Orsatti Water Consultants

Ms. Anna Mauss
Colorado Water Conservation Board
1313 Sherman St., Room 718
Denver, CO 80203

August 21, 2019
17007-Report

Reference: Town of Georgetown – Georgetown Lake Lagoon Dredging Project Completion Report

Dear Anna:

In 2017, the Town of Georgetown (Town) was requested by the Clear Creek County Water Commissioners to increase the standing pool volume of Georgetown Lake to provide more on-stream storage of augmentation water in the upper Clear Creek Basin. High mountain runoff and storm drainage from I-70 have contributed significant sediment load to Clear Creek upstream of the Lagoon. Over time that sediment has moved down the Creek to the Lagoon section of Georgetown Lake. Figure 1 is a copy of an aerial image taken from Google Maps, showing the extents of sedimentation in the Lagoon prior to the project. While no actual records exist, anecdotal information suggests that material was last removed from the Lagoon back in 1981.

Stakeholder Development

Orsatti Water Consultants (OWC) was first hired by the Town in December of 2017 to develop a project approach for the removal of sediment from the Lagoon. During this first phase of the project, it was necessary to organize the primary stakeholder group. The Town of Georgetown is an obvious stakeholder due to the physical location of the Lake in Town and the direct recreational benefits enjoyed by residents. As a major owner of the decreed water rights in Georgetown Lake, the City of Blackhawk, Colorado also represented themselves to be a significant project stakeholder and financial partner in the project. After initial discussions with the Colorado Department of Transportation (CDOT), they also agreed to become a financial stakeholder in the project due to large quantities of de-icing sand being applied on I-70 at Georgetown Hill, ultimately washing into the Lagoon.

Private stakeholders have also been identified and organized into several subgroups. First, the general public at large represents a significant stakeholder voice, given the high visitation and use of the Lagoon by the Public. Additional private groups include the private homeowners that surround the Lagoon. These residents have a direct emotional and financial stake in that any work at the Lagoon will directly affect the residents' quality of life and property values


Figure 1
22nd St
Old Georgetown Rd
Argentine St
Muscovite
Flatiron Dr
Bluebird Dr
Alliance Dr
Major Anderson Dr
Clear Creek Dr
6
Google Earth
© 2017 Google
N
600 ft

during and after the project has been completed. Lastly, Bighorn Crossing Development, as landowners of the developing property between the Lagoon's western coastline and Argentine St. to the west, are also directly affected by the sediment removal process at the Lagoon and ultimately shaped the project's final trajectory.

Preliminary Investigation

Before establishing a plan for sediment removal, pre-existing conditions were investigated. Initial land improvement surveying was accomplished around the Lagoon coastline to accurately map topographic and property boundary conditions. This was augmented with an initial bathymetric survey of the Lagoon floor. Additional site investigation work included a full wetlands delineation around the Lagoon limits as Shown in Figure 2. Based on USACE permitting requirements, any wetlands destruction would require direct remediation and planting of wetlands onsite, acre for acre. Finally, geotechnical borings were performed of the in-situ sediment to understand the naturally occurring sediment deposits, and their ability to be reclaimed as structural fill. Eight borings of the Lagoon were drilled through the ice during the 2017/2018 winter season to provide guidance on the most practical sediment removal alternatives.

Project Design & Delivery

The Town decided to use the Construction Management at Risk (CMAR) project delivery method to leverage early engagement by the contractor in developing preliminary cost estimates for alternatives and identifying potential project risks and associated costs. Two alternatives including hydraulic dredging and conventional excavation were selected to be evaluated. Given the adjacent Bighorn Crossing Development was willing to accept the dredged sediment as structural fill for the development, the Town's ability to save more than $500,000 in hauling and disposal costs became a major project driver.

Ultimately, conventional excavation provided the best balance between cost and risk and afforded the delivery of fill to the development within their required delivery schedule. The design incorporated the construction of two coffer dams to isolate the excavation area and a bypass channel for Clear Creek entering the Lagoon 800 ft. further north along the western coastline. A temporary bridge was required to provide construction traffic access across the Creek By-pass to the Lagoon. Another key component to the design was the construction of a groundwater dewatering system to help accelerate and maintain the draining of the Lagoon prior to excavation.

Project scheduling was an additional coordination factor. With the project site at nearly 8,500 feet in elevation, all dredging work was limited to a November 1 deadline because of freezing weather conditions at the Lagoon site. This constraint further supported the lower risk construction approach of conventional excavation.

Georgetown Lake Dredging

- Data Point
- Project Area Boundary
- Wetland (0.831 ac)
- Open Water (3.509 ac)

Image Source: Google Earth©, October 2015

0 50 100 Feet

N

Figure 2
Existing Conditions

Prepared for: Orsatti Water Consultants
File: 7093 Figure 2.mxd (GS)
December 18, 2017

ERO Resources Corp.

