MUNICIPAL SOLID WASTE PERMIT
MAJOR AMENDMENT

PART III-ATTACHMENT C
FACILITY SURFACE WATER DRAINAGE REPORT

NAME OF PROJECT: Beck Landfill

MSW PERMIT APPLICATION NO.: 1848A

OWNER: Nido, LTD (CN603075011)

OPERATOR: Beck Landfill (RN102310968)

CITY, COUNTY: Schertz, Guadalupe County

Major Amendment: Revised September 2023

Prepared by:

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1.0 NARRATIVE

This facility surface water drainage report has been prepared consistent with the requirements of §330.63(c) and §§330.301 through 330.307. Attachment C-Facility Surface Water Drainage Report is organized to include the drainage analysis and design, flood control and analysis, and drainage system plans and details. The facility design complies with the requirements of §330.303(a)-(b) concerning the management of run on and runoff during peak discharge of a 25-year rainfall event, the prevention of off-site discharge of waste and feedstock materials, and the control of surface water discharge in and around the facility. Surface water drainage in and around the facility will also be controlled to minimize surface water running onto, into and off the treatment area. The following is a brief description of each of the attachments.

1.1 ATTACHMENT C1 – DRAINAGE ANALYSIS AND DESIGN

Attachment C1 is the drainage analysis and design of the facility, which includes calculations and demonstrations consistent with the requirements of §330.63(c), and §§330.301-330.307. This attachment includes a comparison of surface water runoff from the existing permitted condition to the post-development condition at each location where surface water enters or exits the facility boundary for the 25-year and 100-year, 24-hour rainfall event. The results of this comparison for the 25-year storm event are shown below and more detailed information is provided in Attachment C1. The comparison between the existing condition and the post-developed condition demonstrates that the proposed vertical expansion of the Beck Landfill will not adversely alter the existing drainage patterns. In addition, this attachment includes the drainage design for the final cover system, drainage benches, downchutes, perimeter channels, and detention ponds. The drainage design will also provide effective erosional stability to top dome surfaces and external embankment side slopes during all phases of landfill operation, closure, and post-closure care in accordance with these rules.

Reach Summary		Q_{25} (cfs)	Vol_{25} (ac-ft)	Vel_{25} (fps)	Runoff/on
Outfall North	existing	322.7	67.2	2.9	runoff
	proposed	291.2	60.7	2.5	
	difference %	*-10%*	*-10%*	*-1.4%*	
Outfall West	existing	179.3	27.7	9.6	runoff
	proposed	112.5	13.9	9.6	
	difference %	*-37%*	*-50%*	*0%*	
Outfall South	existing	209.0	40.2	5.2	runoff
	proposed	183.0	40.1	5.2	
	difference %	-13%	-0%	*0%*	
Outfall East	existing	739.5	151.0	7.3	runoff
	proposed	729.5	147.1	7.3	
	difference %	*-1%*	*-3%*	*0%*	

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls West, South, and East taken from HEC-HMS model of Cibolo Creek and represent the 25-year velocity in the creek at the discharge location.

1.2 ATTACHMENT C2 – FLOOD CONTROL ANALYSIS

Attachment C2 is the flood control analysis, which includes demonstrations consistent with the requirements of §330.63(c)(2). The flood control analysis demonstrates that the proposed expansion of the Beck Landfill will not adversely impact flooding conditions in the area. The landfill is proposed to be protected by an earthen berm, which is constructed at least three feet above the calculated water surface for the 100-year flood. The current FEMA map shows that the 100-year floodplain extends onto a portion of the landfill footprint, however, this map is based on topographic data from before the perimeter berm associated with the current landfill was completed. A Letter of Map Revision (LOMR) application has been submitted to FEMA to revise the map to accurately depict the extents of the floodplain. Additional discussion related to the LOMR application is included in Attachment C2.

The proposed stormwater pond for the landfill is within the 100 year floodplain and a no-rise certification has been submitted to the City of Schertz for the pond. In order to offset the loss of flow area in the floodplain from the pond berm, the area south of the new pond is proposed to be excavated to enhance flow through Cibolo Creek. Based on the modeling in the no-rise certification, there is no increase in the calculated water surface elevation of the floodplain from the pond construction, since the areas along the creek will be excavated to completely offset any effects of the new pond.

1.3 ATTACHMENT C3 – DRAINAGE SYSTEM PLANS AND DETAILS

This attachment includes the permit level site plans and details for the drainage system consistent with §330.63(c) and §§330.301-330.307.

MUNICIPAL SOLID WASTE PERMIT
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PART III-ATTACHMENT C-1
FACILITY SURFACE WATER DRAINAGE REPORT

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1 INTRODUCTION

30 TAC §330.63(c) and 330.301-330.307

1.1 Purpose

This drainage analysis and design is prepared as part of a permit application for the expansion of the Beck Landfill and includes the demonstrations consistent with the requirements of 30 TAC Chapter §§330.63(c) and §§330.301-307. The drainage analysis and design is organized to include a narrative description of the existing and post-development conditions, the proposed drainage system design, effective erosional stability of top dome surfaces and external embankment side slopes during all phases of landfill operation, and a discussion of the existing/post-development comparison at the facility and property boundaries. Drainage calculations are included in the appendices to this section. Drainage design plans and details are included in Attachment C3. The following is a brief description of each of the appendices.

Appendix C1-A- Drainage Maps and Existing/Post-Development Comparison

Appendix C1-A includes drainage area maps that delineate the drainage areas that contribute surface water run-on and runoff at the facility and property boundaries and provide a summary of the peak flow rates, runoff volumes, and runoff velocities at locations along the facility boundary for the existing and post-development conditions. Appendix C1-A also includes a table summarizing the existing/post-development drainage analysis comparison.

Appendix C1-B- Existing Hydrologic Calculations

The existing hydrologic and hydraulic condition is the final permitted condition depicted in TCEQ MSW Permit 1848. The existing hydrologic and hydraulic evaluation is included in Appendix C1-B. The existing analysis includes delineations of drainage areas that contribute surface water run-on and runoff at comparison locations along the facility boundary.

The results of the existing hydrologic evaluation are provided on the existing conditions drainage analysis summary, which shows the 25- and 100-year peak flow rates, runoff volumes, and runoff velocities at comparison locations along the proposed facility boundary.

Appendix C1-C- Post-Development Hydrologic Calculations

The post-development hydrologic and hydraulic evaluation included in Appendix C1-C represents the proposed final closure landfill configuration. The post-development analysis includes delineations of drainage areas that contribute surface water run-on and runoff at comparison points along the proposed facility boundary.

The results of the post-development hydrologic evaluation are provided on the post-development boundary analysis summary, which shows the 25- and 100-year peak flow rates, runoff volumes, and runoff velocities at the comparison locations along the proposed permit boundary.

Appendix C1-D- Perimeter Drainage System Design

Appendix C1-D presents the hydraulic design of the perimeter drainage system. The perimeter drainage plan shows the locations of the perimeter drainage berms and detention ponds. The detention ponds are designed to provide the necessary storage and outlet control to mitigate impacts to the receiving channels downstream of the Beck Landfill. The perimeter berms are designed to convey the 25-year and 100-year, 24-hour storm event.

Appendix C1-E- Final Cover Drainage Structure Design

Appendix C1-E is limited to the design of the permanent final cover drainage structures (i.e., downchute and bench system). The calculations demonstrate that the structures are designed to convey runoff produced from a 25-year storm event, to provide erosion protection, and to minimize sediment loss from the final cover condition.

Appendix C1-F - Intermediate Cover Erosion and Sedimentation Control Plan

Appendix C1-F provides a detailed erosion and sediment control plan during the intermediate cover phase of the landfill development.

Appendix C1-G- Intermediate Cover Erosion Control Structure Design

Appendix C1-G provides the supporting documentation to evaluate and design temporary erosion and sediment control structures for the intermediate cover phase of the landfill development.

2 METHODOLOGY

30 TAC §330.305(f) and §330.307

2.1 Concepts and Methods

The hydrologic and hydraulic methods employed in this study are consistent with the TCEQ regulations. The United States Army Corps of Engineers (COE) HEC-HMS computer program was used to compute peak flow rates and runoff volumes. The HEC-HMS peak flow rates, the NRCS Method, the Universal Soil Loss Equation, and the values defined in the 2018 NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11, Version 2.0:Texas, as required by the TxDOT Hydraulic *Design Manual,* September, 2019, were used to design the final cover drainage system and erosion control features. The drainage analysis proceeded in the following sequence:

- Maps were prepared that provided information about the surface runoff characteristics based on the existing conditions. These maps are included in Appendix C1-B.
- Surface water runoff hydrographs for the existing condition were developed using HEC-HMS. The existing HEC-HMS evaluation is included in Appendix C1-B.
- Maps were prepared that provide information about the surface water runoff characteristics of the post-developed final cover drainage conditions for the Beck Landfill. These maps are included in Appendix C1-C.
- Surface water hydrographs for the post-developed condition, including the perimeter drainage channel and detention ponds, were evaluated using HEC-HMS. The post-developed evaluation is included in Appendix C1-C.
- The final cover system was evaluated for soil loss using the Natural Resources Conservation Service (NRCS) Revised Universal Soil Loss Equation. Final cover drainage systems were evaluated for capacity using the peak flow rates from HEC-HMS, the NRCS Method, and the methods defined in the TxDOT *Hydraulic Design Manual,* October 2011. Final cover drainage systems calculations are included in Appendix C1-E.
- The intermediate cover system was evaluated for soil loss using the Revised Universal Soil Loss Equation. Intermediate cover erosion and sediment control plan and structure design were evaluated for capacity using the NRCS Method and the values defined in the 2018 NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11, Version 2.0:Texas, as required by the TxDOT Hydraulic *Design Manual,* September, 2019. Intermediate and final cover erosion and sediment control plans are included in

Appendix C1-F and C1-G.

2.2 Hydrologic and Hydraulic Modeling

2.2.1 HEC-HMS

The COE HEC-HMS program was developed to simulate the surface water runoff response of a watershed. The HEC-HMS model represents a watershed as a network of hydrologic and hydraulic components. The modeling process results in the computation of stream-flow hydrographs at desired locations in the watershed. HEC-HMS v4.11 was used to perform the hydrologic modeling. Refer to Appendix C1-B for a detailed discussion of the input parameters used for the existing conditions analysis and Appendix C1-C for a detailed discussion of the input parameters used for the post-developed condition.

2.3 Hydrologic Elements Naming Convention

The following naming convention was used in the existing and post-developed hydrologic evaluations:

DA-E - existing drainage rea associated with current permit 1848 (examples: DA-E1, DA-E2)

DA-PX - existing drainage rea associated with current permit 1848 (examples: DA-P01, DA-P02)

POND#- pond reservoir element, (examples: POND1)

Outfall-XX - comparison point where surface water runoff exits the property boundaries (examples: Outfall-N, Outfall-W)

3 EXISTING CONDITIONS

30 TAC §330.305(f) and §330.307

The Beck Landfill includes a Type IV municipal solid waste facility located in Guadalupe County, Texas within the city limits of Schertz, Texas. The Beck Landfill site entrance is located at 550 Farm to Market Road 78.

The Beck Landfill permit boundary encompasses about 257 acres. The area within the permit boundary primarily consists of the landfill footprint with the remaining being flat grasslands or the slope of the perimeter berm down toward Cibolo Creek. The property has been historically used as sand and gravel mining dating back at least to the 1970s. The property is bordered by Cibolo Creek on three sides and slopes towards the creek. The northern portion of the property generally slopes to the south toward the creek.

The facility is located on the south side of FM 78, east of Randolph Air Force base. The proposed landfill footprint is 155 acres and the entire footprint has been excavated and is partially filled with waste. No lateral expansion of the landfill is proposed in this application.

As shown on Drawing C1-1, Cibolo Creek enters the area around the site from the north and runs adjacent to the west permit boundary edge and then bends approximately 180 degrees and runs along the south and east permit boundary borders. The only offsite stormwater entering the permit boundary is via the flow in Cibolo Creek and two drainage areas south of FM 78 (OS-1 and OS-2).

Appendix C1-B includes the existing condition hydrologic calculations. Appendix C1-B includes drawings that depict the existing condition drainage areas and comparison points. Refer to Drawing C1-1 for the existing condition drainage area map, including all offsite drainage areas. Refer to drawing C1-1 also for a detailed drainage area map of the property, which includes the area, peak flow rate, and volume for the 25-year 24-hour rainfall event for each drainage area.

The following table includes a summary of the existing conditions drainage analysis, providing the peak flow rate, volume, and velocity at each comparison point for the 25-year, 24-hour rainfall event. The table also identifies the contributing drainage areas, and states that surface water either enters (run-on) or exits (runoff) at each comparison point.

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	existing	322.7	67.2	2.9	Runoff
Outfall West	existing	179.3	27.7	9.6	Runoff
Outfall-South	existing	209.0	40.2	5.2	Runoff
Outfall East	existing	739.5	151.0	7.3	Runoff

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls East, West, and South taken from 25-Year HEC-RAS model of Cibolo Creek, these discharge points are all inundated during this storm event.

4 POST-DEVELOPED CONDITIONS

30 TAC §330.305(f) and §330.307

The post-developed condition discussion relates to surface water entering and exiting the facility and property boundary, and the comparison points along the facility and property boundary identified in the existing conditions remain unchanged in the post-developed condition. The offsite drainage areas and runoff characteristics outside the Beck Landfill property boundary remain unchanged from the existing conditions. Offsite drainage areas and runoff characteristics that are located within the permit boundary and outside the landfill footprint remain unchanged from existing conditions, except those that are affected by the location of the proposed pond. All drainage areas within the landfill footprint are revised to consider the landfill vertical expansion.

The total drainage area for comparison points Outfall North, Outfall West, Outfall South, and Outfall East remains unaffected by the facility development. However, these drainage areas have been sub-divided where appropriate and runoff characteristics adjusted as appropriate to evaluate the effect of the vertical expansion of the landfill.

The locations where surface water enters and exits the facility and property boundary in the post-development conditions remains unchanged from existing conditions.

Appendix C1-C includes the post-developed hydrologic calculations. Appendix C1-C includes drawings that depict the post-developed drainage areas and comparison points. Refer to drawing C1-2 for the post-developed drainage area map, including all offsite drainage areas. Refer to drawing C1-2 for a detailed drainage area map of the existing property, which includes the area, peak flow rate, and volume for the 25-year and 100-year 24-hour rainfall event for each drainage area. Refer to drawing C1-2 for the post-developed runoff summary for each comparison point.

The following table includes a summary of the post-development conditions drainage analysis, which provides the peak flow rate, volume, and velocity at each comparison point for the 25-year, 24-hour rainfall event. The table also identifies the contributing drainage area, and states that surface water either enters (run-on) or exits (runoff) at each comparison point.

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	proposed	291.2	60.7	2.5	Runoff
Outfall West	proposed	112.5	13.9	9.6	Runoff
Outfall-South	proposed	183.0	40.1	5.2	Runoff
Outfall East	proposed	729.5	147.1	7.3	Runoff

3. Peak flowrates and volumes computed using HEC-HMS.
4. Velocities for Outfalls East, West, and South taken from HEC-RAS model of Cibolo Creek for the 25-year storm event.

5 ANALYSIS OF EXISTING AND PROPOSED CONDITIONS

30 TAC §330.305(f) and §330.307

The tables below provide a comparison of the 25 and 100-year peak flow rates at each outfall. All of the proposed values are lower than the existing values due to the detention and retention effects of the proposed pond on the south side of the landfill.

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	existing	322.7	67.2	2.9	runoff
	proposed	291.2	60.7	2.5	
	difference %	*-10%*	*-10%*	*-1.4%*	
Outfall West	existing	179.3	27.7	9.6	runoff
	proposed	112.5	13.9	9.6	
	difference %	*-37%*	*-50%*	*0%*	
Outfall South	existing	209.0	40.2	5.2	runoff
	proposed	183.0	40.1	5.2	
	difference %	-13%	-0%	*0%*	
Outfall East	existing	739.5	151.0	7.3	runoff
	proposed	729.5	147.1	7.3	
	difference %	*-1%*	*-3%*	*0%*	

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls West, South, and East taken from 25 Year HEC-RAS model of Cibolo Creek and represent the velocity in the creek at the discharge location.

100 Year Return Period

Reach Summary		Q100 (cfs)	Vol100 (ac-ft)	Vel100 (fps)	Runoff/on
Outfall North	existing	491.1	102.4	3.3	runoff
	proposed	431.4	90.7	2.8	
	difference %	*-12%*	*-12%*	*-1.4%*	
Outfall West	existing	281.9	43.6	12.2	runoff
	proposed	165.7	20.8	12.2	
	difference %	*-41%*	*-52%*	*0%*	
Outfall South	existing	329.8	63.4	7.0	runoff
	proposed	267.1	72.7	7.0	
	difference %	-19%	15%	*0%*	
Outfall East	existing	1,146.8	234.4	7.3	runoff
	proposed	1075.8	232.8	7.3	
	difference %	*-6%*	*-1%*	*0%*	

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls West, South, and East taken from HEC-RAS model of Cibolo Creek and represent the velocity in the creek at the discharge location.

The proposed drainage system for the Beck Landfill will consist of drainage benches, berms, downchutes, perimeter ditches, detention ponds and outlet structures.

The facility has been designed to prevent discharge of pollutants into waters of the state or waters of the United States, as defined by the Texas Water Code and the Federal Clean Water Act, respectively. Beck Landfill will receive authorization from the TCEQ to discharge stormwater runoff consistent with Texas Pollutant Discharge Elimination System General Permit No. TXR050000 relating to stormwater discharges associated with industrial activity. Landfills are authorized under the General Permit. This stormwater permit must remain in effect throughout the active life of the facility and will contain limitations on stormwater discharge parameters.

5.1 Perimeter Drainage System Design

The perimeter drainage system is designed to convey the 25-year runoff from the developed landfill consistent with TCEQ regulations. In addition, the perimeter berms have been designed to convey the runoff from a 100-year rainfall event. The perimeter channel system design calculations are referenced in Appendix C1-D. The perimeter drainage structure plans are included in Attachment C3.

The detention pond is designed to provide the necessary storage and outlet control to mitigate impacts to the receiving channels downstream of Beck Landfill. Detention pond design parameters are included in the hydrologic modeling for post-developed conditions in Appendix C1-C. The detention pond details are shown in Attachment C3. The detention pond outlet structures are designed as energy dissipaters to reduce the velocity and turbulence of the flow leaving the detention ponds.

5.2 Final Cover Drainage Structure Design

Stormwater runoff will be collected via berms and benches located near the upper grade break on the landfill and on the 4:1 (horizontal to vertical) side slopes, leading to drainage letdown structures or downchutes and to the perimeter drainage system. The perimeter drainage system will be constructed as the landfill is developed.

The final cover drainage system benches and downchutes are designed to convey the 25-year peak flow rate. These benches, channels, and downchutes will also reduce maintenance at the site after closure by minimizing erosion. The final cover erosion control design calculations are included in Appendix C1-E. The final cover design, showing the locations of the drainage benches, downchutes, and final cover drainage structure details, is illustrated in Appendix C1-E.

The downchute/letdown structures are designed to convey the 25-year, 24-hour peak flow rate. The downchutes are designed using Maccaferri gabion mattresses, rock riprap, geomembranes, or articulating concrete blocks to minimize erosive conditions along the downchute and at bench/downchute confluences. The downchute structures convey stormwater into Cibolo Creek or directly into the detention pond. The downchute structures are designed using concrete, Maccaferri gabion mattresses, rock riprap, geomembranes, or articulating concrete blocks to provide erosion protection at the downchute/creek confluence and where downchutes convey stormwater directly into the detention pond. The downchute design calculations are included in Appendix C1-E. Final cover drainage system details, including the downchute details, are shown in Attachment C3.

6 EROSION AND SEDIMENTATION CONTROL

30 TAC §330.305(f) and §330.307

6.1 Final Cover Stormwater System Control Plan

Perimeter drainage channels and the detention pond will be constructed as the subsequent phased development of the landfill progresses. Erosion will be minimized in these structures by establishment of vegetation or with rock riprap, gabions, or other materials as provided for in the drainage design calculations for these permanent structures as found in Appendix C1-E Final Cover Drainage Structure Design.

Berms, benches, and chutes will be constructed upon placement of the final cover. The final cover includes an erosion layer that is a minimum of 6 inches of earthen material capable of sustaining native plant life and will be seeded with native and introduced grasses immediately following the application of final cover in order to minimize erosion. A soil loss demonstration for the erosion layer is included in Appendix C1-E of this attachment. The benches and chutes include establishment of vegetation, Maccaferri gabion mattress, and other materials as provided in the drainage calculations for these permanent structures.

6.2 Final Cover Stormwater System Maintenance Plan

Beck Landfill will inspect, restore, and repair constructed permanent stormwater systems such as channels, drainage benches, chutes, and flood control structures in the event of washout or failure from extreme storm events. Excessive sediment will be removed, as needed, so that the drainage structures, such as the perimeter channels and detention pond, function as designed. Site inspections by landfill personnel will be performed weekly or within 48 hours of a rainfall event of 0.5 inches or more. The time frame for correction of damaged or deficient items under normal conditions will be within five working days after the inspection identifying these items. Normal conditions are weather, ground and other site-specific conditions that do not impede access to the item, result in additional damage to the site attempting to access or repair the item, or risk equipment or personnel safety. Documentation of the inspection will be included in the site operating record.

The following items will be evaluated during the inspections:

- Erosion of final cover areas, perimeter ditches, chutes, benches, detention pond, berms, and other drainage features
- Settlement of final cover areas, perimeter ditches, chutes, benches, and other drainage features
- Silt and sediment build-up in perimeter ditches, chutes, benches, and the detention pond
- Obstructions in drainage features

- Presence of erosion or sediment discharge at perimeter stormwater discharge locations
- Presence of sediment discharges along the site boundary in areas that have been disturbed by site activities
- Maintenance activities will be performed to correct damaged or deficient items noted during the site inspections. These activities will be performed as soon as reasonably possible after the inspection. The time frame for correction of damaged or deficient items will vary based on weather, ground conditions, and other site-specific conditions.
- Maintenance activities will consist of the following, as needed:
    - Placement of additional temporary or permanent vegetation
    - Placement, grading, and stabilization of additional soils in eroded areas or in areas that have experienced settlement
    - Replacement of Maccaferri gabion mattresses or other structural lining
    - Placement of additional Maccaferri gabion mattresses in eroded areas or in areas that have experienced settlement
    - Removal of obstructions from drainage features
    - Removal of silt and sediment build-up from drainage features
    - Repairs to erosion and sedimentation controls
    - Installation of additional erosion and sedimentation controls

6.3 Intermediate Cover Erosion and Sedimentation Control Plan

Erosion and sediment controls have been designed for the intermediate cover phase of landfill development. The intermediate cover erosion and sedimentation control plan includes temporary structures and establishment of vegetation to minimize erosion of the intermediate cover and documentation requirements. Refer to Appendix C1-F-Intermediate Cover Erosion and Sedimentation Control Plan, and Appendix C1-G-Intermediate Cover Erosion Control Structure Design. Details for the interim drainage and sedimentation controls are included in Appendix C-3.

6.4 Operations Cover Erosion and Sedimentation Control Plan

Erosion and sediment controls for the operational cover phase of landfill development will be consistent with the requirements of Part IV-Site Operating Plan, Landfill Cover. Operational cover will be placed over all solid waste at the end of each operating week as required by Part IV, Section Landfill Cover. The operational cover will be sloped to drain. Runoff from areas that have intact operational cover constructed of a well-compacted earthen material is considered uncontaminated stormwater runoff. Erosion and sediment controls for operational cover will include the following procedures:

- Areas with operational cover will be inspected daily for erosion that may cause contaminated runoff from the daily cover.
- After each rainfall event, all operational cover areas will be inspected for erosion or other damage and repaired as necessary. Runoff from damaged or eroded areas will be handled as contaminated water until repairs are completed.
- Erosion and sediment controls will be implemented within operational cover areas, including compaction of operational cover to minimize infiltration of stormwater.
- Should erosion of operational cover be observed, the operational cover will be replaced so that no solid waste is exposed at the end of the operating day. In the event that additional soil stabilization or erosion control measures are deemed necessary, one or more of the following measures will be constructed: temporary sediment control fence, silt fence, swales, or filter berms.

7 EXISTING AND POST-DEVELOPMENT COMPARISON

30 TAC §330.305(f) and §330.307

Consistent with 30 TAC §330.63(c)(1)(D)(iii) and §330.305(a), the proposed facility development will not adversely alter existing drainage patterns. Refer to Appendix C1-A for a summary of the existing conditions, post-developed conditions, and a comparison of the peak flow rate, volume, and velocity for each comparison point evaluated. Comparisons are provided for the 25-year and 100-year, 24-hour rainfall events. The comparison points established in the existing condition evaluation remain unchanged in the post-developed condition.

Drawing C1-1 - Existing Drainage Area Map: This drawing depicts the existing locations (comparison points) where surface water enters or exits the facility and property boundaries. Each comparison point is shown on the drawing and the peak flow rate, runoff volume, and runoff velocity is provided for each runoff comparison point.

Drawing C1-2 – Proposed Drainage Map: This drawing depicts the existing locations (comparison points) where surface water enters or exits the facility and property boundaries. Each comparison point is shown on the drawing and the peak flow rate, runoff volume, and runoff velocity is provided for each runoff comparison point.

A table comparing the existing condition runoff summary and the post-developed runoff summary is provided in Section 5 of this Attachment. The existing condition and post-developed peak flow rate, runoff volume, and velocity at each comparison point for both the 25- and 100-year, 24-hour rainfall event is provided. The difference, if any, between the existing and post-developed runoff results is also provided in the table.

Given that: (1) drainage from the permit boundary and/or property boundary does not significantly adversely alter the peak flow rates, velocities, or runoff volumes at the facility and property boundaries and receiving channels, and (2) the stormwater discharge outfalls are consistent with the existing site configuration, it is concluded that the proposed landfill development will not adversely alter existing drainage patterns consistent with §330.305(a).

8 CONCLUSIONS

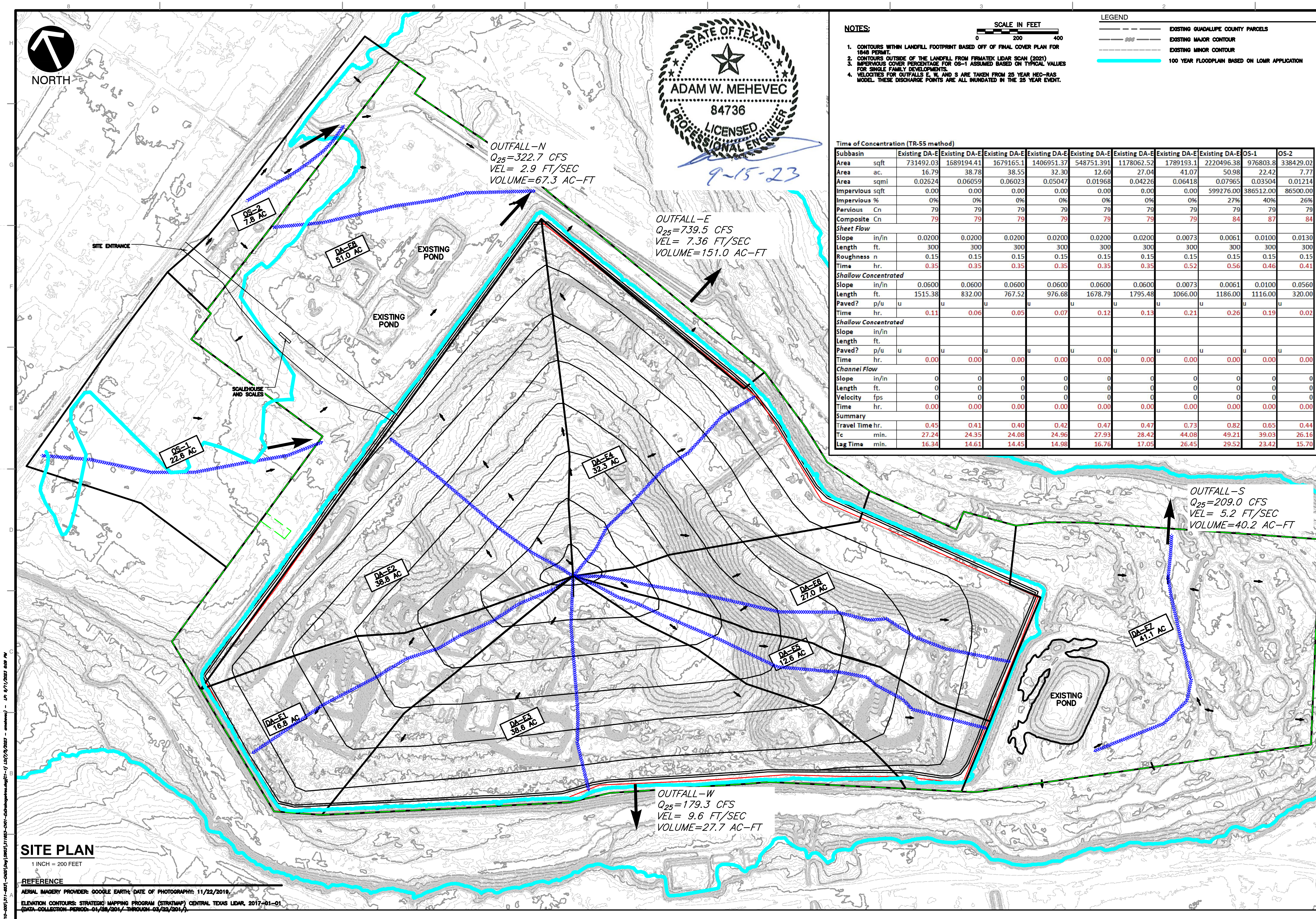
30 TAC §330.305(f) and §330.307

The following conclusions summarize the results of the drainage analysis and design:

- The drainage design criteria and analyses used for these drainage calculations meet and exceed the requirements of 30 TAC Chapter 330.
- The final cover drainage structures (berms, benches, chutes) are designed in accordance with the rules to convey peak flow rates from the 25-year rainfall event.
- Perimeter channels are designed in accordance with the rules for the 25-year rainfall event and will also accommodate the peak flow rate from the 100-year rainfall event.
- Detention pond capacities and outlets are designed in accordance with the rules for the 25-year rainfall event, will also accommodate the peak runoff from the 100-year rainfall event.
- Erosion will be minimized by using Best Management Practices.
- The proposed landfill development will not significantly adversely alter existing drainage patterns at the facility and property boundaries.

BECK LANDFILL
APPENDIX C1-A
FACILITY SURFACE WATER DRAINAGE REPORT
EXISTING/POST-DEVELOPMENT COMPARISON

Includes pages C1-A-1 through C1-A-6



SITE PLAN

1 INCH = 200 FEET

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/2017 THROUGH 03/22/2017).

NOTES:

SCALE IN FEET: 0, 200, 400

1. CONTOURS WITHIN LANDFILL FOOTPRINT BASED OFF OF FINAL COVER PLAN FOR 1848 PERMIT.
2. CONTOURS OUTSIDE OF THE LANDFILL FROM FIRMATEK LIDAR SCAN (2021)
3. IMPERVIOUS COVER PERCENTAGE FOR OS-1 ASSUMED BASED ON TYPICAL VALUES FOR SINGLE FAMILY DEVELOPMENTS.
4. VELOCITIES FOR OUTFALLS E, W, AND S ARE TAKEN FROM 25 YEAR HEC-RAS MODEL. THESE DISCHARGE POINTS ARE ALL INUNDATED IN THE 25 YEAR EVENT.

LEGEND

- EXISTING GUADALUPE COUNTY PARCELS
- 996 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 100 YEAR FLOODPLAIN BASED ON LOMR APPLICATION

Time of Concentration (TR-55 method)

Subbasin		Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	OS-1	OS-2
Area	sqft	731492.03	1689194.41	1679165.1	1406951.37	548751.391	1178062.52	1789193.1	2220496.38	976803.8	338429.02
Area	ac.	16.79	38.78	38.55	32.30	12.60	27.04	41.07	50.98	22.42	7.77
Area	sqmi	0.02624	0.06059	0.06023	0.05047	0.01968	0.04226	0.06418	0.07965	0.03504	0.01214
Impervious	sqft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	599276.00	386512.00	86500.00
Impervious	%	0%	0%	0%	0%	0%	0%	0%	27%	40%	26%
Pervious	Cn	79	79	79	79	79	79	79	79	79	79
Composite	Cn	79	79	79	79	79	79	79	84	87	84
Sheet Flow											
Slope	in/in	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0073	0.0061	0.0100	0.0130
Length	ft.	300	300	300	300	300	300	300	300	300	300
Roughness	n	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Time	hr.	0.35	0.35	0.35	0.35	0.35	0.35	0.52	0.56	0.46	0.41
Shallow Concentrated											
Slope	in/in	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0073	0.0061	0.0100	0.0560
Length	ft.	1515.38	832.00	767.52	976.68	1678.79	1795.48	1066.00	1186.00	1116.00	320.00
Paved?	p/u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.11	0.06	0.05	0.07	0.12	0.13	0.21	0.26	0.19	0.02
Shallow Concentrated											
Slope	in/in										
Length	ft.										
Paved?	p/u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Channel Flow											
Slope	in/in	0	0	0	0	0	0	0	0	0	0
Length	ft.	0	0	0	0	0	0	0	0	0	0
Velocity	fps	0	0	0	0	0	0	0	0	0	0
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Summary											
Travel Time	hr.	0.45	0.41	0.40	0.42	0.47	0.47	0.73	0.82	0.65	0.44
Tc	min.	27.24	24.35	24.08	24.96	27.93	28.42	44.08	49.21	39.03	26.16
Lag Time	min.	16.34	14.61	14.45	14.98	16.76	17.05	26.45	29.52	23.42	15.70

REVISION RECORD

NO	DATE	DESCRIPTION
1	07/05/2023	TECH NOD 3
2	09/15/2023	NOD 4 RESPONSE

Texas Registered Engineering Firm F-38
Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

EXISTING DRAINAGE AREA MAP

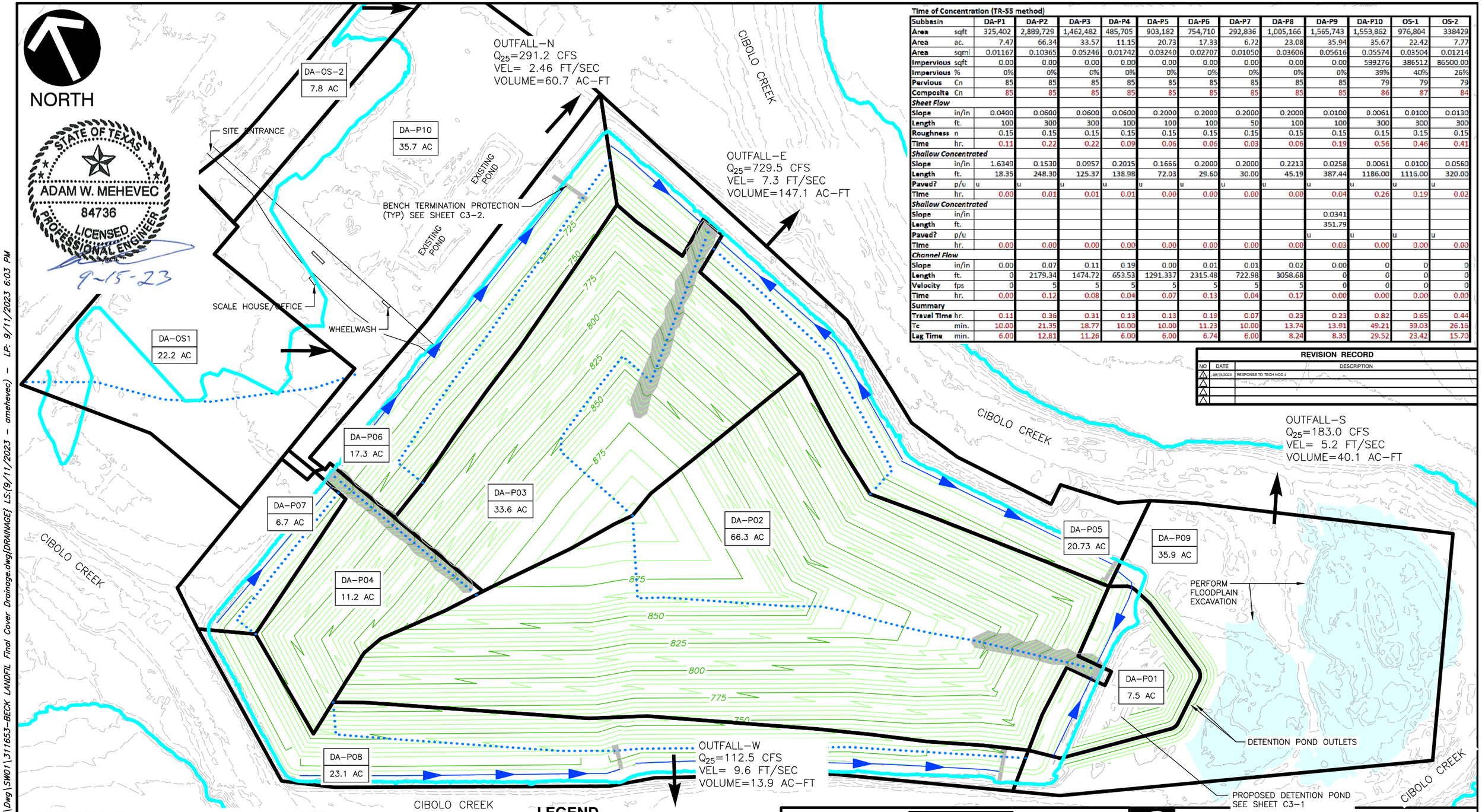
DATE:	7/5/2023	DRAWN BY:	SP
DWG SCALE:	1" = 200'	CHECKED BY:	JCM
PROJECT NO:	311-653.SITE		
APPROVED BY:	AWM		

DRAWING NO.: **C1-1**

25 Year Storm Existing Condition Runoff Summary

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	existing	322.7	67.2	2.9	Runoff
Outfall West	existing	179.3	27.7	9.6	Runoff
Outfall-South	existing	209.0	40.2	5.2	Runoff
Outfall East	existing	739.5	151.0	7.3	Runoff

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls East, West, and South taken from 25 Year HEC-RAS model of Cibolo Creek.



STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED PROFESSIONAL ENGINEER
9-15-23

Time of Concentration (TR-55 method)

Subbasin		DA-P1	DA-P2	DA-P3	DA-P4	DA-P5	DA-P6	DA-P7	DA-P8	DA-P9	DA-P10	OS-1	OS-2
Area	sqft	325,402	2,889,729	1,462,482	485,705	903,182	754,710	292,836	1,005,166	1,565,743	1,553,862	976,804	338429
Area	ac.	7.47	66.34	33.57	11.15	20.73	17.33	6.72	23.08	35.94	35.67	22.42	7.77
Area	sqmi	0.01167	0.10365	0.05246	0.01742	0.03240	0.02707	0.01050	0.03606	0.05616	0.05574	0.03504	0.01214
Impervious	sqft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	599276	386512	86500.00
Impervious	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	39%	40%	26%
Pervious	Cn	85	85	85	85	85	85	85	85	85	79	79	79
Composite	Cn	85	85	85	85	85	85	85	85	85	86	87	84
Sheet Flow													
Slope	in/in	0.0400	0.0600	0.0600	0.0600	0.2000	0.2000	0.2000	0.2000	0.0100	0.0061	0.0100	0.0130
Length	ft.	100	300	300	100	100	100	50	100	100	300	300	300
Roughness	n	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Time	hr.	0.11	0.22	0.22	0.09	0.06	0.06	0.03	0.06	0.19	0.56	0.46	0.41
Shallow Concentrated													
Slope	in/in	1.6349	0.1530	0.0957	0.2015	0.1666	0.2000	0.2000	0.2213	0.0258	0.0061	0.0100	0.0560
Length	ft.	18.35	248.30	125.37	138.98	72.03	29.60	30.00	45.19	387.44	1186.00	1116.00	320.00
Paved?	p/u	u	u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.04	0.26	0.19	0.02
Shallow Concentrated													
Slope	in/in									0.0341			
Length	ft.									351.79			
Paved?	p/u									u	u	u	u
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Channel Flow													
Slope	in/in	0.00	0.07	0.11	0.19	0.00	0.01	0.01	0.02	0.00	0	0	0
Length	ft.	0	2179.34	1474.72	653.53	1291.337	2315.48	722.98	3058.68	0	0	0	0
Velocity	fps	0	5	5	5	5	5	5	5	0	0	0	0
Time	hr.	0.00	0.12	0.08	0.04	0.07	0.13	0.04	0.17	0.00	0.00	0.00	0.00
Summary													
Travel Time	hr.	0.11	0.36	0.31	0.13	0.13	0.19	0.07	0.23	0.23	0.82	0.65	0.44
Tc	min.	10.00	21.35	18.77	10.00	10.00	11.23	10.00	13.74	13.91	49.21	39.03	26.16
Lag Time	min.	6.00	12.81	11.26	6.00	6.00	6.74	6.00	8.24	8.35	29.52	23.42	15.70

REVISION RECORD

NO	DATE	DESCRIPTION
1	09/15/2023	RESPONSE TO TECH NOD 4

REFERENCE

TOPOGRAPHIC INFORMATION FROM AERIAL SURVEY BY FIRMATEK: (SEPTEMBER 15, 2021) AUGMENTED WITH A PORTION OF THE EXISTING GROUND SURFACE PREPARED BY CEC.

SCALE IN FEET

0 400 800

NOTES

1. VELOCITIES AT OUTFALLS W, S, AND E TAKEN FROM CALCULATED FLOW VELOCITY OF CIBOLO CREEK IN HEC–RAS FLOODPLAIN MODELING. VELOCITIES INTERPOLATED BETWEEN 10 YEAR AND 50 YEAR EVENTS.
2. VELOCITY FOR OUTFALL–N ASSUMES 20' WIDE GRASS CHANNEL AT 0.1% SLOPE.
3. PERIMETER DITCHES SHOWN MAY BE MODIFIED TO MATCH FIELD CONDITIONS AT TIME OF CLOSURE.

LEGEND

- PROPOSED DRAINAGE AREAS
- TIME OF CONCENTRATION LINE
- DA–P10 / 41.8 AC — DRAINAGE AREA DESIGNATION / DRAINAGE AREA ACREAGE
- 100 YEAR FLOODPLAIN BASED ON LOMR APPLICATION
- TYPICAL DRAINAGE DITCH

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BEXAR COUNTY, TEXAS

PROPOSED DRAINAGE MAP

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM	FIGURE NO.:
DATE:	03/07/2022	DWG SCALE:	1" = 400'	PROJECT NO:	311-653	C1-2

P:\310-000\311-653\-CADD\Dwg\SW01\311653-BECK LANDFIL Final Cover Drainage.dwg{DRAINAGE} LS:(9/11/2023 - amehevec) - LP: 9/11/2023 6:03 PM

25 Year Storm Post-Developed Condition Runoff Summary

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	proposed	291.2	60.7	2.5	Runoff
Outfall West	proposed	112.5	13.9	9.6	Runoff
Outfall-South	proposed	183.0	40.1	5.2	Runoff
Outfall East	proposed	729.5	147.1	7.3	Runoff

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls East, West, and South taken from 25- Year HEC-RAS model of Cibolo Creek.

Existing/Post-Developed Drainage Analysis Summary Tables

25 Year Return Period

Reach Summary		Q25 (cfs)	Vol25 (ac-ft)	Vel25 (fps)	Runoff/on
Outfall North	existing	322.7	67.2	2.9	runoff
	proposed	291.2	60.7	2.5	
	difference %	*-10%*	*-10%*	*-1.4%*	
Outfall West	existing	179.3	27.7	9.6	runoff
	proposed	112.5	13.9	9.6	
	difference %	*-37%*	*-50%*	*0%*	
Outfall South	existing	209.9	40.2	5.2	runoff
	proposed	183.0	40.1	5.2	
	difference %	-13%	-0%	*0%*	
Outfall East	existing	739.5	151.0	7.3	runoff
	proposed	729.5	147.1	7.3	
	difference %	*-1%*	*-3%*	*0%*	

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls West, South, and East taken from 25 Year HEC-RAS model of Cibolo Creek and represent the velocity in the creek at the discharge location.

100 Year Return Period

Reach Summary		Q100 (cfs)	Vol100 (ac-ft)	Vel100 (fps)	Runoff/on
Outfall North	existing	491.1	102.4	3.3	runoff
	proposed	431.4	90.7	2.8	
	difference %	*-12%*	*-12%*	*-1.4%*	
Outfall West	existing	281.9	43.6	12.2	runoff
	proposed	165.7	20.8	12.2	
	difference %	*-41%*	*-52%*	*0%*	
Outfall South	existing	329.8	63.4	7.0	runoff
	proposed	267.1	72.7	7.0	
	difference %	-19%	15%	*0%*	
Outfall East	existing	1,146.8	234.4	7.3	runoff
	proposed	1075.8	232.8	7.3	
	difference %	*-6%*	*-1%*	*0%*	

1. Peak flowrates and volumes computed using HEC-HMS.
2. Velocities for Outfalls West, South, and East taken from the 100-year HEC-RAS model of Cibolo Creek and represent the velocity in the creek at the discharge location.

BECK LANDFILL

APPENDIX C1-B
FACILITY SURFACE WATER DRAINAGE REPORT
EXISTING CONDITION HYDROLOGIC CALCULATIONS

Includes pages C1-B-1 through C1-B-14

EXISTING CONDITION NARRATIVE

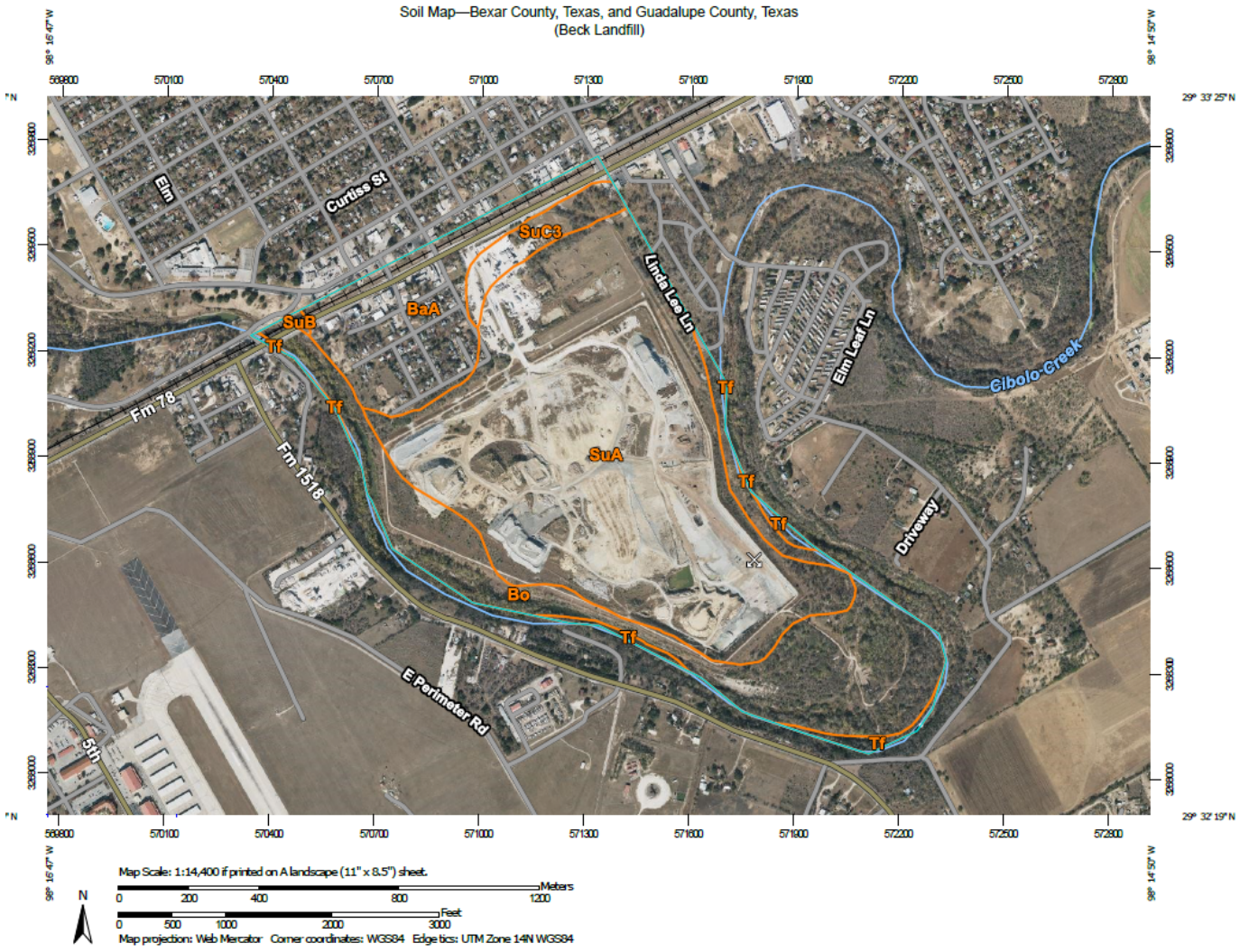
30 TAC §330.305

This existing condition site evaluation represents the hydrologic calculations for Beck Landfill, in accordance with §330.305.

