1	151.2	157.2	158.4	157.7	157.5	157.9	162.5	163.3	162.5	162.4	162.9	164.8	165.3	164.5	164.3	164.9
33	7893-08-8434	11999 MANNING RD MANASSAS, VA 20112	BEST LINDA & TERRI GULAN SURV	(161)	150.1	151.6	151.2	151.1	151.2	157.2	158.4	157.7	157.6	157.9	162.6	163.3	162.6	162.4	162.9	164.9	165.3	164.6	164.4	164.9
34	7893-28-0875	8448 JACQUELINE AVE MANASSAS, VA 20112	SUN MARGARET & HWA LUN LIU T-C	(159.8)	149.9	151.5	151.0	151.0	151.1	156.5	157.9	157.1	156.9	157.4	161.6	162.4	161.6	161.4	162.0	163.8	164.3	163.4	163.2	163.8
35	7893-18-6785	8400 JACQUELINE AVE MANASSAS, VA 20112	LINEHAN GARY & CONSTANCE SURV	156.78	149.9	151.5	151.0	150.9	151.1	156.2	157.6	156.8	156.7	157.1	161.1	162.0	161.1	160.9	161.5	163.2	163.8	162.9	162.6	163.3
DOWNSTREAM OF LAKE JACKSON																								
36**	7894-32-5147	11400 SAND BRIDGE CT MANASSAS, VA 20111	HINTOSH JEFFREY A	(142.5)	131.9	131.9	131.9	131.9	131.9	142.9	142.9	142.9	142.9	142.9	150.3	150.3	150.3	150.3	150.3	153.3	153.3	153.3	153.3	153.3
37**	7894-32-4460	11380 SAND BRIDGE CT MANASSAS, VA 20111	GIBSON CURTIS A & BEVERLY J GIBSON	(150.1)	131.9	131.9	131.9	131.9	131.9	142.9	142.9	142.9	142.9	142.9	150.3	150.3	150.3	150.3	150.3	153.4	153.4	153.4	153.4	153.4

**STRUCTURES LOCATED DOWNSTREAM OF DAM. NO CHANGES IN WSE WERE COMPUTED FOR THESE DOWNSTREAM STRUCTURES BECAUSE THE MODELING ASSUMPTIONS MADE FOR THIS STUDY DO NOT CONSIDER CHANGES IN RESERVOIR ATTENUATION EFFECTS BETWEEN THE VARIOUS SPILLWAY MODIFICATION ALTERNATIVES.