Project Construction

Project work started in the late Spring of 2018 with the General Contractor, Filanc Construction mobilizing forces and equipment, and performing preliminary construction activities including temporary relocation of an existing outfall sanitary sewer, installation of the groundwater dewatering system, construction of the Clear Creek Bypass channel, and installation of the construction access bridge across the Bypass. All work within the limits of the Lagoon remained on hold until the USACE Permit was received in late August of 2018.

USACE ultimately issued a Nationwide 3C permit for the rehabilitation of the Lagoon. First steps following delivery of the permit were to complete the connection of the Bypass to the Lagoon through construction of a diverting cofferdam immediately north of the pedestrian bridge at the south end of the Lagoon. This was followed by completion of the construction dewatering system and the large northern coffer dam south of the Bypass, separating the Lagoon from the remaining Lake to the north. This process allowed continued delivery of Clear Creek to downstream uses with no impact to flow or the environment.

Once the Lagoon was hydraulically isolated from the remaining Lake, Filanc utilized a combination of the groundwater dewatering system and submersible transfer pumps to drain the Lagoon. Lagoon draining required approximately 3 weeks, before heavy equipment could be safely brought into the Lagoon. Lagoon excavation generally occurred 12 hours a day, 6 days a week due to the permit delay. Large dump trucks were filled using a combination of large track excavators and bulldozers. The dump trucks then moved and placed the excavated sediment on the Bighorn Crossing Development parcel as requested by the Developer. Further spreading and compaction of the fill was provided as excavation continued.

Initial estimates of the excavated earthwork volume were anticipated to be in the 55K to 70K cubic yard range. Once the design limits of excavation were completed, surface compaction of the excavation occurred prior to re-filling of the Lagoon. Senior water right calls on Clear Creek in the late fall prohibited a rapid filling rate of the Lagoon. Once the Lagoon reached near the operating level of the Lake, both the northern and southern coffer dams were breached, reconnecting the Lagoon and Lake hydraulically.

Final removal of the coffer dams required specialized long reach excavation equipment, but even with reduced production rates, Filanc Construction was able to complete removal of the coffer dams as ice was forming on the Lake for the coming winter. Final re-piping of the sanitary sewer, regrading of the Bypass channel, initial wetlands mitigation work and site cleanup all occurred before the winter of 2018/2019.

In the spring of 2019, final wetlands mitigation work, along with a bathymetric survey of the Lake & Lagoon was completed to confirm final grading conditions above and below the Lagoon waterline.

Project Summary

In total, Filanc Construction removed in excess of 60,000 cubic yards of sediment from Georgetown Lake Lagoon. The majority of the excavated material was utilized as clean fill on the Bighorn Crossing Development, immediately adjacent to the Lagoon's western coastline. Approximately 3,000 cubic yards of excavated material was utilized in the regrading of the Lagoon's eastern shoreline. The earthwork verification process was accomplished in two steps. The first step shown on Sheet 1 of the Record Drawings compares the original survey before construction to the land survey accomplished on the Lagoon prior to refilling. This survey does not include the additional fill removal associated with the temporary berm construction. Results of that analysis indicate a removal of approximately 59,000 cubic yards prior to coffer dam removal.

The second phase of earthwork verification came from a comparison of the original survey to the final bathymetric survey of the Lake and Lagoon bottom, as shown on Sheet 2 of the Record Drawings. This survey was accomplished after final removal of the temporary coffer dams. Results of that analysis indicate a total removal of approximately 61,700 cubic yards of sediment from the Lagoon.

During construction, wetlands disturbance and mitigation was an important part of the USACE permitting process. As shown on Sheet 3 of the Record Drawings, less than 0.30 total acres of wetlands was disturbed or destroyed during the construction process. However, through the planting of additional wetlands associated with the project, the total established wetlands area around the Lagoon has increased by more than 0.73 acres.

Also included in the report are photos highlighting the construction process and post construction conditions around the Lagoon showing wetlands rehabilitation. Feel free to call me should you require any additional information. Thank you and the Colorado Water Conservation Board again for making this project possible.