EXISTING CONDITION DRAINAGE AREA DRAWINGS

The existing condition drainage area maps depict the Beck Landfill property, facility boundary, and surrounding contributing areas. These maps reflect each individual drainage area, peak runoff, velocity, and volume for the 25-year rainfall event. Further, the existing condition runoff summary provides the peak flow rate, volume, and velocity at each comparison point along the property boundary. Offsite drainage areas are designated by the prefix "DA". Refer to Drawing C1-1 for the existing condition offsite drainage areas map.

The figure below is a soils map that depicts Beck Landfill drainage areas and the existing soil types. The Soil Survey of Guadalupe County, Texas, published by the Natural Resource Conservation Service is the reference for the base map and soils information. Based on the soils types, most of the soils surrounding the landfill are Hydrologic Group B. The map unit legend following the soils map list the various soil types within the contributing drainage area.



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/27/2022
Page 1 of 3

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Tf	Tinn and Frio soils, 0 to 1 percent slopes, frequently flooded	6.5	1.8%
Subtotals for Soil Survey Area		**6.5**	**1.8%**
Totals for Area of Interest		**370.5**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BaA	Barbarosa silty clay, 0 to 1 percent slopes	50.2	13.5%
Bo	Bosque and Seguin soils, frequently flooded	90.0	24.3%
SuA	Sunev loam, 0 to 1 percent slopes	210.8	56.9%
SuB	Sunev loam, 1 to 3 percent slopes	0.6	0.2%
SuC3	Sunev loam, 3 to 5 percent slopes, eroded	12.3	3.3%
Subtotals for Soil Survey Area		**364.0**	**98.2%**
Totals for Area of Interest		**370.5**	**100.0%**

WATERSHED CHARACTERISTICS

Watershed characteristics have been developed for the existing condition hydrologic evaluation. The watershed characteristics address drainage area runoff characteristics, unit hydrograph data, and reach characteristics.

The Existing Condition Watershed Characteristics, provides the summary of drainage areas, soil types, Curve Numbers (CN) values, initial loss, reach slope calculations, and determination of Manning's "n" values. The Soil Conservation Service (NRCS) CN were derived from watershed characteristic tables from the Urban Hydrology for Small Watersheds, Technical Report 55 (TR-55), which included evaluation of soil and surface cover/condition characteristics.

RAINFALL DATA

The rainfall depth, duration, and frequency relationships for the storm event for the facility was taken from the 2018 NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11, Version 2.0: Texas. Return periods of 25 and 100 years and a duration of 24 hours were used for the design storms. The synthetic rainfall distribution is the NRCS 24-hour Type III storm. The Depth-Duration Frequency rainfall depths for the facility located in Guadalupe County, Texas are 8.56” for the 25-year storm event and 12.2” for the 100-year storm event. The maximum Tc for the model is sub-basins DA-E8 with 49.21 minutes and the minimum for is DA-E3 with 24.1 minutes.

HEC-HMS SCHEMATIC

The schematic for the HEC-HMS model is included in the appendix to this section. The schematic provides the hydrologic element number and routing used for evaluating the existing condition in HEC-HMS.

HYDROLOGIC ANALYSIS

For the hydrologic evaluation, HEC-HMS version 4.11 was used for the precipitation-runoff simulation for the existing condition.

Watershed Subareas and Schematization

The drainage areas that contribute flow to Beck Landfill were delineated into subareas to derive peak flows to determine existing entering and exiting flows. Hydrographs are developed for each subarea and appropriately combined and routed through existing surface drainage features. The subareas are shown on Drawings C1-1 and C1-2 - Existing Condition Offsite Drainage Areas.

Time Step

The time step, or the program computation interval, selected for the analysis is 1 minute, which results in 1,440 hydrograph ordinates in 24 hours.

Hypothetical Precipitation

Return periods of 25 and 100 years and duration of 24 hours were used for the design storms. The precipitation is assumed to be evenly distributed over the entire basin for each time interval.

Precipitation Losses

Precipitation losses (the precipitation which does not contribute to the runoff) are calculated using the Soil Conservation Service (NRCS) Curve Number (CN) method. CN is a function of soil cover, land use, and antecedent moisture conditions. The CN values used for each drainage area are shown in the Watershed Characteristics tables.

Synthetic Unit Hydrographs and Routing

The rainfall/runoff transformation was performed with the NRCS method. The parameters and input values for this model are included in the Watershed Characteristics tables.

The Lag Method was used for routing flow through the existing drainage channels. A minimum 6-minute lag time was used to reflect a minimum 10 minute time of concentration.

EXISTING CONDITION FLOW SUMMARY

The existing condition flow summary table lists the peak flow rate and volume of runoff for each drainage area for the 25- and 100-year rainfall event. This table summarizes the results of the hydrologic evaluation.

EXISTING CONDITION VELOCITY SUMMARY

Surface water velocities were determined for each discharge point where the surface water exits the facility boundary. For Outfalls West, South, and East, which discharge directly into Cibolo Creek, the calculated 25-year flow velocity of the creek from the HEC-RAS model was used for both existing and proposed conditions. For Outfall North, the 25- and 100-year, 24-hour peak flow rates were used to determine the velocity at the drainage area boundary. Manning's Equation via the Flowmaster software was used to evaluate the velocities. Refer to the appendix to this report section for the existing condition velocity calculations.

EXISTING CONDITION DRAINAGE ANALYSIS SUMMARY

The analysis summary for the existing condition for each comparison point (Outfall-W, Outfall-S, Outfall-N, and Outfall-E) the peak flow rate, velocity, and volume resulting from the HEC-HMS evaluation for the 25- and 100-year, 24 hour rainfall is shown in the appendix to this report section.

WATERSHED CHARACTERISTICS

The curve numbers (Cn) used in the HEC-HMS model for non-landfill and the existing condition landfill were taken from Table 4-18 in the TxDOT Hydraulic *Design Manual,* September 2019. The curve numbers assume Hydrologic Soil Group B and Poor Condition grass coverage. See Table 4-18 below. The Cn for the proposed landfill was taken from the TCEQ Surface Water Drainage and Erosional Stability Guidelines for a Municipal Solid Waste Landfills Section 1.4.3, which recommends a range between 85 and 90 for the landfill final cover. Since the soils surrounding the Beck Landfill are predominately Hydrologic Group B and there is no synthetic component to the final cover to limit infiltration, a Curve Number of 85 was selected. The table below summarizes the selected Curve Numbers.

Cn Values Selected	
Offsite and Onsite Areas Outside of Landfill Footprint and Existing Landfill Final Cover	79
Area Within Landfill Footprint Affected by Vertical Expansion	85

Note: Curve numbers were adjusted to account for impervious cover within drainage area. Impervious areas were assigned a Cn of 98.

Table 4-18: Runoff Curve Numbers For Urban Areas

Cover type and hydrologic condition	Average percent impervious area	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Notes: Values are for average runoff condition, and $I_a = 0.2S$. The average percent impervious area shown was used to develop the composite CNs. Other assumptions are: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.					
Cover type and hydrologic condition	**Average percent impervious area**	**A**	**B**	**C**	**D**
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm drains (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-in. sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas: Newly graded areas (pervious area only, no vegetation)		77	86	91	94
Notes: Values are for average runoff condition, and $I_a = 0.2S$. The average percent impervious area shown was used to develop the composite CNs. Other assumptions are: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.					

RAINFALL DATA

NOAA Atlas 14, Volume 11, Version 2
Location name: Schertz, Texas, USA*
Latitude: 29.5483°, Longitude: -98.2639°
Elevation: 706.71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.443 (0.336-0.585)	0.524 (0.400-0.684)	0.655 (0.499-0.860)	0.765 (0.574-1.02)	0.918 (0.667-1.26)	1.04 (0.733-1.46)	1.16 (0.798-1.68)	1.29 (0.864-1.91)	1.46 (0.949-2.25)	1.60 (1.01-2.53)
10-min	0.705 (0.534-0.931)	0.835 (0.637-1.09)	1.05 (0.796-1.37)	1.22 (0.918-1.63)	1.47 (1.07-2.02)	1.66 (1.18-2.35)	1.86 (1.28-2.69)	2.05 (1.38-3.05)	2.31 (1.50-3.55)	2.50 (1.58-3.95)
15-min	0.902 (0.683-1.19)	1.06 (0.808-1.38)	1.32 (1.00-1.73)	1.53 (1.15-2.04)	1.83 (1.33-2.51)	2.06 (1.46-2.90)	2.29 (1.58-3.33)	2.54 (1.71-3.78)	2.88 (1.87-4.44)	3.15 (1.99-4.98)
30-min	1.27 (0.962-1.68)	1.49 (1.14-1.95)	1.84 (1.40-2.42)	2.14 (1.60-2.85)	2.54 (1.84-3.48)	2.85 (2.02-4.02)	3.17 (2.19-4.60)	3.53 (2.37-5.25)	4.03 (2.62-6.21)	4.43 (2.80-7.00)
60-min	1.64 (1.24-2.16)	1.93 (1.48-2.52)	2.42 (1.84-3.17)	2.82 (2.12-3.76)	3.39 (2.45-4.63)	3.81 (2.69-5.37)	4.27 (2.94-6.19)	4.78 (3.22-7.12)	5.53 (3.59-8.53)	6.14 (3.89-9.70)
2-hr	1.95 (1.48-2.56)	2.38 (1.81-3.05)	3.04 (2.32-3.95)	3.62 (2.73-4.80)	4.46 (3.26-6.09)	5.14 (3.65-7.21)	5.88 (4.07-8.48)	6.73 (4.54-9.96)	7.98 (5.20-12.3)	9.03 (5.74-14.2)
3-hr	2.11 (1.61-2.76)	2.64 (1.99-3.33)	3.42 (2.61-4.42)	4.13 (3.12-5.45)	5.18 (3.79-7.05)	6.05 (4.31-8.47)	7.02 (4.87-10.1)	8.14 (5.50-12.0)	9.80 (6.40-15.0)	11.2 (7.13-17.5)
6-hr	2.40 (1.84-3.12)	3.08 (2.32-3.83)	4.06 (3.11-5.21)	4.98 (3.79-6.54)	6.38 (4.70-8.65)	7.57 (5.43-10.6)	8.92 (6.22-12.8)	10.5 (7.12-15.4)	12.8 (8.42-19.6)	14.8 (9.49-23.1)
12-hr	2.71 (2.09-3.50)	3.52 (2.65-4.32)	4.67 (3.60-5.95)	5.77 (4.41-7.53)	7.46 (5.53-10.1)	8.91 (6.43-12.4)	10.6 (7.42-15.0)	12.6 (8.55-18.3)	15.6 (10.2-23.6)	18.1 (11.6-28.1)
24-hr	3.05 (2.36-3.91)	3.99 (3.01-4.85)	5.31 (4.11-6.73)	6.60 (5.06-8.55)	8.56 (6.38-11.5)	10.3 (7.44-14.2)	12.2 (8.61-17.3)	14.6 (9.96-21.1)	18.2 (12.0-27.3)	21.2 (13.7-32.7)
2-day	3.46 (2.70-4.42)	4.54 (3.45-5.50)	6.07 (4.72-7.64)	7.54 (5.81-9.71)	9.78 (7.32-13.0)	11.7 (8.53-16.1)	14.0 (9.87-19.6)	16.6 (11.4-23.9)	20.7 (13.7-30.9)	24.1 (15.6-37.0)
3-day	3.77 (2.94-4.80)	4.93 (3.76-5.95)	6.58 (5.13-8.25)	8.15 (6.30-10.5)	10.5 (7.91-14.0)	12.6 (9.20-17.2)	15.0 (10.6-21.0)	17.7 (12.2-25.5)	21.9 (14.6-32.7)	25.5 (16.5-39.0)
4-day	4.02 (3.14-5.10)	5.22 (4.01-6.32)	6.96 (5.45-8.71)	8.60 (6.67-11.0)	11.1 (8.33-14.7)	13.2 (9.65-18.0)	15.6 (11.1-21.8)	18.5 (12.7-26.4)	22.7 (15.1-33.7)	26.3 (17.0-40.0)
7-day	4.60 (3.62-5.81)	5.90 (4.57-7.15)	7.80 (6.14-9.73)	9.56 (7.44-12.2)	12.2 (9.19-16.1)	14.4 (10.6-19.5)	16.9 (12.0-23.5)	19.7 (13.7-28.1)	23.9 (16.0-35.5)	27.5 (17.9-41.7)
10-day	5.09 (4.01-6.41)	6.45 (5.03-7.83)	8.48 (6.69-10.6)	10.3 (8.06-13.1)	13.1 (9.87-17.1)	15.3 (11.3-20.7)	17.9 (12.7-24.7)	20.7 (14.4-29.5)	24.9 (16.6-36.7)	28.4 (18.5-42.9)
20-day	6.56 (5.19-8.21)	8.08 (6.40-9.88)	10.5 (8.31-13.0)	12.5 (9.81-15.8)	15.5 (11.7-20.1)	17.8 (13.1-23.9)	20.4 (14.6-28.0)	23.1 (16.1-32.8)	27.1 (18.2-39.8)	30.4 (19.9-45.8)
30-day	7.76 (6.16-9.66)	9.40 (7.51-11.5)	12.0 (9.61-14.9)	14.3 (11.2-17.9)	17.4 (13.2-22.6)	19.8 (14.6-26.5)	22.4 (16.1-30.7)	25.1 (17.6-35.4)	29.0 (19.5-42.4)	32.1 (21.0-48.1)
45-day	9.40 (7.48-11.7)	11.2 (9.04-13.8)	14.2 (11.4-17.6)	16.7 (13.2-20.9)	20.1 (15.3-26.0)	22.7 (16.8-30.2)	25.4 (18.3-34.8)	28.2 (19.8-39.7)	32.1 (21.7-46.8)	35.1 (23.1-52.5)
60-day	10.8 (8.65-13.4)	12.8 (10.4-15.8)	16.2 (13.0-19.9)	18.9 (14.9-23.6)	22.6 (17.2-29.1)	25.4 (18.8-33.6)	28.2 (20.3-38.4)	31.1 (21.8-43.6)	35.0 (23.7-50.8)	38.0 (25.0-56.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

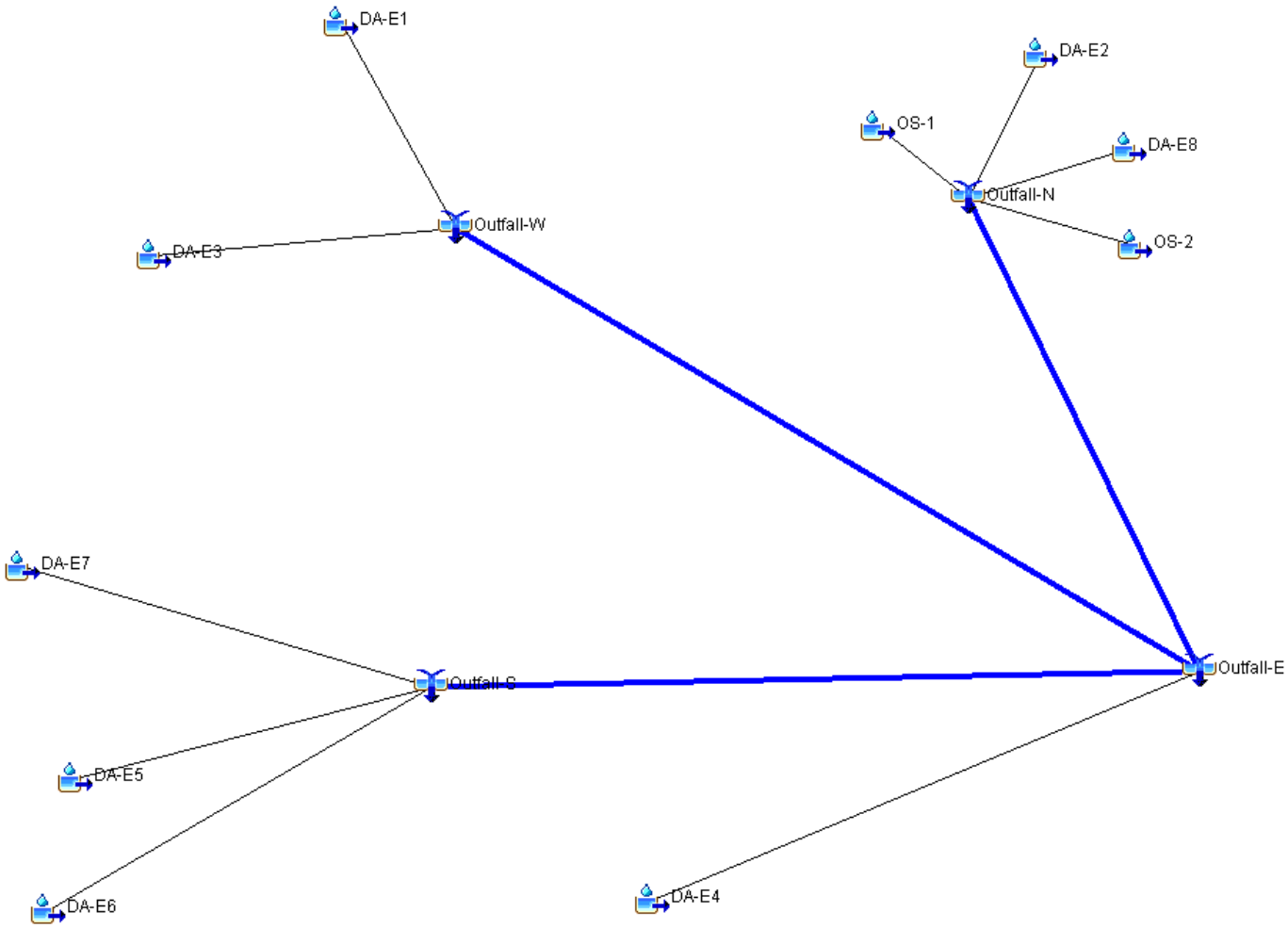
Please refer to NOAA Atlas 14 document for more information.

EXISTING CONDITIONS TIME OF CONCENTRATION TABLE C1-B-1

Time of Concentration (TR-55 method)

Subbasin		Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	Existing DA-E	OS-1	OS-2
Area	sqft	731492.03	1689194.41	1679165.1	1406951.37	548751.391	1178062.52	1789193.1	2220496.38	976803.8	338429.02
Area	ac.	16.79	38.78	38.55	32.30	12.60	27.04	41.07	50.98	22.42	7.77
Area	sqmi	0.02624	0.06059	0.06023	0.05047	0.01968	0.04226	0.06418	0.07965	0.03504	0.01214
Impervious	sqft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	599276.00	386512.00	86500.00
Impervious	%	0%	0%	0%	0%	0%	0%	0%	27%	40%	26%
Pervious	Cn	79	79	79	79	79	79	79	79	79	79
Composite	Cn	79	79	79	79	79	79	79	84	87	84
Sheet Flow											
Slope	in/in	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0073	0.0061	0.0100	0.0130
Length	ft.	300	300	300	300	300	300	300	300	300	300
Roughness	n	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Time	hr.	0.35	0.35	0.35	0.35	0.35	0.35	0.52	0.56	0.46	0.41
Shallow Concentrated											
Slope	in/in	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0073	0.0061	0.0100	0.0560
Length	ft.	1515.38	832.00	767.52	976.68	1678.79	1795.48	1066.00	1186.00	1116.00	320.00
Paved?	p/u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.11	0.06	0.05	0.07	0.12	0.13	0.21	0.26	0.19	0.02
Shallow Concentrated											
Slope	in/in										
Length	ft.										
Paved?	p/u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Channel Flow											
Slope	in/in	0	0	0	0	0	0	0	0	0	0
Length	ft.	0	0	0	0	0	0	0	0	0	0
Velocity	fps	0	0	0	0	0	0	0	0	0	0
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Summary											
Travel Time	hr.	0.45	0.41	0.40	0.42	0.47	0.47	0.73	0.82	0.65	0.44
Tc	min.	27.24	24.35	24.08	24.96	27.93	28.42	44.08	49.21	39.03	26.16
Lag Time	min.	16.34	14.61	14.45	14.98	16.76	17.05	26.45	29.52	23.42	15.70

EXISTING CONDITION HEC-HMS SCHEMATIC



HYDROLOGIC ANALYSIS

25-YEAR, TYPE III, NRCS, 24-HOUR STORM EVENT
100-YEAR, TYPE III, NRCS, 24-HOUR STORM EVENT

EXISTING CONDITION FLOW SUMMARY

25-Year Results

Project: Beck with Southern Outfall Simulation Run: EX 100-YR

Start of Run: 01Jan2001, 00:01 Basin Model: Existing Beck
End of Run: 02Jan2001, 00:02 Meteorologic Model: 100-YR
Compute Time: 08Sep2023, 16:10:10 Control Specifications: TypeIII-24Hr

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
DA-E3	0.1	200.4	1 January 2001, 10:08	30.4
DA-E1	0.0	82.5	1 January 2001, 10:10	13.2
Outfall-W	0.1	281.9	1 January 2001, 10:09	43.6
DA-E8	0.1	196.5	1 January 2001, 10:23	44.8
DA-E2	0.1	201.0	1 January 2001, 10:08	30.6
OS-1	0.0	100.1	1 January 2001, 10:16	20.2
OS-2	0.0	41.7	1 January 2001, 10:09	6.8
Outfall-N	0.2	491.1	1 January 2001, 10:12	102.4
E to N reach	0.2	491.1	1 January 2001, 10:15	102.3
DA-E7	0.1	155.5	1 January 2001, 10:20	32.2
DA-E6	0.0	129.6	1 January 2001, 10:11	21.3
DA-E5	0.0	60.9	1 January 2001, 10:10	9.9
Outfall-S	0.1	329.8	1 January 2001, 10:13	63.4
S to E	0.1	329.8	1 January 2001, 10:19	63.3
W to E Reach	0.1	281.9	1 January 2001, 10:27	43.4
DA-E4	0.1	165.1	1 January 2001, 10:09	25.4
Outfall-E	0.5	1146.8	1 January 2001, 10:20	234.4

100-Year Results

Project: Beck with Southern Outfall Simulation Run: EX 100-YR

Start of Run: 01Jan2001, 00:01 Basin Model: Existing Beck
End of Run: 02Jan2001, 00:02 Meteorologic Model: 100-YR
Compute Time: 08Sep2023, 16:10:10 Control Specifications: TypeIII-24Hr

Show Elements: All Elements Volume Units: ○ IN ◉ ACRE-FT Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
DA-E3	0.1	200.4	1 January 2001, 10:08	30.4
DA-E1	0.0	82.5	1 January 2001, 10:10	13.2
Outfall-W	0.1	281.9	1 January 2001, 10:09	43.6
DA-E8	0.1	196.5	1 January 2001, 10:23	44.8
DA-E2	0.1	201.0	1 January 2001, 10:08	30.6
OS-1	0.0	100.1	1 January 2001, 10:16	20.2
OS-2	0.0	41.7	1 January 2001, 10:09	6.8
Outfall-N	0.2	491.1	1 January 2001, 10:12	102.4
E to N reach	0.2	491.1	1 January 2001, 10:15	102.3
DA-E7	0.1	155.5	1 January 2001, 10:20	32.2
DA-E6	0.0	129.6	1 January 2001, 10:11	21.3
DA-E5	0.0	60.9	1 January 2001, 10:10	9.9
Outfall-S	0.1	329.8	1 January 2001, 10:13	63.4
S to E	0.1	329.8	1 January 2001, 10:19	63.3
W to E Reach	0.1	281.9	1 January 2001, 10:27	43.4
DA-E4	0.1	165.1	1 January 2001, 10:09	25.4
Outfall-E	0.5	1146.8	1 January 2001, 10:20	234.4

BECK LANDFILL

APPENDIX C1-C
FACILITY SURFACE WATER DRAINAGE REPORT
POST-DEVELOPMENT HYDROLOGIC CALCULATIONS

Includes pages C1-C-1 through C1-C-14

POST-DEVELOPMENT NARRATIVE

30 TAC §330.305

The post-development hydrologic analysis represents the hydrologic calculations after the proposed landfill is developed in accordance with §330.305(a)-(d).

POST-DEVELOPMENT DRAINAGE AREA DRAWINGS

The post-development drainage area drawings depict Beck Landfill facility development and the offsite drainage areas. These drawings depict the drainage areas for the facility development including the entrance facilities, storage and processing facilities, and the landfill development. Further, the post-development runoff summary provides peak discharge, volume, and velocity for the 25- and 100-year rainfall events at each comparison point along the facility and property boundary. Offsite and onsite drainage areas are designated by the prefix "DA".

WATERSHED CHARACTERISTICS

Watershed characteristics have been developed for the post-development hydrologic evaluation. The watershed characteristics address drainage area runoff characteristics, unit hydrograph data, reach characteristics, and the proposed final condition drainage system including the detention pond.

The first table, Post-development Watershed Characteristics, provides the summary of drainage areas, soil types, Curve Number (CN) values, initial loss, reach slope calculations, and determination of Manning's "n" values. The Soil Conservation Service (NRCS) CN were derived from watershed characteristic tables from the TxDOT Hydraulic *Design Manual,* September 2019, as discussed in Appendix C1-B, which included evaluation of anticipated post-development soil and surface cover/condition characteristics. The runoff characteristics for the offsite drainage areas did not change from the existing condition.

POST-DEVELOPMENT SURFACE WATER IMPOUNDMENT DESIGN PARAMETERS

This appendix to this section of the report includes pond and outlet structure data for the surface water impoundment incorporated in the hydrologic model.

HEC-HMS SCHEMATIC

The schematic for the HEC-HMS model provides the hydrologic element number and routing used for evaluating the post-development condition in HEC-HMS.

HYDROLOGIC ANALYSIS

For the hydrologic evaluation, HEC-HMS was used for the precipitation runoff simulation for the post-development condition. The following describes the various modeling components.

Watershed Subareas and Schematization

The landfill area that contributes flow to Cibolo Creek and the detention pond was delineated into sub basins to derive peak discharge and hydrographs. Hydrographs developed for each sub basin are appropriately combined and routed through the benches and perimeter channels. The sub basins are shown on Figure C1-2, and the HEC-HMS schematic of the post-development condition.

Time Step

The time step, or the program computation interval, selected for the analysis is 1 minute, which results in 1,440 hydrograph ordinates in 24 hours.

Hypothetical Precipitation

Return periods of 25, and 100 years and duration of 24 hours are used for the design storm. The rainfall distribution is the NRCS 24-hour Type III storm. The precipitation is assumed to be evenly distributed over the entire basin for each time interval.

Precipitation Losses

Precipitation losses (precipitation that does not contribute to the runoff) are calculated using the Soil Conservation Service (NRCS) Curve Number (CN) method. CN is a function of soil cover, land use, and antecedent moisture conditions. The CN values used for each drainage area are shown in the Watershed Characteristics table.

Synthetic Unit Hydrographs and Routing

The rainfall/runoff transformation was performed with the NRCS Method as described in detail in Urban Hydrology for Small Watersheds, (TR-55). The parameters and input values for this model are included in the Watershed Characteristics tables.

The Lag Method was used for routing through the existing and proposed drainage channels.

POST-DEVELOPMENT FLOW SUMMARY

The post-development flow summary table lists the peak flow rate and volume of runoff for each drainage area for the 25- and 100-year rainfall event. This table summarizes the results of the post-development hydrologic evaluation.

POST-DEVELOPMENT VELOCITY SUMMARY

Surface water velocities were determined for each discharge point where the surface water exits the facility boundary. For Outfalls West, South, and East, which discharge directly into Cibolo Creek, the calculated 25-year flow velocity of the creek from the HEC-RAS model was used for both existing and proposed conditions. For Outfall North, the 25- and 100-year, 24-hour peak flow rates were used to determine the velocity at the drainage area boundary.

Manning's Equation via the Flowmaster software was used to evaluate the velocities. Refer to the appendix to this report section for the proposed condition velocity calculations.

POST-DEVELOPMENT DRAINAGE ANALYSIS SUMMARY

The analysis summary for the proposed condition for each comparison point (Outfall-W, Outfall-S, Outfall-N, and Outfall-E) the peak flow rate, velocity, and volume resulting from the HEC-HMS evaluation for the 25- and 100-year, 24 hour rainfall is shown in the appendix to this report section.

WATERSHED CHARACTERISTICS

The curve numbers (Cn) used in the HEC-HMS model for non-landfill and the existing condition landfill were taken from Table 4-18 in the TxDOT Hydraulic *Design Manual,* September 2019. The curve numbers assume Hydrologic Soil Group B and Poor Condition grass coverage. See Table 4-18 below. The Cn for the proposed landfill was taken from the TCEQ Surface Water Drainage and Erosional Stability Guidelines for a Municipal Solid Waste Landfill Section 1.4.3, which recommends a range between 85 and 90 for the landfill final cover. Since the soils surrounding the Beck Landfill are predominately Hydrologic Group B and there is no synthetic component to the final cover to limit infiltration, a Curve Number of 85 was selected. The table below summarizes the selected Curve Numbers.

Cn Values Selected	
Offsite and Onsite Areas Outside of Landfill Footprint and Existing Landfill Final Cover	79
Area Within Landfill Footprint Affected by Vertical Expansion	85

Note: Curve numbers were adjusted to account for impervious cover within drainage area. Impervious areas were assigned a Cn of 98.

Table 4-18: Runoff Curve Numbers For Urban Areas

Cover type and hydrologic condition	Average percent impervious area	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Notes: Values are for average runoff condition, and $I_a = 0.2S$. The average percent impervious area shown was used to develop the composite CNs. Other assumptions are: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.					
Cover type and hydrologic condition	**Average percent impervious area**	**A**	**B**	**C**	**D**
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm drains (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-in. sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (townhouses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas: Newly graded areas (pervious area only, no vegetation)		77	86	91	94
Notes: Values are for average runoff condition, and $I_a = 0.2S$. The average percent impervious area shown was used to develop the composite CNs. Other assumptions are: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.					

RAINFALL DATA

NOAA Atlas 14, Volume 11, Version 2
Location name: Schertz, Texas, USA*
Latitude: 29.5483°, Longitude: -98.2639°
Elevation: 706.71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.443 (0.336-0.585)	0.524 (0.400-0.684)	0.655 (0.499-0.860)	0.765 (0.574-1.02)	0.918 (0.667-1.26)	1.04 (0.733-1.46)	1.16 (0.798-1.68)	1.29 (0.864-1.91)	1.46 (0.949-2.25)	1.60 (1.01-2.53)
10-min	0.705 (0.534-0.931)	0.835 (0.637-1.09)	1.05 (0.796-1.37)	1.22 (0.918-1.63)	1.47 (1.07-2.02)	1.66 (1.18-2.35)	1.86 (1.28-2.69)	2.05 (1.38-3.05)	2.31 (1.50-3.55)	2.50 (1.58-3.95)
15-min	0.902 (0.683-1.19)	1.06 (0.808-1.38)	1.32 (1.00-1.73)	1.53 (1.15-2.04)	1.83 (1.33-2.51)	2.06 (1.46-2.90)	2.29 (1.58-3.33)	2.54 (1.71-3.78)	2.88 (1.87-4.44)	3.15 (1.99-4.98)
30-min	1.27 (0.962-1.68)	1.49 (1.14-1.95)	1.84 (1.40-2.42)	2.14 (1.60-2.85)	2.54 (1.84-3.48)	2.85 (2.02-4.02)	3.17 (2.19-4.60)	3.53 (2.37-5.25)	4.03 (2.62-6.21)	4.43 (2.80-7.00)
60-min	1.64 (1.24-2.16)	1.93 (1.48-2.52)	2.42 (1.84-3.17)	2.82 (2.12-3.76)	3.39 (2.45-4.63)	3.81 (2.69-5.37)	4.27 (2.94-6.19)	4.78 (3.22-7.12)	5.53 (3.59-8.53)	6.14 (3.89-9.70)
2-hr	1.95 (1.48-2.56)	2.38 (1.81-3.05)	3.04 (2.32-3.95)	3.62 (2.73-4.80)	4.46 (3.26-6.09)	5.14 (3.65-7.21)	5.88 (4.07-8.48)	6.73 (4.54-9.96)	7.98 (5.20-12.3)	9.03 (5.74-14.2)
3-hr	2.11 (1.61-2.76)	2.64 (1.99-3.33)	3.42 (2.61-4.42)	4.13 (3.12-5.45)	5.18 (3.79-7.05)	6.05 (4.31-8.47)	7.02 (4.87-10.1)	8.14 (5.50-12.0)	9.80 (6.40-15.0)	11.2 (7.13-17.5)
6-hr	2.40 (1.84-3.12)	3.08 (2.32-3.83)	4.06 (3.11-5.21)	4.98 (3.79-6.54)	6.38 (4.70-8.65)	7.57 (5.43-10.6)	8.92 (6.22-12.8)	10.5 (7.12-15.4)	12.8 (8.42-19.6)	14.8 (9.49-23.1)
12-hr	2.71 (2.09-3.50)	3.52 (2.65-4.32)	4.67 (3.60-5.95)	5.77 (4.41-7.53)	7.46 (5.53-10.1)	8.91 (6.43-12.4)	10.6 (7.42-15.0)	12.6 (8.55-18.3)	15.6 (10.2-23.6)	18.1 (11.6-28.1)
24-hr	3.05 (2.36-3.91)	3.99 (3.01-4.85)	5.31 (4.11-6.73)	6.60 (5.06-8.55)	8.56 (6.38-11.5)	10.3 (7.44-14.2)	12.2 (8.61-17.3)	14.6 (9.96-21.1)	18.2 (12.0-27.3)	21.2 (13.7-32.7)
2-day	3.46 (2.70-4.42)	4.54 (3.45-5.50)	6.07 (4.72-7.64)	7.54 (5.81-9.71)	9.78 (7.32-13.0)	11.7 (8.53-16.1)	14.0 (9.87-19.6)	16.6 (11.4-23.9)	20.7 (13.7-30.9)	24.1 (15.6-37.0)
3-day	3.77 (2.94-4.80)	4.93 (3.76-5.95)	6.58 (5.13-8.25)	8.15 (6.30-10.5)	10.5 (7.91-14.0)	12.6 (9.20-17.2)	15.0 (10.6-21.0)	17.7 (12.2-25.5)	21.9 (14.6-32.7)	25.5 (16.5-39.0)
4-day	4.02 (3.14-5.10)	5.22 (4.01-6.32)	6.96 (5.45-8.71)	8.60 (6.67-11.0)	11.1 (8.33-14.7)	13.2 (9.65-18.0)	15.6 (11.1-21.8)	18.5 (12.7-26.4)	22.7 (15.1-33.7)	26.3 (17.0-40.0)
7-day	4.60 (3.62-5.81)	5.90 (4.57-7.15)	7.80 (6.14-9.73)	9.56 (7.44-12.2)	12.2 (9.19-16.1)	14.4 (10.6-19.5)	16.9 (12.0-23.5)	19.7 (13.7-28.1)	23.9 (16.0-35.5)	27.5 (17.9-41.7)
10-day	5.09 (4.01-6.41)	6.45 (5.03-7.83)	8.48 (6.69-10.6)	10.3 (8.06-13.1)	13.1 (9.87-17.1)	15.3 (11.3-20.7)	17.9 (12.7-24.7)	20.7 (14.4-29.5)	24.9 (16.6-36.7)	28.4 (18.5-42.9)
20-day	6.56 (5.19-8.21)	8.08 (6.40-9.88)	10.5 (8.31-13.0)	12.5 (9.81-15.8)	15.5 (11.7-20.1)	17.8 (13.1-23.9)	20.4 (14.6-28.0)	23.1 (16.1-32.8)	27.1 (18.2-39.8)	30.4 (19.9-45.8)
30-day	7.76 (6.16-9.66)	9.40 (7.51-11.5)	12.0 (9.61-14.9)	14.3 (11.2-17.9)	17.4 (13.2-22.6)	19.8 (14.6-26.5)	22.4 (16.1-30.7)	25.1 (17.6-35.4)	29.0 (19.5-42.4)	32.1 (21.0-48.1)
45-day	9.40 (7.48-11.7)	11.2 (9.04-13.8)	14.2 (11.4-17.6)	16.7 (13.2-20.9)	20.1 (15.3-26.0)	22.7 (16.8-30.2)	25.4 (18.3-34.8)	28.2 (19.8-39.7)	32.1 (21.7-46.8)	35.1 (23.1-52.5)
60-day	10.8 (8.65-13.4)	12.8 (10.4-15.8)	16.2 (13.0-19.9)	18.9 (14.9-23.6)	22.6 (17.2-29.1)	25.4 (18.8-33.6)	28.2 (20.3-38.4)	31.1 (21.8-43.6)	35.0 (23.7-50.8)	38.0 (25.0-56.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

PROPOSED CONDITIONS TIME OF CONCENTRATION TABLE C1-C-1

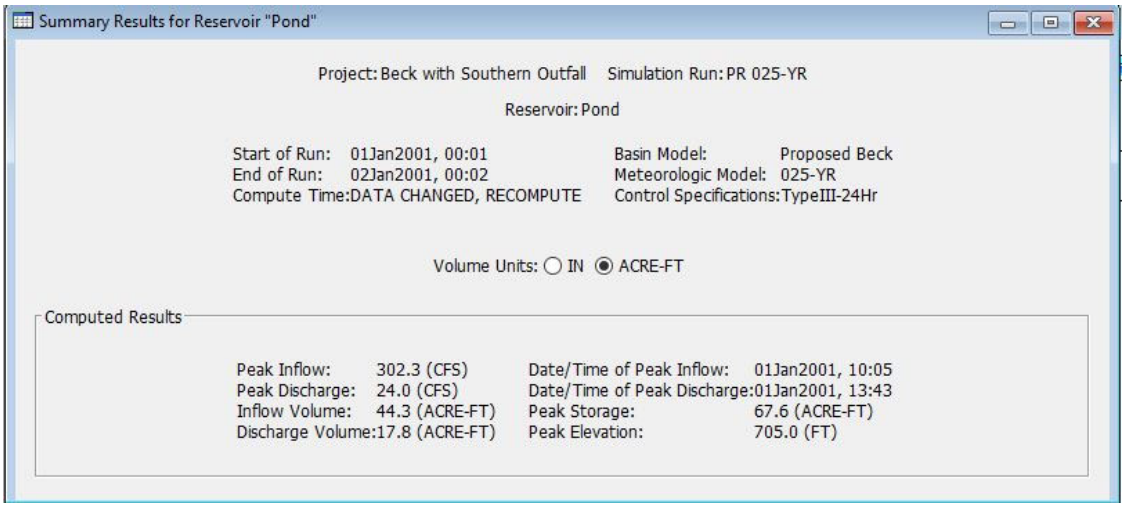
Subbasin		DA-P1	DA-P2	DA-P3	DA-P4	DA-P5	DA-P6	DA-P7	DA-P8	DA-P9	DA-P10	OS-1	OS-2
Area	sqft	325,402	2,889,729	1,462,482	485,705	903,182	754,710	292,836	1,005,166	1,565,743	1,553,862	976,804	338429
Area	ac.	7.47	66.34	33.57	11.15	20.73	17.33	6.72	23.08	35.94	35.67	22.42	7.77
Area	sqmi	0.01167	0.10365	0.05246	0.01742	0.03240	0.02707	0.01050	0.03606	0.05616	0.05574	0.03504	0.01214
Impervious	sqft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	599276	386512	86500.00
Impervious	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	39%	40%	26%
Pervious	Cn	85	85	85	85	85	85	85	85	85	79	79	79
Composite	Cn	85	85	85	85	85	85	85	85	85	86	87	84
Sheet Flow													
Slope	in/in	0.0400	0.0600	0.0600	0.0600	0.2000	0.2000	0.2000	0.2000	0.0100	0.0061	0.0100	0.0130
Length	ft.	100	300	300	100	100	100	50	100	100	300	300	300
Roughness	n	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Time	hr.	0.11	0.22	0.22	0.09	0.06	0.06	0.03	0.06	0.19	0.56	0.46	0.41
Shallow Concentrated													
Slope	in/in	1.6349	0.1530	0.0957	0.2015	0.1666	0.2000	0.2000	0.2213	0.0258	0.0061	0.0100	0.0560
Length	ft.	18.35	248.30	125.37	138.98	72.03	29.60	30.00	45.19	387.44	1186.00	1116.00	320.00
Paved?	p/u	u	u	u	u	u	u	u	u	u	u	u	u
Time	hr.	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.04	0.26	0.19	0.02
Shallow Concentrated													
Slope	in/in									0.0341			
Length	ft.									351.79			
Paved?	p/u									u	u	u	u
Time	hr.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Channel Flow													
Slope	in/in	0.00	0.07	0.11	0.19	0.00	0.01	0.01	0.02	0.00	0	0	0
Length	ft.	0	2179.34	1474.72	653.53	1291.337	2315.48	722.98	3058.68	0	0	0	0
Velocity	fps	0	5	5	5	5	5	5	5	0	0	0	0
Time	hr.	0.00	0.12	0.08	0.04	0.07	0.13	0.04	0.17	0.00	0.00	0.00	0.00
Summary													
Travel Time	hr.	0.11	0.36	0.31	0.13	0.13	0.19	0.07	0.23	0.23	0.82	0.65	0.44
Tc	min.	10.00	21.35	18.77	10.00	10.00	11.23	10.00	13.74	13.91	49.21	39.03	26.16
Lag Time	min.	6.00	12.81	11.26	6.00	6.00	6.74	6.00	8.24	8.35	29.52	23.42	15.70

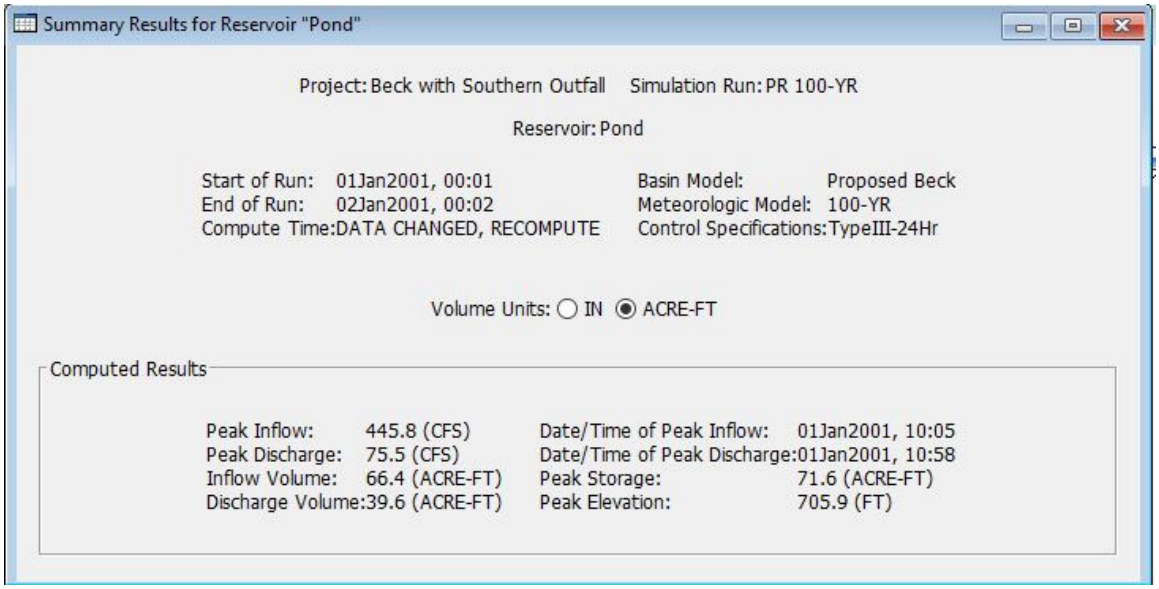
POST-DEVELOPMENT SURFACE WATER IMPOUNDMENTS DESIGN PARAMETERS

South Pond - Proposed Condition

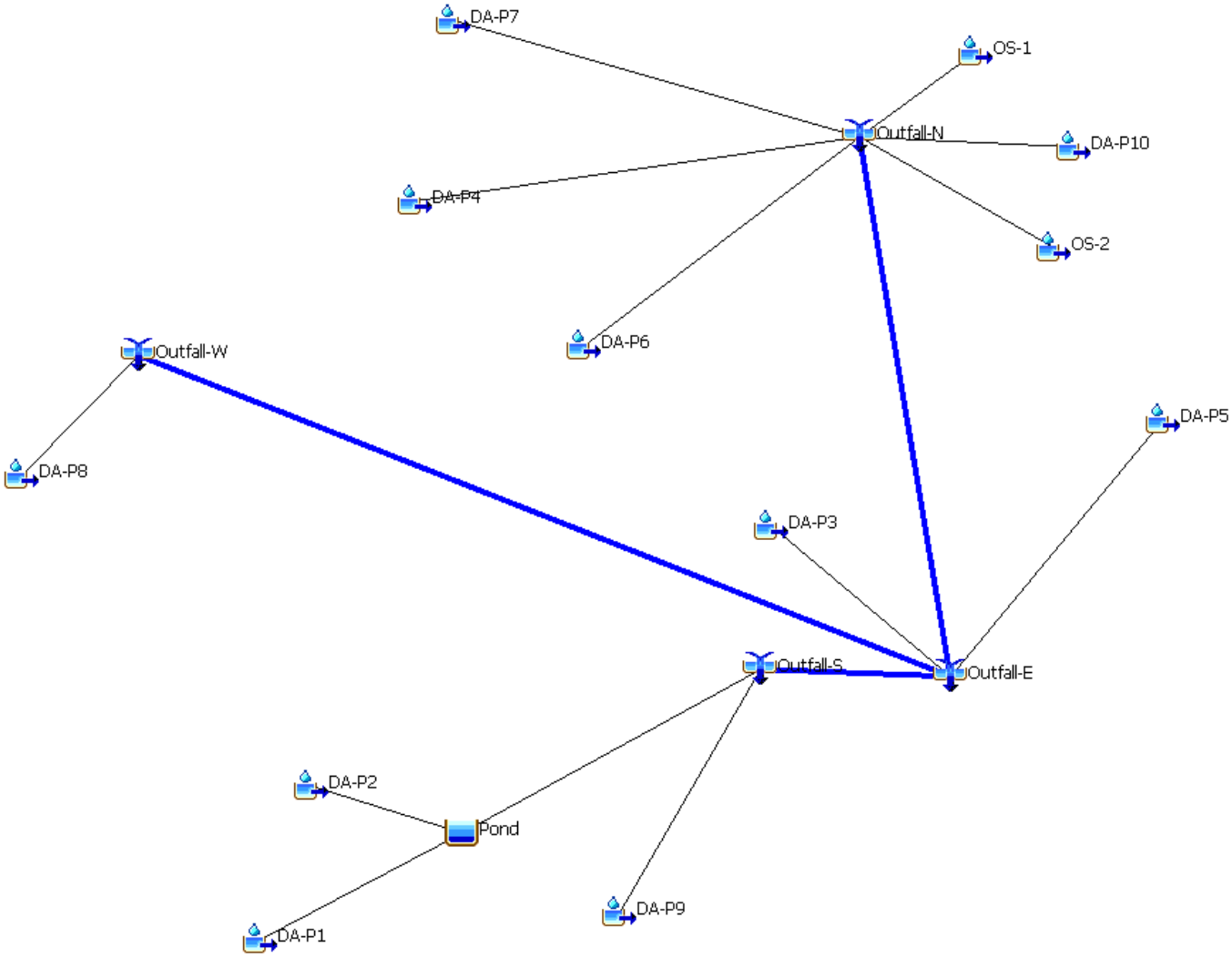
Outfall Structures					
Outfall Number	Outfall Type	Length or Diameter (ft)	Orifice Coefficient	Critical Elevation type	Critical Elevation (msl)
1	Orifice	1	0.66	Flowline	698.0
2	Orifice	4	0.66	Flowline	703.0