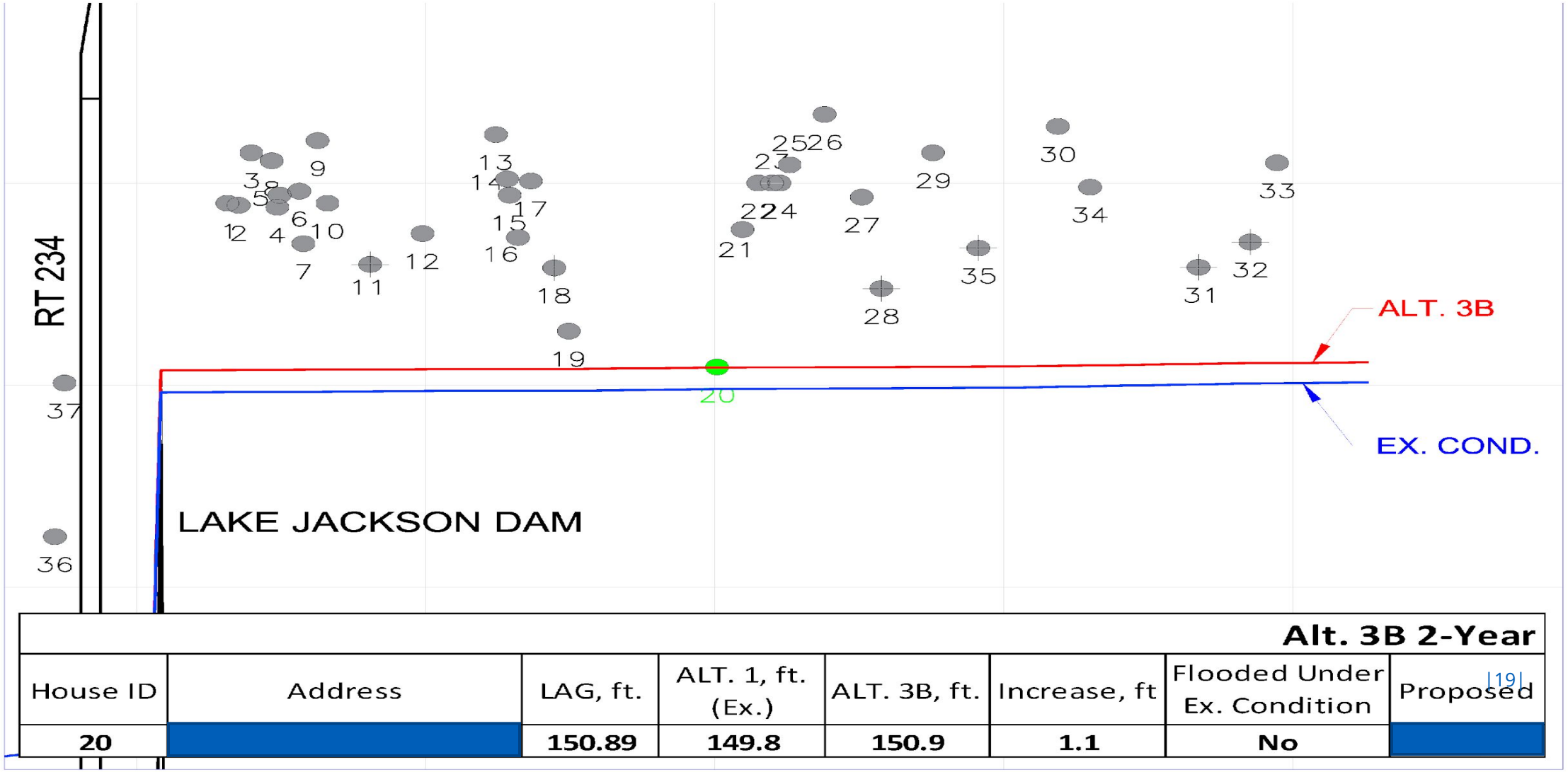
***FROM FEMA FLOOD ELEVATION CERTIFICATE PROVIDED BY OWNER

RED numbers (i.e. 150.3) implies water surface elevation over structure lowest adjacent grade

BLUE numbers (i.e. 150.3) implies water surface elevation below structure lowest adjacent grade