Very truly yours,
Orsatti Water Consultants

Bob Orsatti, P.E.
President

Enclosures

Post Construction Record Drawings (3 Sheets)
Georgetown Lake Post Construction Bathymetric Survey (3 Sheets)
Construction & Post Construction Photos (24 images)

Construction Photos


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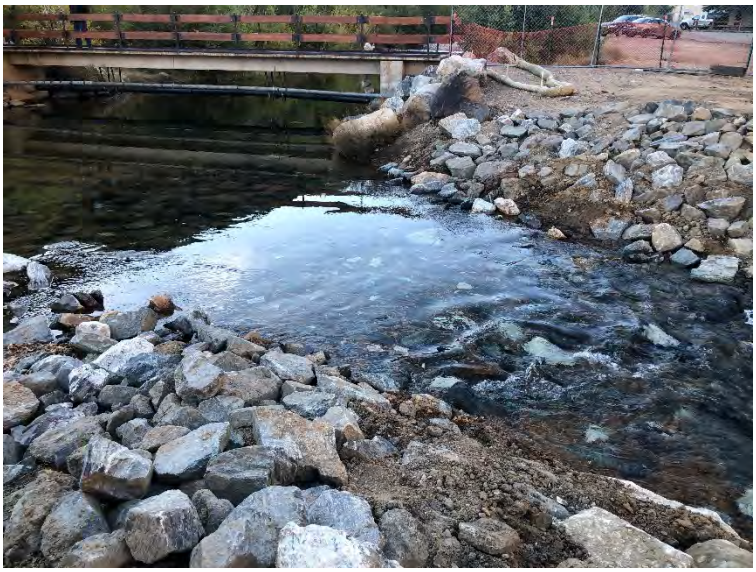
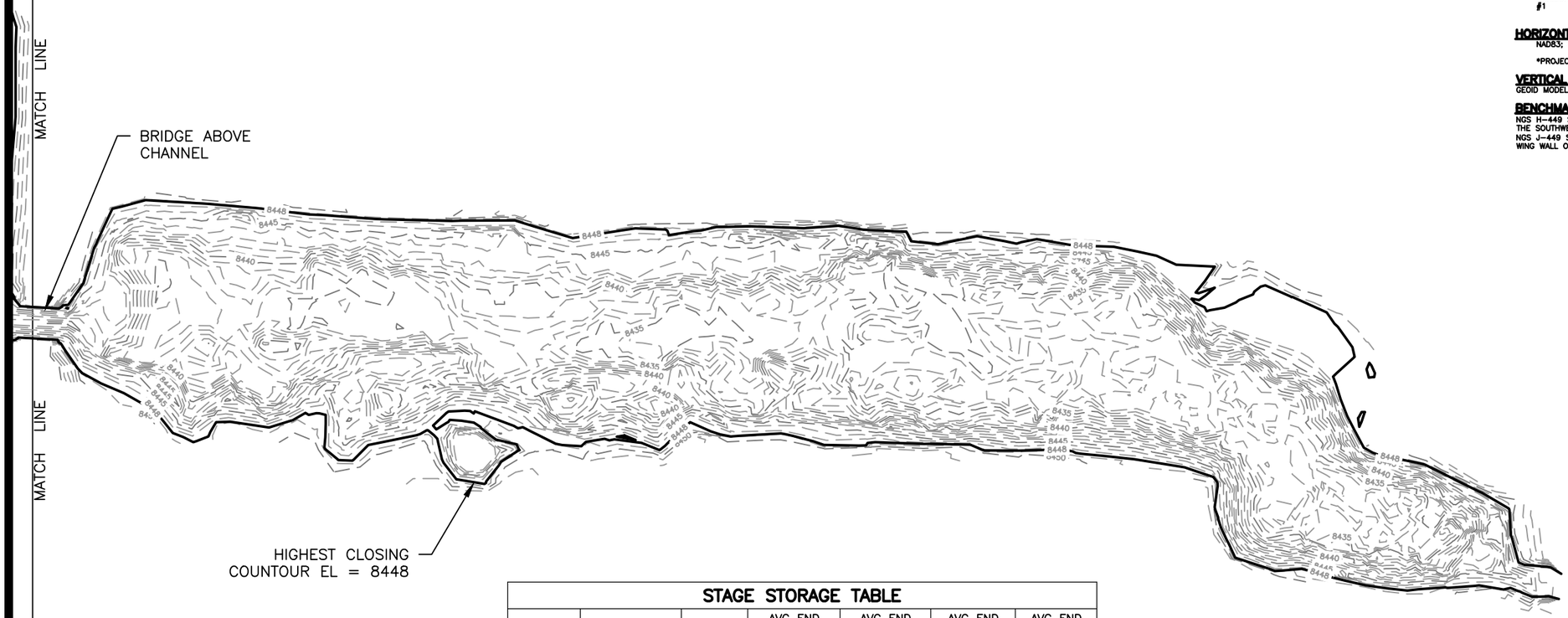


Georgetown Lake

Bathymetric Survey



0 150
SCALE: 1"= 150'