Pond Geometry Summary							
Stage (msl)	Pond Area (ac)	Pond Area (sf)	Sectional Volume (cu. Ft.)	Cumulative Volume (cu.ft.)	Outfall 1 Rating (cfs)	Outfall 2 Rating (cfs)	Cumulative Outflow (cfs)
668	0.141	6,136	-	-			
670	0.203	8,824	17,648	17,648			
672	0.278	12,091	24,183	41,831			
674	0.370	16,103	32,206	74,036			
676	0.467	20,350	40,701	114,737			
678	0.554	24,144	48,287	163,024			
680	0.648	28,207	56,415	219,439			
682	0.752	32,768	65,537	284,976			
684	0.854	37,192	74,384	359,360			
686	1.869	81,409	162,819	522,178			
688	2.187	95,274	190,549	712,727			
690	2.403	104,670	209,341	922,068			
692	2.536	110,468	220,936	1,143,004			
694	2.670	116,318	232,637	1,375,640			
696	2.934	127,805	255,610	1,631,251			
698	3.230	140,677	281,354	1,912,605	0		0.0
700	3.527	153,649	307,298	2,219,903	5.1		5.1
702	3.737	162,784	325,567	2,545,470	7.8		7.8
703	4.167	181,528	181,528	2,726,998	8.8		8.8
704	4.363	190,065	190,065	2,917,063	9.8		9.8
706	4.643	202,267	404,533	3,321,596	11.4	66.6	78.0
708	4.925	214,542	429,083	3,750,680	12.8	115.3	128.1
709	5.111	222,618	222,618	3,973,298	13.5	133.1	146.6


Summary Results for Reservoir "Pond"
Project: Beck with Southern Outfall Simulation Run: PR 025-YR
Reservoir: Pond
Start of Run: 01Jan2001, 00:01
End of Run: 02Jan2001, 00:02
Compute Time: DATA CHANGED, RECOMPUTE
Basin Model: Proposed Beck
Meteorologic Model: 025-YR
Control Specifications: TypeIII-24Hr
Volume Units: IN ACRE-FT
Computed Results
Peak Inflow: 302.3 (CFS)
Peak Discharge: 24.0 (CFS)
Inflow Volume: 44.3 (ACRE-FT)
Discharge Volume: 17.8 (ACRE-FT)
Date/Time of Peak Inflow: 01Jan2001, 10:05
Date/Time of Peak Discharge: 01Jan2001, 13:43
Peak Storage: 67.6 (ACRE-FT)
Peak Elevation: 705.0 (FT)


Summary Results for Reservoir "Pond"
Project: Beck with Southern Outfall Simulation Run: PR 100-YR
Reservoir: Pond
Start of Run: 01Jan2001, 00:01
End of Run: 02Jan2001, 00:02
Compute Time: DATA CHANGED, RECOMPUTE
Basin Model: Proposed Beck
Meteorologic Model: 100-YR
Control Specifications: TypeIII-24Hr
Volume Units: IN ACRE-FT
Computed Results
Peak Inflow: 445.8 (CFS)
Peak Discharge: 75.5 (CFS)
Inflow Volume: 66.4 (ACRE-FT)
Discharge Volume: 39.6 (ACRE-FT)
Date/Time of Peak Inflow: 01Jan2001, 10:05
Date/Time of Peak Discharge: 01Jan2001, 10:58
Peak Storage: 71.6 (ACRE-FT)
Peak Elevation: 705.9 (FT)

PROPOSED CONDITION HEC-HMS SCHEMATIC



Peak Velocity Calculation for Pond Outlet 1

Project Description	
Solve For	Discharge Coefficient

Input Data	
Discharge	11.40 cfs
Headwater Elevation	705.90 ft
Centroid Elevation	698.50 ft
Tailwater Elevation	698.00 ft
Diameter	12.0 in

Results	
Discharge Coefficient	0.665
Headwater Height Above Centroid	7.40 ft
Tailwater Height Above Centroid	-0.50 ft
Flow Area	0.8 ft²
Velocity	14.51 ft/s

Peak Velocity Calculation for Pond Outlet 2

Project Description	
Solve For	Discharge Coefficient

Input Data	
Discharge	66.60 cfs
Headwater Elevation	705.90 ft
Centroid Elevation	705.00 ft
Tailwater Elevation	703.00 ft
Diameter	48.0 in

Results	
Discharge Coefficient	0.696
Headwater Height Above Centroid	0.90 ft
Tailwater Height Above Centroid	-2.00 ft
Flow Area	12.6 ft²
Velocity	5.30 ft/s

HYDROLOGIC ANALYSIS

25-YEAR, 24-YEAR STORM EVENT
100-YEAR, 24-YEAR STORM EVENT

Type III, 24-hour Storm, 25 Year Event - Proposed Condition

Project: Beck with Southern Outfall Simulation Run: PR 025-YR

Start of Run: 01Jan2001, 00:01 Basin Model: Proposed Beck
End of Run: 02Jan2001, 00:02 Meteorologic Model: 025-YR
Compute Time: 08Sep2023, 16:10:21 Control Specifications: TypeIII-24Hr

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
DA-P10	0.1	93.1	1 January 2001, 10:23	21.2
OS-1	0.0	67.5	1 January 2001, 10:16	13.5
DA-P6	0.0	89.8	1 January 2001, 10:01	10.8
DA-P4	0.0	59.1	1 January 2001, 10:00	6.7
OS-2	0.0	27.8	1 January 2001, 10:09	4.5
DA-P7	0.0	35.6	1 January 2001, 10:00	4.0
Outfall-N	0.2	291.2	1 January 2001, 10:02	60.7
DA-P2	0.1	274.2	1 January 2001, 10:06	39.8
DA-P1	0.0	39.6	1 January 2001, 10:00	4.5
Pond	0.1	24.0	1 January 2001, 13:43	17.8
DA-P9	0.1	175.8	1 January 2001, 10:02	22.3
Outfall-S	0.2	183.0	1 January 2001, 10:02	40.1
South to East	0.2	183.0	1 January 2001, 10:08	40.0
E to N Reach	0.2	291.2	1 January 2001, 10:05	60.7
DA-P3	0.1	146.6	1 January 2001, 10:05	20.2
DA-P8	0.0	112.5	1 January 2001, 10:02	13.9
Outfall-W	0.0	112.5	1 January 2001, 10:02	13.9
W to E Reach	0.0	112.5	1 January 2001, 10:20	13.8
DA-P5	0.0	109.9	1 January 2001, 10:00	12.5
Outfall-E	0.5	729.5	1 January 2001, 10:05	147.1

Type III, 24-hour Storm, 100 Year Event - Proposed Condition

Project: Beck with Southern Outfall Simulation Run: PR 100-YR

Start of Run: 01Jan2001, 00:01 Basin Model: Proposed Beck
End of Run: 02Jan2001, 00:02 Meteorologic Model: 100-YR
Compute Time: 08Sep2023, 16:10:35 Control Specifications: TypeIII-24Hr

Show Elements: All Elements Volume Units: IN ACRE-FT Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (ACRE-FT)
DA-P10	0.1	138.7	1 January 2001, 10:23	31.7
OS-1	0.0	100.1	1 January 2001, 10:16	20.2
DA-P6	0.0	131.7	1 January 2001, 10:00	16.0
DA-P4	0.0	87.0	1 January 2001, 10:00	10.0
OS-2	0.0	41.7	1 January 2001, 10:09	6.8
DA-P7	0.0	52.4	1 January 2001, 10:00	6.1
Outfall-N	0.2	431.4	1 January 2001, 10:02	90.7
DA-P2	0.1	404.4	1 January 2001, 10:06	59.7
DA-P1	0.0	58.3	1 January 2001, 10:00	6.7
Pond	0.1	75.5	1 January 2001, 10:58	39.6
DA-P9	0.1	257.9	1 January 2001, 10:02	33.1
Outfall-S	0.2	267.1	1 January 2001, 10:02	72.7
South to East	0.2	267.1	1 January 2001, 10:08	72.6
E to N Reach	0.2	431.4	1 January 2001, 10:05	90.6
DA-P3	0.1	216.0	1 January 2001, 10:05	30.2
DA-P8	0.0	165.7	1 January 2001, 10:02	20.8
Outfall-W	0.0	165.7	1 January 2001, 10:02	20.8
W to E Reach	0.0	165.7	1 January 2001, 10:20	20.7
DA-P5	0.0	161.8	1 January 2001, 10:00	18.7
Outfall-E	0.5	1075.8	1 January 2001, 10:05	232.8

BECK LANDFILL
APPENDIX C1-D
FACILITY SURFACE WATER DRAINAGE REPORT
PERIMETER DRAINAGE BERM DESIGN

Includes pages C1-D-1 through C1-D-5

Revised January 2023

NARRATIVE

30 TAC §330.305

This appendix presents the design of Beck Landfill perimeter drainage channels and detention pond in accordance with §330.305(a)-(d).

PERIMETER DRAINAGE PLAN

Drawing C1-2 depicts the perimeter drainage system and detention pond location for Beck Landfill. The typical section for the perimeter drainage berms is shown on Figure C1-2A and the detention pond details are shown on Figure C3-1 and C3-2. The perimeter berm hydraulic analysis is included for the 25-year rainfall event. Profiles for the perimeter berms are shown on Figures C1-2A through C1-2F.

PERIMETER BERM DESIGN SUMMARY

The perimeter berms are designed for the peak discharge resulting from the 25-year storm event while maintaining velocities between 2 fps and 6 fps. The typical perimeter berm has 2:1 sideslopes, two feet top width, and is two feet high. The berm slope is 2%. The largest area contributing to a perimeter berm occurs for Berm 8 (See Figure C1-2) and is 6.5 acres. The Rational Method and methods and parameters included in the TxDOT Hydraulic *Design Manual,* September 2019 will be used to calculate the peak flow anticipated in this worst-case perimeter berm.

The rational formula estimates the peak rate of runoff at a specific location in a watershed as a function of the drainage area, runoff coefficient, and mean rainfall intensity for a duration equal to the time of concentration. The rational formula is:

$$Q=CIA$$

Where:

Q = maximum rate of runoff (cfs)

C = runoff coefficient

I = average rainfall intensity (in./hr.)

A = drainage area (ac)

Runoff Coefficient (C)

The following table from the TxDOT manual lists appropriate run-off coefficients for various uses and surface conditions. Steep grassed slopes was chosen as the most appropriate for the landfill final cover, which corresponds to a coefficient of 0.70.

Chapter 4 — Hydrology *Section 12 — Rational Method*

Table 4-10: Runoff Coefficients for Urban Watersheds

Type of drainage area	Runoff coefficient
Business:	
Downtown areas	0.70-0.95
Neighborhood areas	0.30-0.70
Residential:	
Single-family areas	0.30-0.50
Multi-units, detached	0.40-0.60
Multi-units, attached	0.60-0.75
Suburban	0.35-0.40
Apartment dwelling areas	0.30-0.70
Industrial:	
Light areas	0.30-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.30-0.40
Railroad yards	0.30-0.40
Unimproved areas:	
Sand or sandy loam soil, 0-3%	0.15-0.20
Sand or sandy loam soil, 3-5%	0.20-0.25
Black or loessial soil, 0-3%	0.18-0.25
Black or loessial soil, 3-5%	0.25-0.30
Black or loessial soil, > 5%	0.70-0.80
Deep sand area	0.05-0.15
Steep grassed slopes	0.70
Lawns:	
Sandy soil, flat 2%	0.05-0.10
Sandy soil, average 2-7%	0.10-0.15
Sandy soil, steep 7%	0.15-0.20
Heavy soil, flat 2%	0.13-0.17
Heavy soil, average 2-7%	0.18-0.22

Hydraulic Design Manual *4-53* *TxDOT 09/2019*

Rainfall Intensity (I)

The rainfall intensity (I) is the average rainfall rate in in./hr. for a specific rainfall duration and a selected frequency. The duration is assumed to be equal to the time of concentration. The intensity was taken from the following table from 2018 NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11, Version 2.0: Texas, assuming a time of concentration and storm duration of ten minutes. From the table the 25-year intensity is 8.8 in/hr and the 100-year intensity is 11.1 in/hr.

NOAA Atlas 14, Volume 11, Version 2
Location name: Schertz, Texas, USA*
Latitude: 29.5483°, Longitude: -98.2639°
Elevation: 706.71 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite
NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	5.32 (4.03-7.02)	6.29 (4.80-8.21)	7.86 (5.99-10.3)	9.18 (6.89-12.2)	11.0 (8.00-15.1)	12.4 (8.80-17.5)	13.9 (9.58-20.1)	15.4 (10.4-22.9)	17.5 (11.4-27.0)	19.2 (12.1-30.3)
10-min	4.23 (3.20-5.59)	5.01 (3.82-6.54)	6.28 (4.78-8.24)	7.34 (5.51-9.77)	8.81 (6.42-12.1)	9.97 (7.07-14.1)	11.1 (7.68-16.1)	12.3 (8.27-18.3)	13.8 (8.99-21.3)	15.0 (9.50-23.7)
15-min	3.61 (2.73-4.77)	4.24 (3.23-5.53)	5.26 (4.00-6.90)	6.12 (4.59-8.15)	7.30 (5.31-10.0)	8.22 (5.82-11.6)	9.17 (6.32-13.3)	10.2 (6.84-15.1)	11.5 (7.49-17.8)	12.6 (7.98-19.9)
30-min	2.54 (1.92-3.36)	2.98 (2.27-3.89)	3.68 (2.80-4.84)	4.27 (3.21-5.69)	5.08 (3.69-6.96)	5.70 (4.03-8.04)	6.35 (4.38-9.20)	7.05 (4.74-10.5)	8.05 (5.23-12.4)	8.86 (5.61-14.0)
60-min	1.64 (1.24-2.16)	1.93 (1.48-2.52)	2.42 (1.84-3.17)	2.82 (2.12-3.76)	3.39 (2.45-4.63)	3.81 (2.69-5.37)	4.27 (2.94-6.19)	4.78 (3.22-7.12)	5.53 (3.59-8.53)	6.14 (3.89-9.70)
2-hr	0.974 (0.740-1.28)	1.19 (0.902-1.52)	1.52 (1.16-1.98)	1.81 (1.37-2.40)	2.23 (1.63-3.04)	2.57 (1.83-3.61)	2.94 (2.04-4.24)	3.37 (2.27-4.98)	3.99 (2.60-6.13)	4.52 (2.87-7.10)
3-hr	0.703 (0.536-0.920)	0.877 (0.663-1.11)	1.14 (0.869-1.47)	1.37 (1.04-1.81)	1.72 (1.26-2.35)	2.01 (1.44-2.82)	2.34 (1.62-3.36)	2.71 (1.83-4.00)	3.26 (2.13-4.99)	3.73 (2.37-5.84)
6-hr	0.401 (0.307-0.522)	0.514 (0.387-0.639)	0.678 (0.520-0.870)	0.832 (0.632-1.09)	1.07 (0.786-1.44)	1.26 (0.907-1.76)	1.49 (1.04-2.13)	1.75 (1.19-2.57)	2.15 (1.41-3.27)	2.48 (1.58-3.86)
12-hr	0.225 (0.173-0.290)	0.292 (0.220-0.358)	0.387 (0.299-0.494)	0.479 (0.366-0.625)	0.619 (0.459-0.835)	0.739 (0.533-1.03)	0.879 (0.616-1.25)	1.04 (0.710-1.52)	1.29 (0.849-1.96)	1.51 (0.965-2.33)
24-hr	0.127 (0.098-0.163)	0.166 (0.126-0.202)	0.221 (0.171-0.280)	0.275 (0.211-0.356)	0.357 (0.266-0.478)	0.428 (0.310-0.591)	0.510 (0.359-0.721)	0.608 (0.415-0.880)	0.757 (0.500-1.14)	0.885 (0.570-1.36)
2-day	0.072 (0.056-0.092)	0.095 (0.072-0.115)	0.126 (0.098-0.159)	0.157 (0.121-0.202)	0.204 (0.152-0.272)	0.244 (0.178-0.335)	0.291 (0.206-0.409)	0.346 (0.238-0.499)	0.430 (0.285-0.644)	0.502 (0.324-0.770)
3-day	0.052 (0.041-0.067)	0.068 (0.052-0.083)	0.091 (0.071-0.115)	0.113 (0.088-0.145)	0.146 (0.110-0.195)	0.175 (0.128-0.239)	0.208 (0.147-0.291)	0.246 (0.170-0.354)	0.305 (0.202-0.454)	0.354 (0.229-0.541)
4-day	0.042 (0.033-0.053)	0.054 (0.042-0.066)	0.073 (0.057-0.091)	0.090 (0.069-0.115)	0.115 (0.087-0.153)	0.138 (0.101-0.188)	0.163 (0.116-0.227)	0.192 (0.132-0.275)	0.236 (0.157-0.352)	0.274 (0.177-0.417)
7-day	0.027 (0.022-0.035)	0.035 (0.027-0.043)	0.046 (0.037-0.058)	0.057 (0.044-0.073)	0.073 (0.055-0.096)	0.086 (0.063-0.116)	0.101 (0.072-0.140)	0.117 (0.081-0.168)	0.143 (0.095-0.211)	0.164 (0.106-0.248)
10-day	0.021 (0.017-0.027)	0.027 (0.021-0.033)	0.035 (0.028-0.044)	0.043 (0.034-0.055)	0.054 (0.041-0.071)	0.064 (0.047-0.086)	0.074 (0.053-0.103)	0.086 (0.060-0.123)	0.104 (0.069-0.153)	0.118 (0.077-0.179)
20-day	0.014 (0.011-0.017)	0.017 (0.013-0.021)	0.022 (0.017-0.027)	0.026 (0.020-0.033)	0.032 (0.024-0.042)	0.037 (0.027-0.050)	0.042 (0.030-0.058)	0.048 (0.034-0.068)	0.057 (0.038-0.083)	0.063 (0.041-0.095)
30-day	0.011 (0.009-0.013)	0.013 (0.010-0.016)	0.017 (0.013-0.021)	0.020 (0.016-0.025)	0.024 (0.018-0.031)	0.028 (0.020-0.037)	0.031 (0.022-0.043)	0.035 (0.024-0.049)	0.040 (0.027-0.059)	0.045 (0.029-0.067)
45-day	0.009 (0.007-0.011)	0.010 (0.008-0.013)	0.013 (0.011-0.016)	0.015 (0.012-0.019)	0.019 (0.014-0.024)	0.021 (0.016-0.028)	0.024 (0.017-0.032)	0.026 (0.018-0.037)	0.030 (0.020-0.043)	0.033 (0.021-0.049)
60-day	0.008 (0.006-0.009)	0.009 (0.007-0.011)	0.011 (0.009-0.014)	0.013 (0.010-0.016)	0.016 (0.012-0.020)	0.018 (0.013-0.023)	0.020 (0.014-0.027)	0.022 (0.015-0.030)	0.024 (0.016-0.035)	0.026 (0.017-0.039)

For the worst-case perimeter berm:

Q_{25} = CIA

= (0.7)(8.8 in/hr)(6.52 Acres)

= 40.16 cfs

Q_{100} = CIA

= (0.7)(11.1 in/hr)(6.52 Acres)

= 50.7 cfs

The Flowmaster software package was utilized to determine flow depth for each of the perimeter berms and the table below lists each berm, the contributing area, and the calculated 25-year flow depth.

Beck Landfill Perimter Berm Design Calculations

C= 0.7 Steep grassed slopes
i= 8.8 (in/hr) (25 yr return period)

BERM	CONTRIBUTING AREA (SF)	CONTRIBUTING AREA (AC)	PEAK FLOW (CFS)	Peak Velocity (FT/SEC)	FLOW DEPTH (FT)
1	137,456	3.16	19.44	5.41	1.1
2	129,787	2.98	18.35	5.33	1.1
3	99,459	2.28	14.06	4.99	1.0
4	206,752	4.75	29.24	5.99	1.3
5	102,102	2.34	14.44	5.02	1.0
6A	94,439	2.17	13.36	4.93	1.0
6B	110,462	2.54	15.62	5.12	1.0
7A	39,377	0.90	5.57	3.96	0.7
7B	51,131	1.17	7.23	4.22	0.8
7C	27,391	0.63	3.87	3.62	0.6
8	283,991	6.52	40.16	6.49	1.4
9	38,656	0.89	5.47	3.94	0.7
10A	122,091	2.80	17.27	5.25	1.0
10B	93,610	2.15	13.24	4.92	0.9

Notes: 1) Flow depths and velocities calculated using FlowMaster Hydraulic Calculator
2) Peak flow calculated using Rational Method with factors shown in the table

Worst-Case Perimeter Berm

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.025
Channel Slope	0.020 ft/ft
Left Side Slope	2.000 H:V
Right Side Slope	4.000 H:V
Discharge	40.16 cfs
Results	
Normal Depth	1.4 ft
Flow Area	6.2 ft²
Wetted Perimeter	9.1 ft
Hydraulic Radius	0.7 ft
Top Width	8.62 ft
Critical Depth	1.6 ft
Critical Slope	0.011 ft/ft
Velocity	6.49 ft/s
Velocity Head	0.65 ft
Specific Energy	2.09 ft
Froude Number	1.349
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.4 ft
Critical Depth	1.6 ft
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

DETENTION POND ANALYSIS

The rainfall depth, duration, and frequency relationships for the storm event for the facility was taken from the 2018 NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 11, Version 2.0: Texas. Return periods of 25 and 100 years and a duration of 24 hours was used for the design storm. The synthetic rainfall distribution is the NRCS 24-hour Type Ill storm. The rainfall data for the facility located in Guadalupe County, Texas is shown on page C1-C-7. The details for the detention pond are shown on Figure C3-1 and the pond outlet design and elevation-stage-storage tables are shown on Page C1-C-9.

BECK LANDFILL

APPENDIX C1-E
FACILITY SURFACE WATER DRAINAGE REPORT
FINAL COVER DRAINAGE STRUCTURE DESIGN

Includes pages C1-E-1 through C1-E-11

NARRATIVE

30 TAC §§330.303 AND 330.305

This appendix presents the supporting documentation for evaluation of the final cover erosion layer and drainage structures.

FINAL COVER PLAN

The final cover plans depict the proposed final cover drainage system, which consists of a series of benches and downchutes designed to convey the flow of surface water produced during the 25-year storm event. The locations of the sideslope benches and downchutes are shown on Drawing C1-2. Final cover details are included in Attachment D3.

EROSION LAYER EVALUATION

The erosion layer evaluation is based on the Universal Soil Loss Equation (USLE) following Natural Resource Soil Conservation Service (NRCS) procedures. The evaluation is based on a 25-year storm event. The proposed 12-inch thick erosion layer is shown to provide sufficient erosion protection. Calculations are included beginning on page C1-E-2.

DRAINAGE BENCH DESIGN

The drainage bench design calculations are presented for the typical proposed bench flowline slope of 2 percent. The procedures in the TxDOT Hydraulic Design Manual, September 2019 were used to determine the flow depth, bench capacity, and contributing drainage area. The largest contributing area to any bench occurs in the western portion of DA-P02 and is 9.7 acres. Using the Rational Method procedures described in Attachment C1-D, the calculated peak flowrates for the worst-case bench for the 25-year and 100-year storms are 59.8 cfs and 75.4 cfs, respectively. The Flowmaster program was utilized to determine the full-flow capacity of the bench, which is 275.8 cfs. Therefore, the selected downchutes have abundant capacity to convey the 25-year and 100-year runoff flows. The output from the Flowmaster calculation is included below.

DOWNCHUTE DESIGN

The drainage downchute design calculations are presented for the typical proposed downchute flowline slope of 25 percent. The HEC-HMS model was used to calculate the 25-year flow for the worst-case downchute. The largest contributing area to a downchute is DA-P03 (66.3 acres). The 25-year flow from the HEC-HMS model for this downchute is 274.2 cfs and the 100-year flow is 404.4 cfs. The Flowmaster program was utilized to determine the full-flow capacity of the downchute, which is 802.2 cfs. Therefore, the selected downchutes have abundant capacity to convey the 25-year and 100-year runoff flows. The output from the Flowmaster calculation is included below. The downchutes were also evaluated using the Rational Method. The worst-case

downchute has a drainage area of 66.3 acres and a time of concentration of 18 minutes. The 25-year intensity is therefore 7.3 inches/hour. The worst-case Rational Method flow is determined by:

Q_{25} = CIA

= (0.7)(7.3 in/hr)(66.3 Acres)

= 338.8 cfs

A Flowmaster calculation is provided below for this condition.

EROSION LAYER EVALUATION

This discussion presents the supporting documentation for evaluation of the thickness of the erosion layer for the final cover system at Beck Landfill. The evaluation is based on the premise of adding excess soil to increase the time required before maintenance is needed as recommended in the EPA Solid Waste Disposal Facility Criteria Technical Manual (EPA 530-R-93-017, November 1993).

The design procedure is as follows:

1. The minimum thickness of the erosion layer is based on the depth of frost penetration, or six inches, whichever is greater. For Guadalupe County, the approximate depth of frost penetration is less than five inches.
2. Soil loss is calculated using the Universal Soil Loss Equation (USLE) by following NRCS procedures. The TCEQ Surface Water Drainage and Erosional Stability Guidelines for a Municipal Solid Waste Landfills, states that acceptable soil erosion for the final cover condition is 3 tons/acre/year. The calculated erosion rates for the top deck and sideslope areas are both less than 3 tons/acre/year. These results show that the thickness of the proposed 6-inch erosion layer is a sufficiently conservative design.
3. Vegetation for the site will be native and introduced grasses with root depths of 6 inches to 8 inches.
4. Native and introduced grasses will be hydroseeded with fertilizer on the disked (parallel to contours) erosion layer upon final grading. Temporary cold weather vegetation will be established if needed. Irrigation may be employed for 6 to 8 weeks or until vegetation is well established. Erosion control measures such as silt fences and straw bales will be used to minimize erosion until the vegetation is established. Areas that experience erosion or do not readily vegetate after hydroseeding will be reseeded until vegetation is established.
5. Slope stability information is included in Attachment D5 -Geotechnical Design.

MAXIMUM ALLOWABLE BENCH SPACING CALCULATION

Based on the discussion in the TCEQ Surface Water Drainage and Erosional Stability Guidelines for a Municipal Solid Waste Landfills, acceptable soil erosion for the final cover condition is 3 tons/acre/year. The USLE equation was utilized to calculate the bench spacing on the top deck and sideslope required to meet this value. Soil loss is calculated using the Universal Soil Loss Equation (USLE) by following NRCS procedures in Use *of the Universal Soil* Loss *Equation in Final Cover/Configuration Design Procedural Handbook* (October 1997). The soil loss is based on 90 percent vegetative cover. For the top deck, the bench seperation can be up to 1,000 feet, so no benches are required. For the sideslopes, a horizontal bench spacing of 120 feet provides a calculated erosion rate of 2.7 tons/acre/year. The 120 horizontal bench spacing has been used for the Beck landfill.

SIDESLOPE BENCH SEPARATION CALCULATION

SOIL EROSION (RUSLE)

A = R*K*L*S*C*P	
R	265
K	0.32
LS	5.3
C	0.006
P	1
A (tons/acre/year)	**2.697**
Bench Seperation	**120.000**

Figure 2-1 Isoerodent Map, USDA 1997
Monsic Clay Loam (more conservative than clay factor in Schertz Texas)
Using the value of LS that you find go to table 4-3 and use the LS and slope to find bench distance.
(should be different for Intermediate and Final Cover) (Type D, 90% grass - 0.006)
Usually 1 for landfills (conservative case from the table provided in "P" Tab)
50 tons/ac/yr max for Intermediate Cover, 3 tons/ac/yr max for final cover
Required Bench Horizontal Spacing

TOP DECK BENCH SEPARATION CALCULATION

SOIL EROSION (RUSLE)

A = R*K*L*S*C*P	
R	265
K	0.32
LS	3.3
C	0.006
P	1
A (tons/acre/year)	**1.679**
Bench Seperation	**1000**

Figure 2-1 Isoerodent Map, USDA 1997
Monsic Clay Loam (more conservative than clay factor in Schertz Texas)
Using the value of LS that you find go to table 4-3 and use the LS and slope to find bench
(should be different for Intermediate and Final Cover) (Type D, 90% grass - 0.006)
Usually 1 for landfills (conservative case from the table provided in "P" Tab)
50 tons/ac/yr max for Intermediate Cover, 3 tons/ac/yr max for final cover
Required Bench Horizontal Spacing

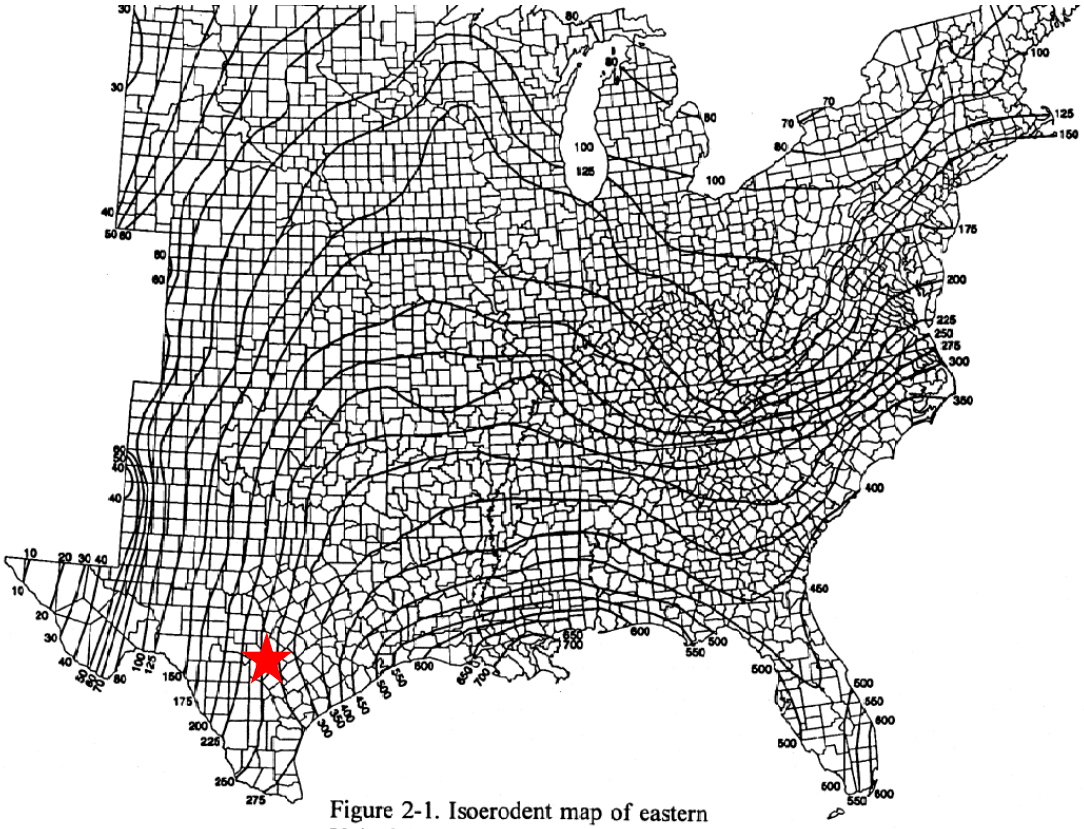


Figure 2-1. Isoerodent map of eastern United States. Units are hundreds ft·tonf·in(ac·h·yr)$^{-1}$.

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Rainfall-Runoff Erosivity Factor (R)

TABLE 1.—*Computed K values for soils on erosion research stations*

Soil	Source of data	Computed K
Dunkirk silt loam	Geneva, N.Y.	[1]0.69
Keene silt loam	Zanesville, Ohio	.48
Shelby loam	Bethany, Mo.	.41
Lodi loam	Blacksburg, Va.	.39
Fayette silt loam	LaCrosse, Wis.	[1].38
Cecil sandy clay loam	Watkinsville, Ga.	.36
Marshall silt loam	Clarinda, Iowa	.33
Ida silt loam	Castana, Iowa	.33
Mansic clay loam	Hays, Kans.	.32
Hagerstown silty clay loam	State College, Pa.	[1].31
Austin clay	Temple, Tex.	.29
Mexico silt loam	McCredie, Mo.	.28
Honeoye silt loam	Marcellus, N.Y.	[1].28
Cecil sandy loam	Clemson, S.C.	[1].28
Ontario loam	Geneva, N.Y.	[1].27
Cecil clay loam	Watkinsville, Ga.	.26
Boswell find sandy loam	Tyler, Tex.	.25
Cecil sandy loam	Watkinsville, Ga.	.23
Zaneis fine sandy loam	Guthrie, Okla.	.22
Tifton loamy sand	Tifton, Ga.	.10
Freehold loamy sand	Marlboro, N.J.	.08
Bath flaggy silt loam with surface stones > 2 inches removed	Arnot, N.Y.	[1].05
Albia gravelly loam	Beemerville, N.J.	.03

[1] Evaluated from continuous fallow. All others were computed from rowcrop data.

TABLE 10.—*Factor C for permanent pasture, range, and idle land*[1]

Vegetative canopy		Cover that contacts the soil surface					
			Percent ground cover				
Type and height[2]	Percent cover[3]	Type[4]	0	20	40	60	80	95+
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	.45	.24	.15	.091	.043	.011
Tall weeds or short brush with average drop fall height of 20 in	25	G	.36	.17	.09	.038	.013	.003
		W	.36	.20	.13	.083	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.076	.039	.011
	75	G	.17	.10	.06	.032	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or bushes, with average drop fall height of 6½ ft	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.087	.042	.011
	50	G	.34	.16	.08	.038	.012	.003
		W	.34	.19	.13	.082	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.078	.040	.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.089	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.087	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.084	.041	.011

[1] The listed C values assume that the vegetation and mulch are randomly distributed over the entire area.

[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 ft.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in deep.
W: cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Table 4-3.
Values for topographic factor, LS, for high ratio of rill to interrill erosion.[1]

Slope (%)	Horizontal slope length (ft)																
	<3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.12	0.12	0.13
1.0	0.09	0.09	0.09	0.09	0.09	0.10	0.13	0.14	0.15	0.17	0.18	0.19	0.20	0.22	0.24	0.26	0.27
2.0	0.13	0.13	0.13	0.13	0.13	0.16	0.21	0.25	0.28	0.33	0.37	0.40	0.43	0.48	0.56	0.63	0.69
3.0	0.17	0.17	0.17	0.17	0.17	0.21	0.30	0.36	0.41	0.50	0.57	0.64	0.69	0.80	0.96	1.10	1.23
4.0	0.20	0.20	0.20	0.20	0.20	0.26	0.38	0.47	0.55	0.68	0.79	0.89	0.98	1.14	1.42	1.65	1.86
5.0	0.23	0.23	0.23	0.23	0.23	0.31	0.46	0.58	0.68	0.86	1.02	1.16	1.28	1.51	1.91	2.25	2.55
6.0	0.26	0.26	0.26	0.26	0.26	0.36	0.54	0.69	0.82	1.05	1.25	1.43	1.60	1.90	2.43	2.89	3.30
8.0	0.32	0.32	0.32	0.32	0.32	0.45	0.70	0.91	1.10	1.43	1.72	1.99	2.24	2.70	3.52	4.24	4.91
10.0	0.35	0.37	0.38	0.39	0.40	0.57	0.91	1.20	1.46	1.92	2.34	2.72	3.09	3.75	4.95	6.03	7.02
12.0	0.36	0.41	0.45	0.47	0.49	0.71	1.15	1.54	1.88	2.51	3.07	3.60	4.09	5.01	6.67	8.17	9.57
14.0	0.38	0.45	0.51	0.55	0.58	0.85	1.40	1.87	2.31	3.09	3.81	4.48	5.11	6.30	8.45	10.40	12.23
16.0	0.39	0.49	0.56	0.62	0.67	0.98	1.64	2.21	2.73	3.68	4.56	5.37	6.15	7.60	10.26	12.69	14.96
20.0	0.41	0.56	0.67	0.76	0.84	1.24	2.10	2.86	3.57	4.85	6.04	7.16	8.23	10.24	13.94	17.35	20.57
25.0	0.45	0.64	0.80	0.93	1.04	1.56	2.67	3.67	4.59	5.3	6.30	7.88	9.38	10.81	13.53	18.57	23.24	27.66
30.0	0.48	0.72	0.91	1.08	1.24	1.86	3.22	4.44	5.58	7.70	9.67	11.55	13.35	16.77	23.14	29.07	34.71
40.0	0.53	0.85	1.13	1.37	1.59	2.41	4.24	5.89	7.44	10.35	13.07	15.67	18.17	22.95	31.89	40.29	48.29
50.0	0.58	0.97	1.31	1.62	1.91	2.91	5.16	7.20	9.13	12.75	16.16	19.42	22.57	28.60	39.95	50.63	60.84
60.0	0.63	1.07	1.47	1.84	2.19	3.36	5.97	8.37	10.63	14.89	18.92	22.78	26.51	33.67	47.18	59.93	72.15

[1]Such as for freshly prepared construction and other highly disturbed soil conditions with little or no cover (not applicable to thawing soil)

Between the proposed benches, the run-off condition will be sheet flow and Figure 5-4 from the TxDOT 2004 Hydraulic Manual below demonstrates that sheet flow from the 6% top deck and 25% sideslopes will travel at a velocity less than six feet per second, which will prevent significant erosion from occurring. For areas with final cover, it is assumed that the soil layer will have vegetation equivalent to "short grass pasture and lawns" and the calculated sheet flow velocity for the top deck is 1.9 ft/sec while the calculated sheet flow velocity for the sideslopes is 3.1 ft/sec.

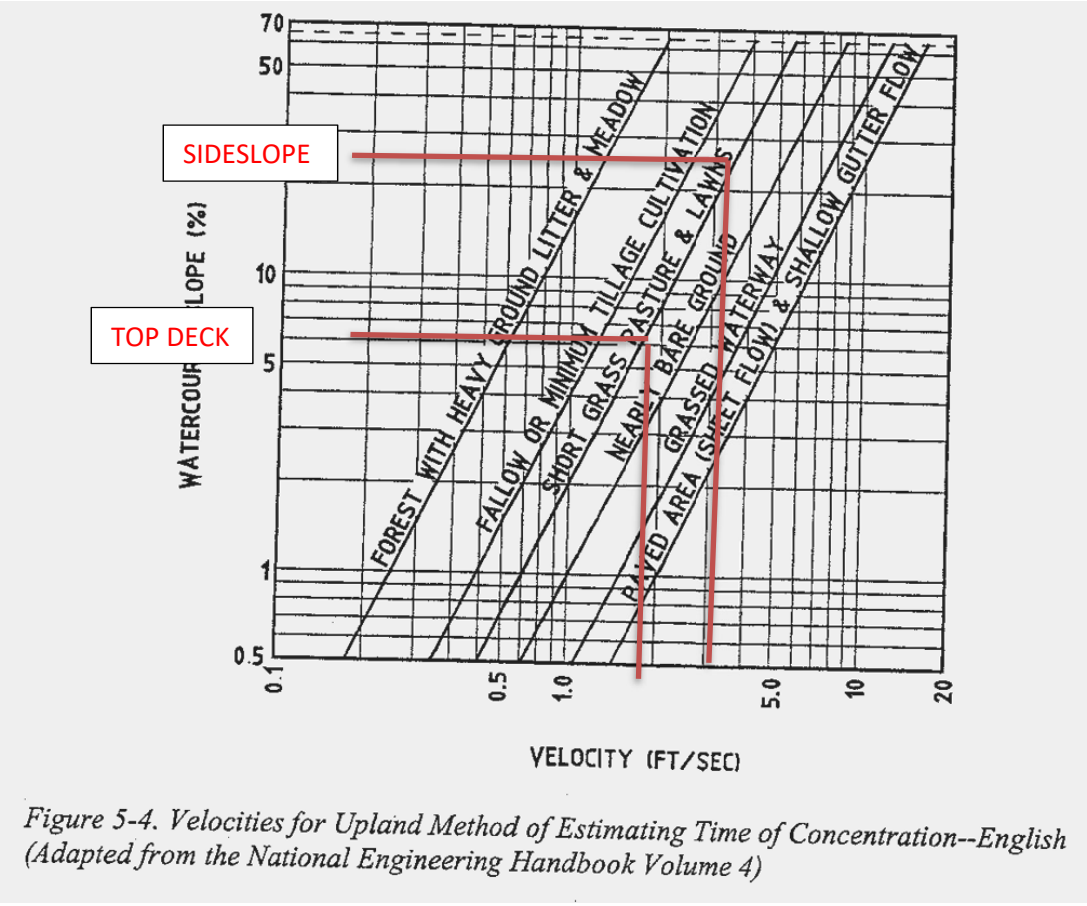


Figure 5-4. Velocities for Upland Method of Estimating Time of Concentration--English (Adapted from the National Engineering Handbook Volume 4)

FINAL COVER BENCH FULL-FLOW CALCULATION

Full-Flow Bench

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Channel Slope	0.020 ft/ft
Normal Depth	2.6 ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	10.00
0+04	8.00
0+08	7.43
0+20	10.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 10.00)	(0+20, 10.40)	0.025

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Discharge	275.75 cfs
Roughness Coefficient	0.025
Elevation Range	7.4 to 10.4 ft
Flow Area	26.5 ft²
Wetted Perimeter	19.2 ft
Hydraulic Radius	1.4 ft
Top Width	18.38 ft
Normal Depth	2.6 ft
Critical Depth	3.1 ft
Critical Slope	0.008 ft/ft
Velocity	10.41 ft/s
Velocity Head	1.68 ft
Specific Energy	4.25 ft
Froude Number	1.529
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 ft

Beck Hydraulic Calcs.fm8
8/28/2022

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

FlowMaster
[10.03.00.03]
Page 1 of 2

FINAL COVER DOWNCHUTE FULL-FLOW CALCULATION

Worst-Case Downchute Full Flow Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.069
Channel Slope	0.250 ft/ft
Normal Depth	2.0 ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	20.00 ft
Results	
Discharge	802.22 cfs
Flow Area	56.0 ft²
Wetted Perimeter	36.5 ft
Hydraulic Radius	1.5 ft
Top Width	36.00 ft
Critical Depth	3.0 ft
Critical Slope	0.055 ft/ft
Velocity	14.33 ft/s
Velocity Head	3.19 ft
Specific Energy	5.19 ft
Froude Number	2.025
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.0 ft
Critical Depth	3.0 ft
Channel Slope	0.250 ft/ft
Critical Slope	0.055 ft/ft

FINAL COVER DOWNCHUTE RATIONAL METHOD
WORST-CASE CALCULATION

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.069	
Channel Slope	0.250	ft/ft
Left Side Slope	4.000	H:V
Right Side Slope	4.000	H:V
Bottom Width	20.00	ft
Discharge	339.00	cfs

Results		
Normal Depth	1.2	ft
Flow Area	31.0	ft²
Wetted Perimeter	30.2	ft
Hydraulic Radius	1.0	ft
Top Width	29.93	ft
Critical Depth	1.8	ft
Critical Slope	0.063	ft/ft
Velocity	10.94	ft/s
Velocity Head	1.86	ft
Specific Energy	3.10	ft
Froude Number	1.896	
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.0	ft
Length	0.0	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.2	ft
Critical Depth	1.8	ft
Channel Slope	0.250	ft/ft
Critical Slope	0.063	ft/ft

Permissible Velocities

Table 8-6 below from the USDA Part 654 Stream Restoration Design National Engineering Handbook provides maximum allowable velocities for grass-lined channels to maintain non-erosive conditions. The clay soils at the site would be considered erosion resistant in this table. For Bermudagrass lined earthen channels with slopes of 0-5%, the maximum non-erosive velocity is 8 feet per second. The highest calculated velocity for any of the final cover control structures is for Perimeter Berm 8 and it is 6.49 ft/sec. The benches and other berms all have lower calculated peak velocities. The velocities in the downchutes are higher than 8 ft/sec, which is why they are proposed to be armored with gabion mattresses.

Table 8–6 Allowable velocities for channels lined with grass

Cover	Slope range percent	Allowable velocity (ft/s)	
		Erosion-resistant soils	Easily eroded soils
Bermudagrass	0–5	8	6
	5–10	7	5
	>10	6	4
Buffalograss, Kentucky bluegrass, smooth brome, blue grama	0–5	7	5
	5–10	6	4
	>10	5	3
Grass mixture	0–5	5	4
	5–10	4	3
	Not recommended on slopes greater than 10%		
Lespedeza sericea, weeping lovegrass, ischaemum (yellow bluestem), kudzu, alfalfa, crabgrass	0–5	3.5	2.5
	Not recommended on slopes greater than 5%, except for side slopes in a compound channel		
Annuals—used on mild slopes or as temporary protection until permanent covers are established, common lespedeza, Sudangrass	0–5	3.5	2.5
	Not recommended for slopes greater than 5%		

(210–VI–NEH, August 2007) 8–27

BECK LANDFILL

APPENDIX C1-F
FACILITY SURFACE WATER DRAINAGE REPORT
INTERMEDIATE COVER
EROSION AND SEDIMENTATION CONTROL PLAN

Includes pages C1-F-1 through C1-F-8

CONTENTS

NARRATIVE

This appendix presents temporary erosion and sediment control structures for the intermediate cover phase of landfill development. "Temporary", for the purposes of this narrative, is defined as the time between the construction of intermediate cover and the construction of final cover or the placement of additional waste, as the case may be. Intermediate top slope surfaces and external sideslopes, for the purposes of compliance with 30 TAC §330.305(d), are those above-grade slopes that:

a) Drain directly to the site perimeter stormwater management system (i.e., areas where the stormwater directly flows to a perimeter channel or detention pond),

b) Have received intermediate or final cover, and

c) Have either reached their permitted elevation, or will subsequently remain inactive for longer than 180 days.

Slopes that drain to ongoing waste placement, pre-excavated areas, areas that have received only operational cover, or areas under construction that have not received waste are not covered under this appendix and do not contribute to offsite runoff.

EROSION AND SEDIMENT CONTROL LANDFILL COVER PHASES

The purpose of this section is to define the landfill cover phases and where they are addressed throughout the Beck Landfill Site Development Plan:

Operational Cover- Operational cover is defined in §330.165(a), except that for Type IV landfills it is required weekly. Operational cover consists of 6 inches of well-compacted earthen material not previously mixed with garbage, rubbish, or other solid waste applied as required in the Site Operating Plan. The placement and erosion control practices for operational cover areas are defined in Part IV- Site Operating Plan and in the Best Management Practices Section of this appendix.

Intermediate Cover - Intermediate cover is defined in §330.165(c). Intermediate cover consists of at least 12 inches of suitable earthen material and is graded and maintained to prevent erosion and ponding of water. The placement requirements and erosion control practices for intermediate cover areas are defined in this appendix.