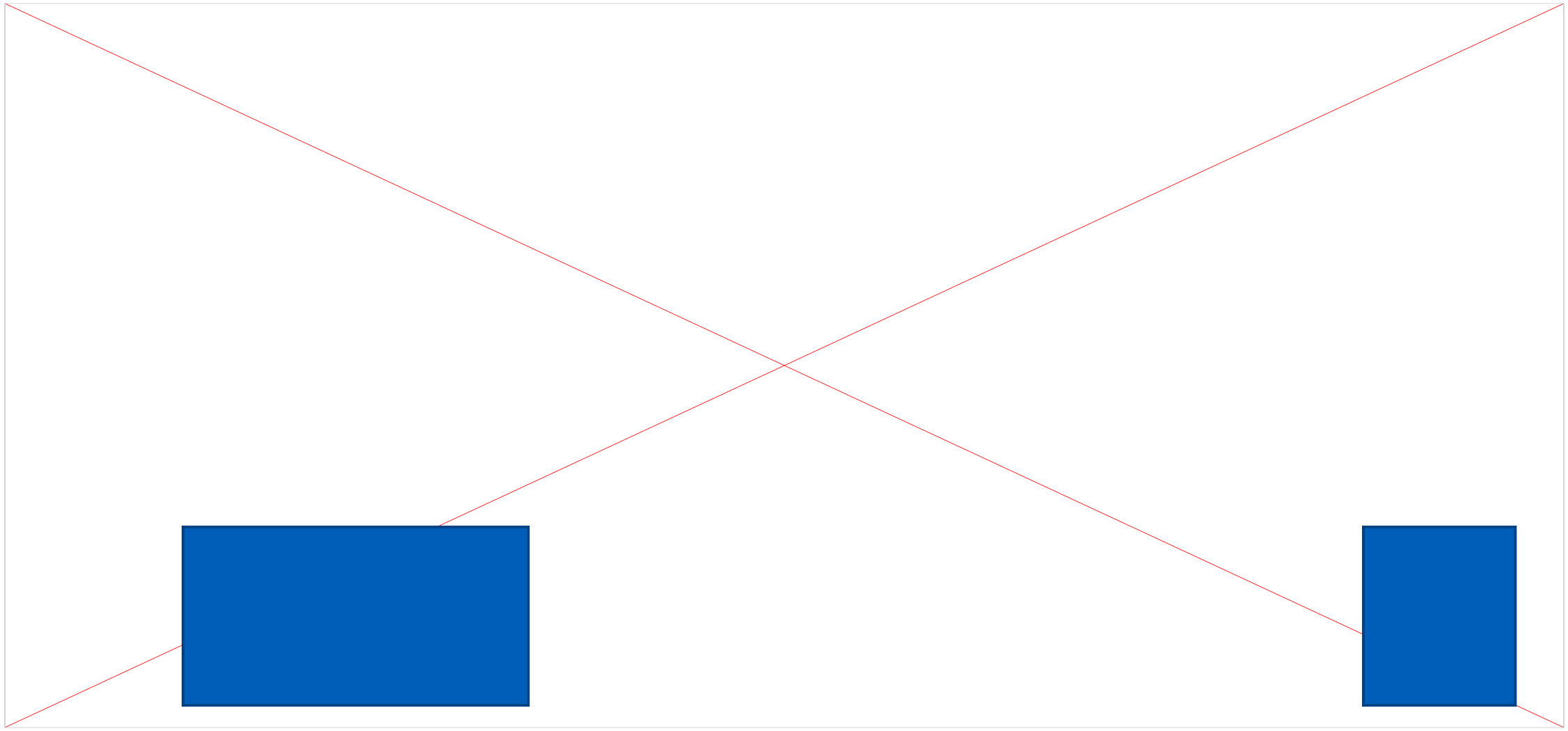


Alternative 3B, 2-Year Storm Event



Alt. 3B 2-Year							
House ID	Address	LAG, ft.	ALT. 1, ft. (Ex.)	ALT. 3B, ft.	Increase, ft	Flooded Under Ex. Condition	Proposed
20		150.89	149.8	150.9	1.1	No	

Alternative 3B, 10-Year Storm Event



Photoshop Alt. 3B No Catwalk or Piers

Occoquan Dam Spillway

Buoys

DAM MODIFICATION	ESTIMATED COST	PROS	CONS
ALT 1 Replace existing radial gate with modern computerized gate	• $2.5M+ for new gate • $150K+/year O&M	• Status quo, least impact to community	• Staff safety concerns with gate operation/debris removal • Highest overtime/O&M costs • Debris against piers after rains • Future dam safety regulations
ALT 2 Discontinue gate operation during storm events	• $100K+/year O&M	• Few costs compared to ALT 1	• Safety concerns w/debris removal • Highest upstream water levels • Greatest #homes impacted • Requests to operate gate • Gate will require O&M • Debris against piers • May violate existing dam permit
ALT 3A/3B Remove radial gate & replace with fixed crest concrete spillway 3B removes gate, catwalk, gate piers 3A leaves gate piers	• $3.5M one-time depending on # of homes purchased and grants received • $25K+/year O&M	• Eliminates staff safety/overtime • 3B has lowest upstream water levels during 50/100 year storms • 3B fewest homes impacted during 50/100 year storms • Lowest O&M costs of all • Prepares County for future	• County may need to purchase up to 6 homes w/mixed source of funds • Some homeowners won't sell • Requires warning buoys • Requires way to lower lake level
ALT 4A Replace radial gate with weir wall	• $750K w/out homes purchased • $75K/year O&M	• Lowest initial cost (non O&M) compared to others	• Safety concerns w/debris removal • High upstream water levels • Some # of homes impacted, may still need to purchase some • Requires way to lower lake level
ALT 5 Remove entire dam	• Unknown cost but expensive	• Lake goes back to being a river • Strong community resistance • Long permitting process	• Once dam is removed County has no future involvement • Better for the environment