NOTES

DATES OF FIELD WORK: 10/25/2019, 10/29/2018, 05/16/2019

PROJECT LOCATION CONTROL

HORIZONTAL CONTROL POINT
#1 N: 1690931.944 E: 2946085.841
LAT: 40°27'11.95476"N LONG: 105°04'40.38256"W

HORIZONTAL DATUM

NAD83; COLORADO STATE PLANE, CENTRAL

*PROJECT IS IN GRID COORDINATES

VERTICAL DATUM

GEOID MODEL: 12AUS

BENCHMARKS USED:

NGS H-449 STORED AS POINT #100 EL = 8457.519, LOCATED ON THE WEST END OF THE SOUTHWESTERN WING WALL OF A CONCRETE SPILLWAY
NGS J-449 STORED AS POINT #101 EL = 8454.595, LOCATED ON THE SOUTHWESTERN WING WALL OF THE DRIVABLE BRIDGE OVER THE CHANNEL

STAGE STORAGE TABLE

ELEV	AREA (SQ FT)	DEPTH H (FT)	AVG END INC. VOL. (CU. FT.)	AVG END TOTAL VOL. (CU. FT.)	AVG END INC. VOL. (AC FT)	AVG END TOTAL VOL. (AC FT)
8448	2758541	1	2721080	19108177	62.47	438.66
8447	2683718	1	2651398	16387098	60.87	376.20
8446	2619079	1	2584408	13735699	59.33	315.33
8445	2549737	1	2487656	11151291	57.11	256.00
8444	2425574	1	2311972	8663636	53.08	198.89
8443	2198370	1	2168006	6351664	49.77	145.81
8442	2137642	1	1637351	4138658	37.59	96.04
8441	1137061	1	888605	2546306	20.40	58.46
8440	640149	1	511371	1657701	11.74	38.06
8439	382592	1	330546	1146330	7.59	26.32
8438	278500	1	244939	815784	5.62	18.73
8437	211378	1	191388	570845	4.39	13.10
8436	171398	1	146241	379457	3.36	8.71
8435	121084	1	105971	233217	2.43	5.35
8434	90858	1	73465	127246	1.69	2.92
8433	56072	1	39707	53781	0.91	1.23
8432	23342	1	14074	14074	0.32	0.32
8431	4805	1				

0 150
IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

Orsatti Water Consultants

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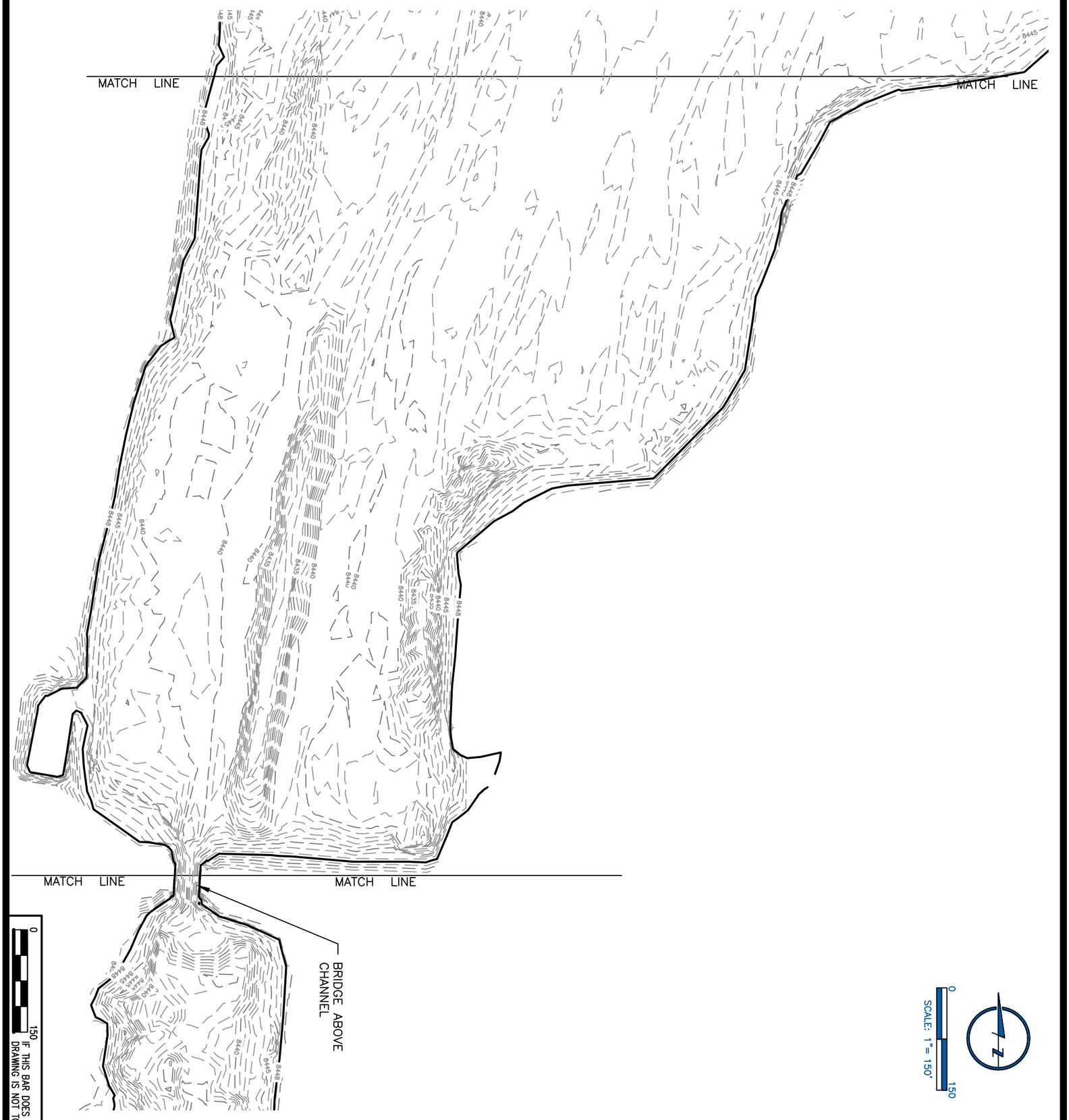
12596 W. BAYAUD AVE., STE. 300
LAKEWOOD, CO 80228
303.971.0030
LampRynearson.com