Final Cover - Final cover is defined in Subchapter K. The placement and erosion control practices for final cover areas are defined in Attachment C1, Appendix C1-E. Final cover at Beck Landfill will be managed as provided for in the closure and post-closure plan required by 30 TAC 330 Subchapter K, Closure and Post-Closure.

During all phases of operation, the goal is keep all run-off from the sideslopes and top dome areas as sheet flow to reduce the formation of erosion rills. Based on the TxDOT (2004 Hydraulic Design Manual) Figure 5-4 below, sheet flow from the 6% top deck and 25% sideslopes will travel at a velocity less than six feet per second, which will prevent significant erosion from occurring. For areas with operational and intermediate cover, it is conservatively assumed that the soil layer will be “nearly bare ground” and the calculated sheet flow velocity for the top deck is 2.5 ft/sec while the calculated sheet flow velocity for the sideslopes is 5.0 ft/sec. In order to maintain sheet flow conditions, temporary structural controls should be placed at 300 to 400 feet maximum spacings. Based on the USLE calculations provided in Appendix C1-G, no temporary structural controls are required on the top deck to maintain allowable erosion levels, and temporary structural controls are required at a maximum spacing of 400 feet for the sideslopes.

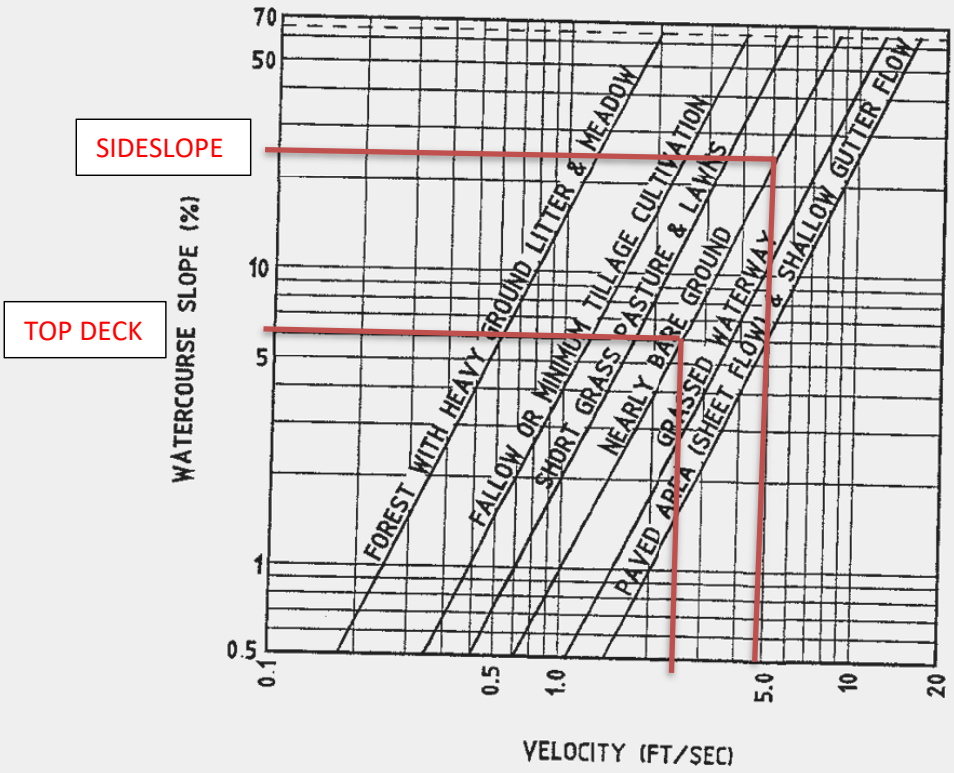


Figure 5-4. Velocities for Upland Method of Estimating Time of Concentration--English (Adapted from the National Engineering Handbook Volume 4)

BEST MANAGEMENT PRACTICES

Vegetation and temporary erosion control structures provide the most effective means of reducing the amount of soil loss during operation of the landfill. Best management practices utilized for erosion and sediment control may be broadly categorized as nonstructural and structural controls. Nonstructural controls addressing erosion include the following:

- Minimization of the disruption of the natural features, drainage, topography, or vegetative cover features
- Phased development to minimize the area of bare soil exposed at any given time
- Disturbing only the smallest area necessary to perform current activities
- Confining sediment to the construction area during the construction phase
- Scheduling of construction activities during the time of year with the least erosion potential, when applicable
- Stabilization of exposed surfaces in a timely manner
- Structural controls are preventative and also mitigative since they control erosion and sediment movement. In the event that additional soil stabilization or erosion control measures are deemed necessary, one or more of the following measures will be implemented:
- Vegetative and Non-Vegetative Stabilization. A soil stabilization and vegetation schedule is provided in this appendix.
- Check Dams. Check dams shall be constructed using gravel, rock, gabions, compost socks, or sand bags to reduce flow velocity and therefore erosion in a perimeter channel or detention pond.
- Filter Berms. Filter berms shall be constructed of mulch, woodchips, brush, compost, shredded wood waste, or synthetic filter materials. Mesh socks shall be filled with compost, mulch, woodchips, brush, or shredded wood waste. Filter berms or filled mesh socks shall be installed at the bottom of slopes, throughout the perimeter drainage system, and on sideslopes. The maximum drainage area to the filter berm or filled mesh sock will not exceed two acres. Specifications for the filter berms are provided on Drawing C3-3.
- Baled Hay, Hay bales, straw bales, or baled hay shall be approximately 30 inches in length and be composed entirely of vegetable matter. Hay bales shall be embedded in the soil a minimum of four inches.

- Sediment Traps. Sediment traps are small, excavated areas that function as sediment basins. Sediment traps allow for the settling of suspended sediment in stormwater runoff. Sediment traps shall be constructed in perimeter channels, temporary internal channels, and at entrances to detention ponds. The maximum drainage area contributing to a sediment trap will not exceed 10 acres.
- Temporary Sediment Control Fence or Silt Fence. Silt fences or fabric filter fences shall be used where there is sheet flow and sediment transport. The maximum drainage area to the silt fence will not exceed the manufacturer's specification, but will in no case be greater than 0.5 acre per 100 feet of fence. To ensure sheet flow, a gravel collar or level spreader may be used upslope of the silt fence.
- Berms. These structures will be constructed of earthen material with the top six inches capable of sustaining native plant growth. Rolled erosion control mats or blankets made from natural materials or synthetic fiber, grass, or compost/mulch/straw may be used as erosion protection along the flowline. These structures direct the flow to the drainage system. These structures decrease downslope velocities of runoff that could cause erosion on the intermediate cover slopes.
- Benches. These structures will be constructed out of the waste material and covered with intermediate cover. Rolled erosion control mats or blankets made from natural materials or synthetic fiber, grass, or compost/mulch/straw may be used as erosion protection along the flowline. These structures direct the flow to the drainage system. These structures decrease downslope velocities of runoff that could cause erosion on the intermediate cover slopes.
- Downchutes. downchutes are bermed conveyance structures constructed on the intermediate cover slopes. Flow will be directed to the downchutes via swales, then conveyed to the perimeter drainage system. The downchutes will be lined with an FML geomembrane, turf reinforcement mats, Maccaferri gabion mattresses, concrete, gabions, crushed concrete, or stone.

SOIL STABILIZATION AND VEGETATION SCHEDULE

The soil stabilization and vegetation schedule is as follows:

- Areas that will remain inactive for greater than 180 days will receive intermediate cover.
- Intermediate cover on slopes will be stabilized by tracking into the slope. Soil stabilization can be enhanced by mulching, the addition of soil tackifiers, or a combination of these measures. The intermediate cover will be graded to provide positive drainage.
- Temporary erosion control structures will be installed within 180 days from when intermediate cover is constructed.
- The intermediate cover area will be seeded or sodded as soon as practical, following placement of intermediate cover and will be documented in the site operating record. All intermediate cover areas will be managed to control erosion and achieve a predicted soil loss of less than 50 tons per acre per year. A 60 percent vegetative cover will be established over the intermediate cover areas within 180 days from intermediate cover construction unless prevented by climatic events (e.g., drought, rainfall, etc.). Additional temporary erosion control measures will be implemented during these events to promote establishment of vegetative cover.
- Mulch, woodchips, or compost may be used as a layer placed over the intermediate cover to protect the exposed soil surface from erosive forces and conserve soil moisture until vegetation can be established. The mulch, woodchips, or compost will be used to stabilize recently graded or seeded areas. The mulch, woodchips, or compost will be spread evenly over a recently seeded area and tracked into the surface to protect the soil from erosion and moisture loss, if required to promote the establishment of vegetation. These materials are not required for the establishment of vegetation on the intermediate cover; however, they may be used if Beck Landfill determines they are needed to promote vegetative growth or to provide additional erosional stability to the intermediate cover surface. These materials will vary in thickness but will not be placed to a thickness to inhibit vegetative growth.
- The intermediate cover and temporary erosion control structures will be maintained as detailed in the Stormwater System Maintenance Plan.
- Final cover will be constructed as the site develops. Temporary erosion control features will be removed as permanent erosion control structures are constructed.

STORMWATER SYSTEM MAINTENANCE PLAN

Beck Landfill will restore and repair temporary stormwater systems such as channels, benches, drainage swales, chutes, and flood control structures in the event of washout or failure. In addition, the BMPs discussed in this appendix will also be replaced or repaired in the event of failure. Excessive sediment will be removed, as needed, so that the drainage structures function as designed. Site inspections by facility personnel will be performed weekly or within 48 hours of a rainfall event of 0.5 inches or more. The final cover system and the erosion sediment control structures will be maintained throughout the site life and post-closure period.

The following items will be evaluated during the inspections:

- Erosion of intermediate cover areas, perimeter ditches, temporary chutes, swales, detention ponds, berms, and other drainage features
- Settlement of intermediate cover areas, final cover areas, perimeter ditches, chutes, swales, and other drainage features
- Silt and sediment build-up in perimeter ditches, chutes, swales, and detention ponds
- Presence of ponded water on intermediate cover or behind temporary erosion control structures
- Obstructions in drainage features
- Presence of erosion or sediment discharge at offsite stormwater discharge locations
- Temporary erosion and sediment control features

Maintenance activities will be performed to correct damaged or deficient items noted during the site inspections. These activities will be performed as soon as possible after the inspection. The time frame for correction of damaged or deficient items will vary based on weather, ground conditions, and other site-specific conditions.

Maintenance activities will consist of the following, as needed:

- Placement of additional temporary or permanent vegetation
- Placement, grading, and stabilization of additional soils in eroded areas or in areas which have settled
- Replacement of gabion mattresses or other structural lining
- Removal of obstructions from drainage features
- Removal of silt and sediment build-up from the temporary erosion control structures. Removed sediment will be re-used as daily or intermediate cover.

- Removal of ponded water on the intermediate cover or behind temporary erosion control structures. If removed water has not contacted waste, it may be discharged in accordance with the site's stormwater permit. If the water has potentially contacted waste, it will be managed as contaminated stormwater,
- Repairs to erosion and sedimentation controls
- Installation of additional erosion and sedimentation controls
- Documentation and training requirements are discussed below:
- Site inspections by facility personnel will be performed weekly or within 48 hours of a rainfall event of 1.5 inches or more.
- Documentation of the inspection will be included in the site operating record.
- Documentation of maintenance activities that were performed to correct damaged or deficient items noted during the site inspections will be included in the site operating record.
- Facility personnel will be trained to perform inspections, and to install and maintain temporary erosion control structures.

BECK LANDFILL

APPENDIX C1-G
FACILITY SURFACE WATER DRAINAGE REPORT
INTERMEDIATE COVER
EROSION CONTROL STRUCTURE DESIGN

Includes pages C1-G-1 through C1-G-6

CONTENTS

NARRATIVE

This appendix presents the supporting documentation to evaluate and design temporary erosion and sediment control structures for the intermediate cover phase of landfill development.

INTERMEDIATE COVER PLAN

As intermediate cover is constructed, benches, temporary chutes and berms will be constructed to prevent erosion and sedimentation. Erosion control features (i.e., filter berms, rock check dams, hay bales, or equivalent) may be constructed at the toe of filled areas to minimize erosion and prevent disturbance of the existing grassed slopes. Otherwise, temporary erosion and sediment control features will be installed within 180 days from when the intermediate cover is constructed. An existing conditions summary and Best Management Practices are included in Appendix C1-F. Example intermediate cover drainage calculations are included in this appendix for use in site operations.

INTERMEDIATE COVER EVALUATION

The intermediate cover evaluation is based on the Universal Soil Loss Equation (USLE) following Natural Resource Conservation Service (NRCS) procedures. The evaluation is based on a 12-inch thick intermediate cover layer with 60 percent vegetated cover. Calculations for the soil loss for intermediate cover on external 6 percent and 25 percent slopes have been provided below.

TEMPORARY DRAINAGE BERM DESIGN

The temporary drainage berms are designed for typical drainage areas and flowline slopes. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

TEMPORARY DIVERSION CHANNEL DESIGN

The temporary diversion channels are designed for typical drainage areas and flowline slopes. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and diversion channel capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

TEMPORARY DRAINAGE DOWNCHUTE DESIGN

The temporary drainage downchutes are designed for typical drainage areas on a 25 percent external side slope. The procedures in the TxDOT Hydraulic Design Manual, September 2019, were used to determine peak flow, flow depth, flow velocity, and downchute capacity. The Rational Method and the Manning's Equation were used to calculate the design parameters.

INTERMEDIATE COVER EVALUATION

SOIL LOSS

This section presents the supporting documentation for evaluation of the potential for intermediate cover soil erosion loss at Beck Landfill. The evaluation is based on the premise of adding excess soil to increase the time required before maintenance is needed as recommended in the EPA Solid Waste Disposal Facility Criteria Technical Manual (EPA 530-R-93-017, November 1993).

The design procedure is as follows:

1. Minimum thickness of the intermediate cover is evaluated based on the maximum soil loss of 50 tons per acre per year.
2. Soil loss is calculated using the Universal Soil Loss Equation (USLE) by following NRCS procedures. The soil loss is based on 60 percent vegetative cover as recommended in the TCEQ, Use *of the Universal Soil* Loss *Equation in Final Cover/Configuration Design Procedural Handbook* (October 1997). The pages from the NRCS manual are included in Appendix C1-E. These results of the calculations show that erosion controls must be placed on maximum 400 feet spacing on the sideslopes.

SOIL EROSION (RUSLE)

A = R*K*L*S*C*P	
R	265
K	0.32
LS	13.53
C	0.042
P	1
A (tons/acre/year)	**48.188**
Control Seperation	**400**

Figure 2-1 Isoerodent Map, USDA 1997
Monsic Clay Loam (more conservative than clay factor in Schertz Texas)
Using the value of LS that you find go to table 4-3 and use the LS and slope to find bench distance.
(should be different for Intermediate and Final Cover) (Type G, 60% grass - 0.042)
Usually 1 for landfills (conservative case from the table provided in "P" Tab)
50 tons/ac/yr max for Intermediate Cover, 3 tons/ac/yr max for final cover
Required Berm, Bench, or Other Control Horizontal Spacing

3. Temporary vegetation for the intermediate cover areas will be native and introduced grasses with root depths of six inches to eight inches.

Native and introduced grasses will be hydroseeded, drill seeded, or broadcast seeded with fertilizer on the disked (parallel to contours) intermediate cover layer as soon as practical following placement of intermediate cover and will be documented in the site operating record. All intermediate cover areas will be managed to control erosion and achieve a predicted soil loss of less than 50 tons per acre per year. Temporary erosion and sediment control features (including at least 60 percent vegetative cover) will be installed within 180 days from when the intermediate cover is constructed. Areas that experience erosion or do not readily vegetate will be reseeded and additional temporary erosion control measures will be implemented until vegetation is established or the soil will be replaced with soil that will support the grasses.

The facility will utilize a combination of vegetation and interim and permanent structural controls to control sediment creation. Soil loss calculations above demonstrate that the expected worst-case conditions for the interim phases of the landfill produce less sediment than the maximum recommended values provided in Section 2.5 of TCEQ guidance document RG-417. The site operations are regulated through the Texas Pollutant Discharge Elimination System program for stormwater discharges and interim controls will be continuously evaluated to ensure that the minimum amount of sediment possible will be discharged from the site.

Table 4-3.
Values for topographic factor, LS, for high ratio of rill to interrill erosion.[1]

	Horizontal slope length (ft)																
Slope (%)	<3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.12	0.12	0.13
1.0	0.09	0.09	0.09	0.09	0.09	0.10	0.13	0.14	0.15	0.17	0.18	0.19	0.20	0.22	0.24	0.26	0.27
2.0	0.13	0.13	0.13	0.13	0.13	0.16	0.21	0.25	0.28	0.33	0.37	0.40	0.43	0.48	0.56	0.63	0.69
3.0	0.17	0.17	0.17	0.17	0.17	0.21	0.30	0.36	0.41	0.50	0.57	0.64	0.69	0.80	0.96	1.10	1.23
4.0	0.20	0.20	0.20	0.20	0.20	0.26	0.38	0.47	0.55	0.68	0.79	0.89	0.98	1.14	1.42	1.65	1.86
5.0	0.23	0.23	0.23	0.23	0.23	0.31	0.46	0.58	0.68	0.86	1.02	1.16	1.28	1.51	1.91	2.25	2.55
6.0	0.26	0.26	0.26	0.26	0.26	0.36	0.54	0.69	0.82	1.05	1.25	1.43	1.60	1.90	2.43	2.89	3.30
8.0	0.32	0.32	0.32	0.32	0.32	0.45	0.70	0.91	1.10	1.43	1.72	1.99	2.24	2.70	3.52	4.24	4.91
10.0	0.35	0.37	0.38	0.39	0.40	0.57	0.91	1.20	1.46	1.92	2.34	2.72	3.09	3.75	4.95	6.03	7.02
12.0	0.36	0.41	0.45	0.47	0.49	0.71	1.15	1.54	1.88	2.51	3.07	3.60	4.09	5.01	6.67	8.17	9.57
14.0	0.38	0.45	0.51	0.55	0.58	0.85	1.40	1.87	2.31	3.09	3.81	4.48	5.11	6.30	8.45	10.40	12.23
16.0	0.39	0.49	0.56	0.62	0.67	0.98	1.64	2.21	2.73	3.68	4.56	5.37	6.15	7.60	10.26	12.69	14.96
20.0	0.41	0.56	0.67	0.76	0.84	1.24	2.10	2.86	3.57	4.85	6.04	7.16	8.23	10.24	13.94	17.35	20.57
25.0	0.45	0.64	0.80	0.93	1.04	1.56	2.67	3.67	4.59	6.30	7.88	9.38	10.81	13.53	18.57	23.24	27.66
30.0	0.48	0.72	0.91	1.08	1.24	1.86	3.22	4.44	5.58	7.70	9.67	11.55	13.35	16.77	23.14	29.07	34.71
40.0	0.53	0.85	1.13	1.37	1.59	2.41	4.24	5.89	7.44	10.35	13.07	15.67	18.17	22.95	31.89	40.29	48.29
50.0	0.58	0.97	1.31	1.62	1.91	2.91	5.16	7.20	9.13	12.75	16.16	19.42	22.57	28.60	39.95	50.63	60.84
60.0	0.63	1.07	1.47	1.84	2.19	3.36	5.97	8.37	10.63	14.89	18.92	22.78	26.51	33.67	47.18	59.93	72.15

[1]Such as for freshly prepared construction and other highly disturbed soil conditions with little or no cover (not applicable to thawing soil)

TEMPORARY DRAINAGE BERM DESIGN

The temporary drainage berm design for intermediate cover areas is presented for the typical berm flowline of 2 percent. The procedures in the TxDOT Hydraulic Design Manual were used to determine peak flow, flow depth, flow velocity, and berm capacity. The temporary berms will be located on the intermediate cover to prevent erosion as follows:

All temporary berms shall be designed to minimize erosion and provide a maximum flow depth of two feet. The total height of the berms at the flowline is a minimum of three feet. A detail for the temporary drainage berm is provided on Figure C3-4, in Appendix C-3. As noted in the calculations, the velocities in the berms are less than permissible non-erodible velocities. If sustained erosion is observed, facility management will evaluate and construct additional temporary drainage berms. Example drainage berm calculations for a grassed intermediate cover are provided below.

Berms	
Bottom width	0 ft
Side slope 1 (horiz./vert.)	4/1
Side slope 2 (horiz./vert.)	3/1
Manning roughness, n	0.03
Channel slope	2%
Flow depth	2 ft

Results		
Flow area	14	ft^2
Wetted perimeter	14.57	ft
Hydraulic radius	0.96	ft
Velocity, v	6.82	ft/sec
Flow, Q	95.49	cfs
Velocity head, h_v	0.72	ft
Top width, T	14	ft

The cross-sections for the temporary berms is three feet height, two feet top width, 3:1 uphill sideslopes and 2:1 downhill sideslopes. A detail for the temporary drainage berm is provided on Figure C3-4, in Appendix C-3. Based on the Rational Method parameters developed in Appendix C1-D, the maximum drainage area allowable for a temporary berm is 15 acres.

$Q_{25} = CIA$

95 cfs= (0.7)(8.8 in/hr)(A)

A= 15 acres

TEMPORARY DRAINAGE DOWNCHUTE DESIGN

The temporary downchute design is applicable for external side slopes of the landfill with intermediate cover. Temporary downchutes will typically consist of channels lined with erosion control material. The flow capacity of the downchute structures was determined based on the Manning's Equation. The maximum flow calculated from the Manning's Equation is used to determine the maximum drainage area based on the NRCS Method. The design calculations presented below represent typical calculations for temporary downchutes on a 25 percent slope. If sustained erosion is observed, facility management will evaluate the use and construction of temporary letdowns.

Chute Design		
Bottom	ft	20
Depth	ft	2
Side slope	%	25
Channel slope	%	25
Roughness	Natural channel, very poor condition	0.06

Parameters		
Flow area	56.00	ft^2
Wetted perimeter	36.49	ft
Hydraulic radius	1.53	ft
Velocity, v	16.47	ft/sec
Flow, Q	922.54	cfs
Velocity head, h_v	4.22	ft
Top width, T	36.00	ft

Capacity (max)		
Q	cfs	922.54
V	fps	16.47
D	ft	2

The cross-sections for the temporary downchutes is shown above. A detail for the temporary drainage berm is provided on Figure C3-4, in Appendix C-3. Based on the Rational Method parameters developed in Appendix C1-D, the maximum drainage area allowable for a temporary downchute is 149 acres.

Q_{25} = CIA

922.5 cfs= (0.7)(8.8 in/hr)(A)

A= 149 acres

DESIGN SUMMARY

Beck Landfill will implement the erosion and sediment control features on the intermediate cover as the landfill develops. The following items will be implemented, as filling operations are ongoing:

- Intermediate cover will be established on all areas that have received waste but will remain inactive for periods greater than 180 days.
- Sufficient permanent and temporary erosion and sediment control features shall be constructed to redirect surface water and prevent erosion.
- Temporary erosion and sediment control features shall be constructed within 180 days of placement of intermediate cover.
- Temporary erosion control structures (e.g., rock check dams, filter berms) may be established along the toe of existing vegetated intermediate cover areas with approximately 70-90 percent coverage.
- Final cover may be constructed as the site develops. Temporary erosion control features will be removed as permanent erosion controls are constructed.

The facility will utilize a combination of vegetation and interim and permanent structural controls to control sediment creation. Soil loss calculations previously provided demonstrate that the expected worst-case conditions for the interim and final phases of the landfill produce less sediment than the maximum recommended values provided in Section 2.5 of TCEQ guidance document RG-417. The site operations are regulated through the Texas Pollutant Discharge Elimination System program for stormwater discharges and interim controls will be continuously evaluated to ensure that the minimum amount of sediment possible will be discharged from the site.

MUNICIPAL SOLID WASTE PERMIT
MAJOR AMENDMENT

PART III-ATTACHMENT C2 - FLOOD CONTROL ANALYSIS

NAME OF PROJECT: Beck Landfill

MSW PERMIT APPLICATION NO.: 1848A

OWNER: Nido, LTD (CN603075011)

OPERATOR: Beck Landfill (RN102310968)

CITY, COUNTY: Schertz, Guadalupe County

Major Amendment: Revised September 2023

Prepared by:

Civil & Environmental Consultants, Inc.

Texas Registration Number F-38
1221 S MoPac Expressway
Suite 350,
Austin, Texas 78746
(512) 329-0006

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED
PROFESSIONAL ENGINEER
9-15-23

TABLE OF CONTENTS

Discussion of 100 Year Floodplain

The current FEMA map panels for the area around the landfill property are numbers 48187C0210F & 48029C0295F, which were revised in 2007 and 2010, respectively. At the time the model for these panels was created, the Beck Landfill was permitted to be filled to its final grades, but not yet constructed to an extent where the entire footprint was above the calculated 100-year water surface. FEMA modeled this permitted future condition by placing blocked obstructions on the cross-sections that traverse the landfill footprint, so that the model accounted for the authorized final condition of the landfill. FEMA then extended the floodplain across the portions of the landfill that had not yet been constructed above the 100-year water surface elevations.

To prevent the wash-out of waste by a flood event, the entire landfill footprint is encompassed by a compacted clay berm, which extends above the current 100-year flood elevation. As part of the amendment application, Beck Landfill is proposing to extend the berm 10 feet vertically to provide additional freeboard above the 100-year event. The entire footprint of the landfill and perimeter berm is currently constructed above the 100-year water surface and Beck Landfill has submitted a LOMR application to the City of Schertz and FEMA to revise the affected panels to accurately reflect the lateral extents of the floodplain. The LOMR application has updated cross-sections affected by the landfill with current topography and re-delineated the extents of the floodplain. The floodway shown on these panels was also revised to reflect the updated topography. The LOMR application maintains the hydrologic flow values included in the effective FEMA model.

The City of Schertz has approved the LOMR application and a copy of their concurrence is included in this section. The LOMR has been submitted to FEMA and has been assigned Case No. 22-06-2567P. A complete copy of the LOMR application is included in Appendix C2-A.

In compliance with 30 TAC §330.63(c)(2)(C), the following table has been prepared to show the projected 100 year flood elevation, top of the existing perimeter berm, and top of the proposed perimeter berm at each cross-section used in the HEC-RAS hydraulic model that was submitted to FEMA as part of the LOMR application. The locations of each of these cross-sections are shown on Figure C2-2.

Table C2-1 Comparison of Projected Flooding Levels and Perimeter Berm

Cross-Section Label	LOMR 100 Year Water Surface Elevation (ft MSL)	Perimeter Dike Elevation (ft MSL)		Proposed Freeboard Above 100 Year Flood (ft)
		Existing	Proposed	
444777	714.34	716	726	11.7
442240	712.59	716	726	13.4
443555	712.24	715	725	12.8
442891	711.58	714	724	12.4
442214	709.72	714	724	14.3
441476	708.12	712	722	13.9
440762	705.81	709	719	13.2
439971	705.51	709	719	13.5
438740	705.3	709	719	13.7
437996	705.21	709	719	13.8
437265	705.03	709	719	14.0
436536	704.27	708	718	13.7
435810	703.05	706	716	13.0
435043	702.4	704	714	11.6
434953	701.08	702	712	10.9
433730	700.47	701	711	10.5
433539	700.39	701	711	10.6

Stormwater Detention and Sedimentation Pond

The proposed stormwater pond for the landfill is within the 100-year floodplain. The pond will be excavated below grade and include above grade compacted soil berms to provide additional volume. The purpose of the pond is to provide detention and sedimentation capacity for the landfill. The pond will be constructed at the same location as the existing stormwater pond and the proposed soil berms will be tied into the existing landfill perimeter berm to minimize the encroachment on the floodplain. In order to offset the loss of flow area in the floodplain from the pond berm, the area south of the new pond is proposed to be excavated to enhance flow through Cibolo Creek. A no-rise certification for the proposed pond was submitted to the City of Schertz for review and a copy of the submittal is included in Appendix C2-B. Based on the modeling in the no-rise certification, there is no increase in the calculated water surface elevation of the floodplain from the pond construction, since the areas along the creek will be excavated to completely offset any effects of the new pond.

The City of Schertz approved the no-rise certification for the pond construction on October 20, 2022.

Since the pond will be located within the floodplain and floodway of Cibolo Creek, the proposed location was evaluated by Power Engineers, Inc. to determine if any Waters of the U.S. (WOTUS) would be impacted by the construction. Attachment K in Part II of this amendment application includes the wetlands report and WOTUS evaluation. As shown on Figure 3 in Attachment K, no WOTUS features are present in the location of the existing sedimentation pond/proposed detention pond. Therefore, a U.S. Army Corps of Engineers permit is not required under Section 404 of the Clean Water Act.

Compliance with Chapter 301

The existing levee and the proposed pond construction have been reviewed and approved by the City of Schertz and are exempt from the requirements of 30TAC§301 pursuant to §301.2(3)(A) and Texas Water Code Section 16.236(h)(3) which states:

> (h) Subsection (a) of this section does not apply to:...
>
> (3) a levee or other improvement within the corporate limits of a city or town provided:
>
> > (a) plans for the construction or maintenance or both must be approved by the city or town as a condition precedent to starting the project and
> >
> > (b) the city or town requires that such plans be in substantial compliance with rules and standards adopted by the commission;

NORTH

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0220F

FIRM

FLOOD INSURANCE RATE MAP

GUADALUPE COUNTY, TEXAS

AND INCORPORATED AREAS

PANEL 220 OF 480

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

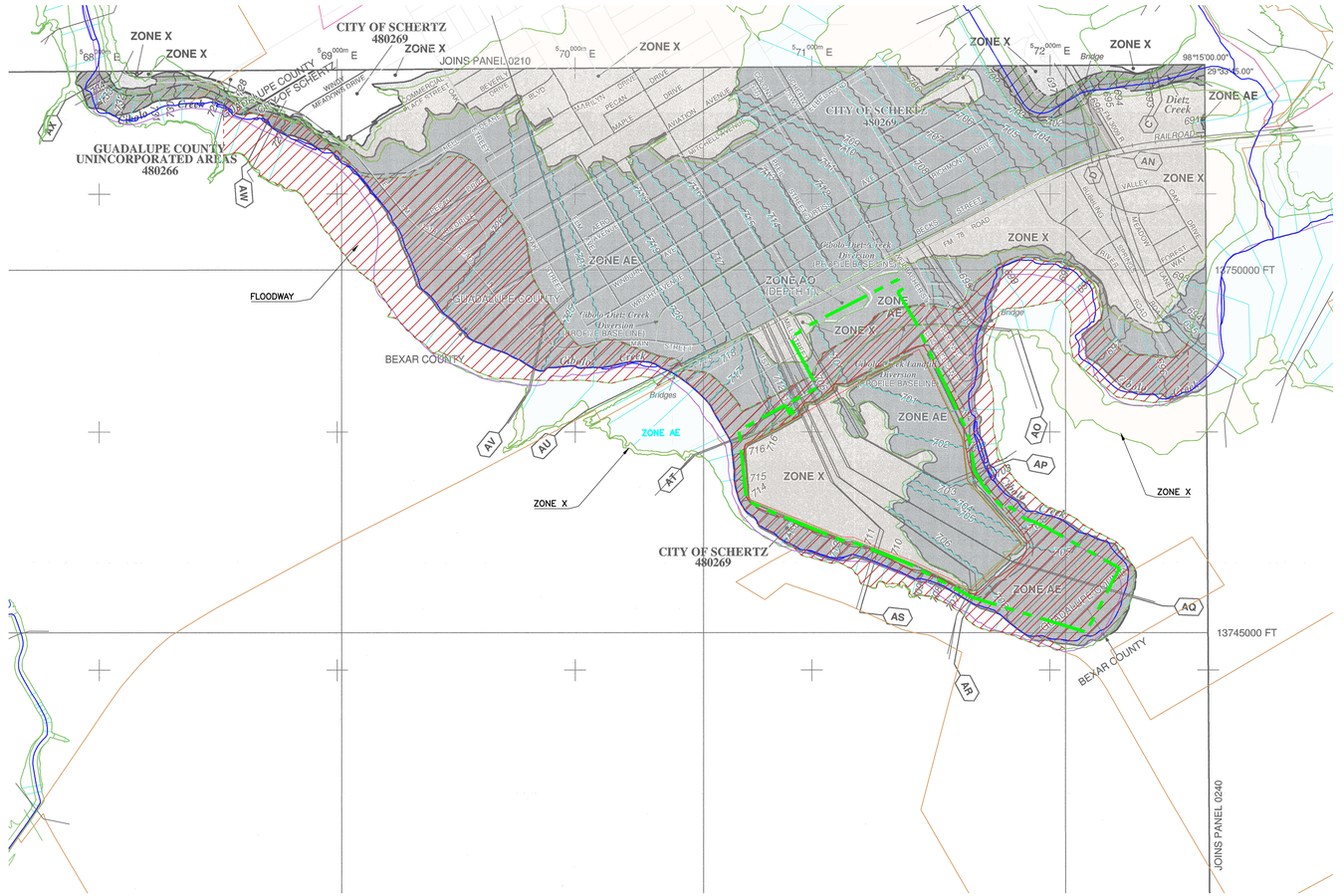
COMMUNITY	NUMBER	PANEL	SUFFIX
GUADALUPE COUNTY	480266	0220	F
SCHERTZ, CITY OF	480269	0220	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48187C0220F

EFFECTIVE DATE
NOVEMBER 2, 2007

Federal Emergency Management Agency



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 14

6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, south central zone (FIPSZONE 4204), Lambert Conformal Conic

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 2, 2007
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

LEGEND

LANDFILL PERMIT BOUNDARY

LANDFILL FOOTPRINT BOUNDARY

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

SCALE IN FEET

0 1000 2000

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED PROFESSIONAL ENGINEER
1-5-23

REVISION RECORD

NO	DATE	DESCRIPTION
1	7/5/2023	TECH NOTES UPDATE, LINE TYPE FOR PERMIT BOUNDARY

CEC
Texas Registered Engineering Firm F-98
Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

FLOOD INSURANCE RATE MAP (FIRM)
48187C0220F

DATE:	12/21/2022
DWG SCALE:	1" = 1000'
PROJECT NO:	311-653.SITE
DRAWN BY:	AGT
CHECKED BY:	JCM
APPROVED BY:	AWM

DRAWING NO.:

C2-1

SHEET C2-1 OF C2-1

P:\310-000\311-653_-CAD\Dwg\CVR\311653-CVR1-C2-1 Effective FIRMette.dwg[C2-1 LS(12/23/2022 - amehevec) - LP: 7/4/2023 12:18 AM

NORTH

REFERENCE

DATUM: TX83-SCF: NAD83 Texas State Planes, South Central Zone, US Foot

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

FLOODPLAIN DATA: FEMA NATIONAL FLOOD HAZARD LAYER (NFHL), 2021-08-18, PUBLICLY AVAILABLE GIS.

THE PORTION OF THE STUDY AREA WITHIN THE UNINCORPORATED PORTION OF BEXAR COUNTY USES NOAA ATLAS-14 RAINFALL DATA. THE PORTION WITHIN THE CITY OF SCHERTZ USES THE EFFECTIVE FEMA MODEL RAINFALL DATA.

LEGEND

- EXISTING CREEK CENTERLINE
- EFFECTIVE 1% ANNUAL CHANCE FLOODPLAIN (ZONE AE)
- EFFECTIVE 1% ANNUAL CHANCE FLOODWAY
- EFFECTIVE ZONE X
- 1% ANNUAL CHANCE FLOODPLAIN BOUNDARY
- 0.2% ANNUAL CHANCE FLOODPLAIN BOUNDARY
- 1% ANNUAL CHANCE FLOODWAY
- CROSS-SECTION LINE FROM CURRENT STUDY
- CROSS-SECTION LINE FROM EFFECTIVE STUDY

SCALE IN FEET
0 300 600
ONE INCH EQUALS 300 FEET

LIMITS OF STUDY
TIE-IN LOCATION

BRIDGE AT PECAN GROVE DRIVE

RAILROAD BRIDGE
FM 78 BRIDGE

LIMITS OF STUDY
TIE-IN LOCATION

433181 WSE: 700.20
433408 WSE: 700.34
433939 WSE: 700.59
433740 WSE: 700.47
434453 WSE: 701.08
435043 WSE: 702.40
435810 WSE: 703.05
436536 WSE: 704.27
437265 WSE: 705.03
437996 WSE: 705.21 (SCHERTZ) WSE: 708.08 (BEXAR COUNTY)
438740 WSE: 705.30 (SCHERTZ) WSE: 708.17 (BEXAR COUNTY)
439471 WSE: 705.51
440762 WSE: 705.81
441476 WSE: 708.12
442214 WSE: 709.72
442891 WSE: 711.58
443555 WSE: 712.24
444240 WSE: 712.59
444777 WSE: 714.34
445233 WSE: 715.46
445537 WSE: 716.47
446037 WSE: 716.14
446236 WSE: 716.12

BEXAR COUNTY

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED PROFESSIONAL ENGINEER
12-21-2022

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
Texas Registered Engineering Firm F-98
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

TOPOGRAPHIC WORK MAP

DATE:	12/22/2022
DWG SCALE:	1" = 300'
PROJECT NO:	311-653.SITE
DRAWN BY:	AGT
CHECKED BY:	JCM
APPROVED BY:	AWM

DRAWING NO.: C2-2

SHEET 2 OF 4

BECK LANDFILL
APPENDIX C2-A
LOMR Application

From:	Tariq Makhdoom
To:	Mehevec, Adam
Cc:	dletbetter@schertz.com; Lokulutu, Bosulu
Subject:	Revision Request Received – LOMR Case Number (22-06-2567P) – Guadalupe County, Texas and Incorporated Areas– Response Requested
Date:	Monday, August 15, 2022 12:17:21 PM

Dear Adam Mehevec:

We have received your request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the flood hazard information on the applicable National Flood Insurance Program (NFIP) map for Guadalupe County, Texas and Unincorporated Areas. This e-mail is being sent to officially acknowledge the receipt of your request and replaces the paper copy acknowledgement letters previously issued by FEMA. We ask that you please respond directly to this e-mail to verify that it has been received.

The case number assigned to your request is 22-06-2567P, and the project identifier is Beck Landfill.

We are reviewing your submitted data and will contact you if additional information is required to process your request.

If additional information is not required, we will issue a final letter of determination within 90 days of receiving your request. Please be aware that this LOMR will become effective approximately 4.5 months after the final letter of determination is issued.

If you have general questions about your request, FEMA policy, or the NFIP, please contact the FEMA Mapping and Insurance eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, the case reviewer's contact information is listed below, or please contact the Revisions Coordinator for your State, Mr. Bosulu Lokulutu, E.I.T., CFM, by e-mail at bosulu.lokulutu@aecom.com or by telephone at (972) 735-7093.

Please be assured we will do our best to respond to all inquiries in a timely manner.

Thank you,

M. Tariq Makhdoom, Ph.D., CFM
Taylor Engineering, Inc., a member of **Compass PTS JV**
10199 Southside Blvd., Suite 310, Jacksonville, FL 32256
Main: 904-731-7040 | Direct: 904 -553 - 5760
TMakhdoom@Taylorengineering.Com

LETTER OF MAP REVISION REQUEST
FOR
FIRM PANELS 48029C0295F AND 48187C0210F

BECK LANDFILL
550 FARM TO MARKET ROAD 78
SCHERTZ, GUADALUPE COUNTY, TEXAS

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
AUSTIN, TEXAS (TEXAS P.E. FIRM F-38)

CEC Project 311-653

JUNE 2022

June 15, 2022

Attention: Kathryn Woodlee, PE, CFM

Subject: LOMR Application
Case Number: Unassigned
Floodplain Panels: 48187C0210F & 48029C0295F
in Guadalupe County, TX
NIDO. Ltd.
CEC Project 311-653

Dear Kathryn,

This letter outlines the methodology used for the preparing the attached Letter of Map Revision (LOMR) request for the area immediately adjacent to the Beck Landfill located at 550 Farm-To-Market Road 78, Schertz, Texas.

The current FEMA map panels for the area around the landfill property are numbers 48187C0210F & 48029C0295F, which were revised in 2007 and 2010, respectively. At the time the model for these panels was created, the Beck Landfill was permitted to be filled to its final grades, but not yet constructed to an extent where the entire footprint was above the calculated 100-year water surface. FEMA modeled this permitted future condition by placing blocked obstructions on the cross-sections that traverse the landfill footprint, so that the model accounted for the authorized final condition of the landfill. FEMA then extended the floodplain across the portions of the landfill, that had not yet been constructed above the 100-year water surface elevations.

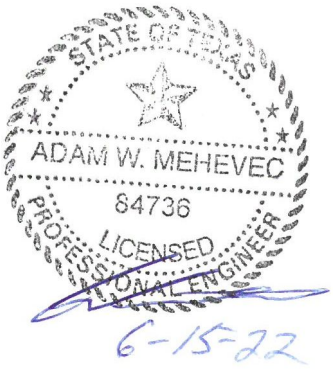
The entire footprint of the landfill has now been constructed above the 100-year water surface and Beck Landfill is submitting this LOMR application to revise the affected panels to accurately reflect the lateral extents of the floodplain. We have updated the cross-sections affected by the landfill with current topography and re-delineated the extents of the floodplain. The floodway shown on these panels has not been revised since the new topography did not affect the areas shown as floodway. We have also maintained the flow values included in the effective FEMA model.

Please feel free to contact me at (512) 329-0006 or amehevec@cecinc.com if you have any questions related to this LOMR application.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
Texas Registered Engineering Firm F-38

Adam W. Mehevec, P.E.
Principal



DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

OVERVIEW & CONCURRENCE FORM

OMB Control Number: 1660-0016
Expiration: 1/31/2024

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472 , Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.
PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).
ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.
DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72). All CLOMRs require documentation of compliance with the Endangered Species Act. Refer to the Instructions for details.

☒ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72).

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
480269	City of Schertz; Guadalupe County	TX	48187C	0220F	11/2/07

2. a. Flooding Source: Cibolo Creek

b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH) ☐ Alluvial Fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Beck Landfill

4. FEMA zone designations (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

a. Effective: AE

b. Revised: AE

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change	☐ Improved Methodology/Data	☐ Regulatory Floodway Revision	☐ Base Map Changes
☐ Coastal Analysis	☐ Hydraulic Analysis	☒ Hydrologic Analysis	☐ Corrections
☐ Weir-Dam Changes	☐ Levee Certification	☐ Alluvial Fan Analysis	☐ Natural Changes
☒ New Topographic Data	☐ Other (Attach Description)		

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert ☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $ 8,000

☐ No, Attach Explanation

- Please see the DHS-FEMA Web site at http://www.fema.gov/forms-documents-and-software/flood-map-related-fees for Fee Amounts and Exemptions.

D. SIGNATURES

1. REQUESTOR'S SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Adam Mehevec	Company: Civil and Environmental Consultants, Inc.	
Mailing Address: 3711 S. Mopac Expressway, Bldg 1, Suite 550 Austin, TX 78745	Daytime Telephone: 512-225-8103	Fax No.: 512-329-0096
	E-mail Address: amehevec@cecinc.com	
	Date: July 30, 2022	
Signature of Requestor (required):		

2. COMMUNITY CONCURRENCE

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Doug Letbetter, CFM		
Mailing Address: 10 Commercial Place, Building 2 Schertz, TX 78154	Community Name: City of Schertz	
	Daytime Telephone: 210-619-1800	Fax No.: 210-619-1849
	E-mail Address: dletbetter@schertz.com	
Community Official's Signature (required):	Date: 08-01-2022	

3. CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Adam W. Mehevec, PE		License No.: 84736	Expiration Date: 12/31/2022
Company Name: Civil and Environmental Consultants, Inc.		Mailing Address: 3711 S. Mopac Expressway, Bldg 1, Suite 550 Austin, TX 78745	
Telephone No.: 512-225-8103	Fax No.: 512-329-0096		
E-mail Address: amehevec@cecinc.com			
Signature:			Date: 7-30-2022

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

RIVERINE HYDROLOGY & HYDRAULICS FORM (FORM 2)

OMB Control Number: 1660-0016
Expiration: 1/31/2024

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472 , Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.
PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).
ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.
DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

Flooding Source: Cibolo Creek

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply):

☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Precipitation/Runoff Model → Specify Model: Beck Duration: 24-hr Rainfall Amount: 13.2 (100yr)
☐ Statistical Analysis of Gage Records
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review. 4. HEC-RAS File Description**:

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☒ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevation (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	Watershed Study	432987	704.84	699.92
Upstream Limit*	Watershed Study	446383	719.48	717.88

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS

☒ Steady State ☐ Unsteady State ☐ One-Dimensional ☐ Two-Dimentional

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4. HEC-RAS File Description**:

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
	CiboloCkR1LOMR	Cibolo Creek Update			
Revised or Post-Project Conditions Model	File Name:	Plan Name:	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.
**See instructions for information about modeling other then HEC-RAS. ☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Topographic Information: ☐ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Source: Strategic Mapping Program Center Texas LIDAR | Date: 1/28/2021 through 3/22/2021

Vertical Datum: NAVD88 | Spatial Projection:

Accuracy:

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☐ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) or Special Flood Hazard Areas (SFHAs) increase compared to the effective BFEs? ☐ Yes ☒ No

   If Yes, please attach **proof of property owner notification**. Examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

3. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

4. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.

5. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA). For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

ENGINEERING & DRAINAGE REPORT

600 FM 78
SCHERTZ, GUADALUPE COUNTY TEXAS

Prepared For:

NIDO, LTD.

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
AUSTIN, TEXAS

CEC Project 311-653

JUNE 2022

TABLE OF CONTENTS

APPENDICES

1.0 GENERAL

1.1 PROJECT INTRODUCTION

The proposed project is to continue using the site for existing landfill purposes on the property located in Guadalupe County, Texas, consisting of approximately 154.6 acres within the Full Purpose Jurisdiction of the City of Schertz. The site lies within the Cibolo Creek Watershed and is not located within any zones of the Edwards Aquifer. This report accompanies a Letter of Map Revision (LOMR) submittal to revise the relevant floodplain maps to reflect the current topography of the site.

The current FEMA map panels for the area around the landfill property are numbers 48187C0210F & 48029C0295F, which were revised in 2007 and 2010, respectively. At the time the model for these panels was created, the Beck Landfill was permitted to be filled to its final grades, but not yet constructed to an extent where the entire footprint was above the calculated 100-year water surface. FEMA modeled this permitted future condition by placing blocked obstructions on the cross-sections that traverse the landfill footprint, so that the model accounted for the authorized final condition of the landfill. FEMA then extended the floodplain across the portions of the landfill, that had not yet been constructed above the 100-year water surface elevations.

The entire footprint of the landfill has now been constructed above the 100-year water surface and Beck Landfill is submitting this LOMR application to revise the affected panels to accurately reflect the lateral extents of the floodplain. The cross-sections affected by the landfill construction have been updated with current topography and we have re-delineated the extents of the floodplain. The floodway shown on these panels has not been revised since the new topography did not affect the areas shown as floodway. We have also maintained the flow values included in the effective FEMA model.

2.0 EXISTING CONDITIONS

2.1 ZONING

The site is currently zoned M-2 (Heavy Manufacturing), which allows for landfilling with the approval of a specific use permit. The landfill pre-dates the establishment of zoning in this area and therefore the current use is allowed to continue as long as there is no lateral expansion of the landfill.

2.2 TOPOGRAPHY AND STORMWATER CONVEYANCE PATTERNS

Cibolo Creek loops around three sides of the site, west, south, and east. The subject tract sheet flows into Cibolo Creek along three sides and into a constructed drainage channel on the north side. The site contains an operating landfill and the current topography of the landfill area has a high point elevation of approximately ±785 feet Mean Sea Level (MSL) located near the northwest corner of the landfill. The low point elevation on the site is in Cibolo Creek near the northeast corner of the tract and is approximately ±668 feet MSL. The site consists of varying slopes, with slopes along the creek from 1%-5%, while slopes in the landfill area are as steep as 33%. The native soils are mostly Sunev Loam with some areas of Barbarosa Silty Clay and Bosque and Seguin Soils. See the appendices of this report for a soil map.