Various Alternatives Pros and Cons

- ***Alt 1*** – ***New gate w/remote operation*** costly (~$2.5M) still safety concerns
- ***Alt 2*** – ***Not operating gate for storm events*** little to no cost but produces worst impacts on dwellings and the highest lake level for all storm events
- ***Alt 3A*** – ***Removing everything except the thrust piers*** (~$1.5M) and installing weir in place of gate still requires difficult/costly debris removal
- ******Alt 3B*** – ***Removing everything including thrust piers*** (~$3.5M) to create a uniform concrete spillway produced best results for lake levels/flooding
- ***Alt 4A*** – ***Replace gate with weir 1' lower than the crest*** ($750K) debris still a concern and lake levels go up in all scenarios, especially in more frequent storms
- ***Alt 5*** – ***Remove entire dam*** (unknown cost) lake becomes a river again, flooding concerns go away but likely not popular

General Observations

- Gate will need to be replaced in next 3-5 years and it will be very expensive
- Not currently funded or in any Capital Improvement budget – early discussion stage
- Staff safety must be addressed
- Operating and maintenance (O&M) costs are escalating
- VA Dam Safety requirements are increasing
- FEMA is actively looking for community-wide flooding issues to mitigate

Staff Recommendation

- **Alternative 3B**
  - Only alternative that **lowers** 100 year flood plain
  - Lake level **goes down** 50/100 year storms, less flooding w/big storms
  - On-going maintenance costs drop to virtually nothing, water and debris flows over the dam spillway during storms
  - Purchase of up to 6 properties (1 of which is severe repetitive loss) is a one time cost
  - Need to add buoys upstream of dam for water safety
  - Practically **eliminates staff safety/dam liability** concerns
  - Long term costs greatly reduced, very little to fix or repair

Considerations Specific to Option 3B

- Ability to pay for this with various funding sources such as stormwater fee, state or federal grants can be explored
- Lake remains at existing lake pool level
- **“Sinking fund” can be established for future lake dredging**
- **Ability to drain lake will be included**
- Flood insurance costs can be reduced for all County residents (flood premiums increasing an average of 8.2% per year) by eliminating flood prone properties

Costs Details Alternative 3B

- $1M+ demolition/removal of catwalk, piers and gate (SW fee/State and Federal sources/grants)
- $2.5M purchase/removal of up to 6 homes (FEMA Grants?)
- $25K buoys before dam
- $300K contingency
- **$3,825,000 estimated one time costs**

  (recall $2.5M for gate replacement with new gate)

Details Alternative 3B

- Already spending average of **$105K** per year on operating alone; routine maintenance additional, and new automatic gate is ~ $2.5M
- Possibility for FEMA grants/other funds as some % of total
- Buying of homes in flood plain thru FEMA is **voluntary.** But FEMA supports because this eliminates risk
- County must maintain eliminated homes as open space
- Prepares community well for the future; pro-active and addresses the issues for the long term

Timeline

- Met with Coles District Staff and Supervisor Nohe **4/18/19**
- Met with BOCS in closed session **8/6/19**
- Met with Lake Jackson Citizens Association/community **3/19/19, 5/28/19, 9/9/19, 12/16/19**
- Town Hall with Coles District Staff and Supervisor Vega **3/12/20**

Next Steps

- Prepare public presentation with concept plan
- Develop funding alternatives
- Obtain approval to proceed through the County's Capital Improvement Program
- Begin discussions with FEMA, Elected Officials, Permitting Officials, and the Community, make changes as needed
- Develop 100% plans with firm costs
- Obtain final funding for the project
- 2-3 year process