TOWN OF GEORGETOWN
LAKE LAGOON DREDGING PROJECT

BATHYMETRIC SURVEY

PROJECT No.: 17007
DATE: 8/6/2019
DESIGNED BY: RPO
DRAWN BY: DEN
CHECKED BY: RPO



2 of 3

PROJECT No.: 17007
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BATHYMETRIC SURVEY

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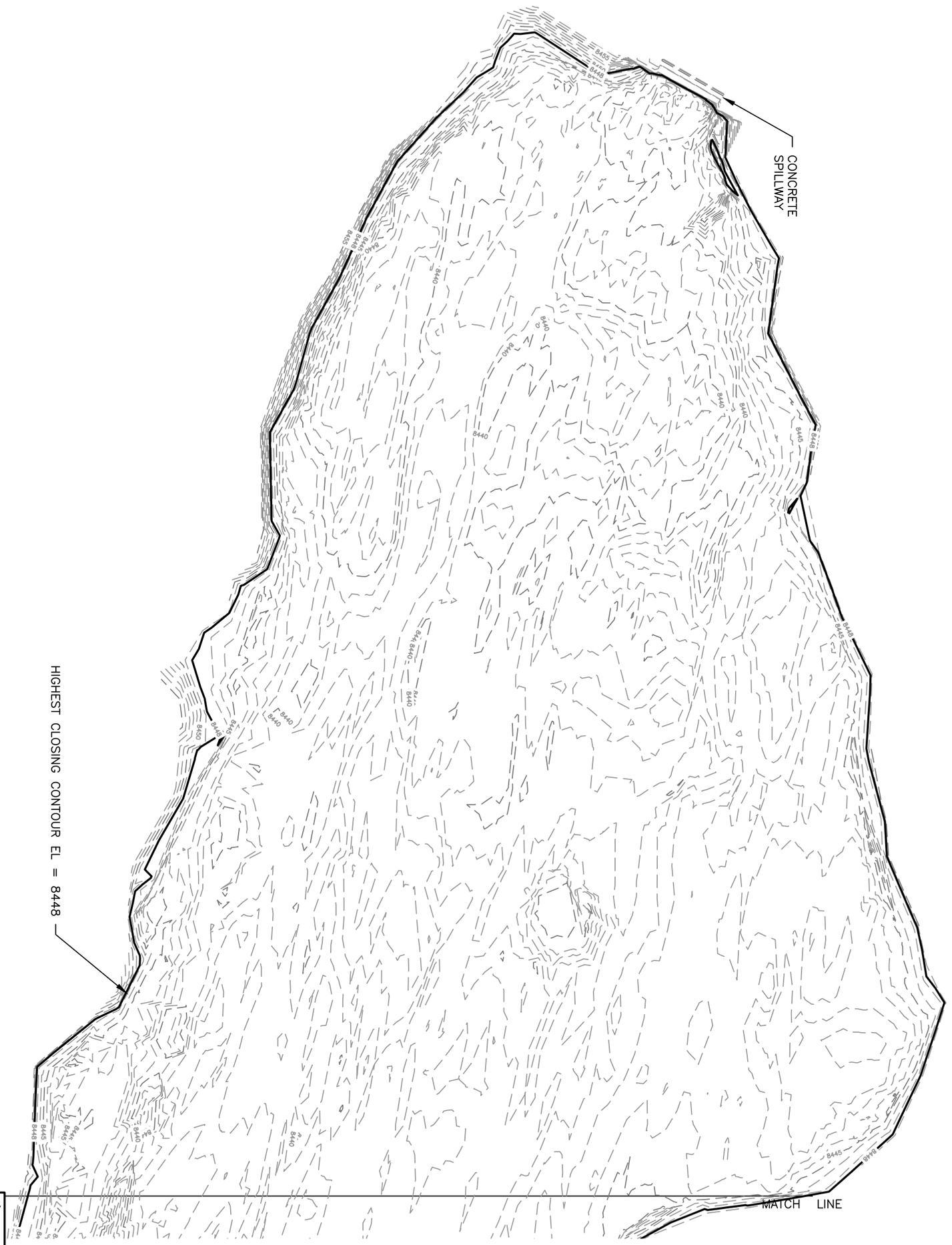