2.3 FLOODPLAIN

According to FEMA Panel Numbers 48187C0220F and 48029C9295F effective November 2, 2007 and September 29, 2010 respectively, the majority of the site lies within the 100-year floodplain. The FIRMs are included in the appendices of this report.

2.4 UPSTREAM DRAINAGE AREAS

There is existing City of Schertz maintained storm water conveyance infrastructure south of the right-of-way (ROW) of John E. Peterson Blvd. The site is surrounded by Cibolo Creek and City

of Schertz public stormwater structures that divert stormwater around the site. Therefore there is no off-site drainage flowing onto the subject property other than the flow in Cibolo Creek. The hydrology data for the offsite flow in Cibolo Creek was taken from the effective FEMA model. Maps showing the general location and nature of the stormwater structures from the City of Schertz GIS are included in the appendices of this report. No offsite stormwater enters the landfill footprint.

3.0 PROPOSED CONDITIONS

3.1 DETENTION AND WATER QUALITY

There is no change in the stormwater flow rates associated with this LOMR submittal. The hydrology included in the effective FEMA model was maintained in the proposed condition. No detention or water quality ponds are proposed in conjunction with this LOMR submittal.

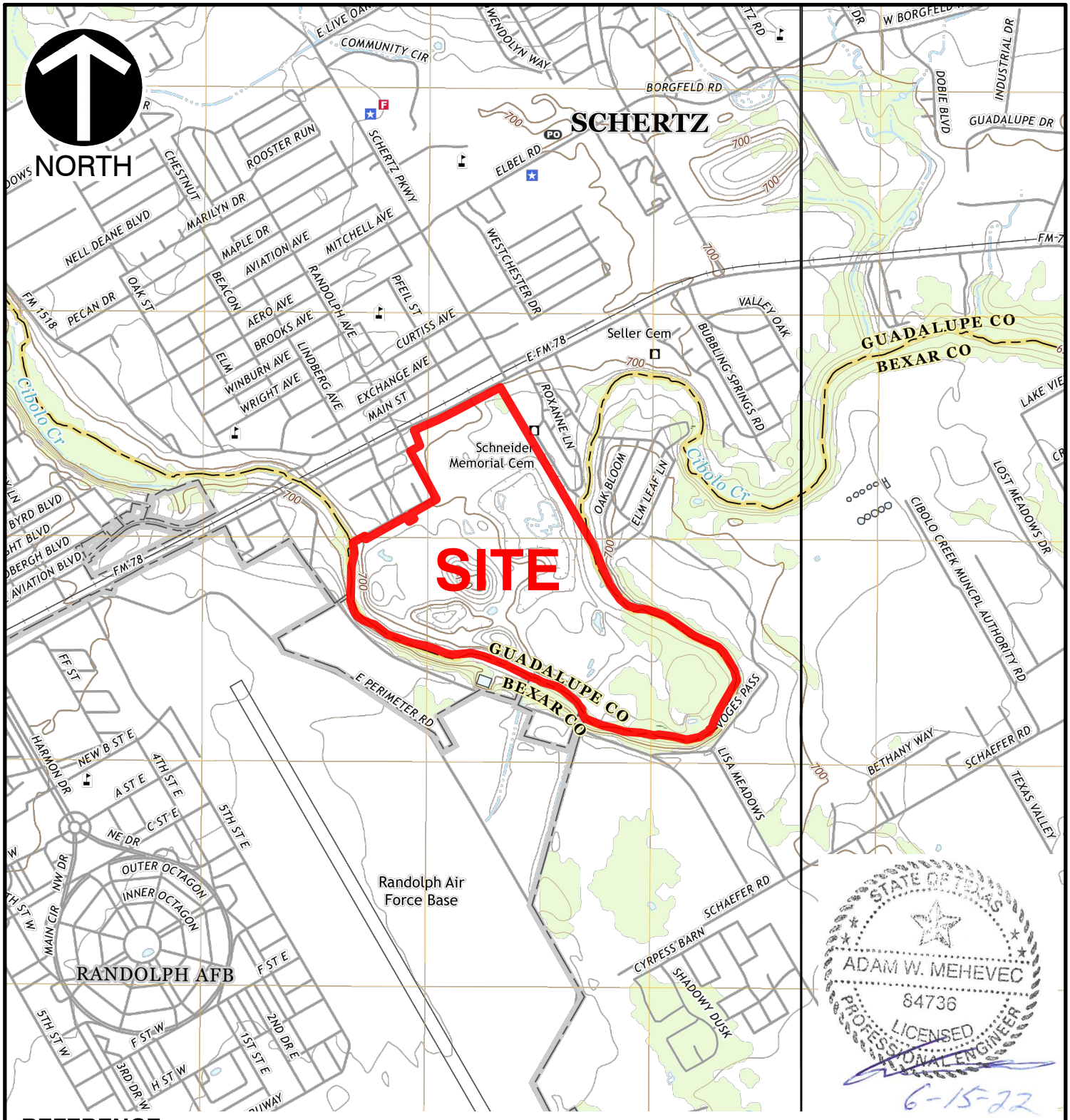
3.2 VARIANCES AND WAIVERS

No new variances or waivers are requested or planned for this development.

3.3 SOIL DISPOSAL

No improvements are proposes as part of this submittal, so there will not be any spoils generated.

LOCATION MAP



ADAM W. MEHEVEC
84736
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
6-15-22

REFERENCE

U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP:
SCHERTZ, TEXAS (DATED 2019) AND MARION, TEXAS (DATED 2019)

SCALE IN FEET

0 2,000 4,000

*HAND SIGNATURE ON FILE

Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com
Texas Registered Engineering Firm F-38

LOMR FOR BECK LANDFILL
600 FM 78, SCHERTZ, TX 78154
GUADALUPE COUNTY, TEXAS

LOCATION MAP

DRAWN BY:	AGT	CHECKED BY:	JCM	APPROVED BY:	JCM*	FIGURE NO.:	1
DATE:	4/28/2022	DWG SCALE:	1" = 2,000'	PROJECT NO:	311-653.SITE		

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SOIL MAP

Search

Map Unit Legend

Guadalupe County, Texas (TX187)

Guadalupe County, Texas (TX187)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bo	Bosque and Seguin soils, frequently flooded	13.4	8.2%
SuA	Sunev loam, 0 to 1 percent slopes	150.3	91.8%
Totals for Area of Interest		**163.7**	**100.0%**

Legend

Soil Map

FIRM MAPS

NORTH

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

PANEL 0220F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

GUADALUPE COUNTY, TEXAS

AND INCORPORATED AREAS

PANEL 220 OF 480

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

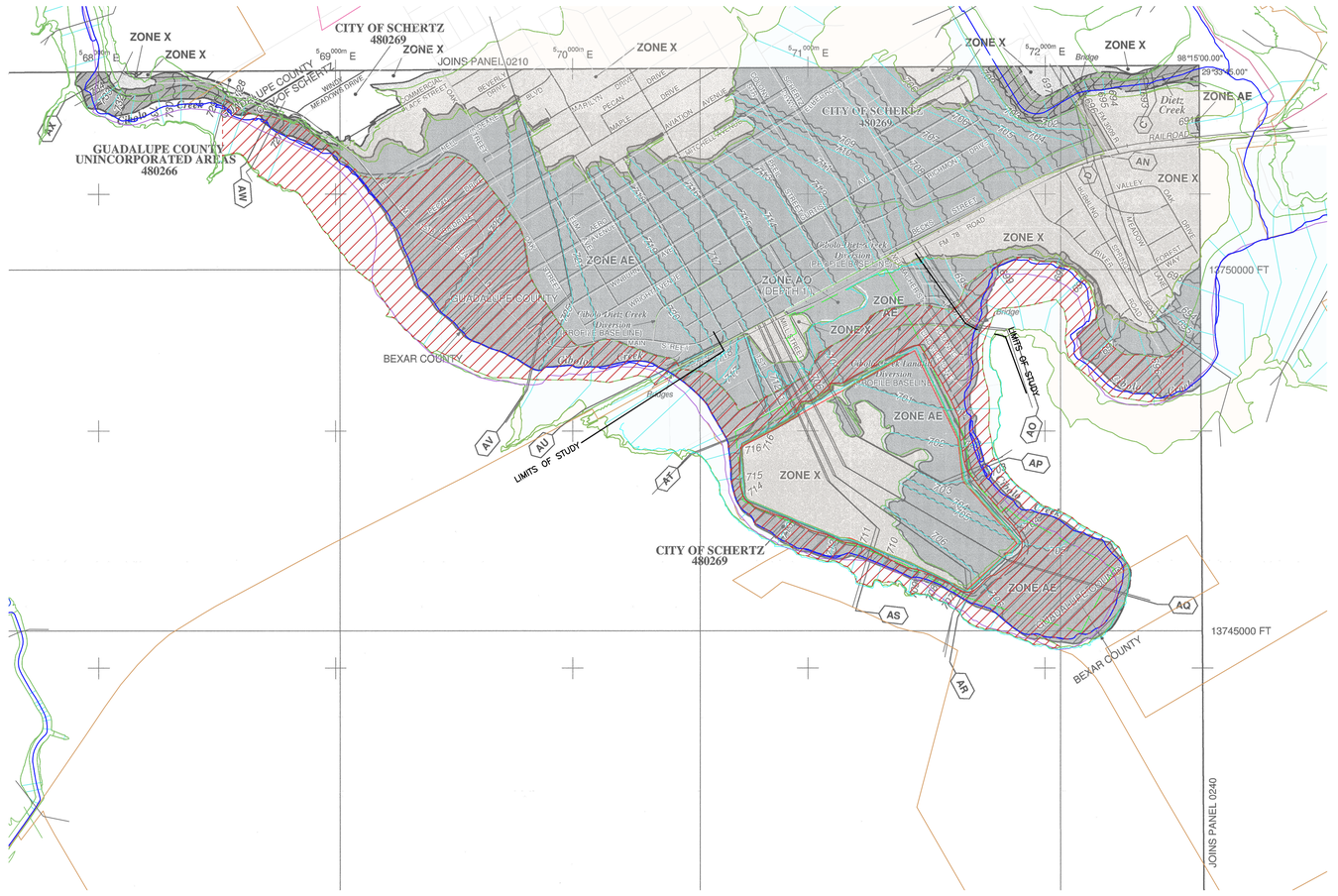
COMMUNITY	NUMBER	PANEL	SUFFIX
GUADALUPE COUNTY	480266	0220	F
SCHERTZ, CITY OF	480269	0220	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48187C0220F

EFFECTIVE DATE
NOVEMBER 2, 2007

Federal Emergency Management Agency



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

$^{42}75^{000m}$N — 1000-meter Universal Transverse Mercator grid ticks, zone 14

6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, south central zone (FIPSZONE 4204), Lambert Conformal Conic

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 2, 2007
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

SCALE IN FEET

0 1000 2000

STATE OF TEXAS
ADAM W. MEHEVEC
94738
LICENSED
PROFESSIONAL
ENGINEER
6-15-22

REVISION RECORD

NO	DESCRIPTION	DATE

Civil & Environmental Consultants, Inc.
Texas Registered Engineering Firm F-98
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

ANNOTATED FLOOD INSURANCE RATE MAP (FIRM) 48187C0220F

DATE:	5/2/2022
DRAWN BY:	AGT
DWG SCALE:	1" = 1000'
CHECKED BY:	JCM
PROJECT NO:	311-653.SITE
APPROVED BY:	AWM

DRAWING NO.: **3**

SHEET 3 OF 4

P:\310-000\311-653\1-CAD\Dwg\CVR\311653-CVR1-AnnotatedFIRMmap.dwg[3] 5/5/2022 - mvinke - LP: 5/16/2022 12:42 PM

NORTH

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0295F

FIRM

FLOOD INSURANCE RATE MAP

BEXAR COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 295 OF 785

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

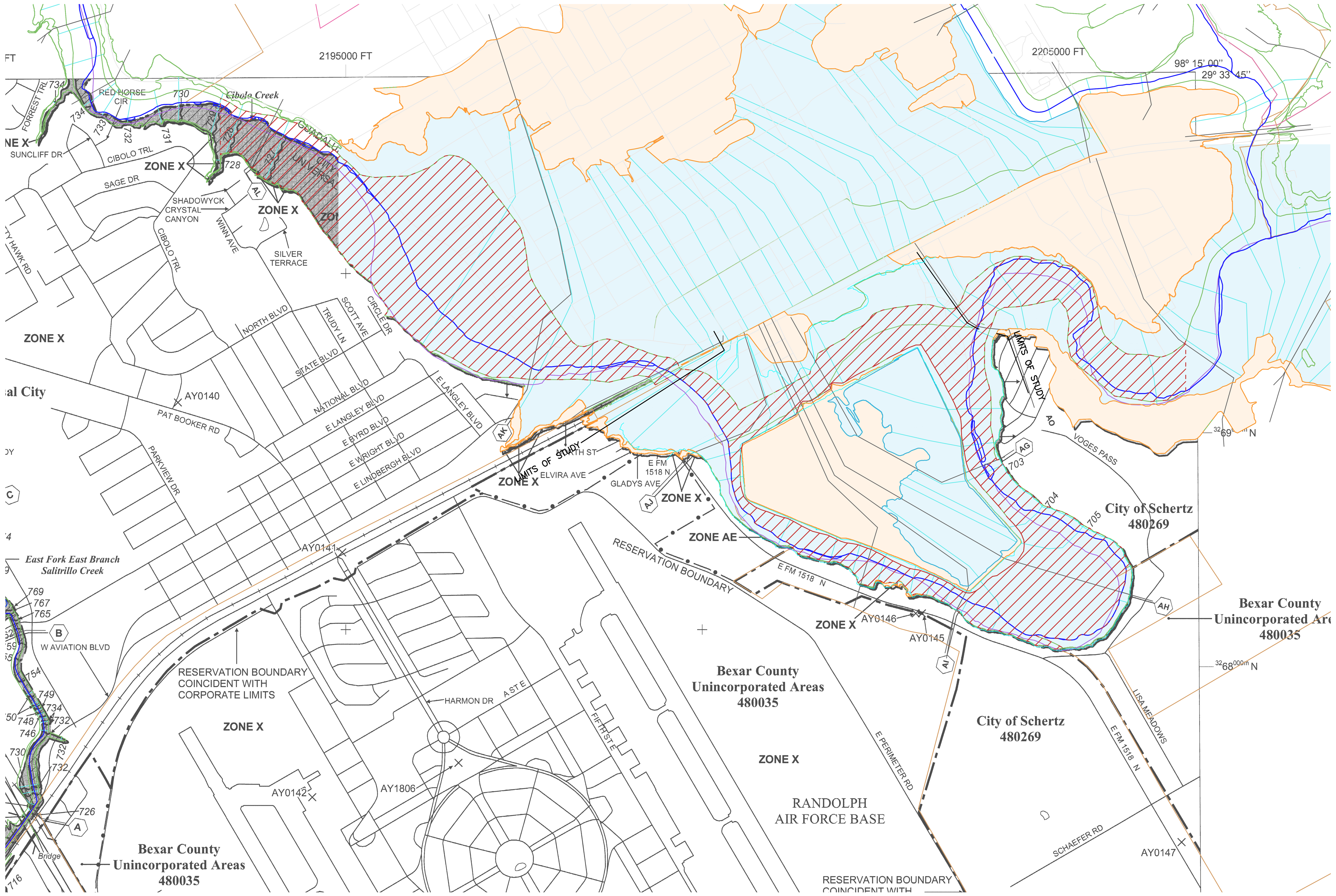
COMMUNITY	NUMBER	PANEL	SUFFIX
BEXAR COUNTY	480035	0295	F
CONVERSE, CITY OF	480038	0295	F
SAN ANTONIO, CITY OF	480045	0295	F
SCHERTZ, CITY OF	480269	0295	F
UNIVERSAL CITY, CITY OF	480049	0295	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 48029C0295F

MAP REVISED SEPTEMBER 29, 2010

Federal Emergency Management Agency



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
ZONE X (Future Base Flood)	Areas of 1% annual chance flood based on future conditions hydrology. No Base Flood Elevations determined.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000FT	5000-foot grid ticks: Texas State Plane coordinate system, south central zone (FIPS Zone 4204), Transverse Mercator
4989000m N	1000-meter Universal Transverse Mercator grid values, Zone 14
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
REFER TO LISTING OF MAP REPOSITORIES ON MAP INDEX

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

FEBRUARY 16, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 29, 2010 - to change the Base Flood Elevations, Special Flood Hazard Areas, floodway and zone designations; to add Base Flood Elevations, Special Flood Hazard Areas, roads and road names; to reflect updated topographic information; to incorporate previously issued Letters of Map Revision and to update corporate limits.

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

SCALE IN FEET

0 1000 2000

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED PROFESSIONAL ENGINEER
6-15-22

REVISION RECORD

NO	DATE	DESCRIPTION

Texas Registered Engineering Firm F-38
Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

ANNOTATED FLOOD INSURANCE RATE MAP (FIRM) 48029C0295F

DATE:	4/29/2022	DRAWN BY:	AGT
DWG SCALE:	1" = 1000'	CHECKED BY:	JCM
PROJECT NO:	311-653.SITE		
APPROVED BY:	AWM		

DRAWING NO.: 4

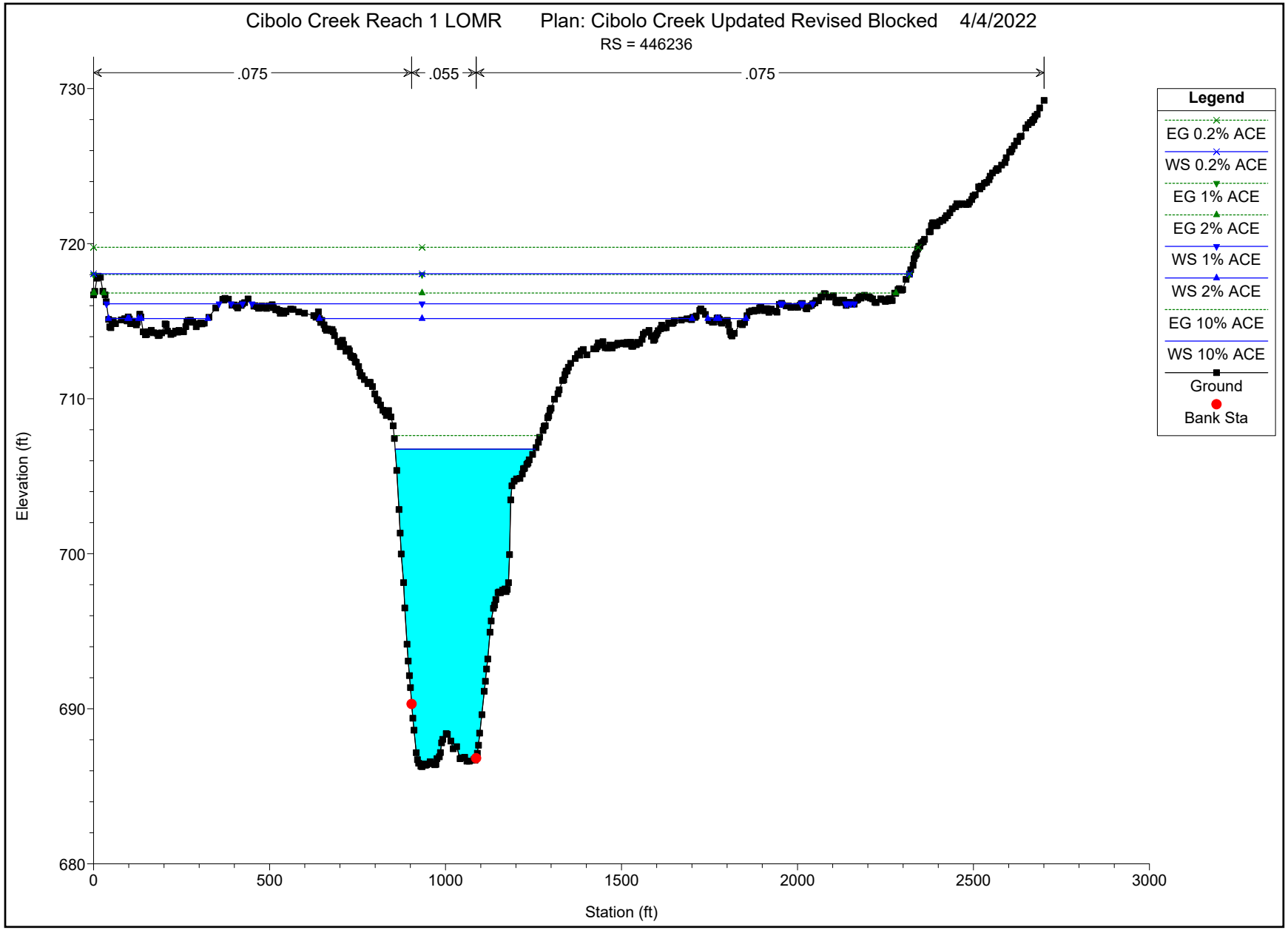
SHEET 4 OF 4

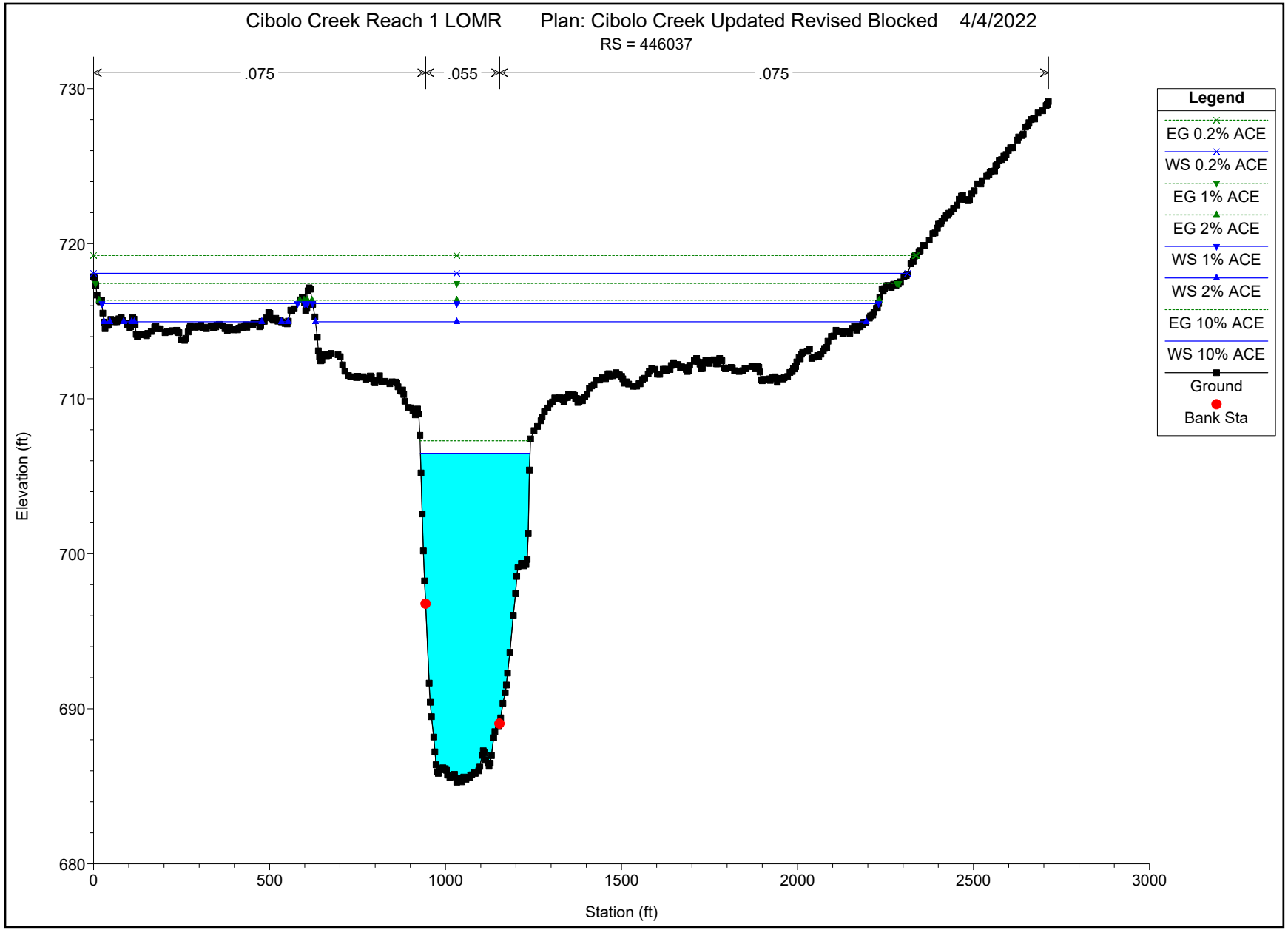
P:\310-000\311-653\-0400\Dwg\CIVIL\311653-0101-Annotated FIRM map 48029C.dwg{4} LS:(4/29/2022 - mnoriea) - LP: 5/16/2022 12:43 PM

HEC-RAS HYDRAULIC RESULTS

HEC-RAS Plan: Updated Revised Blocked River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	446236	1% ACE	83554.00	686.27	716.12		718.00	0.002356	12.35	12083.89	1951.03	0.40
Reach 1	446037	1% ACE	83554.00	685.26	716.14		717.43	0.001662	10.38	14568.45	2171.55	0.34
Reach 1	445573	1% ACE	83554.00	683.27	715.47		716.64	0.001635	10.24	13853.91	1272.36	0.34
Reach 1	445235	1% ACE	74844.00	683.27	715.46		716.09	0.000839	7.38	14446.55	819.21	0.24
Reach 1	444777	1% ACE	74844.00	683.27	714.34		715.55	0.001357	9.41	9324.66	418.29	0.31
Reach 1	444240	1% ACE	74844.00	683.14	712.59		714.56	0.002177	11.70	7112.57	303.76	0.39
Reach 1	443555	1% ACE	74844.00	682.52	712.24		713.19	0.001159	8.05	9943.71	424.81	0.28
Reach 1	442891	1% ACE	74844.00	679.79	711.58		712.49	0.000944	7.77	10195.40	409.13	0.25
Reach 1	442214	1% ACE	74844.00	678.90	709.72		711.43	0.002485	12.16	8711.94	548.33	0.40
Reach 1	441476	1% ACE	74844.00	678.52	708.12		709.76	0.001991	10.59	7947.43	421.93	0.36
Reach 1	440762	1% ACE	74844.00	677.76	705.81		707.89	0.002707	11.80	6709.83	304.53	0.42
Reach 1	439971	1% ACE	74844.00	677.96	705.51		705.71	0.000410	4.27	22216.60	1144.96	0.16
Reach 1	438740	1% ACE	74844.00	675.84	705.30		705.41	0.000223	3.38	33040.49	1844.11	0.12
Reach 1	437996	1% ACE	74844.00	674.71	705.21		705.29	0.000189	3.18	35176.72	1824.69	0.11
Reach 1	437265	1% ACE	74844.00	674.32	705.03		705.18	0.000290	3.98	27754.92	1486.97	0.14
Reach 1	436536	1% ACE	74844.00	673.98	704.27		704.82	0.000810	6.89	15281.89	921.79	0.23
Reach 1	435810	1% ACE	74844.00	672.59	703.05		703.98	0.001244	8.45	10535.21	526.54	0.29
Reach 1	435043	1% ACE	74844.00	672.92	702.40		703.12	0.000674	7.03	11817.77	513.44	0.24
Reach 1	434453	1% ACE	74844.00	672.90	701.08		702.28	0.001688	9.93	10304.78	657.11	0.34
Reach 1	433730	1% ACE	74844.00	668.74	700.47		701.07	0.001006	7.16	14270.50	937.56	0.24
Reach 1	433539	1% ACE	74844.00	667.11	700.39		700.85	0.000790	6.40	16157.71	1041.30	0.21
Reach 1	433408	1% ACE	74844.00	667.31	700.34		700.73	0.000749	6.22	17384.43	1111.20	0.21
Reach 1	433181	1% ACE	86791.00	667.56	700.20		700.53	0.000716	5.98	23132.56	1884.55	0.20