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SCALE: 1" = 150'

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3 of 3

PROJECT No.: 17007
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TOWN OF GEORGETOWN
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BATHYMETRIC SURVEY

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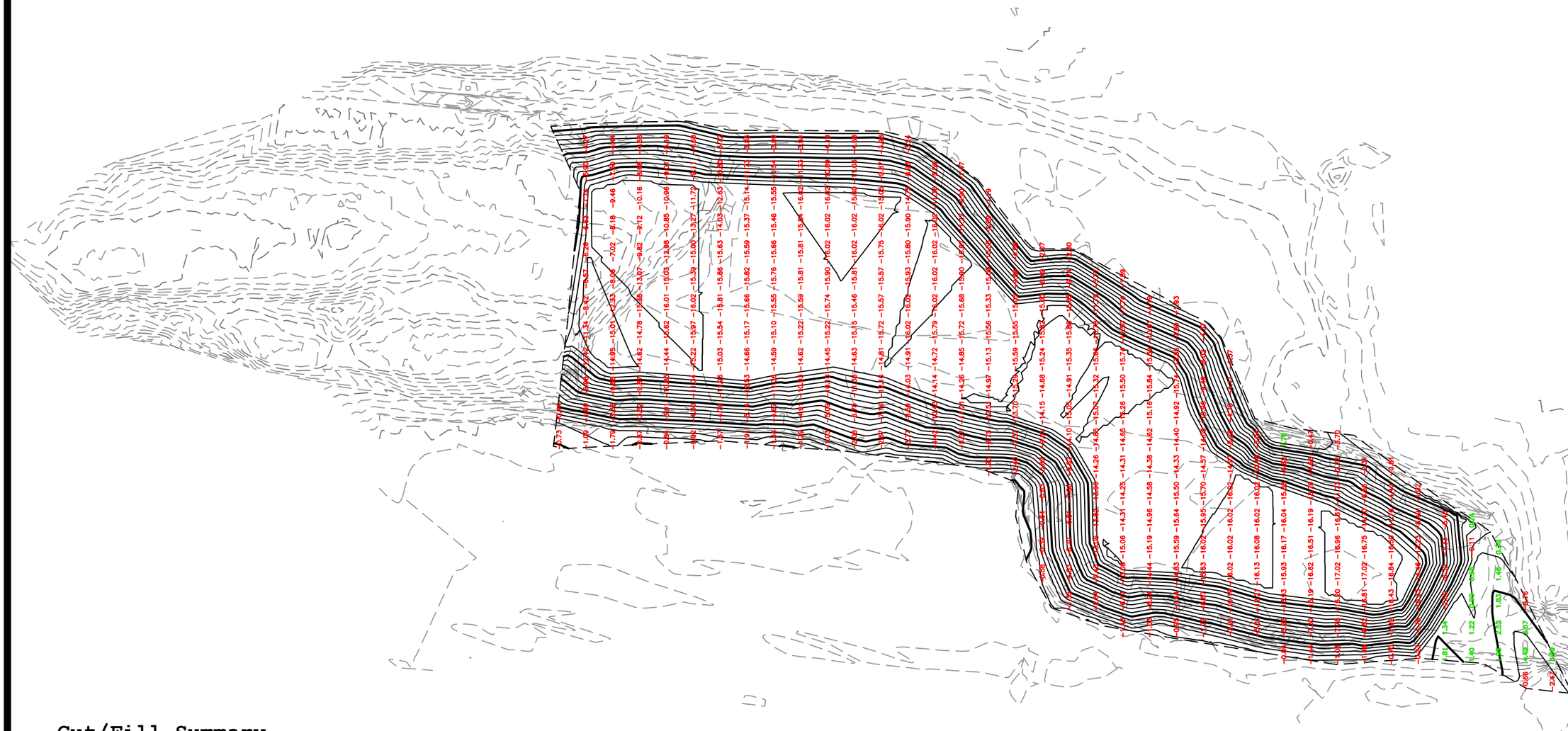
Georgetown Lake Lagoon

Construction Record Drawings



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOLM	**1.000**	**1.000**	182680.00 Sq. Ft.	59005.03 Cu. Yd.	1850.07 Cu. Yd.	57154.96 Cu. Yd.<Cut>
Totals			182680.00 Sq. Ft.	59005.03 Cu. Yd.	1850.07 Cu. Yd.	57154.96 Cu. Yd.<Cut>

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IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

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TOWN OF GEORGETOWN
LAKE LAGOON DREDGING PROJECT

FILANC ASBUILT VOLUME EXHIBIT

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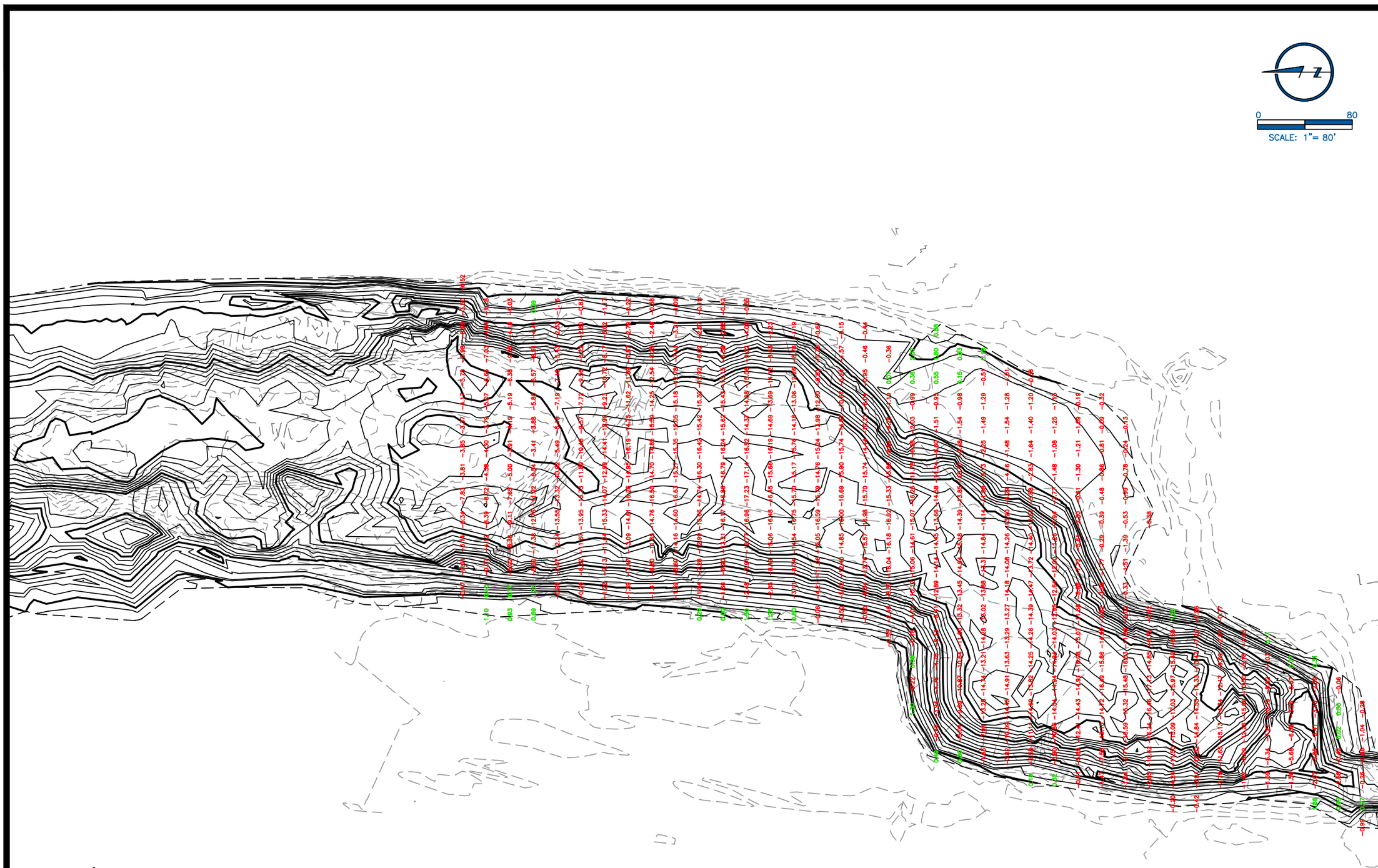
DRAWN BY: DEN
CHECKED BY: RPO



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Lamp v EG	**1.000**	**1.000**	271558.51 Sq. Ft.	61671.52 Cu. Yd.	1061.82 Cu. Yd.	60609.71 Cu. Yd.<Cut>
Totals			271558.51 Sq. Ft.	61671.52 Cu. Yd.	1061.82 Cu. Yd.	60609.71 Cu. Yd.<Cut>

0 80
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TOWN OF GEORGETOWN
LAKE LAGOON DREDGING PROJECT

LAMP RYNEARSON ASBUILT VOLUME EXHIBIT

PROJECT No.: 17007
DATE: 8/6/2019
DESIGNED BY: RPO
DRAWN BY: DEN
CHECKED BY: RPO

LEGEND:

HISTORICALLY OCCURRING WETLANDS (34,844 TOTAL SQ. FT) .80 AC.