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 446236
.075
.055
.075
730
720
710
700
690
680
Elevation (ft)
0
500
1000
1500
2000
2500
3000
Station (ft)
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta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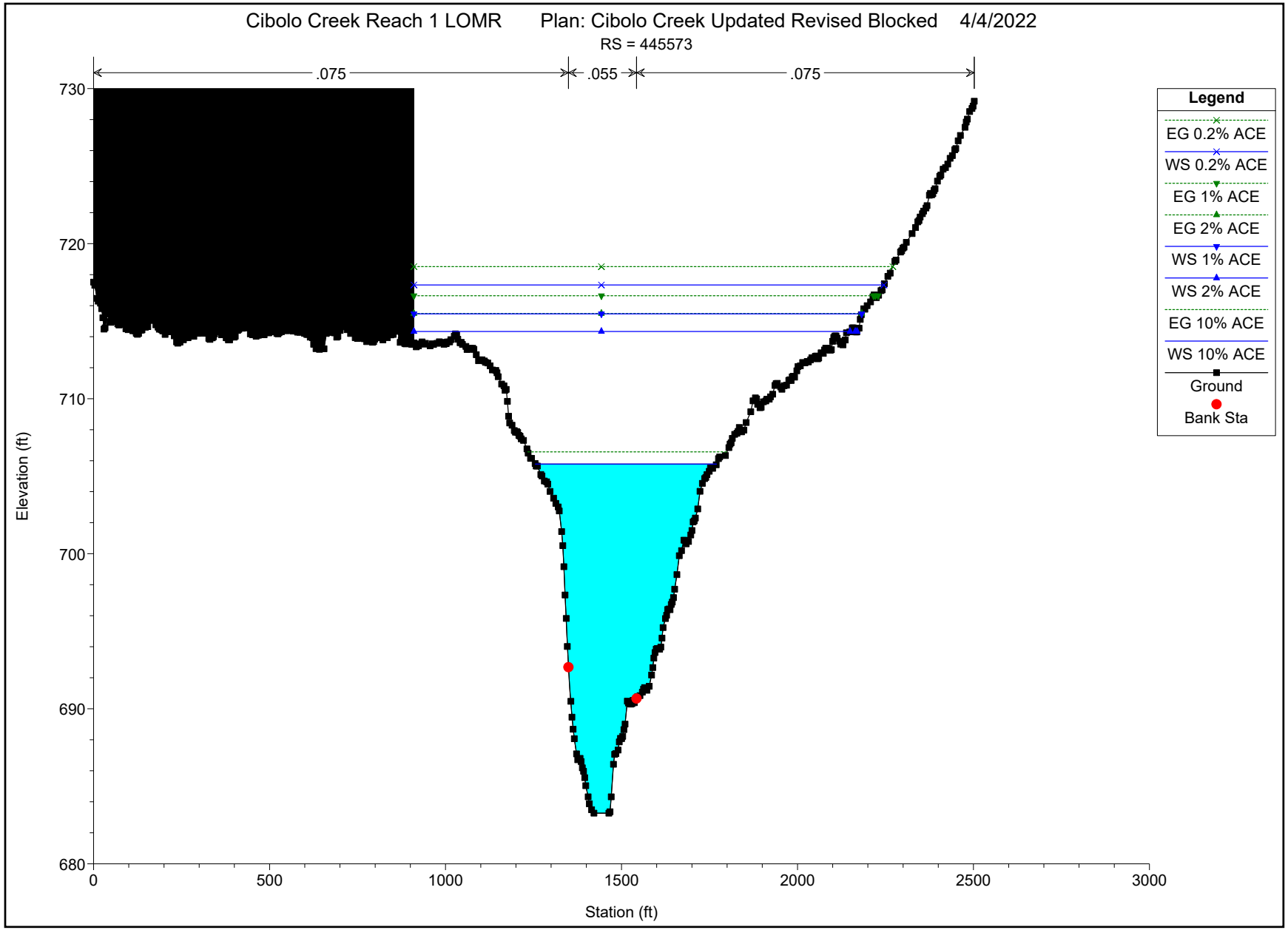
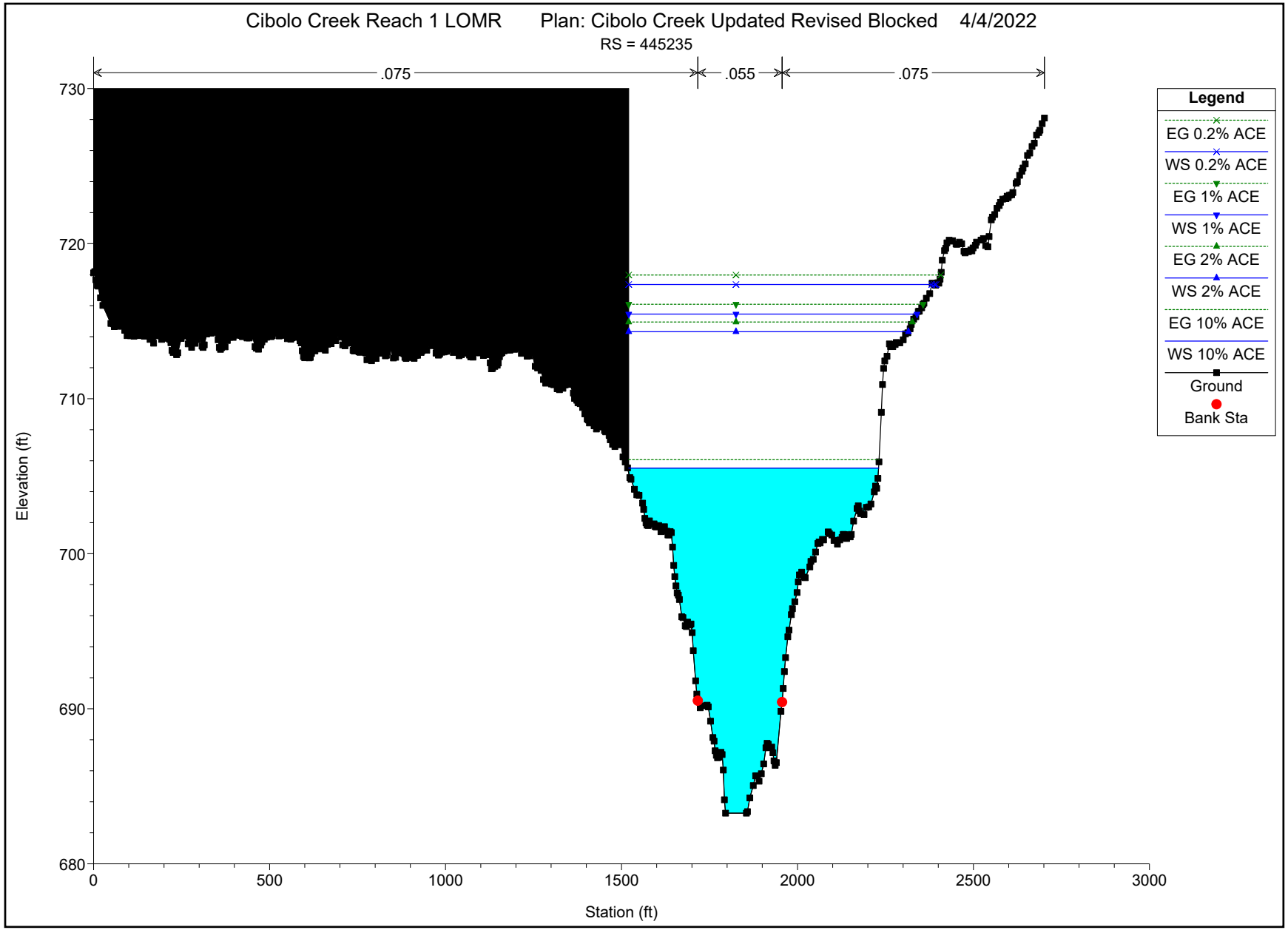
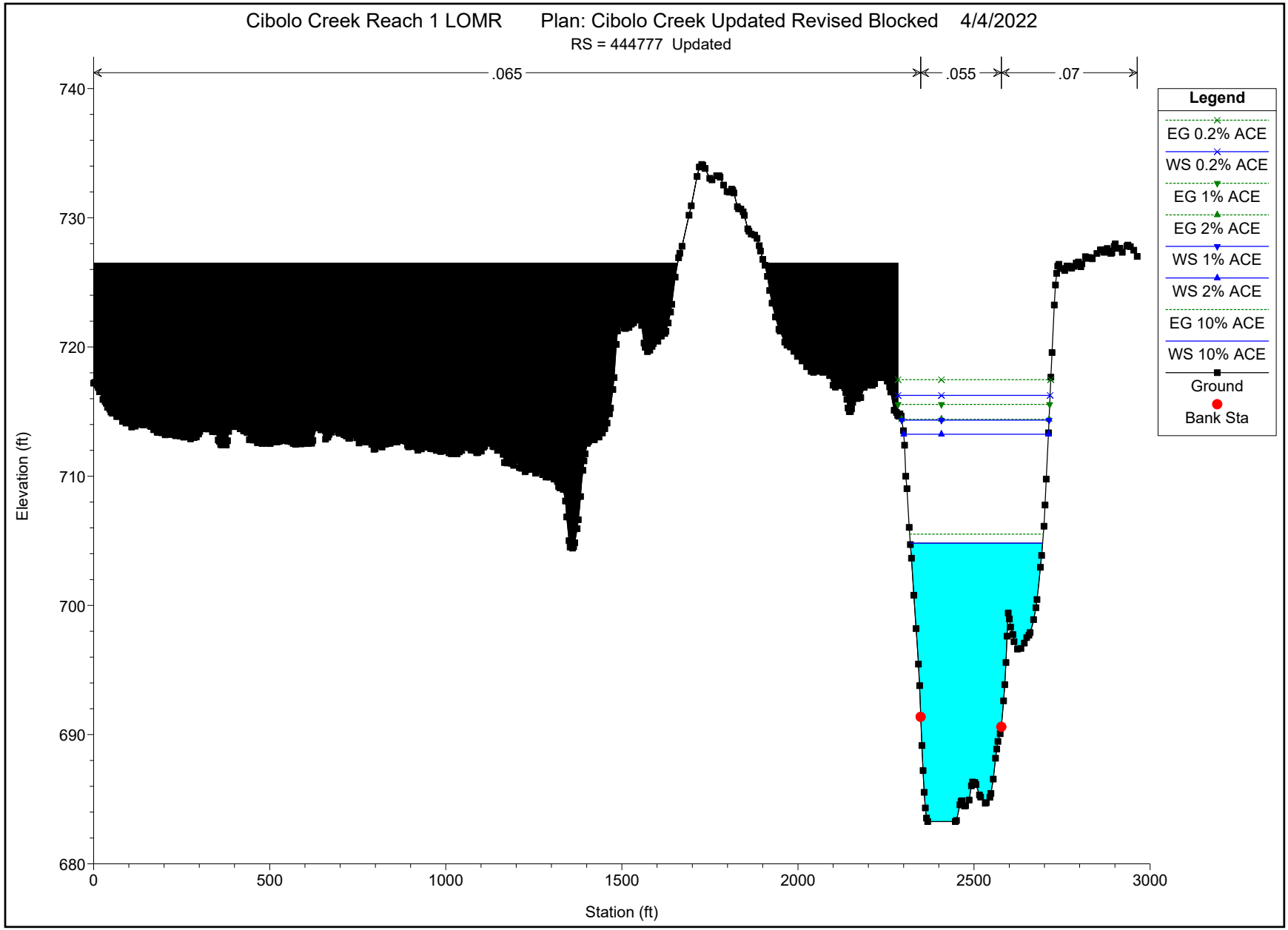
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 446037
.075
.055
.075
730
720
710
700
690
680
Elevation (ft)
0
500
1000
1500
2000
2500
3000
Station (ft)
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 445573
.075
.055
.075
730
720
710
700
690
680
Elevation (ft)
0
500
1000
1500
2000
2500
3000
Station (ft)
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 445235
.075
.055
.075
730
720
710
700
690
680
Elevation (ft)
0
500
1000
1500
2000
2500
3000
Station (ft)
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 444777 Updated
.065
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
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710
700
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500
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1500
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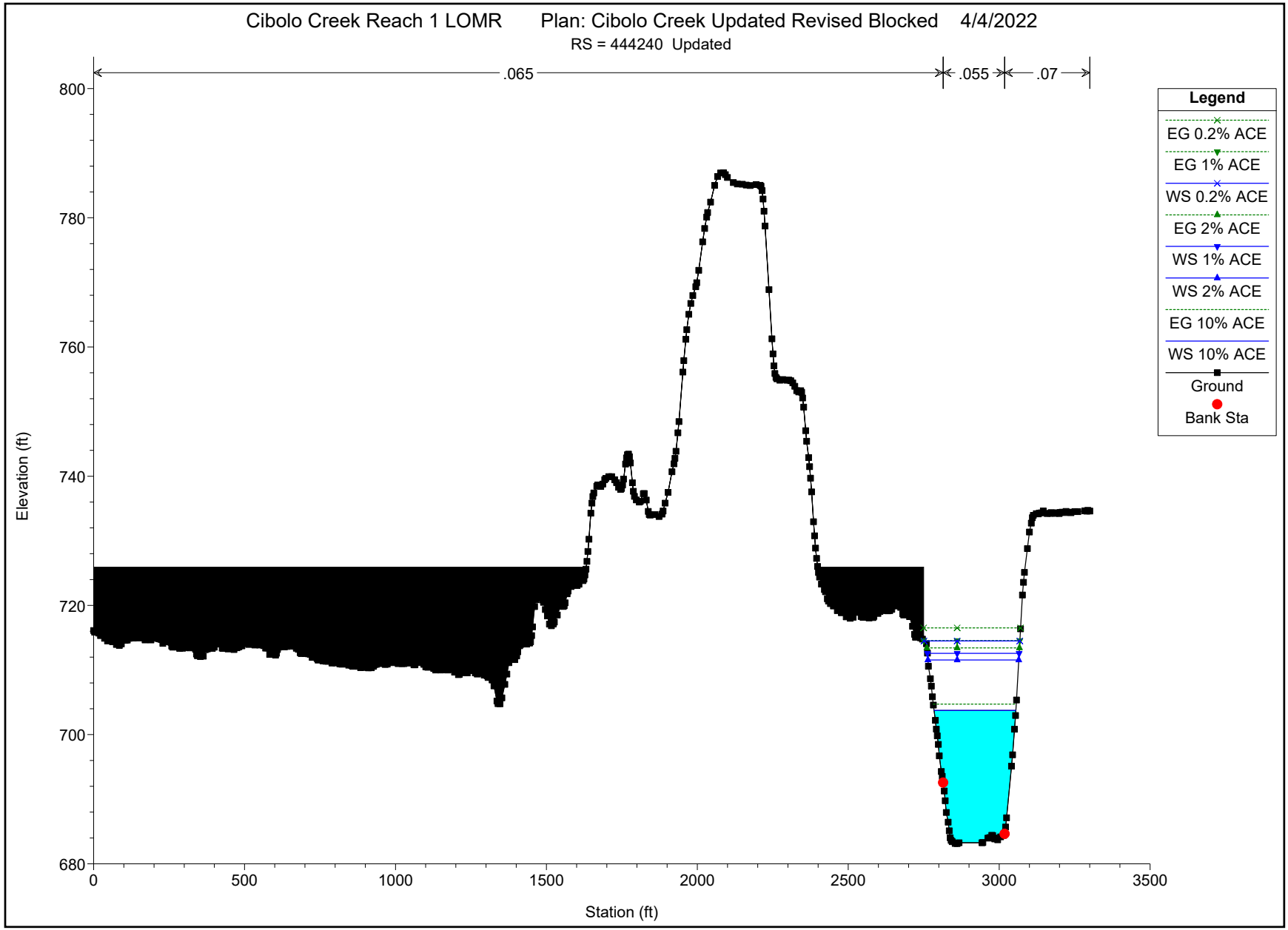
2500
3000
Station (ft)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Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 444240 Updated
.065
.055
.07
Legend
EG 0.2% ACE
EG 1% ACE
WS 0.2% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
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720
700
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0
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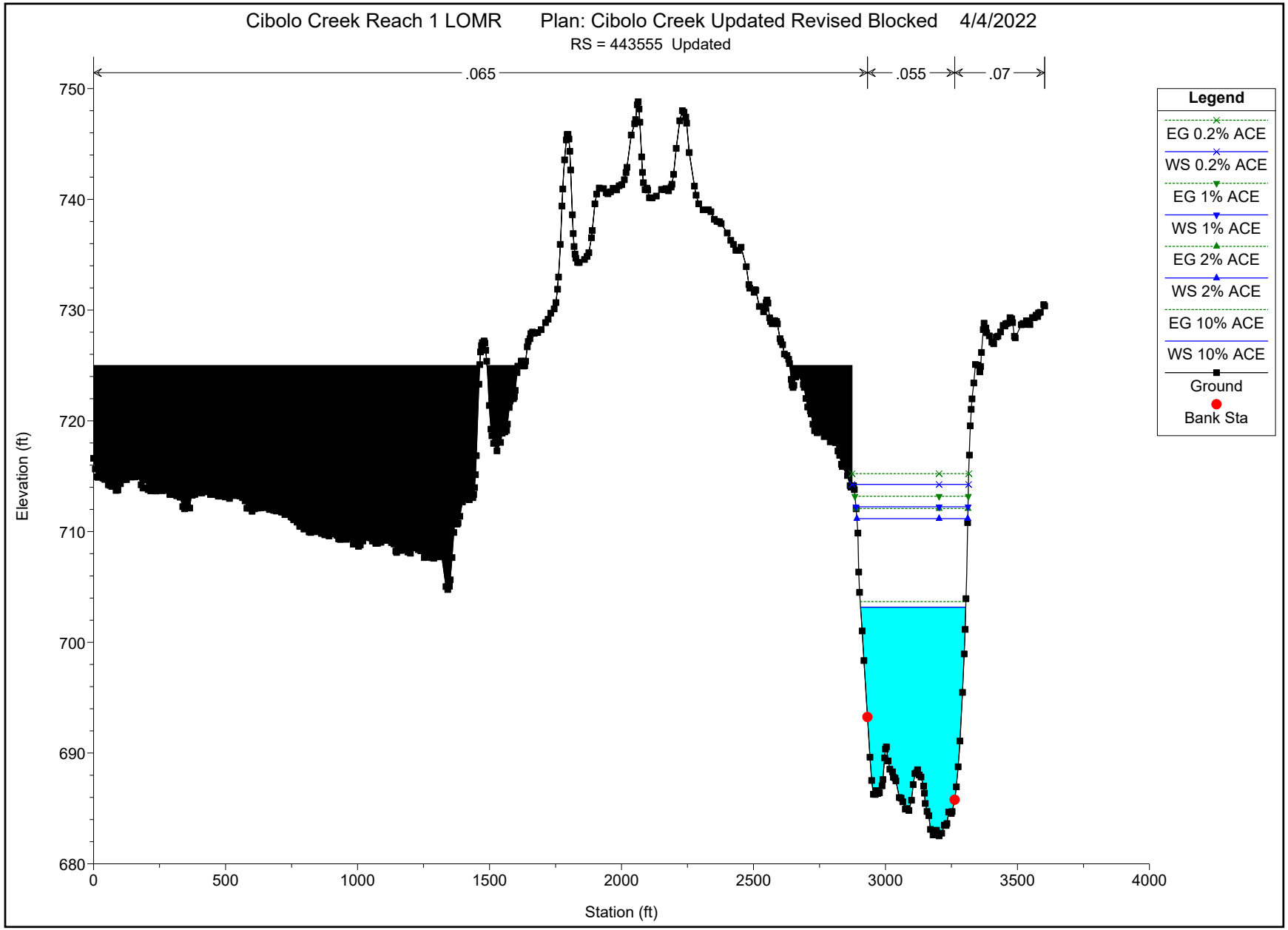
1000
1500
2000
2500
3000
3500
Station (ft)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Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 443555 Updated
.065
.055
.07
Legend
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WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
Station (ft)
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710
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690
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1000
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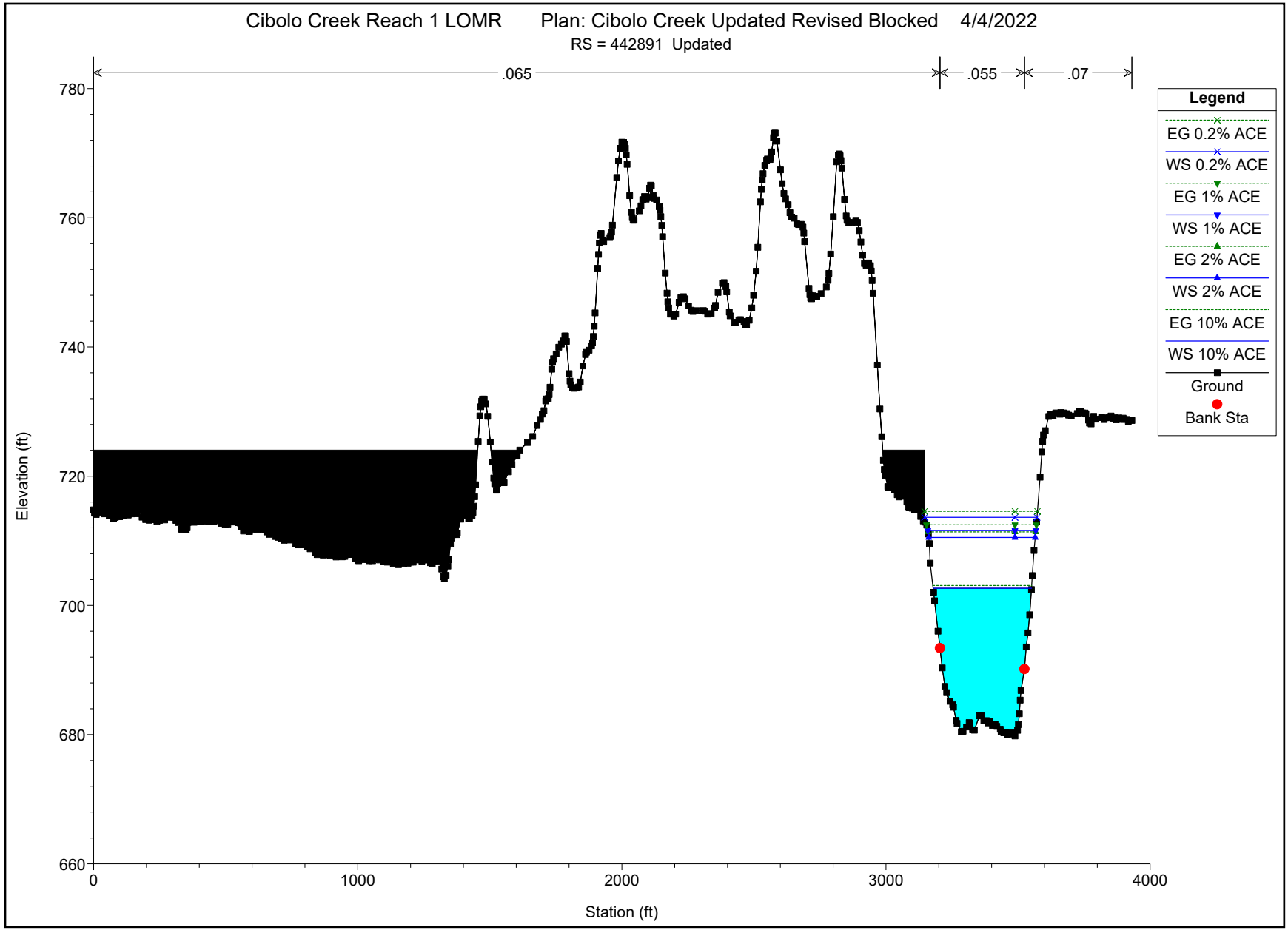
3500
4000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Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 442891 Updated
.065
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
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760
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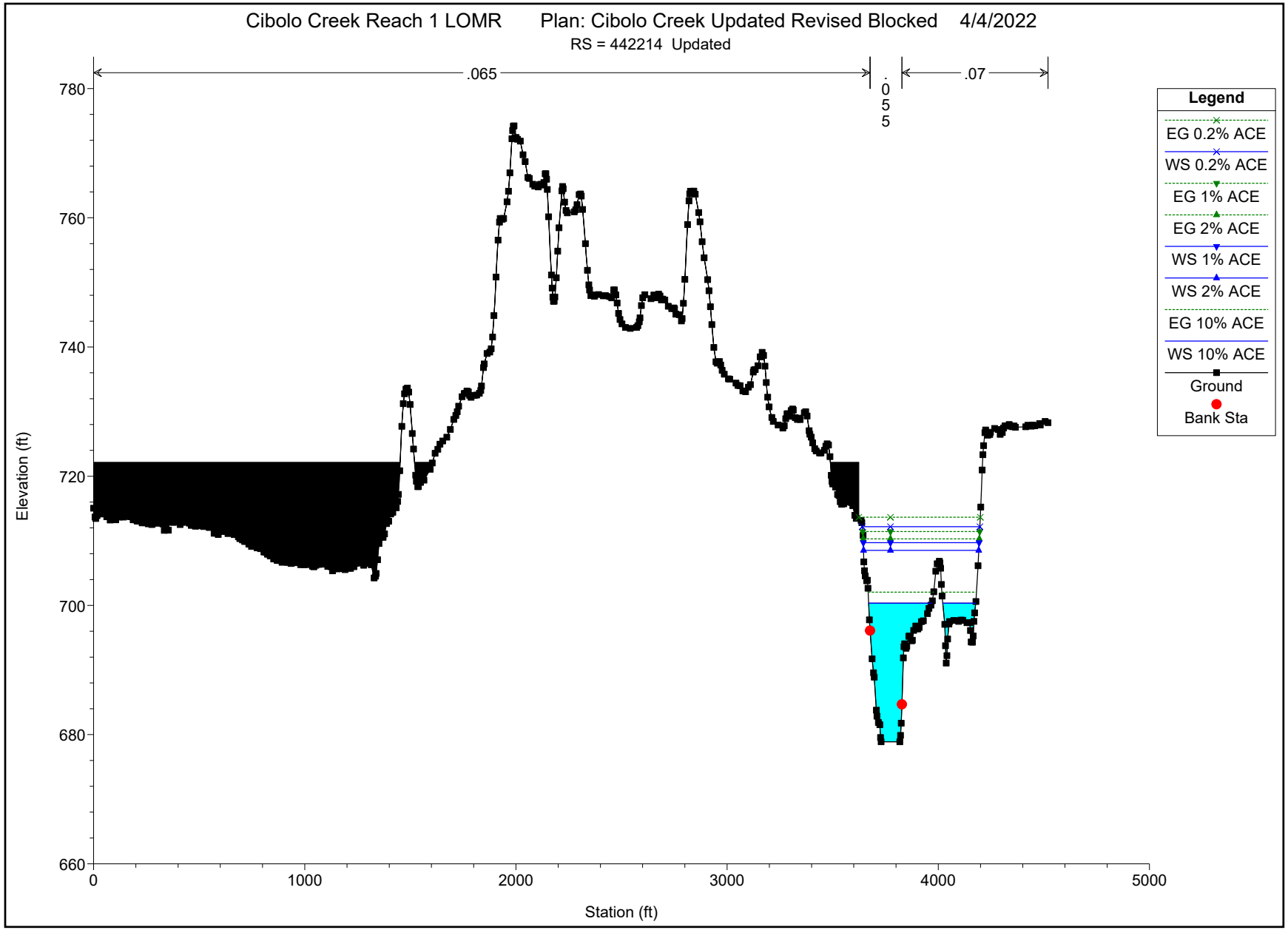
720
700
680
660
0
1000
2000
3000
4000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 442214 Updated
.065
.055
.07
Legend
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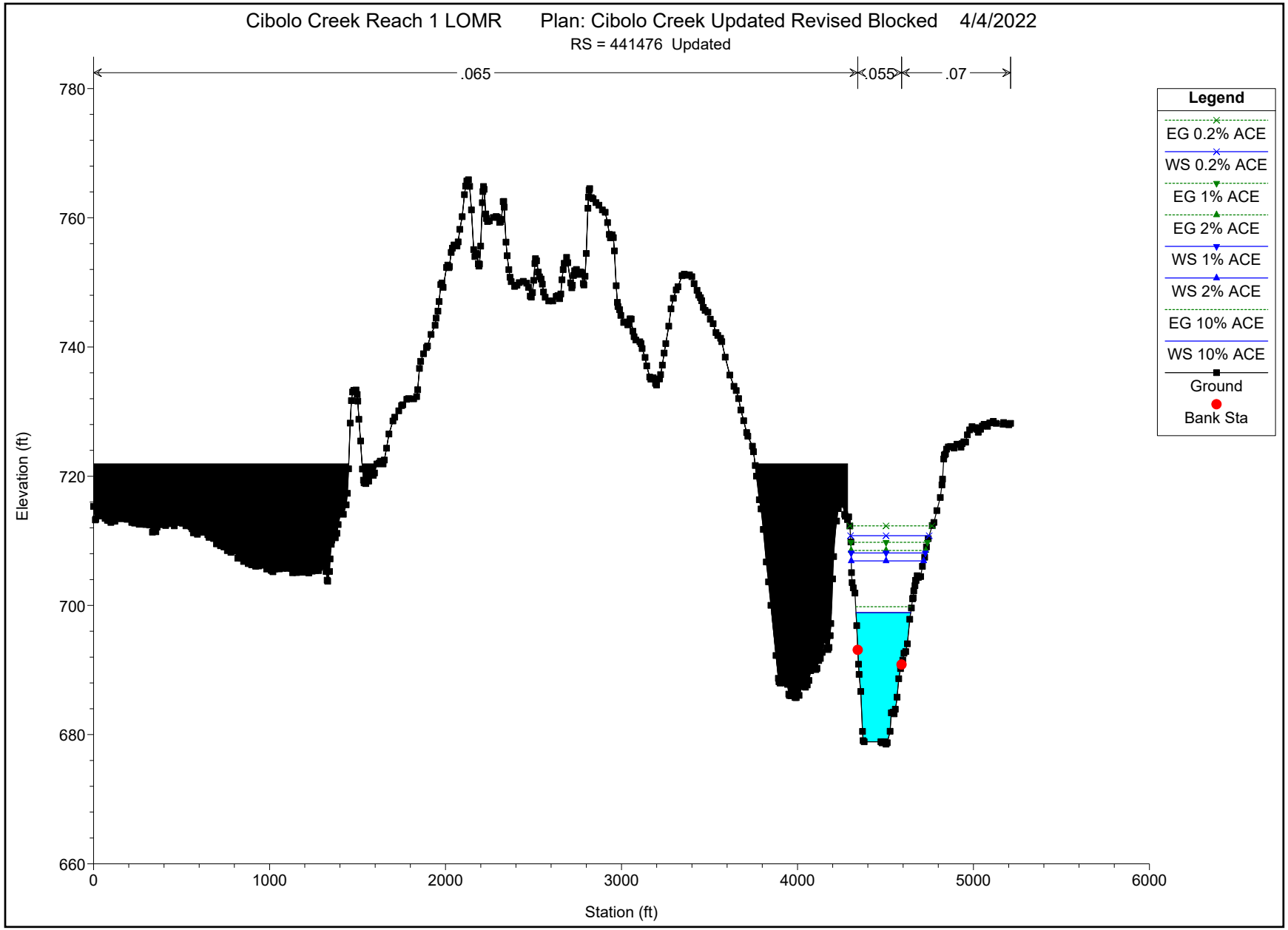
WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 441476 Updated
.065
.055
.07
Legend
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WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
780
760
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700
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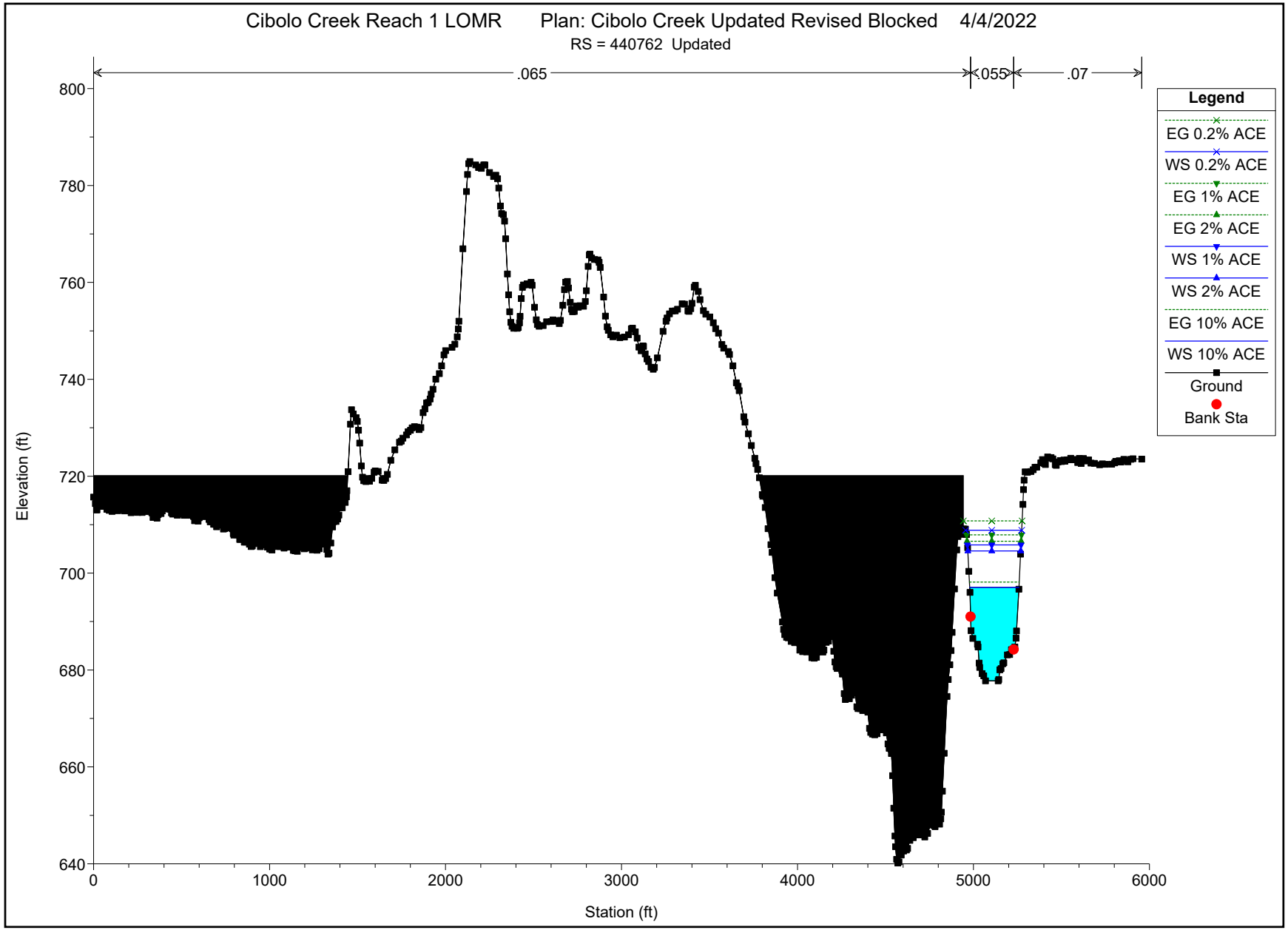
660
0
1000
2000
3000
4000
5000
6000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 440762 Updated
.065
.055
.07
Legend
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WS 0.2% ACE
EG 1% ACE
EG 2% ACE
WS 1% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
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760
740
720
700
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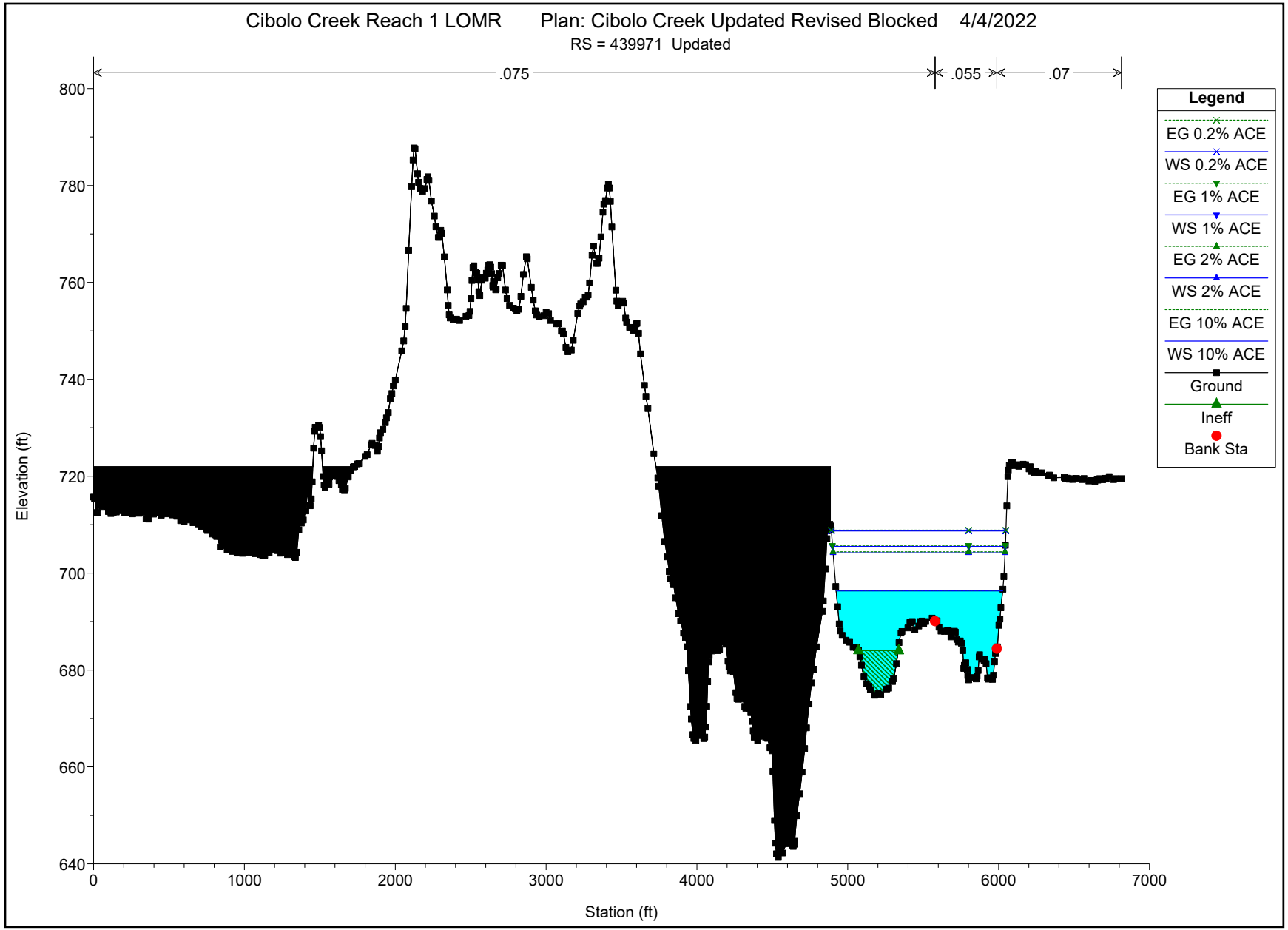
640
0
1000
2000
3000
4000
5000
6000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 439971 Updated
.075
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Ineff
Bank Sta
Elevation (ft)
800
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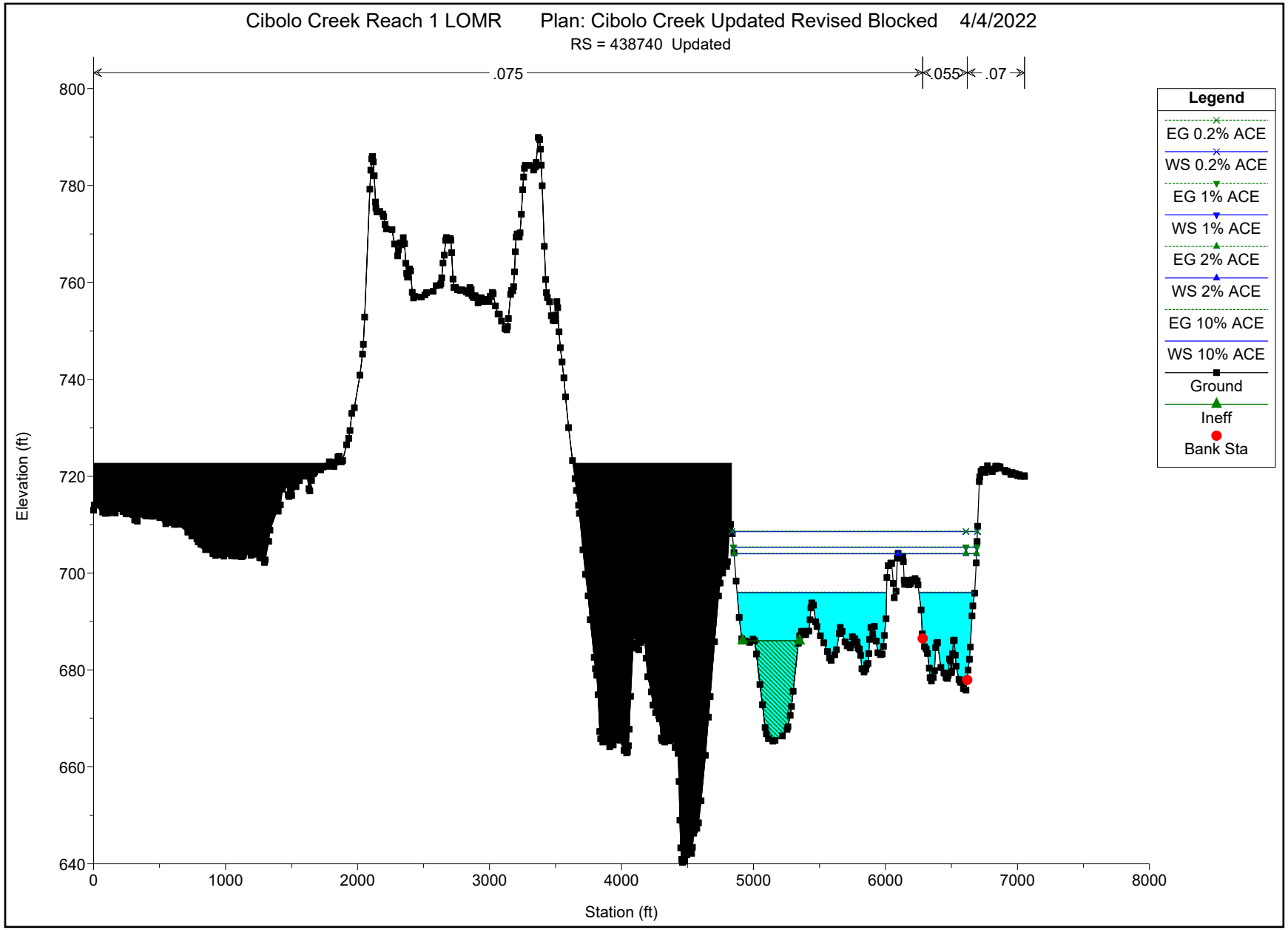
5000
6000
7000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 438740 Updated
.075
.055
.07
Legend
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WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Ineff
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
640
0
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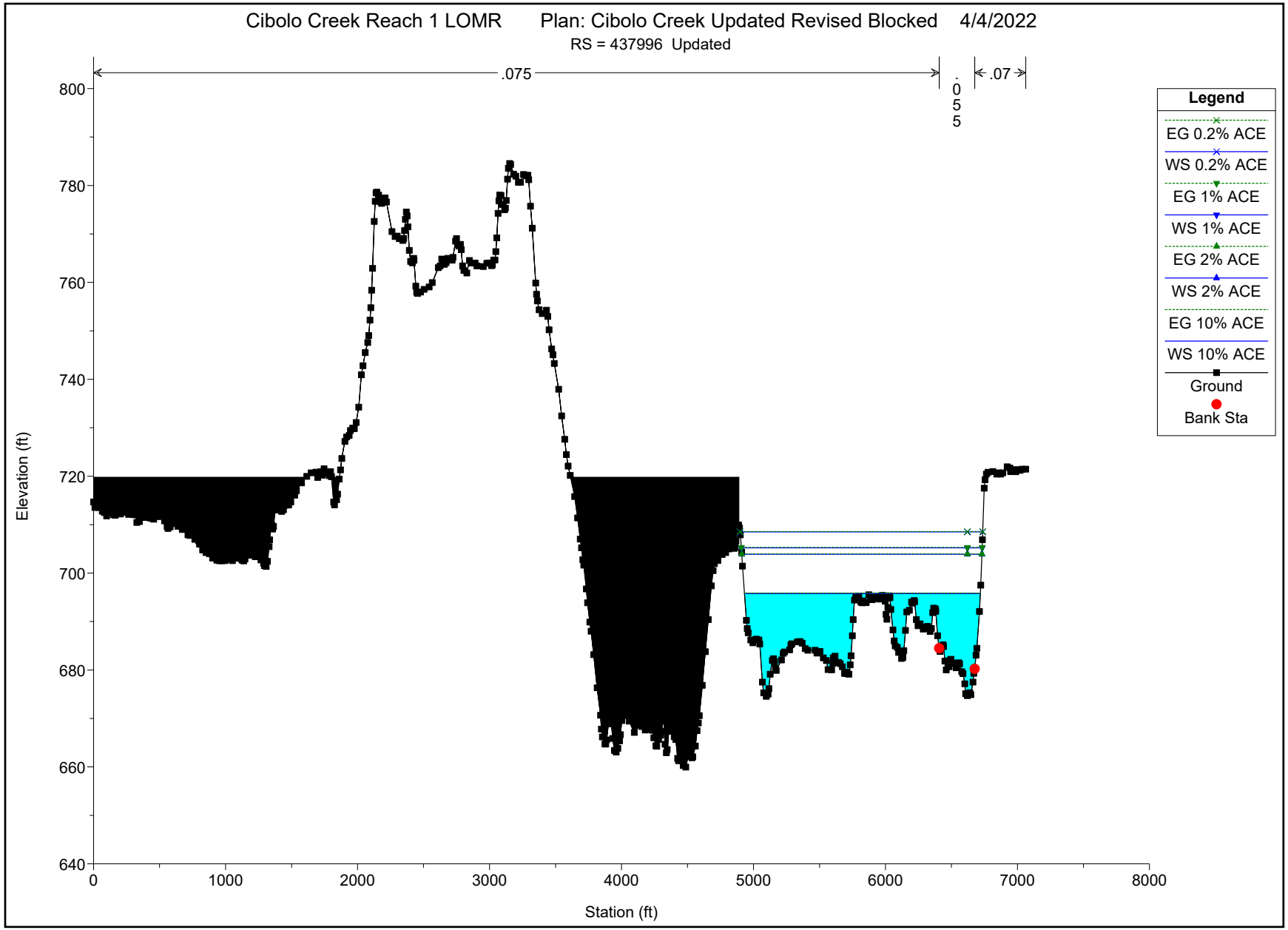
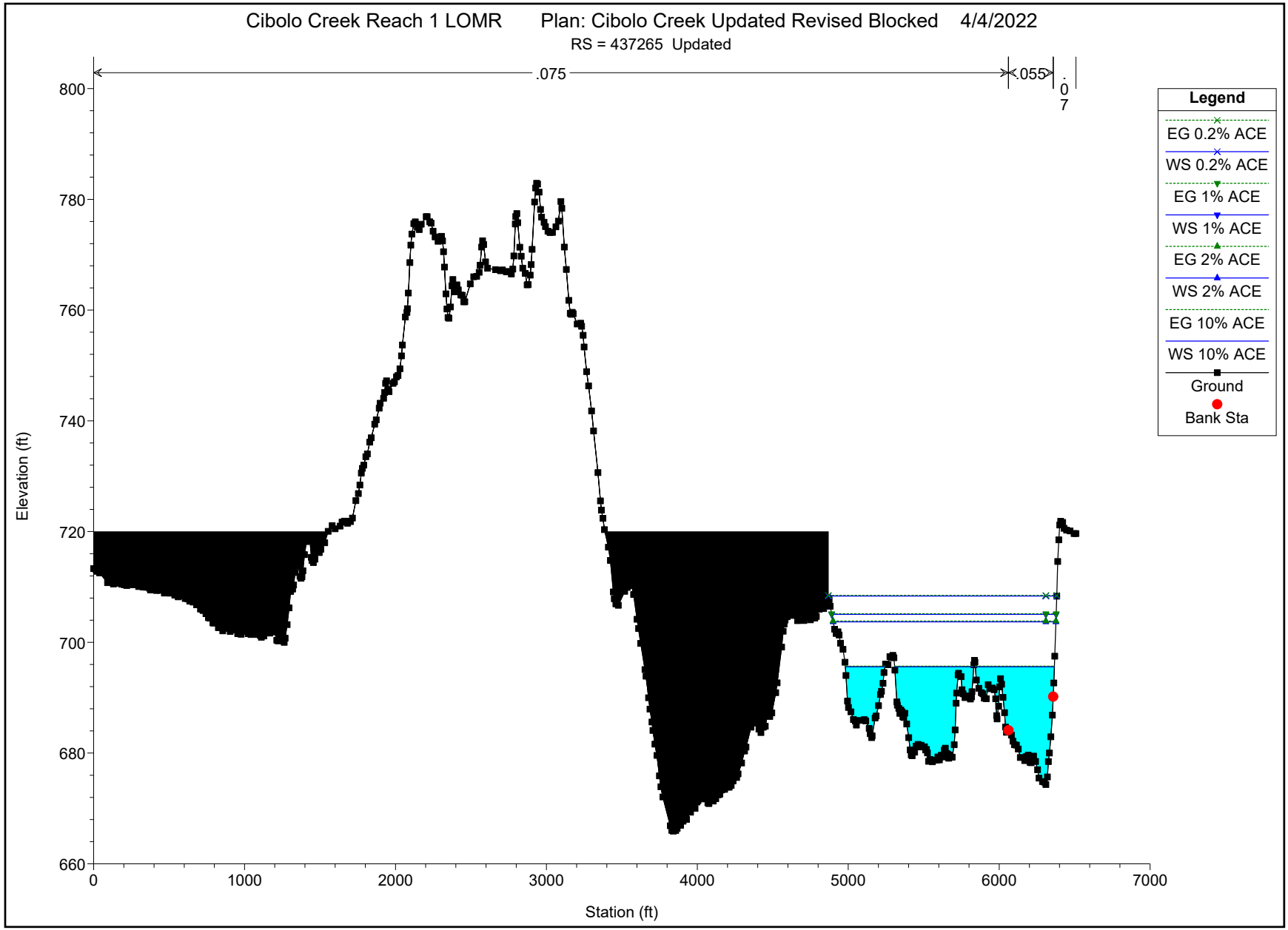
2000
3000
4000
5000
6000
7000
8000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 437996 Updated
.075
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
640
0
1000
2000
3000
4000
5000
6000
7000
8000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 437265 Updated
.075
.055
.07
Legend
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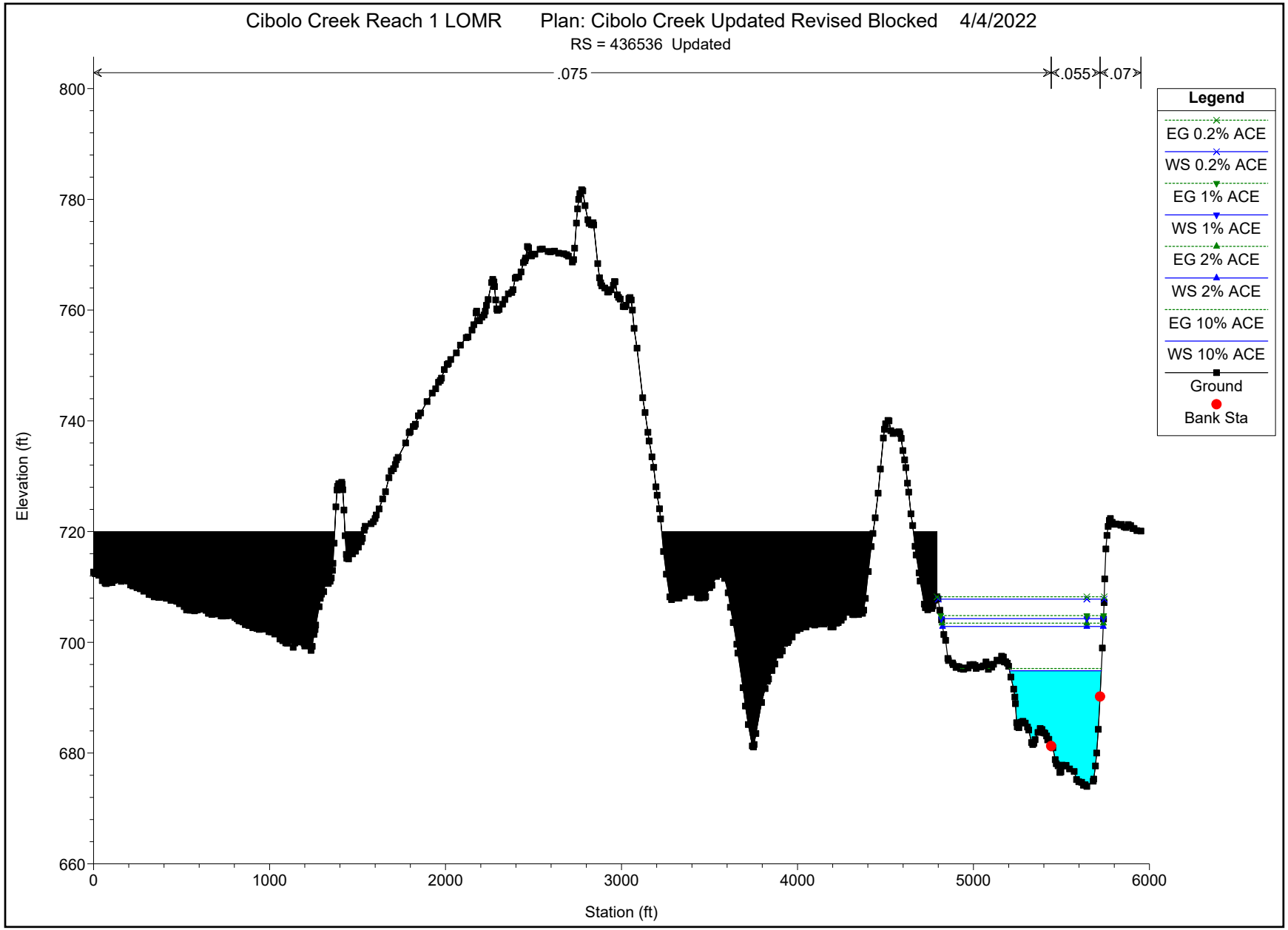
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
6000
7000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 436536 Updated
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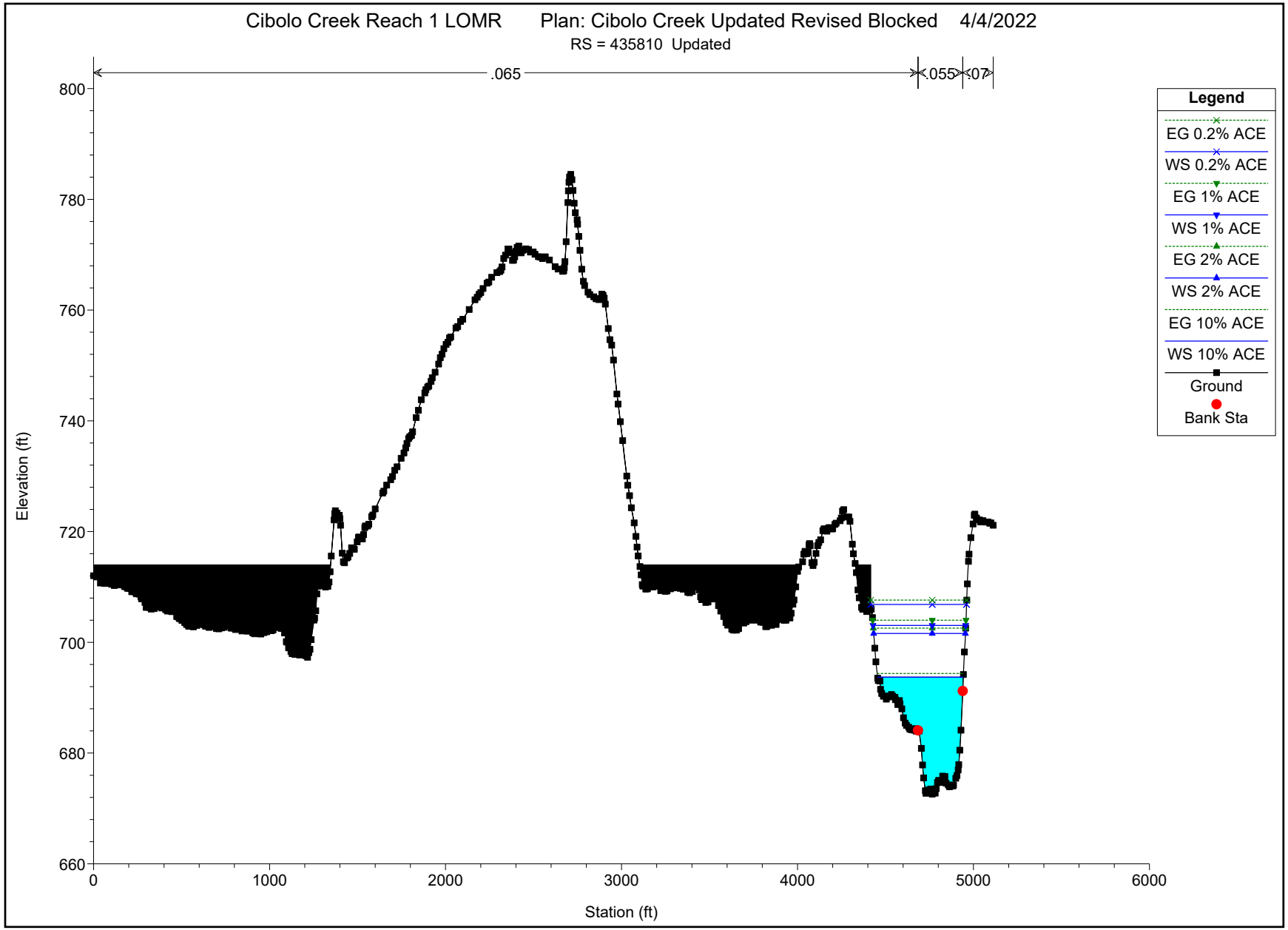
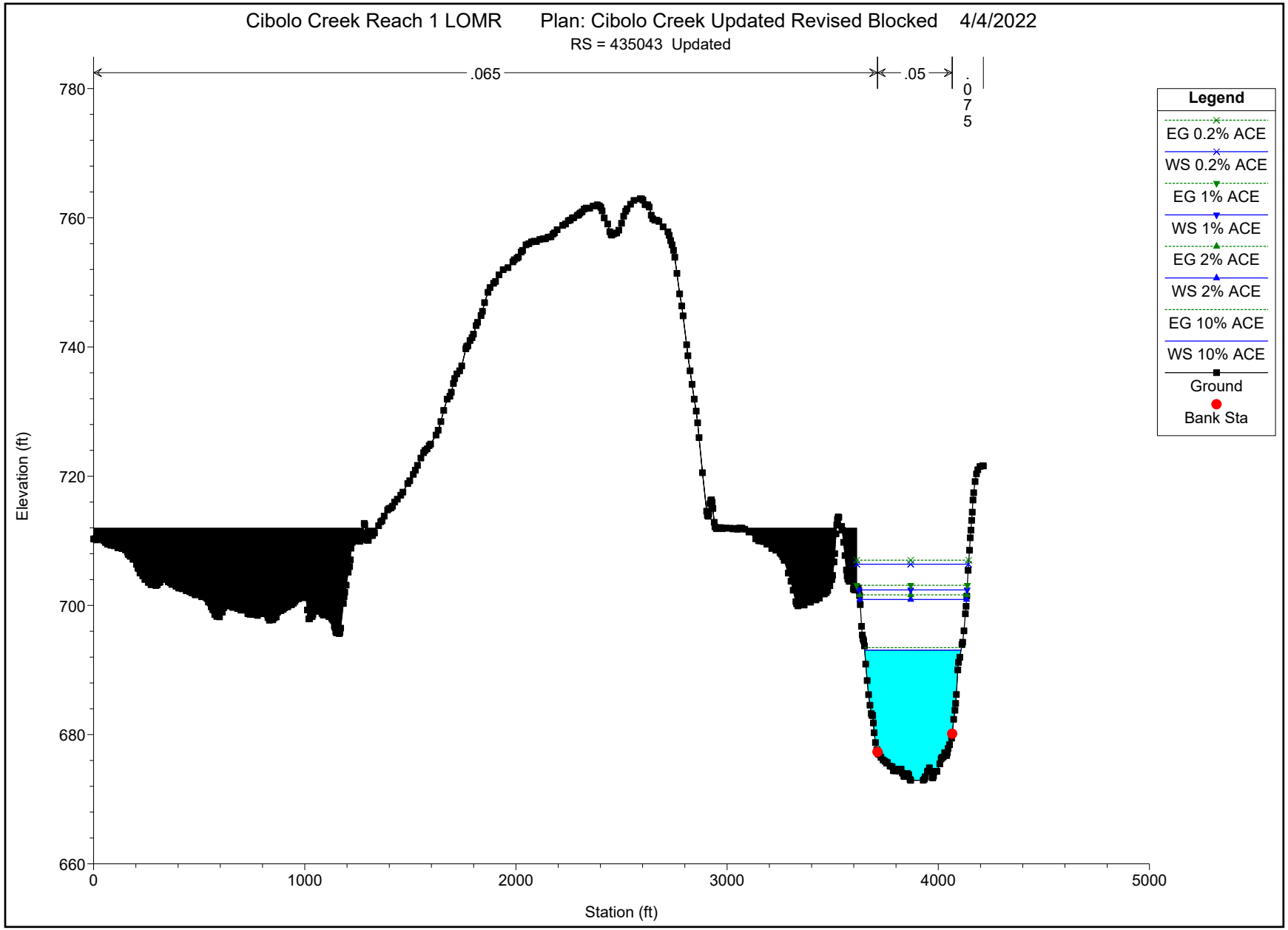
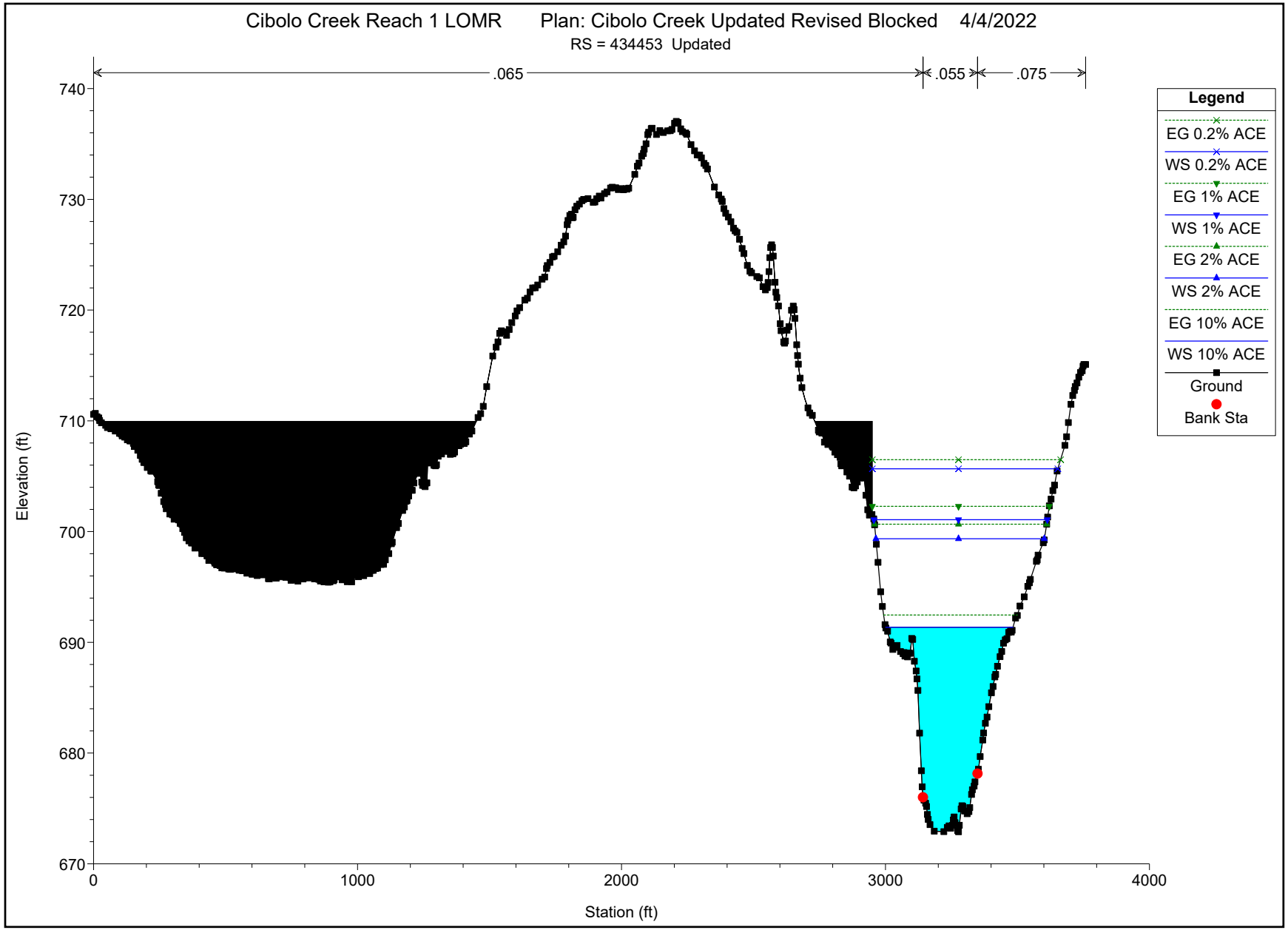
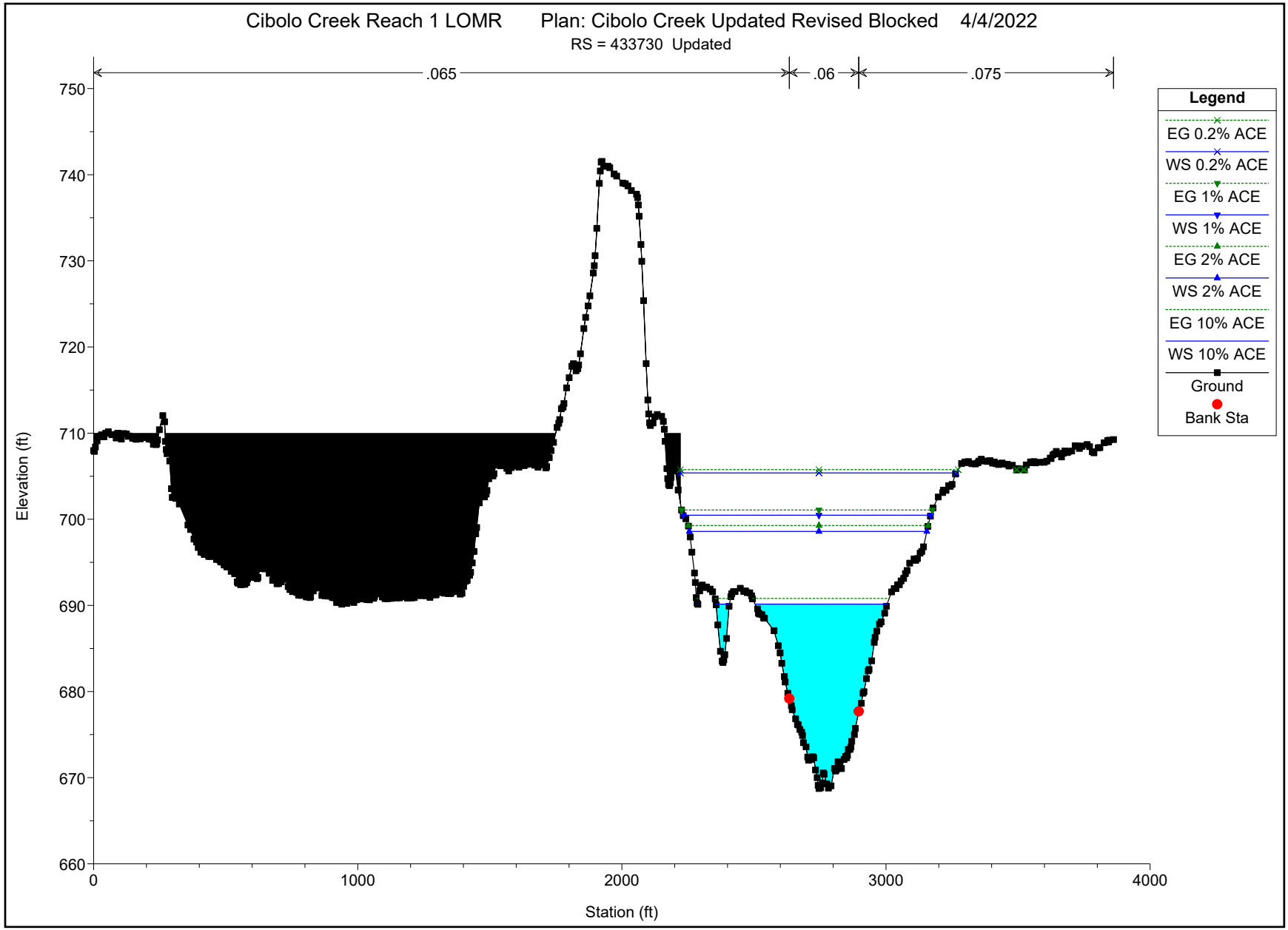
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
6000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 435810 Updated
.065
.055
.07
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
6000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked
4/4/2022
RS = 435043 Updated
.065
.05
.075
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 434453 Updated
.065
.055
.075
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
740
730
720
710
700
690
680
670
0
1000
2000
3000
4000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 433730 Updated
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.06
.075
Legend
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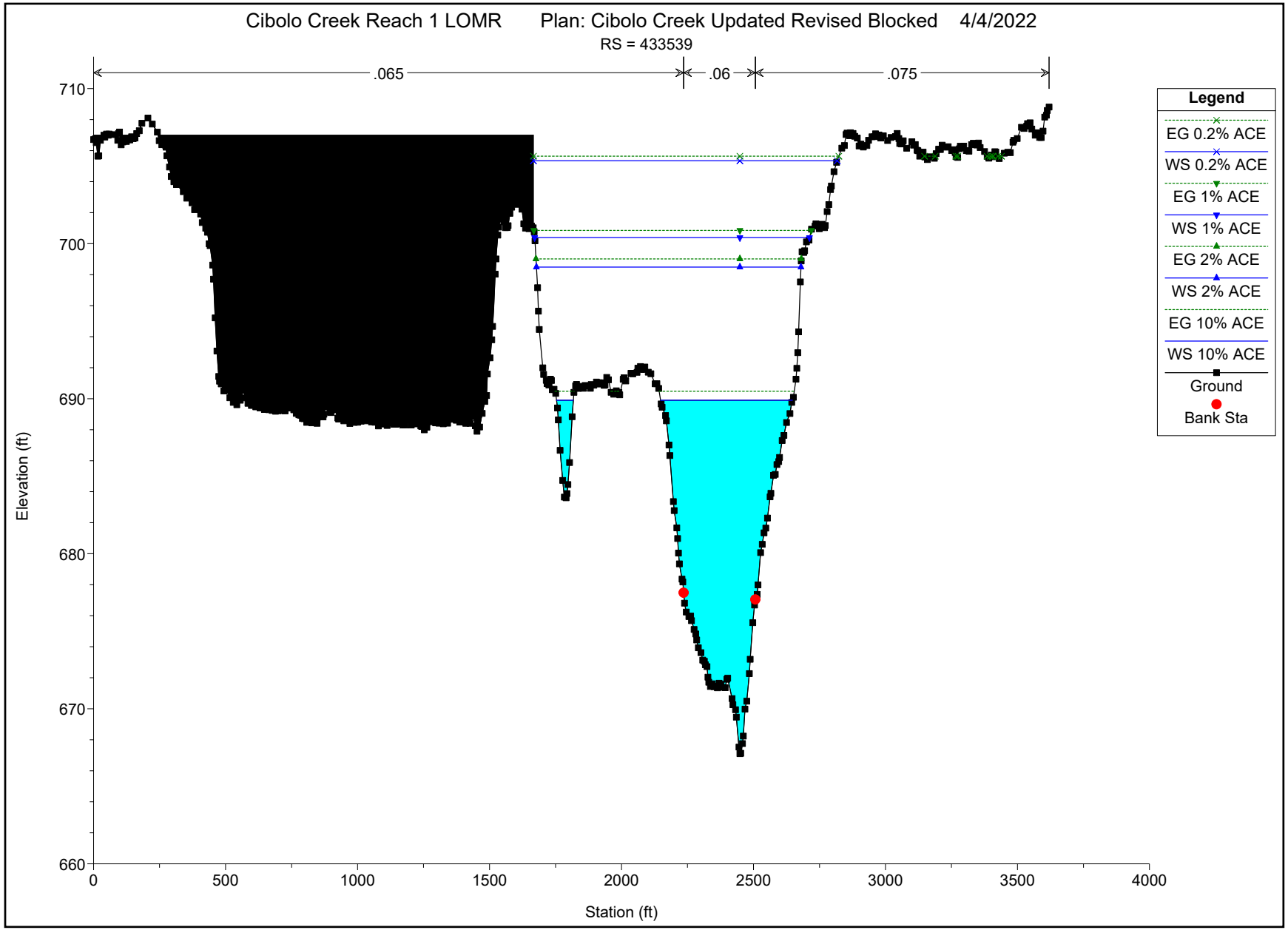
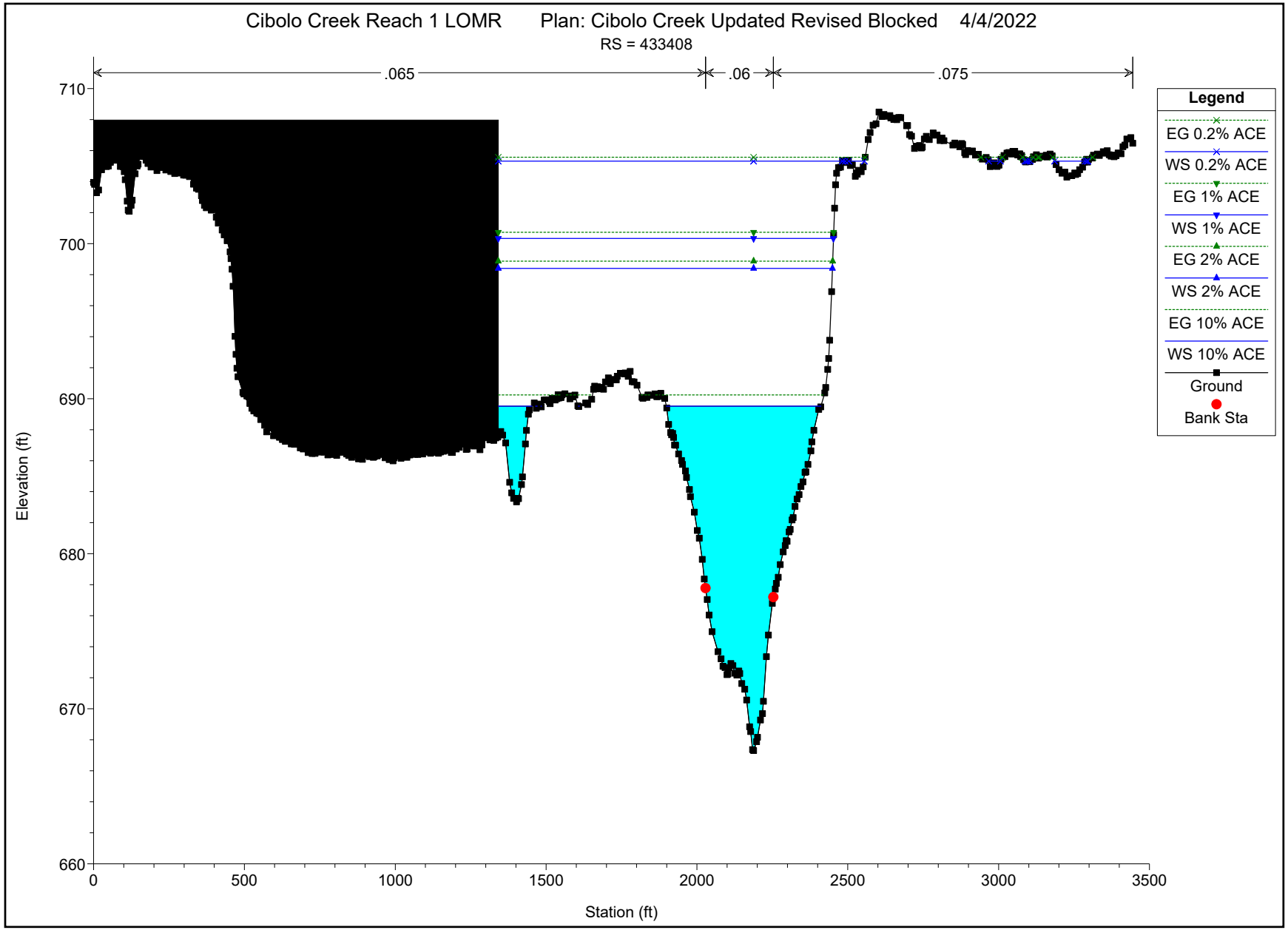
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
750
740
730
720
710
700
690
680
670
660
0
1000
2000
3000
4000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 433539
.065
.06
.075
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
710
700
690
680
670
660
0
500
1000
1500
2000
2500
3000
3500
4000
Station (ft)