HISTORICALLY REMOVED WETLANDS (7,516 TOTAL SQ. FT.) .17 AC.

NEWLY PLANTED WETLANDS, SUBMERGED (6,510 SQ. FT.) .15 AC

NEWLY PLANTED WETLANDS (31,637 SQ. FT.) .73 AC

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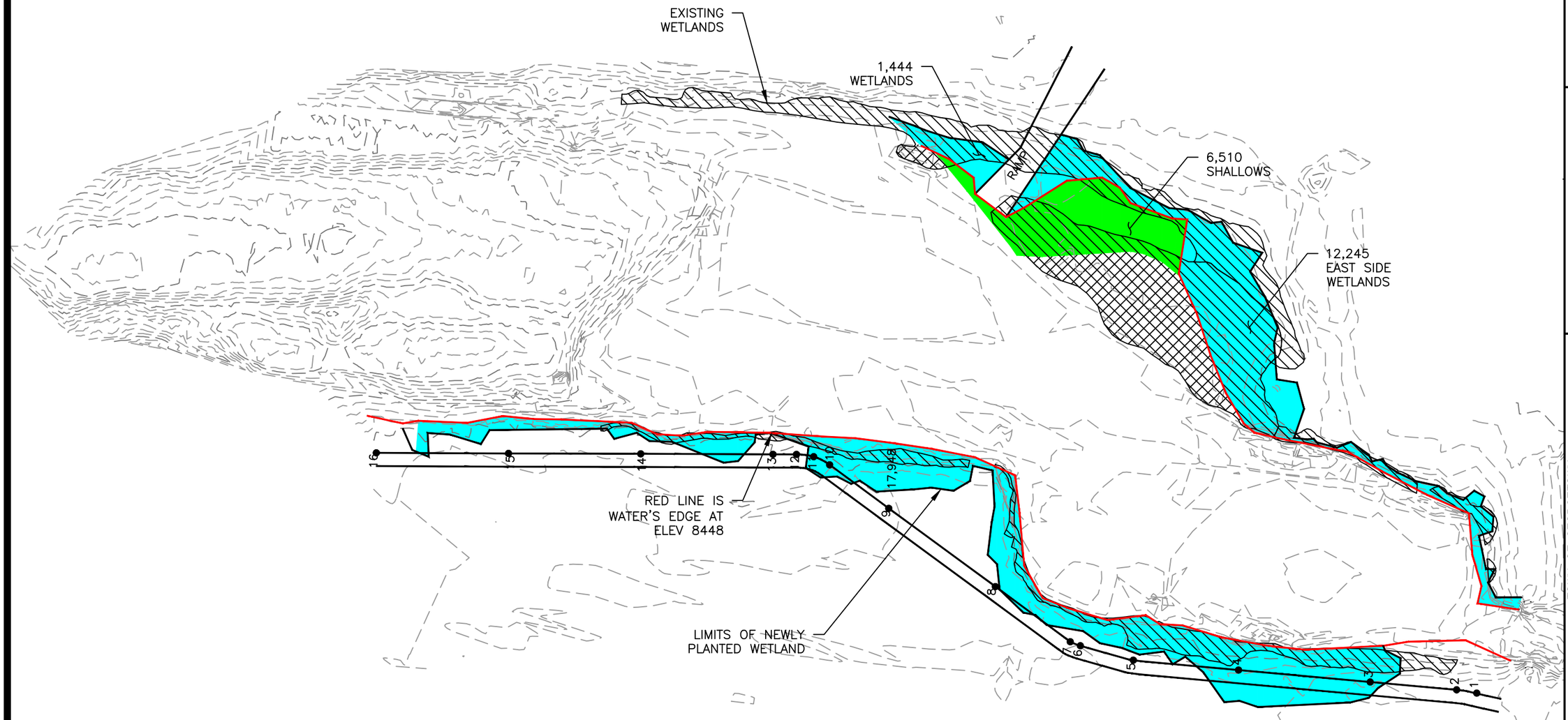
SCALE: 1"= 80'



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WETLANDS EXHIBIT

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