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 433408
.065
.06
.075
Legend
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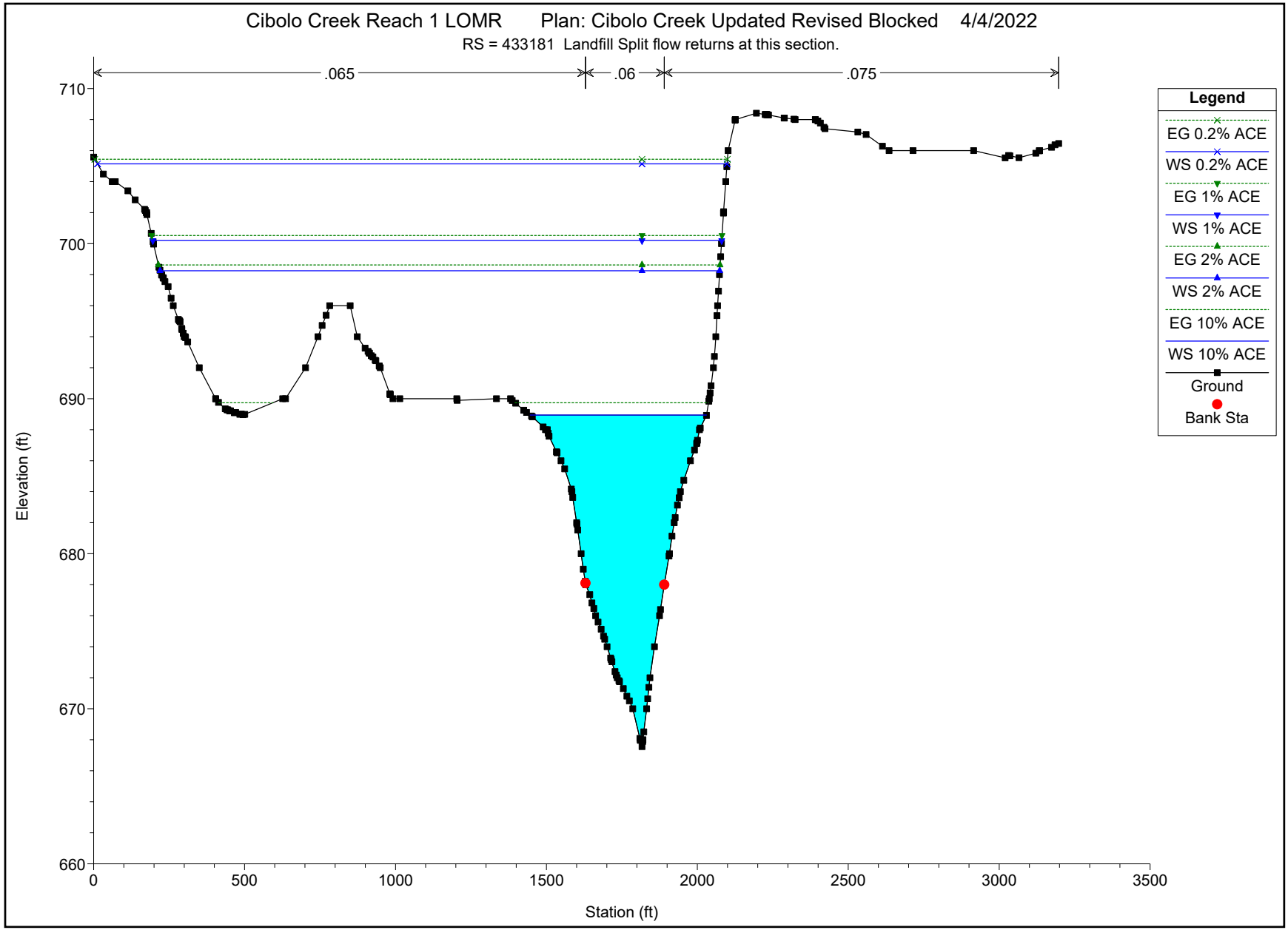
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
710
700
690
680
670
660
0
500
1000
1500
2000
2500
3000
3500
Station (ft)


Cibolo Creek Reach 1 LOMR Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 433181 Landfill Split flow returns at this section.
.065
.06
.075
Legend
EG 0.2% ACE
WS 0.2% ACE
EG 1% ACE
WS 1% ACE
EG 2% ACE
WS 2% ACE
EG 10% ACE
WS 10% ACE
Ground
Bank Sta
Elevation (ft)
710
700
690
680
670
660
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

BECK LANDFILL
APPENDIX C2-B
No-Rise Certification for Proposed Stormwater Pond

City of Schertz

Floodplain Permit

Permit PRGR202202064

Date Issued: October 20, 2022 **Expires:** April 18, 2023

Project Address: 550 FM 78;

Subdivision:

Lot # **Block #**

Owner Information:

Contractor:

Proposed Use: **Not Applicable**

Description of Work:

- Floodplain:
- Clearing and Grading: Disturbing Soil (Greater than 1/10th of an Acre)

Note: Permit is for construction of new detention basin for landfill.

Conditions:

Issued By:
Engineering Department

Kathy Woodlee
City Engineer
(210) 619-1823

Permits are non-transferable and shall be displayed on site at all times.

NO RISE CERTIFICATION

PROPOSED STORMWATER POND

NAME OF PROJECT: Beck Landfill Stormwater Pond

OWNER: Nido, LTD

CITY, COUNTY: Schertz, Guadalupe County

August 15, 2022

Prepared by:

Civil & Environmental Consultants, Inc.

Texas Registration Number F-38
3711 S MoPac Expressway
Building 1 Suite 550,
Austin, Texas 78746
(512) 329-0006

EXECUTIVE SUMMARY

The Beck Landfill proposes to construct a new Stormwater Pond (Pond) located in the Cibolo Creek watershed southeast of the existing landfill (see Figure 1). The Pond will be excavated below grade and include above grade compacted soil berms to provide additional volume. The purpose of the pond is to provide detention and sedimentation capacity for the existing landfill. The pond will be constructed at the same location as the existing stormwater pond and the proposed soil berms will be tied into the existing landfill perimeter berm to minimize the encroachment on the floodplain. In order to offset the loss of flow area in the floodplain from the pond berm, the area south of the new pond is proposed to be excavated to enhance flow through Cibolo Creek. There is no increase in the calculated water surface elevation of the floodplain from the pond construction, since the areas along the creek will be excavated to completely offset any effects of the new pond. This report provides engineering support for a No Rise Certificate for the pond construction.

FEMA FLOODPLAIN

The proposed Pond site is located within the floodway of Cibolo Creek (see Figure 2). Given the location, under City of Schertz regulations there is to be no rise in the 1-percent annual exceedance probability (AEP) event water surface elevations associated with the installation of the facility.

HYDRAULIC MODELING

To evaluate the potential impact, the effective FEMA model for this reach of Cibolo Creek was utilized. The effective model was obtained from the San Antonio River Authority. FIRMATEK 3D Mapping Solutions (FIRMATEK) performed an aerial survey of the Beck Landfill site which included the Cibolo Creek channel around the facility in 2021. The effective model geometry (Cibolo Creek Reach 1) was updated around the landfill to reflect the latest topography (CiboloCkR1LOMR) and this model was utilized in the recently submitted LOMR application to the City of Schertz and FEMA.

A digital elevation model (DEM) was developed for the vicinity of the landfill to create the above noted Cibolo Creek Reach 1 LOMR geometry. The base topography for the area around the landfill was derived from the FEMA 2011 61 cm Comal, Guadalupe LiDAR dataset. For the area in and

around the landfill, the FIRMATEK dataset was utilized. Lastly, a third geometry (CiboloCreek-South) was developed for the site. It used the Cibolo Creek Reach 1 LOMR geometry DEM and a DEM that includes the proposed Pond contours.

Figure 3 shows the proposed pond and the cross-section locations from the models. Note that four cross sections (439971, 438740, 437996, and 437265) pass through the proposed Pond. Plots of the four cross sections comparing the elevations with and without the proposed Pond are found in Appendix A. The cross sections for both the LOMR configuration and the LOMR configuration with the Pond added, were evaluated using HEC-RAS 6.1. It is my opinion that the analyzed cross sections reasonably reflect the impact of the proposed Pond without needing supplemental cross sections. The flow values used in this evaluation are the same as the discharges from the effective model.

RESULTS

Both geometries (Cibolo Creek Reach 1 LOMR and Cibolo Creek-South) were run using the same inflow dataset. HEC-RAS output summary tables with the cross-sections effected by the Pond highlighted, are included in Appendix A. A summary of the results for the two models is also shown below in Table 1.

Table 1-Comparison of Water Surface Elevations

Cross-Section Label	LOMR 1% Chance Water Surface (Feet MSL)	Proposed Pond 1% Chance Water Surface (Feet MSL)	Difference in Water Surface Elevation (Feet)
439971	705.51	705.33	-0.18
438740	705.30	705.21	-0.09
437996	705.21	705.13	-0.08
437265	705.03	705.03	0.00

The proposed excavation more than offsets the proposed pond berm and all of the modeled cross-sections either shown no change between the two models or show a slight reduction in water surface for the model including the Pond. Based on the results of the modeling, a No Rise Certificate is warranted for the proposed Pond.

NORTH

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

FLOODPLAIN DATA: FEMA NATIONAL FLOOD HAZARD LAYER (NFHL), 2021-08-18, PUBLICLY AVAILABLE GIS.

LEGEND

EXISTING WATER BOUNDARY

SCALE IN FEET
0 200 400

THIS DOCUMENT IS RELEASED FOR REVIEW ONLY AND IS NOT INTENDED FOR PERMITTING, CONSTRUCTION, OR ANY OTHER PURPOSE.
JAMES C. MASSARO
P.E. 92530 (TEXAS)
April 26, 2022

433408 WSE: 700.34
433539 WSE: 700.39
433730 WSE: 700.47
434453 WSE: 701.08
435043 WSE: 702.40
435810 WSE: 703.05
436536 WSE: 704.27
437865 WSE: 705.03
437996 WSE: 705.21
438740 WSE: 705.50
439971 WSE: 705.51
440762 WSE: 705.81
441476 WSE: 708.12
442214 WSE: 709.72
442891 WSE: 711.58
443555 WSE: 712.24
444240 WSE: 712.59
444717 WSE: 714.34
445235 WSE: 715.46
445573 WSE: 715.47

EXISTING LANDFILL

PROPOSED LOCATION OF POND

STATE OF TEXAS
ADAM W. MEHEVEC
94739
LICENSED PROFESSIONAL ENGINEER
8-15-2022

REVISION RECORD

NO	DATE	DESCRIPTION

CEC
Texas Registered Engineering Firm F-98
Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTXZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

TOPOGRAPHIC WORK MAP

DATE:	4/26/2022	DRAWN BY:	AGT
DWG SCALE:	1" = 200'	CHECKED BY:	JCM
PROJECT NO:		311-653.SITE	
APPROVED BY:			AWM

DRAWING NO.: **1**

SHEET 2 OF 4

P:\310-005\311-653\-CAD\Dwg\C001\311653-C001-TopoWorkMap.dwg[2] LS:4/26/2022 - amehevec - LP: 4/27/2022 8:10 AM

NORTH

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

PANEL 0220F

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

GUADALUPE COUNTY, TEXAS

AND INCORPORATED AREAS

PANEL 220 OF 480

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

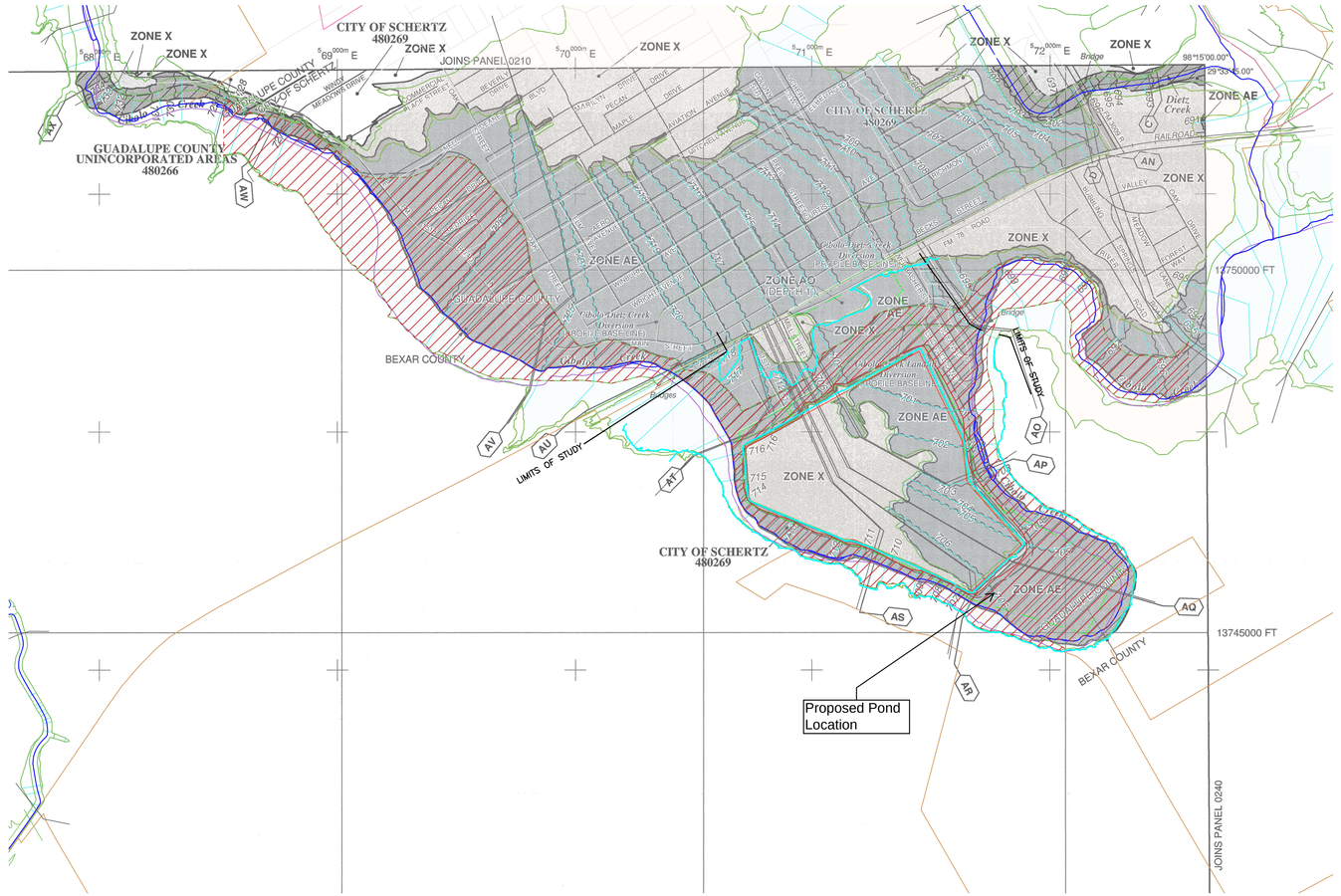
COMMUNITY	NUMBER	PANEL	SUFFIX
GUADALUPE COUNTY	480266	0220	F
SCHERTZ, CITY OF	480269	0220	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48187C0220F

EFFECTIVE DATE
NOVEMBER 2, 2007

Federal Emergency Management Agency



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AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 14

6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, south central zone (FIPSZONE 4204), Lambert Conformal Conic

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 2, 2007
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

SCALE IN FEET
0 1000 2000

STATE OF TEXAS
ADAM W. MEHEVEC
64738
LICENSED
PROFESSIONAL ENGINEER
6-15-22

REVISION RECORD

NO	DESCRIPTION	DATE

CEC
Texas Registered Engineering Firm F-98
Civil & Environmental Consultants, Inc.
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL EXPANSION
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

ANNOTATED FLOOD INSURANCE RATE MAP (FIRM) 48187C0220F

DATE:	5/2/2022
DWG SCALE:	1" = 1000'
PROJECT NO:	311-653.SITE
DRAWN BY:	AGT
CHECKED BY:	JCM
APPROVED BY:	AWM

DRAWING NO.: 2

SHEET 3 OF 4

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NORTH

REFERENCE

AERIAL IMAGERY PROVIDER: GOOGLE EARTH; DATE OF PHOTOGRAPHY: 11/22/2019.

ELEVATION CONTOURS: STRATEGIC MAPPING PROGRAM (STRATMAP) CENTRAL TEXAS LIDAR, 2017-01-01 (DATA COLLECTION PERIOD: 01/28/201/ THROUGH 03/22/201/).

FLOODPLAIN DATA: FEMA NATIONAL FLOOD HAZARD LAYER (NFHL), 2021-08-18, PUBLICLY AVAILABLE GIS.

LEGEND

- EXISTING CREEK CENTERLINE
- 1% ANNUAL CHANCE FLOODPLAIN BOUNDARY
- CROSS-SECTION LINE FROM CURRENT STUDY

SCALE IN FEET
0 300 600

LIMITS OF STUDY

LIMITS OF STUDY

EXISTING LANDFILL

433181 WSE: 700.20
433408 WSE: 700.34
433539 WSE: 700.39
433730 WSE: 700.47
434453 WSE: 701.08
435043 WSE: 702.40
436810 WSE: 703.05
436936 WSE: 704.27
437265 WSE: 705.03
437996 WSE: 705.21
438710 WSE: 705.46
439997 WSE: 706.35
440762 WSE: 705.81
441476 WSE: 708.12
442214 WSE: 709.72
442891 WSE: 711.58
443555 WSE: 712.23
444240 WSE: 712.89
444777 WSE: 714.34
445235 WSE: 715.46
445573 WSE: 715.47
446037 WSE: 716.14
446236 WSE: 716.12

EXCAVATION AREA

PROPOSED POND

STATE OF TEXAS
ADAM W. MEHEVEC
84733
LICENSED PROFESSIONAL ENGINEER
8-15-2022

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
Texas Registered Engineering Firm F-98
3711 South MoPac Expressway · Building 1, Suite 550 · Austin, TX 78746
Ph: 512.439.0400 · Fax: 512.329.0096
www.cecinc.com

BECK LANDFILL
600 FM 78, SCHERTZ, TEXAS 78154
GUADALUPE COUNTY, TEXAS

PROPOSED POND

DATE:	8/14/2022
DWG SCALE:	1" = 200'
PROJECT NO:	311-653.SITE
APPROVED BY:	AVM
DRAWN BY:	AGT
CHECKED BY:	JCM

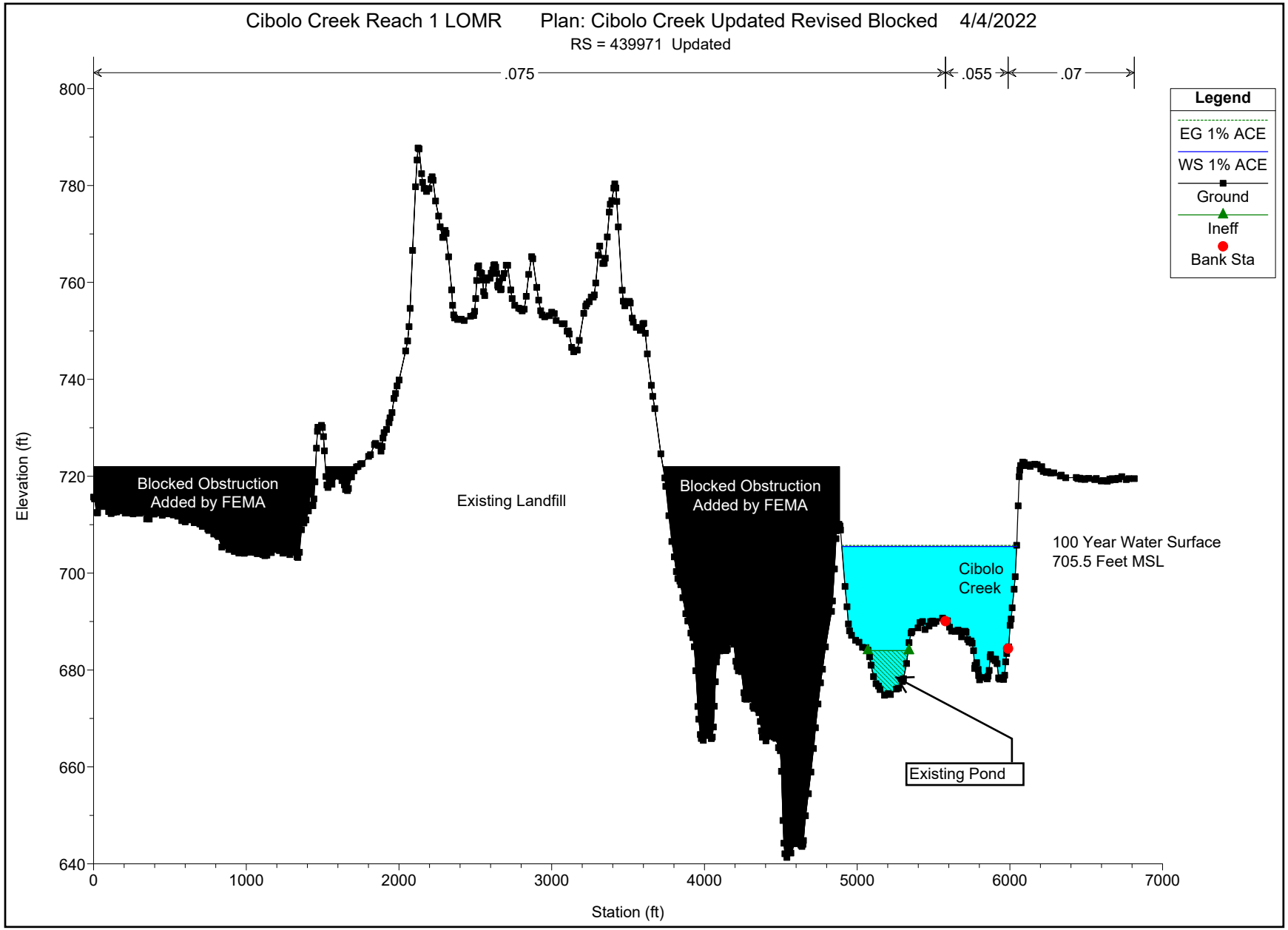
DRAWING NO.: 3

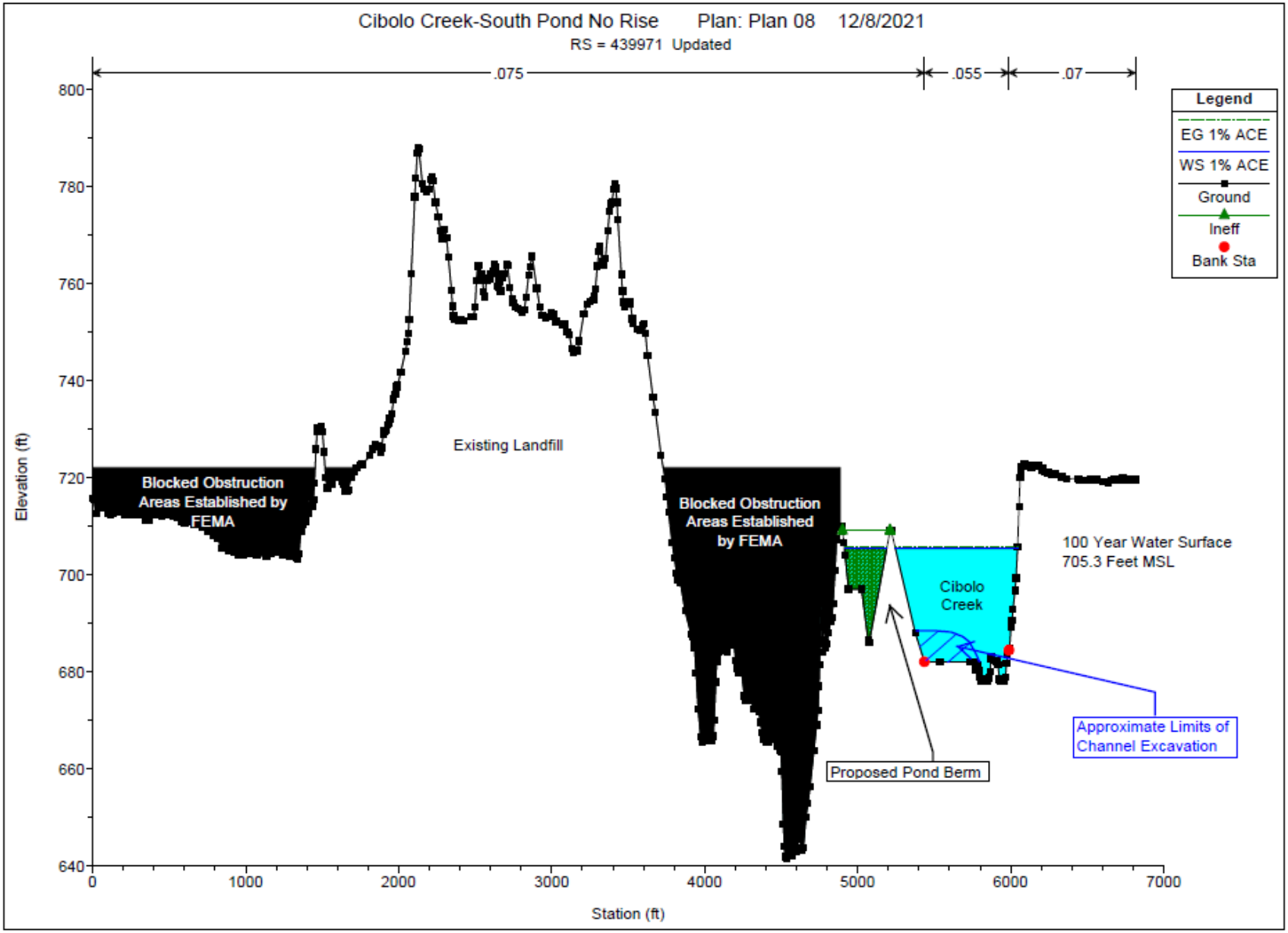
SHEET 3 OF

P:\310-000\311-653\-04(01)\dwg\[01(01)311653-04(01)-No Rise Figure 3.dwg]03(01)(8/16/2022 - cmehevec) - LA: 8/14/2022 5:22 PM

Appendix A

HEC-RAS Cross-Sections and Summary Tables


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 439971 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Blocked Obstruction Added by FEMA
Existing Landfill
Blocked Obstruction Added by FEMA
Cibolo Creek
100 Year Water Surface
705.5 Feet MSL
Existing Pond
Elevation (ft)
Station (ft)
800
780
760
740
720
700
680
660
640
0
1000
2000
3000
4000
5000
6000
7000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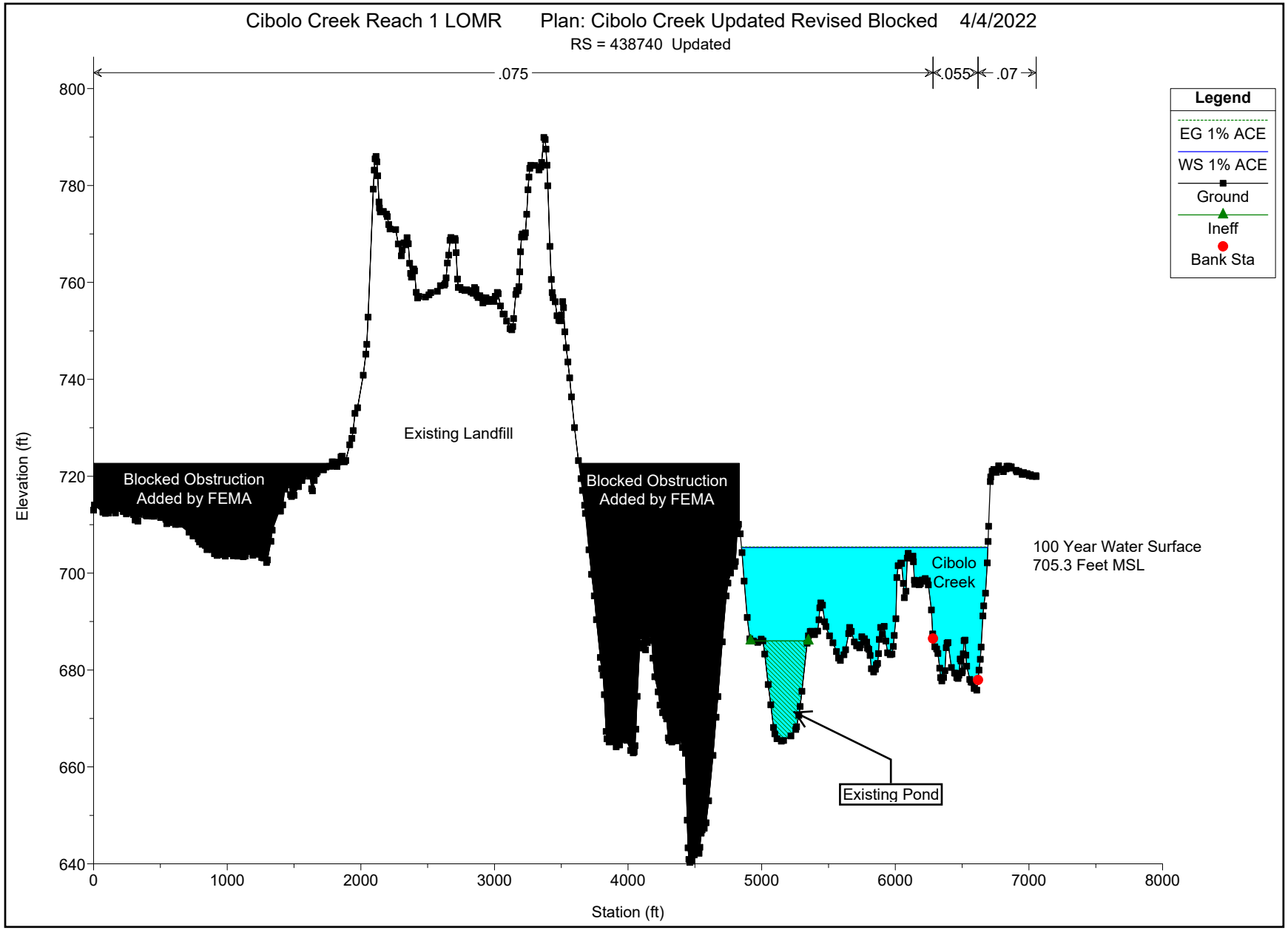
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
640
0
1000
2000
3000
4000
5000
6000
7000
Station (ft)
Existing Landfill
Blocked Obstruction Areas Established by FEMA
Blocked Obstruction Areas Established by FEMA
Cibolo Creek
100 Year Water Surface 705.3 Feet MSL
Approximate Limits of Channel Excavation
Proposed Pond Berm


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 438740 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Existing Landfill
Blocked Obstruction Added by FEMA
Blocked Obstruction Added by FEMA
Cibolo Creek
100 Year Water Surface
705.3 Feet MSL
Existing Pond
Elevation (ft)
Station (ft)
800
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760
740
720
700
680
660
640
0
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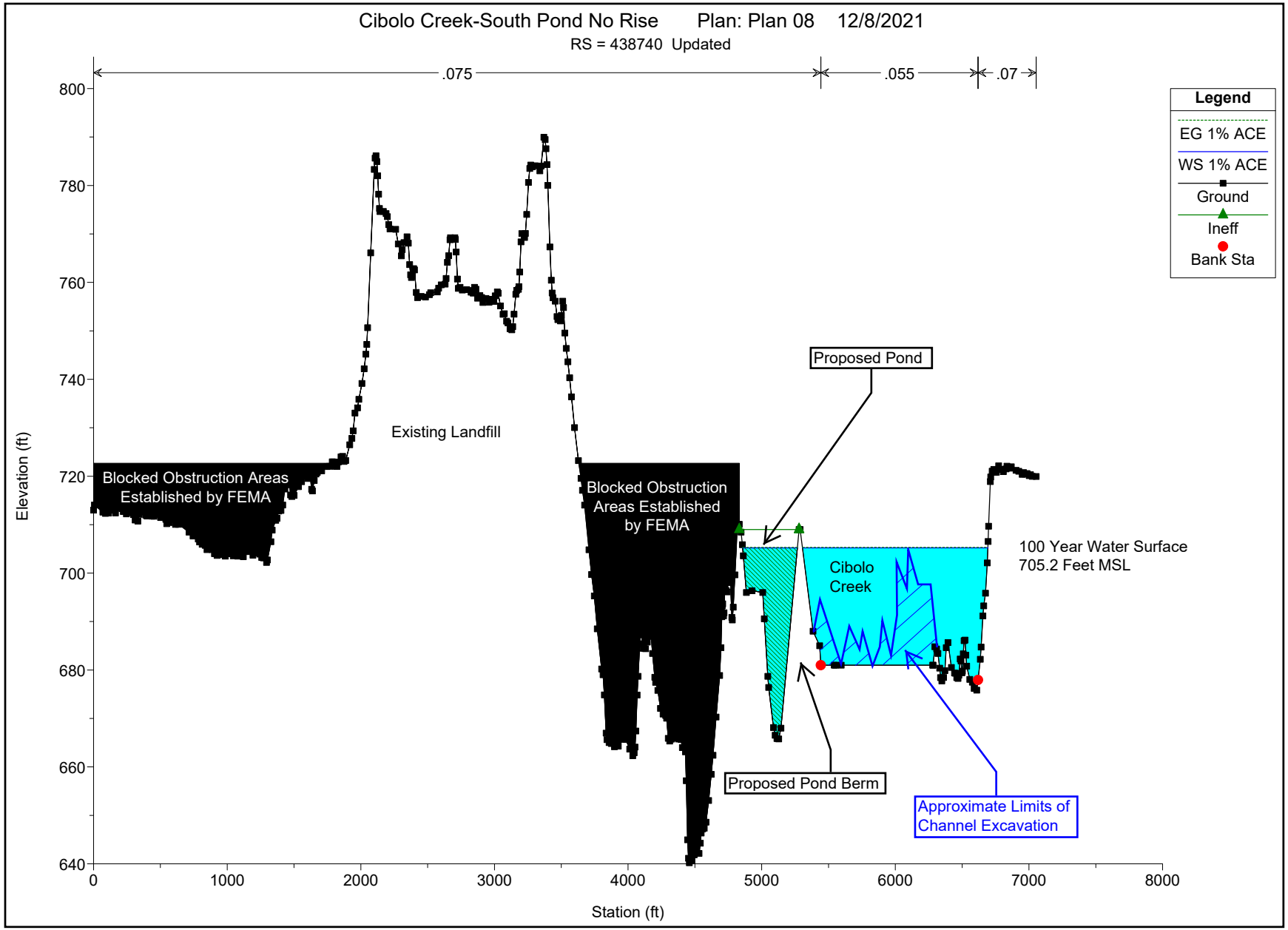
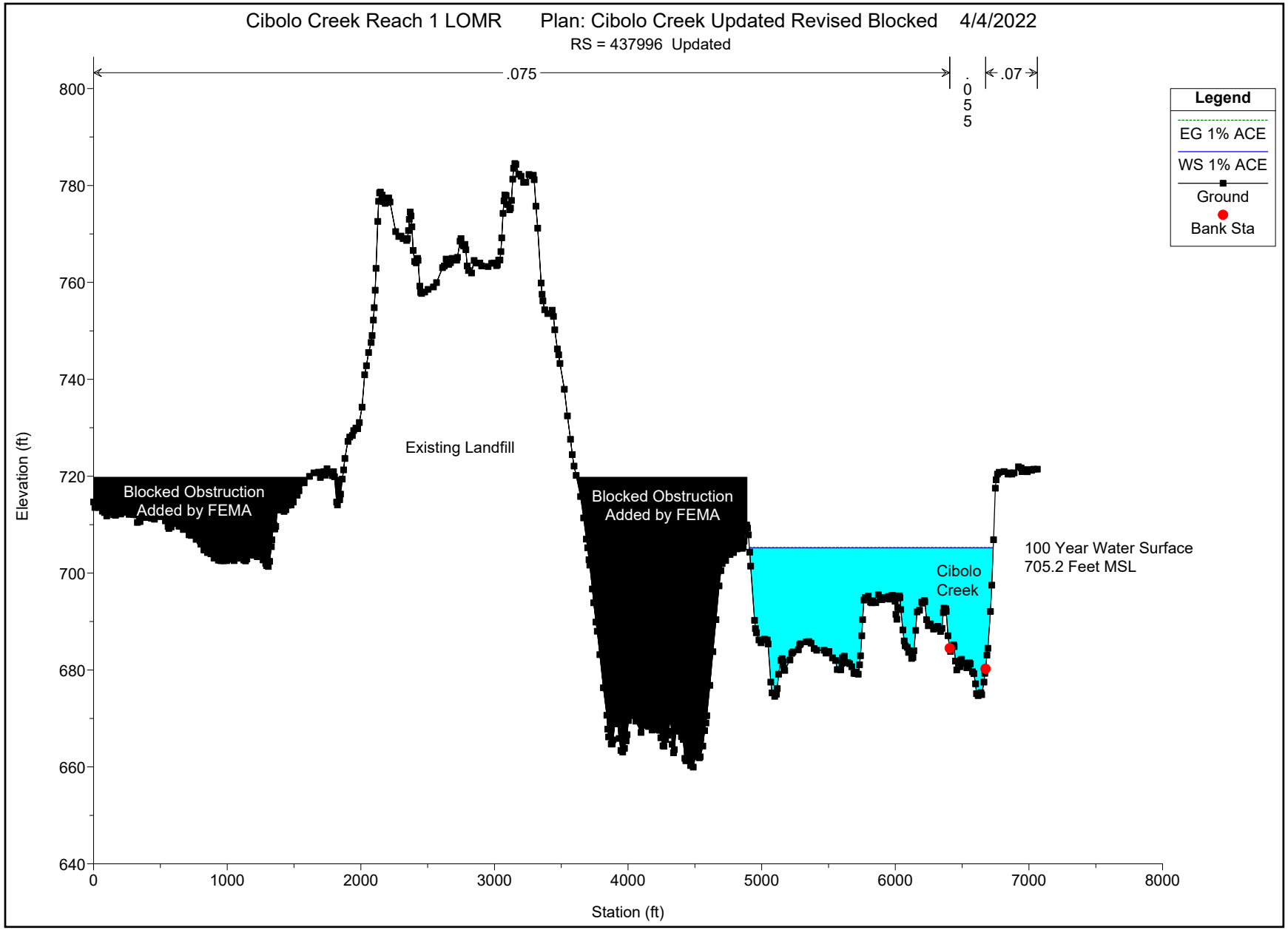
6000
7000
8000


Cibolo Creek-South Pond No Rise Plan: Plan 08 12/8/2021
RS = 438740 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Proposed Pond
Existing Landfill
Blocked Obstruction Areas Established by FEMA
Blocked Obstruction Areas Established by FEMA
Cibolo Creek
100 Year Water Surface 705.2 Feet MSL
Proposed Pond Berm
Approximate Limits of Channel Excavation
Elevation (ft)
Station (ft)
800
780
760
740
720
700
680
660
640
0
1000
2000
3000
4000
5000
6000
7000
8000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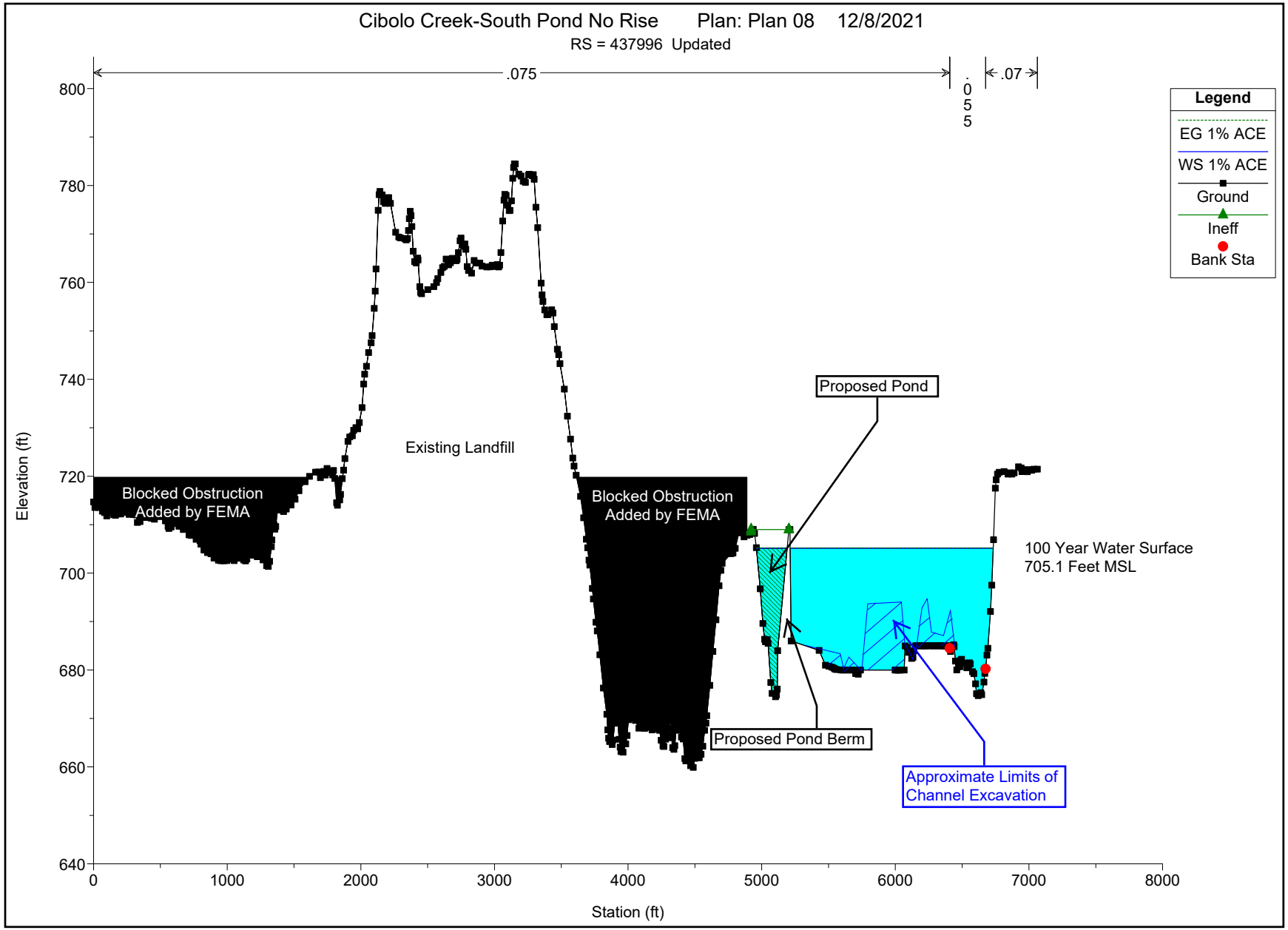
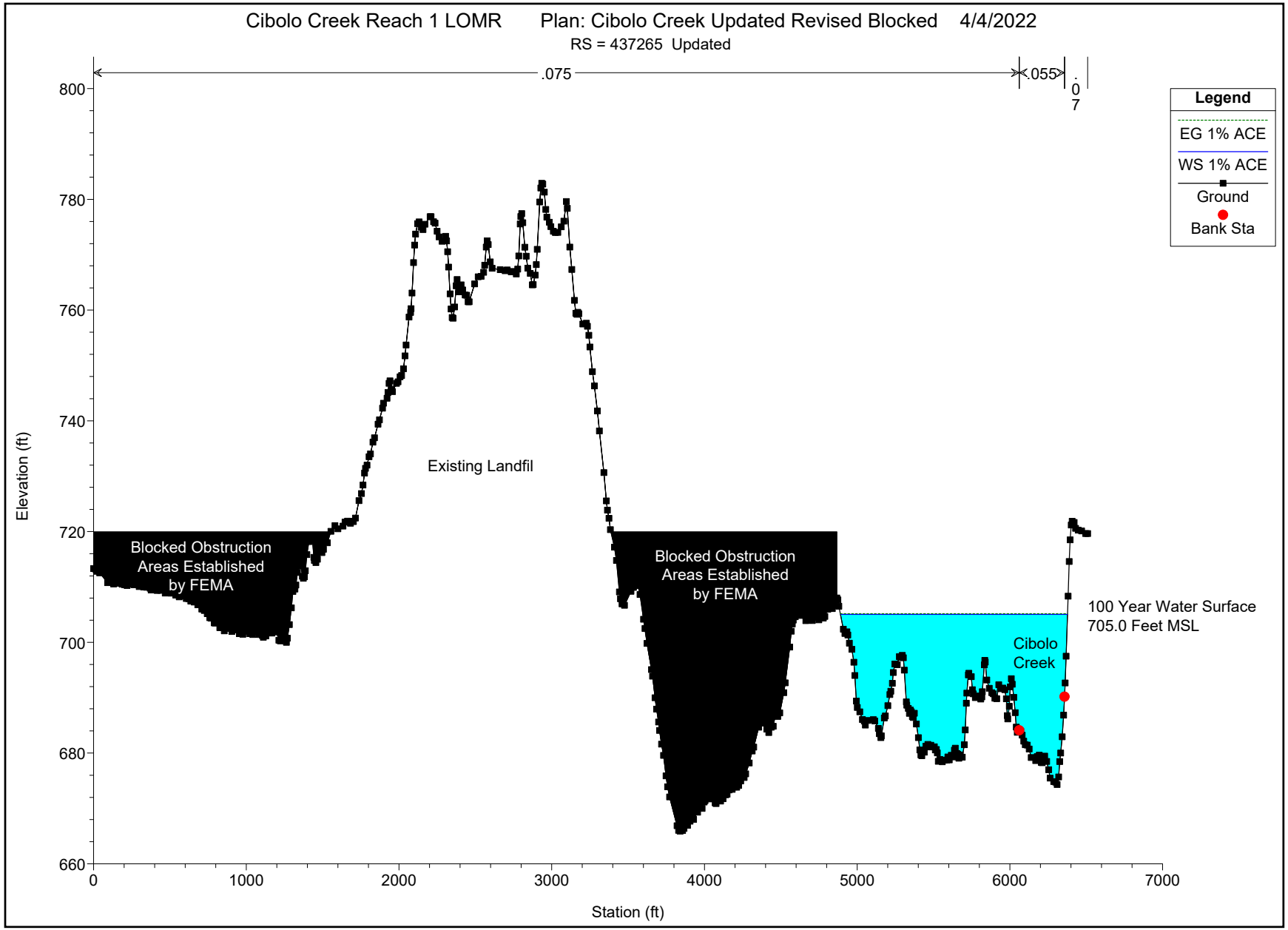
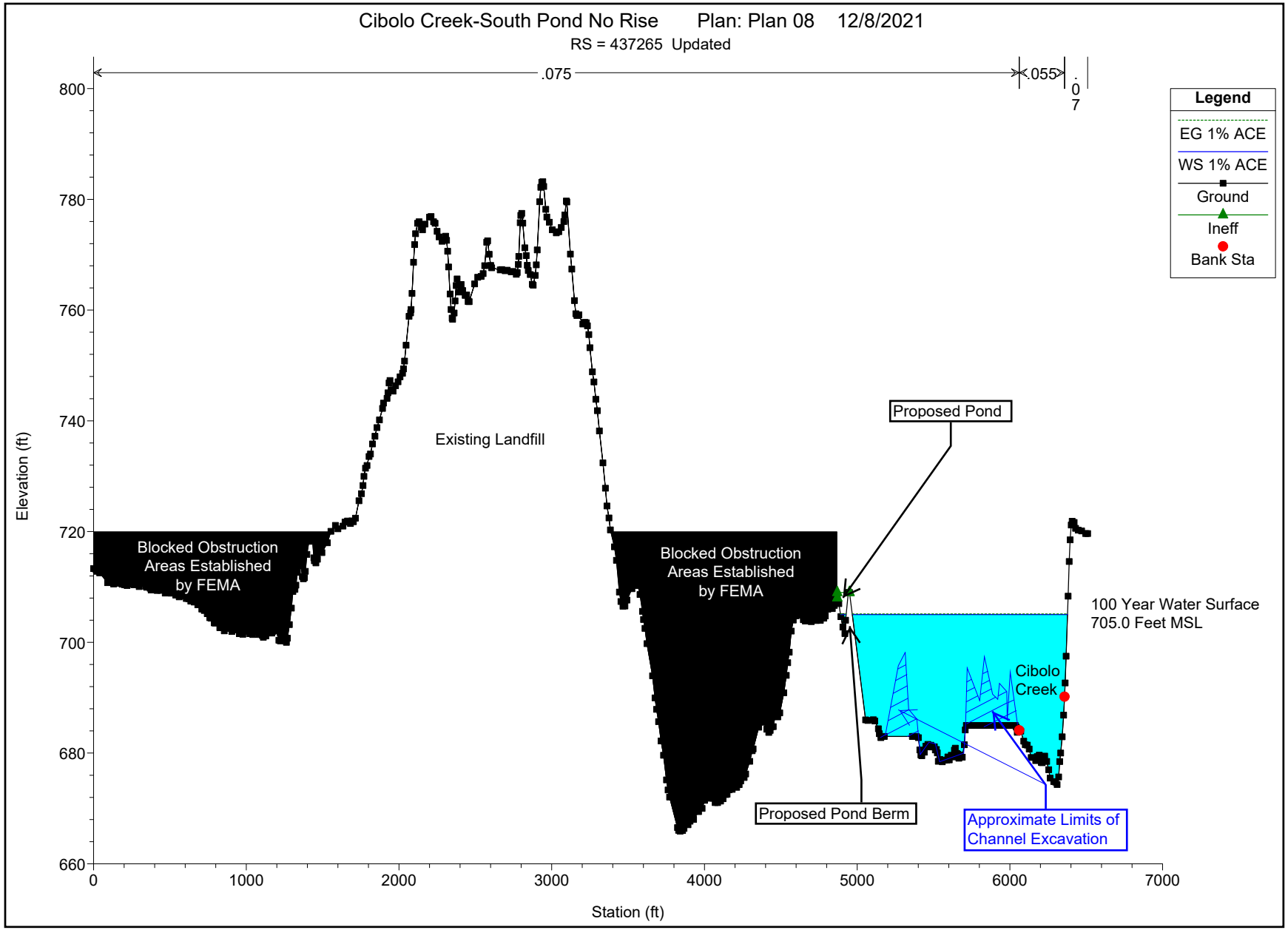
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Bank Sta
Existing Landfill
Blocked Obstruction Added by FEMA
Blocked Obstruction Added by FEMA
Cibolo Creek
100 Year Water Surface
705.2 Feet MSL
Elevation (ft)
Station (ft)
800
780
760
740
720
700
680
660
640
0
1000
2000
3000
4000
5000
6000
7000
8000


Cibolo Creek-South Pond No Rise Plan: Plan 08 12/8/2021
RS = 437996 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Existing Landfill
Blocked Obstruction Added by FEMA
Blocked Obstruction Added by FEMA
Proposed Pond
Proposed Pond Berm
100 Year Water Surface 705.1 Feet MSL
Approximate Limits of Channel Excavation


Cibolo Creek Reach 1 LOMR
Plan: Cibolo Creek Updated Revised Blocked 4/4/2022
RS = 437265 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Bank Sta
Existing Landfil
Blocked Obstruction Areas Established by FEMA
Blocked Obstruction Areas Established by FEMA
Cibolo Creek
100 Year Water Surface
705.0 Feet MSL
Elevation (ft)
Station (ft)
800
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
6000
7000


Cibolo Creek-South Pond No Rise Plan: Plan 08 12/8/2021
RS = 437265 Updated
.075
.055
.07
Legend
EG 1% ACE
WS 1% ACE
Ground
Ineff
Bank Sta
Elevation (ft)
800
780
760
740
720
700
680
660
0
1000
2000
3000
4000
5000
6000
7000
Station (ft)
Existing Landfill
Blocked Obstruction Areas Established by FEMA
Blocked Obstruction Areas Established by FEMA
Proposed Pond
Proposed Pond Berm
100 Year Water Surface 705.0 Feet MSL
Cibolo Creek
Approximate Limits of Channel Excavation

Existing Floodplain Model

HEC-RAS Plan: Updated Revised Blocked River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	471492	1% ACE	99469.00	727.19	763.39		763.62	0.000363	5.69	34601.18	2198.78	0.19
Reach 1	471305	1% ACE	99469.00	727.34	763.24	751.99	763.54	0.000502	6.67	32775.37	2378.41	0.22
Reach 1	471274		Culvert									
Reach 1	471249	1% ACE	99469.00	727.00	763.07		763.48	0.000476	7.82	31870.88	2281.84	0.25
Reach 1	471196	1% ACE	99469.00	721.11	763.04		763.41	0.000343	7.13	33581.38	2059.86	0.21
Reach 1	470981	1% ACE	99469.00	723.50	762.97		763.33	0.000460	7.95	30999.64	1786.67	0.24
Reach 1	470677	1% ACE	99469.00	722.14	762.52		763.13	0.000750	8.87	22466.57	1240.43	0.28
Reach 1	470239	1% ACE	99469.00	722.06	761.48		762.67	0.001344	10.97	15299.25	813.35	0.34
Reach 1	469943	1% ACE	99469.00	726.08	760.41		762.16	0.001764	12.09	11816.91	604.20	0.39
Reach 1	469604	1% ACE	99469.00	722.00	759.79		761.57	0.001731	12.47	12261.42	652.03	0.39
Reach 1	469298	1% ACE	99469.00	725.79	759.46	747.88	760.99	0.001612	11.25	12723.09	768.96	0.37
Reach 1	468962	1% ACE	99469.00	720.47	759.04	747.79	760.45	0.001448	11.49	13295.75	717.29	0.35
Reach 1	468846	1% ACE	99469.00	727.87	758.89	748.23	760.25	0.001685	11.21	13163.75	735.53	0.37
Reach 1	468803	1% ACE	99469.00	728.39	758.74	748.00	760.17	0.001757	11.43	12859.89	730.35	0.38
Reach 1	468557	1% ACE	99469.00	723.63	758.18	747.86	759.75	0.001671	11.99	12723.47	679.51	0.38
Reach 1	468267	1% ACE	99469.00	724.43	757.54	745.26	759.29	0.001374	11.74	12328.48	764.28	0.38
Reach 1	467781	1% ACE	99469.00	725.38	757.35		758.52	0.001097	10.40	15574.31	969.35	0.34
Reach 1	467302	1% ACE	99469.00	725.58	756.89		757.98	0.001053	10.18	14072.04	630.59	0.33
Reach 1	466729	1% ACE	99423.00	720.67	755.65		757.26	0.001413	12.33	13246.73	721.04	0.39
Reach 1	466588	1% ACE	99423.00	725.23	755.51	742.11	757.05	0.001169	10.56	13238.37	1339.60	0.35
Reach 1	466560		Bridge									
Reach 1	466523	1% ACE	99423.00	725.23	754.88		756.39	0.001206	10.57	12502.43	1008.44	0.35
Reach 1	466490	1% ACE	99423.00	721.83	755.07	740.96	756.14	0.000893	9.83	13128.95	552.03	0.31
Reach 1	466425		Bridge									
Reach 1	466354	1% ACE	99423.00	721.83	754.75		755.86	0.000928	9.96	12957.13	550.21	0.31
Reach 1	466304	1% ACE	99423.00	715.93	754.71	738.22	755.82	0.000769	9.73	15903.47	1426.61	0.29
Reach 1	466270		Bridge									
Reach 1	466222	1% ACE	99423.00	715.93	754.12		755.32	0.000843	10.07	15228.43	1102.21	0.30
Reach 1	466042	1% ACE	99423.00	715.18	753.09		754.92	0.001761	12.33	13270.99	1211.70	0.39
Reach 1	465600	1% ACE	99423.00	715.50	752.36		754.12	0.001792	12.07	13679.66	1362.76	0.39
Reach 1	464951	1% ACE	99423.00	714.75	751.13		752.86	0.002219	12.34	12943.91	1202.00	0.39
Reach 1	464376	1% ACE	99423.00	717.01	750.65		751.71	0.001298	9.49	15094.04	1016.61	0.30
Reach 1	463780	1% ACE	99423.00	714.00	750.30		750.92	0.001039	8.40	17758.21	927.53	0.25
Reach 1	463167	1% ACE	99423.00	712.90	749.06	734.71	750.15	0.001540	9.96	15382.57	1071.88	0.31
Reach 1	462386	1% ACE	99423.00	707.75	748.00	730.52	749.09	0.001254	9.06	14363.73	998.33	0.28
Reach 1	461701	1% ACE	99423.00	706.99	745.84	734.94	747.82	0.002534	13.04	11401.77	857.33	0.39
Reach 1	460978	1% ACE	99903.00	707.53	744.22	731.44	746.15	0.002076	12.15	11078.14	1532.76	0.38
Reach 1	460345	1% ACE	99903.00	705.78	743.39		744.71	0.001913	12.14	15028.20	1186.20	0.37
Reach 1	459910	1% ACE	99903.00	704.38	741.75		743.73	0.002360	13.66	12401.75	991.53	0.41
Reach 1	459264	1% ACE	99903.00	703.48	741.05		742.25	0.001633	11.31	14141.04	817.55	0.34
Reach 1	458814	1% ACE	99903.00	704.51	738.56		741.22	0.002421	14.72	9534.16	528.34	0.46
Reach 1	458337	1% ACE	99903.00	704.15	736.32		739.87	0.002914	16.87	9485.20	736.96	0.54
Reach 1	457901	1% ACE	99903.00	703.93	736.12		738.54	0.001862	13.79	10621.30	628.31	0.44
Reach 1	457492	1% ACE	99903.00	705.85	735.03		737.66	0.002384	14.54	10080.05	611.40	0.49
Reach 1	456713	1% ACE	99903.00	703.29	734.33		735.97	0.001534	11.94	12018.84	577.42	0.40
Reach 1	456110	1% ACE	99903.00	698.65	732.00		734.86	0.002122	14.98	9525.05	503.88	0.47
Reach 1	455642	1% ACE	99903.00	699.00	731.20		733.92	0.001927	13.66	8613.68	427.22	0.44
Reach 1	455149	1% ACE	99903.00	697.08	729.59		732.70	0.003058	16.11	9203.39	585.96	0.55
Reach 1	454703	1% ACE	99903.00	697.00	728.76		731.38	0.002325	14.12	9719.65	582.75	0.48
Reach 1	454165	1% ACE	99903.00	696.13	727.30		730.11	0.002426	15.50	10563.10	701.85	0.50
Reach 1	453783	1% ACE	99903.00	695.45	726.66		729.12	0.002377	14.75	11174.07	835.92	0.49
Reach 1	453416	1% ACE	99903.00	695.21	726.33		728.15	0.001926	12.98	12759.13	931.88	0.44
Reach 1	453007	1% ACE	99903.00	694.00	726.35		727.36	0.000979	9.78	15587.71	809.10	0.32
Reach 1	452334	1% ACE	99724.00	698.00	726.15		726.69	0.000732	7.83	19628.12	1072.52	0.27
Reach 1	451728	1% ACE	99724.00	698.00	725.84		726.29	0.000556	6.58	22683.73	1772.64	0.23
Reach 1	451064	1% ACE	99724.00	696.38	725.64		725.95	0.000380	4.89	29761.14	2829.29	0.17
Reach 1	450390	1% ACE	99724.00	694.92	725.50		725.66	0.000354	4.61	39483.48	3158.26	0.16
Reach 1	449860	1% ACE	99724.00	693.42	725.33		725.46	0.000357	4.56	42404.83	3598.56	0.15
Reach 1	449212	1% ACE	99724.00	691.25	725.11		725.26	0.000285	4.11	43286.68	3728.55	0.13
Reach 1	448507	1% ACE	99724.00	688.25	724.62		724.98	0.000497	5.63	32352.47	4178.10	0.17
Reach 1	447828	1% ACE	99724.00	685.72	720.46	715.65	723.97	0.003482	17.56	11159.22	1575.21	0.55
Reach 1	447411	1% ACE	99724.00	684.88	720.00	712.53	722.19	0.002220	14.12	12385.17	1154.88	0.44
Reach 1	446945	1% ACE	99724.00	684.58	719.35	705.90	720.98	0.001799	11.57	15100.73	2232.94	0.36
Reach 1	446723	1% ACE	83554.00	683.76	719.24		720.06	0.000730	8.99	19643.33	1775.99	0.28
Reach 1	446577	1% ACE	83554.00	683.22	719.18	703.70	719.93	0.000701	7.23	15896.08	2061.97	0.26
Reach 1	446515		Bridge									
Reach 1	446493	1% ACE	83554.00	683.22	718.12		719.12	0.000914	8.08	11566.08	1214.31	0.29
Reach 1	446478	1% ACE	83554.00	678.39	718.30	701.74	718.91	0.000507	6.52	16591.38	1748.63	0.22
Reach 1	446440		Bridge									
Reach 1	446383	1% ACE	83554.00	678.39	717.88		718.52	0.000547	6.70	15749.16	1641.55	0.23
Reach 1	446236	1% ACE	83554.00	686.27	716.12		718.00	0.002356	12.35	12083.89	1951.03	0.40
Reach 1	446037	1% ACE	83554.00	685.26	716.14		717.43	0.001662	10.38	14568.45	2171.55	0.34
Reach 1	445573	1% ACE	83554.00	683.27	715.47		716.64	0.001635	10.24	13853.91	1272.36	0.34
Reach 1	445235	1% ACE	74844.00	683.27	715.46		716.09	0.000839	7.38	14446.55	819.21	0.24
Reach 1	444777	1% ACE	74844.00	683.27	714.34		715.55	0.001357	9.41	9324.66	418.29	0.31

HEC-RAS Plan: Updated Revised Blocked River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	444240	1% ACE	74844.00	683.14	712.59		714.56	0.002177	11.70	7112.57	303.76	0.39
Reach 1	443555	1% ACE	74844.00	682.52	712.24		713.19	0.001159	8.05	9943.71	424.81	0.28
Reach 1	442891	1% ACE	74844.00	679.79	711.58		712.49	0.000944	7.77	10195.40	409.13	0.25
Reach 1	442214	1% ACE	74844.00	678.90	709.72		711.43	0.002485	12.16	8711.94	548.33	0.40
Reach 1	441476	1% ACE	74844.00	678.52	708.12		709.76	0.001991	10.59	7947.43	421.93	0.36
Reach 1	440762	1% ACE	74844.00	677.76	705.81		707.89	0.002707	11.80	6709.83	304.53	0.42
Reach 1	439971	1% ACE	74844.00	677.96	705.51		705.71	0.000410	4.27	22216.60	1144.96	0.16
Reach 1	438740	1% ACE	74844.00	675.84	705.30		705.41	0.000223	3.38	33040.49	1844.11	0.12
Reach 1	437996	1% ACE	74844.00	674.71	705.21		705.29	0.000189	3.18	35176.72	1824.69	0.11
Reach 1	437265	1% ACE	74844.00	674.32	705.03		705.18	0.000290	3.98	27754.92	1486.97	0.14
Reach 1	436536	1% ACE	74844.00	673.98	704.27		704.82	0.000810	6.89	15281.89	921.79	0.23
Reach 1	435810	1% ACE	74844.00	672.59	703.05		703.98	0.001244	8.45	10535.21	526.54	0.29
Reach 1	435043	1% ACE	74844.00	672.92	702.40		703.12	0.000674	7.03	11817.77	513.44	0.24
Reach 1	434453	1% ACE	74844.00	672.90	701.08		702.28	0.001688	9.93	10304.78	657.11	0.34
Reach 1	433730	1% ACE	74844.00	668.74	700.47		701.07	0.001006	7.16	14270.50	937.56	0.24
Reach 1	433539	1% ACE	74844.00	667.11	700.39		700.85	0.000790	6.40	16157.71	1041.30	0.21
Reach 1	433408	1% ACE	74844.00	667.31	700.34		700.73	0.000749	6.22	17384.43	1111.20	0.21
Reach 1	433181	1% ACE	86791.00	667.56	700.20		700.53	0.000716	5.98	23132.56	1884.55	0.20
Reach 1	432987	1% ACE	86791.00	665.50	699.92	686.97	700.34	0.000723	6.73	20951.47	1542.86	0.22
Reach 1	432930		Bridge									
Reach 1	432893	1% ACE	86791.00	665.72	699.66		700.17	0.000949	7.65	19846.78	1626.99	0.25
Reach 1	432666	1% ACE	86791.00	664.85	699.28		699.98	0.001047	8.41	18273.86	1533.98	0.27
Reach 1	432475	1% ACE	86791.00	664.59	699.28		699.73	0.000851	7.07	21018.98	1563.84	0.22
Reach 1	431631	1% ACE	86791.00	663.50	698.71		699.12	0.000648	6.09	19799.95	1149.51	0.20
Reach 1	430804	1% ACE	86791.00	662.05	698.03		698.58	0.000627	6.69	17626.60	977.00	0.21
Reach 1	429757	1% ACE	86791.00	659.79	697.35		697.94	0.000607	6.49	16411.76	946.76	0.21
Reach 1	428966	1% ACE	86791.00	660.22	696.67		697.37	0.000933	8.13	17012.12	1091.79	0.26
Reach 1	428447	1% ACE	86791.00	655.39	696.31		696.97	0.000842	7.91	17600.38	1104.76	0.24
Reach 1	427784	1% ACE	86791.00	657.72	695.61		696.42	0.000912	8.09	15742.63	1354.07	0.25
Reach 1	427183	1% ACE	86791.00	658.56	695.14		695.88	0.000854	7.81	17395.66	1465.38	0.24
Reach 1	426517	1% ACE	86791.00	658.35	693.57		694.97	0.001543	10.35	13492.51	1726.15	0.33
Reach 1	425901	1% ACE	86791.00	658.89	692.66		694.01	0.001489	9.78	11945.38	1823.57	0.32
Reach 1	425293	1% ACE	86791.00	657.30	691.32		692.91	0.001912	11.13	11674.76	1309.53	0.36
Reach 1	424714	1% ACE	99926.00	656.85	689.55		691.50	0.002581	12.30	11744.29	1014.46	0.42
Reach 1	424187	1% ACE	99926.00	655.55	687.40		689.74	0.003931	13.70	11114.38	1727.31	0.47
Reach 1	423625	1% ACE	99926.00	653.68	686.08		687.57	0.002622	11.43	14768.28	2343.14	0.39
Reach 1	422995	1% ACE	99926.00	651.65	685.66		686.27	0.001298	8.21	21717.47	2895.78	0.27
Reach 1	422251	1% ACE	99926.00	651.19	683.89		685.01	0.002224	10.61	17479.30	2623.13	0.36
Reach 1	421444	1% ACE	99926.00	651.00	681.94		683.14	0.002420	11.12	17377.66	2736.31	0.37
Reach 1	420481	1% ACE	99926.00	650.01	679.82		680.85	0.002270	10.60	19928.69	3080.66	0.36
Reach 1	419470	1% ACE	99926.00	649.95	677.34		678.56	0.002379	10.19	18437.24	3058.44	0.36
Reach 1	418854	1% ACE	99926.00	647.17	673.65	669.50	675.94	0.006762	14.94	14870.99	3220.12	0.55
Reach 1	418726	1% ACE	99926.00	645.66	673.16		674.47	0.004272	12.13	18139.93	2987.12	0.47
Reach 1	418630	1% ACE	99926.00	646.57	673.02		673.92	0.002823	10.06	20295.93	2916.49	0.38
Reach 1	418516	1% ACE	99926.00	645.77	672.91		673.55	0.002067	8.78	22416.64	2924.63	0.33
Reach 1	418186	1% ACE	99926.00	646.00	671.63		672.69	0.003618	11.74	18578.89	2782.59	0.43
Reach 1	417994	1% ACE	99926.00	646.22	671.06		671.93	0.003361	10.79	19102.21	2394.25	0.39
Reach 1	417303	1% ACE	99986.00	641.33	670.19		670.61	0.000819	6.50	22004.13	1458.89	0.22
Reach 1	415588	1% ACE	99986.00	642.08	669.19		669.34	0.000576	4.31	36541.04	3494.54	0.17
Reach 1	413959	1% ACE	99986.00	639.83	668.36		668.52	0.000467	4.23	35303.80	2983.67	0.16
Reach 1	412994	1% ACE	99986.00	638.91	668.04		668.17	0.000370	3.62	38670.32	3239.86	0.13
Reach 1	412056	1% ACE	99986.00	638.83	667.80		667.88	0.000269	3.10	46699.70	3143.43	0.11
Reach 1	411408	1% ACE	99986.00	637.92	667.67		667.77	0.000315	3.42	44141.79	2987.15	0.12
Reach 1	410660	1% ACE	99986.00	634.42	667.29		667.50	0.000395	5.15	35082.88	2425.33	0.18
Reach 1	409107	1% ACE	99986.00	633.83	666.16		666.68	0.000548	6.73	22106.15	1237.07	0.22
Reach 1	408599	1% ACE	99986.00	631.17	666.00		666.38	0.000494	5.43	22324.77	972.68	0.17
Reach 1	408038	1% ACE	99986.00	623.97	665.78		666.14	0.000379	4.90	21923.51	800.76	0.15
Reach 1	407323	1% ACE	99986.00	625.42	662.33		664.91	0.002816	14.57	9429.65	497.60	0.44
Reach 1	406437	1% ACE	99986.00	626.75	661.14		662.21	0.001111	8.67	13701.50	733.71	0.28
Reach 1	405800	1% ACE	99986.00	625.19	661.04		661.51	0.000414	5.60	19732.68	886.29	0.17
Reach 1	405065	1% ACE	99986.00	623.87	659.43		660.82	0.002263	10.91	12846.01	878.94	0.36
Reach 1	404559	1% ACE	99986.00	624.37	658.99		659.84	0.001392	8.88	15229.70	1004.13	0.29
Reach 1	403683	1% ACE	99986.00	622.00	658.45		659.06	0.000544	6.69	18975.41	946.23	0.20
Reach 1	403073	1% ACE	99986.00	622.00	657.82		658.60	0.000993	7.72	17770.30	1259.77	0.24
Reach 1	402516	1% ACE	99986.00	620.02	656.92		657.98	0.001147	8.50	13724.82	852.67	0.26
Reach 1	402110	1% ACE	99986.00	620.86	656.77		657.58	0.000595	7.58	17021.13	1085.78	0.23
Reach 1	401658	1% ACE	99986.00	617.34	656.80		657.19	0.000548	5.88	23325.88	2226.19	0.18
Reach 1	400921	1% ACE	99986.00	618.50	654.83		656.36	0.002107	11.35	16225.03	2700.87	0.35
Reach 1	399722	1% ACE	100009.00	614.28	653.98		654.57	0.000718	6.73	23308.38	2741.77	0.21
Reach 1	398748	1% ACE	100009.00	610.94	652.50		653.56	0.001221	8.60	15689.14	2167.02	0.27
Reach 1	398061	1% ACE	100009.00	612.67	651.63		652.62	0.001445	8.88	17302.29	1963.08	0.29
Reach 1	397096	1% ACE	100009.00	611.67	650.05		651.19	0.001564	9.29	17393.51	2785.04	0.30
Reach 1	396117	1% ACE	100009.00	612.77	648.24		649.48	0.001923	10.12	16346.06	2012.77	0.33
Reach 1	395546	1% ACE	99891.00	612.04	644.74	637.89	647.69	0.004709	14.88	10453.15	1852.09	0.51
Reach 1	394958	1% ACE	99891.00	611.70	642.25		645.00	0.004263	13.86	9204.31	1083.60	0.49

HEC-RAS Plan: Updated Revised Blocked River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	394251	1% ACE	99891.00	609.16	640.69		642.38	0.002586	10.67	10801.81	896.98	0.38
Reach 1	393283	1% ACE	99891.00	605.09	640.57		640.89	0.000407	4.71	24071.18	1971.56	0.15
Reach 1	392124	1% ACE	99891.00	603.00	639.29		640.09	0.000925	7.32	16874.27	2662.70	0.23
Reach 1	391531	1% ACE	99891.00	600.99	638.24		639.36	0.001235	8.73	14879.94	3221.42	0.29
Reach 1	390995	1% ACE	99891.00	601.37	637.85		638.68	0.000852	7.90	19134.05	2997.57	0.24
Reach 1	390516	1% ACE	99891.00	597.90	637.61		638.09	0.000859	7.02	27225.76	3853.10	0.24
Reach 1	390125	1% ACE	99891.00	597.14	637.67		637.80	0.000145	3.46	49861.13	4814.63	0.10
Reach 1	388545	1% ACE	99891.00	596.19	637.17		637.44	0.000352	4.56	36417.01	5373.92	0.14
Reach 1	387329	1% ACE	99891.00	597.51	636.48		636.84	0.000718	5.65	31584.72	4631.85	0.20
Reach 1	386808	1% ACE	99891.00	600.00	635.44		636.25	0.001411	8.97	26523.83	5095.13	0.28
Reach 1	386042	1% ACE	99891.00	600.00	635.30		635.61	0.000271	4.91	37662.01	6497.65	0.17
Reach 1	384847	1% ACE	99891.00	594.65	633.95	617.86	634.89	0.000901	9.09	27736.11	6078.30	0.28

Summary Table Including Pond

HEC-RAS Plan: Plan 08 River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	471492	1% ACE	99469.00	727.19	763.39		763.62	0.000363	5.69	34603.86	2198.80	0.19
Reach 1	471305	1% ACE	99469.00	727.34	763.24	752.00	763.54	0.000502	6.67	32778.41	2378.44	0.22
Reach 1	471274		Culvert									
Reach 1	471249	1% ACE	99469.00	727.00	763.07		763.48	0.000476	7.82	31873.67	2281.89	0.25
Reach 1	471196	1% ACE	99469.00	721.11	763.04		763.41	0.000343	7.13	33583.77	2059.91	0.21
Reach 1	470981	1% ACE	99469.00	723.50	762.97		763.33	0.000460	7.95	31001.71	1786.70	0.24
Reach 1	470677	1% ACE	99469.00	722.14	762.52		763.13	0.000750	8.87	22468.09	1240.46	0.28
Reach 1	470239	1% ACE	99469.00	722.06	761.48		762.67	0.001343	10.97	15300.34	813.38	0.34
Reach 1	469943	1% ACE	99469.00	726.08	760.41		762.16	0.001764	12.09	11817.76	604.22	0.39
Reach 1	469604	1% ACE	99469.00	722.00	759.79		761.58	0.001730	12.47	12262.42	652.06	0.39
Reach 1	469298	1% ACE	99469.00	725.79	759.47	747.88	760.99	0.001611	11.25	12724.41	769.03	0.37
Reach 1	468962	1% ACE	99469.00	720.47	759.04	747.79	760.45	0.001447	11.49	13296.89	717.42	0.35
Reach 1	468846	1% ACE	99469.00	727.87	758.90	748.23	760.25	0.001684	11.21	13165.05	735.56	0.37
Reach 1	468803	1% ACE	99469.00	728.39	758.74	748.00	760.17	0.001757	11.42	12861.22	730.57	0.38
Reach 1	468557	1% ACE	99469.00	723.63	758.18	747.87	759.75	0.001670	11.99	12724.96	679.54	0.38
Reach 1	468267	1% ACE	99469.00	724.43	757.54	745.26	759.29	0.001373	11.74	12330.34	764.34	0.38
Reach 1	467781	1% ACE	99469.00	725.38	757.35		758.52	0.001097	10.39	15576.80	969.45	0.34
Reach 1	467302	1% ACE	99469.00	725.58	756.89		757.98	0.001053	10.18	14073.73	630.65	0.33
Reach 1	466729	1% ACE	99423.00	720.67	755.65		757.27	0.001412	12.33	13248.97	721.16	0.39
Reach 1	466588	1% ACE	99423.00	725.23	755.52	742.13	757.06	0.001169	10.56	13242.63	1341.25	0.35
Reach 1	466560		Bridge									
Reach 1	466523	1% ACE	99423.00	725.23	754.88		756.40	0.001205	10.57	12505.76	1010.16	0.35
Reach 1	466490	1% ACE	99423.00	721.83	755.07	740.96	756.14	0.000893	9.83	13130.91	552.05	0.31
Reach 1	466425		Bridge									
Reach 1	466354	1% ACE	99423.00	721.83	754.76		755.86	0.000928	9.96	12959.15	550.23	0.31
Reach 1	466304	1% ACE	99423.00	715.93	754.71	738.22	755.82	0.000769	9.73	15909.23	1432.46	0.29
Reach 1	466270		Bridge									
Reach 1	466222	1% ACE	99423.00	715.93	754.12		755.32	0.000842	10.07	15232.27	1102.32	0.30
Reach 1	466042	1% ACE	99423.00	715.18	753.09		754.92	0.001760	12.32	13276.31	1212.22	0.39
Reach 1	465600	1% ACE	99423.00	715.50	752.37		754.13	0.001790	12.06	13687.73	1363.36	0.39
Reach 1	464951	1% ACE	99423.00	714.75	751.14		752.87	0.002216	12.34	12952.27	1202.40	0.39
Reach 1	464376	1% ACE	99423.00	717.01	750.66		751.72	0.001296	9.49	15101.61	1016.85	0.30
Reach 1	463780	1% ACE	99423.00	714.00	750.30		750.93	0.001038	8.40	17765.46	927.86	0.25
Reach 1	463167	1% ACE	99423.00	712.90	749.07	734.72	750.15	0.001538	9.95	15393.04	1072.34	0.31
Reach 1	462386	1% ACE	99423.00	707.75	748.01	730.52	749.10	0.001255	9.07	14369.86	1004.12	0.28
Reach 1	461701	1% ACE	99423.00	706.99	745.85	734.95	747.82	0.002530	13.04	11409.57	857.98	0.39
Reach 1	460978	1% ACE	99903.00	707.53	744.23	731.45	746.16	0.002073	12.15	11087.09	1533.58	0.38
Reach 1	460345	1% ACE	99903.00	705.78	743.40		744.73	0.001907	12.12	15048.04	1186.89	0.37
Reach 1	459910	1% ACE	99903.00	704.38	741.78		743.75	0.002350	13.64	12425.73	992.56	0.41
Reach 1	459264	1% ACE	99903.00	703.48	741.08		742.27	0.001627	11.30	14162.66	818.22	0.34
Reach 1	458814	1% ACE	99903.00	704.51	738.60		741.25	0.002410	14.70	9553.04	529.31	0.46
Reach 1	458337	1% ACE	99903.00	704.15	736.39		739.90	0.002885	16.81	9534.75	740.53	0.54
Reach 1	457901	1% ACE	99903.00	703.93	736.18		738.59	0.001847	13.75	10662.95	630.96	0.44
Reach 1	457492	1% ACE	99903.00	705.85	735.12		737.73	0.002351	14.47	10135.58	612.28	0.49
Reach 1	456713	1% ACE	99903.00	703.29	734.43		736.05	0.001513	11.88	12077.46	578.20	0.39
Reach 1	456110	1% ACE	99903.00	698.65	732.14		734.96	0.002084	14.89	9596.47	505.85	0.46
Reach 1	455642	1% ACE	99903.00	699.00	731.35		734.04	0.001891	13.58	8680.92	429.05	0.43
Reach 1	455149	1% ACE	99903.00	697.08	729.83		732.86	0.002949	15.92	9344.31	590.76	0.54
Reach 1	454703	1% ACE	99903.00	697.00	729.03		731.58	0.002233	13.93	9882.62	588.14	0.47
Reach 1	454165	1% ACE	99903.00	696.13	727.69		730.37	0.002294	15.21	10841.26	727.17	0.49
Reach 1	453783	1% ACE	99903.00	695.45	727.15		729.44	0.002184	14.30	11582.39	845.16	0.47
Reach 1	453416	1% ACE	99903.00	695.21	726.86		728.54	0.001749	12.54	13257.83	940.00	0.42
Reach 1	453007	1% ACE	99903.00	694.00	726.87		727.82	0.000908	9.53	16007.40	812.67	0.31
Reach 1	452334	1% ACE	99724.00	698.00	726.69		727.20	0.000677	7.64	20211.48	1098.01	0.26
Reach 1	451728	1% ACE	99724.00	698.00	726.41		726.83	0.000504	6.36	23701.85	1783.37	0.22
Reach 1	451064	1% ACE	99724.00	696.38	726.24		726.52	0.000337	4.68	31475.13	2865.18	0.16
Reach 1	450390	1% ACE	99724.00	694.92	726.10		726.26	0.000336	4.56	41448.16	3594.21	0.15
Reach 1	449860	1% ACE	99724.00	693.42	725.96		726.08	0.000309	4.30	44680.14	3634.28	0.14
Reach 1	449212	1% ACE	99724.00	691.25	725.77		725.90	0.000251	3.91	45753.06	3824.58	0.12
Reach 1	448507	1% ACE	99724.00	688.25	725.36		725.66	0.000416	5.23	35489.20	4258.06	0.16
Reach 1	447828	1% ACE	99724.00	685.72	721.59	715.65	724.78	0.003065	16.86	13364.60	2197.47	0.51
Reach 1	447411	1% ACE	99724.00	684.88	720.00	712.53	723.45	0.003078	16.63	12391.02	2278.90	0.51
Reach 1	446945	1% ACE	99724.00	684.58	719.35	705.91	720.98	0.001800	11.57	15095.69	2232.34	0.36
Reach 1	446723	1% ACE	83554.00	683.76	719.24		720.06	0.000730	9.00	19639.21	1775.88	0.28
Reach 1	446577	1% ACE	83554.00	683.22	719.18	703.69	719.93	0.000702	7.23	15891.17	2061.55	0.26
Reach 1	446515		Bridge									
Reach 1	446493	1% ACE	83554.00	683.22	718.12		719.11	0.000914	8.09	11563.26	1214.17	0.29
Reach 1	446478	1% ACE	83554.00	678.39	718.30	701.78	718.91	0.000507	6.52	16587.43	1748.27	0.22
Reach 1	446440		Bridge									
Reach 1	446383	1% ACE	83554.00	678.39	717.87		718.52	0.000548	6.70	15744.55	1641.23	0.23
Reach 1	446236	1% ACE	83554.00	686.27	716.11		718.00	0.002359	12.36	12071.99	1947.70	0.40
Reach 1	446037	1% ACE	83554.00	685.26	716.13		717.43	0.001665	10.39	14552.55	2171.10	0.34
Reach 1	445573	1% ACE	83554.00	683.27	715.46		716.63	0.001638	10.24	13842.34	1272.20	0.34
Reach 1	445235	1% ACE	74844.00	683.27	715.45		716.08	0.000840	7.38	14439.60	819.04	0.24
Reach 1	444777	1% ACE	74844.00	683.27	714.33		715.54	0.001358	9.41	9320.71	418.22	0.31

HEC-RAS Plan: Plan 08 River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	444240	1% ACE	74844.00	683.14	712.57		714.55	0.002181	11.70	7109.03	303.73	0.39
Reach 1	443555	1% ACE	74844.00	682.52	712.22		713.18	0.001161	8.06	9938.32	424.75	0.28
Reach 1	442891	1% ACE	74844.00	679.79	711.56		712.47	0.000946	7.78	10189.74	409.03	0.25
Reach 1	442214	1% ACE	74844.00	678.90	709.70		711.42	0.002494	12.18	8700.73	548.28	0.41
Reach 1	441476	1% ACE	74844.00	678.52	708.09		709.74	0.001998	10.60	7936.46	421.75	0.36
Reach 1	440762	1% ACE	74844.00	677.76	705.78		707.86	0.002716	11.82	6702.37	303.83	0.42
Reach 1	439971	1% ACE	74844.00	677.96	705.33		705.70	0.000510	5.08	16345.16	1073.76	0.18
Reach 1	438740	1% ACE	74844.00	675.84	705.21		705.30	0.000121	2.49	31548.81	1797.33	0.09
Reach 1	437996	1% ACE	74844.00	674.71	705.13		705.21	0.000159	2.91	34735.68	1750.08	0.10
Reach 1	437265	1% ACE	74844.00	674.32	705.03		705.13	0.000203	3.33	30788.60	1446.20	0.12
Reach 1	436536	1% ACE	74844.00	673.98	704.27		704.82	0.000810	6.89	15281.55	921.78	0.23
Reach 1	435810	1% ACE	74844.00	672.59	703.05		703.98	0.001244	8.45	10534.99	526.54	0.29
Reach 1	435043	1% ACE	74844.00	672.92	702.40		703.12	0.000674	7.03	11817.49	513.44	0.24
Reach 1	434453	1% ACE	74844.00	672.90	701.08		702.28	0.001689	9.93	10304.26	657.10	0.34
Reach 1	433730	1% ACE	74844.00	668.74	700.47		701.07	0.001006	7.16	14269.58	937.55	0.24
Reach 1	433539	1% ACE	74844.00	667.11	700.38		700.85	0.000791	6.40	16156.82	1041.29	0.21
Reach 1	433408	1% ACE	74844.00	667.31	700.34		700.73	0.000749	6.22	17383.42	1111.20	0.21
Reach 1	433181	1% ACE	86791.00	667.56	700.19		700.53	0.000717	5.98	23131.06	1884.53	0.20
Reach 1	432987	1% ACE	86791.00	665.50	699.91	686.97	700.34	0.000723	6.73	20950.81	1542.85	0.22
Reach 1	432930		Bridge									
Reach 1	432893	1% ACE	86791.00	665.72	699.66		700.17	0.000950	7.65	19845.98	1626.97	0.25
Reach 1	432666	1% ACE	86791.00	664.85	699.28		699.98	0.001047	8.41	18273.21	1533.96	0.27
Reach 1	432475	1% ACE	86791.00	664.59	699.28		699.73	0.000851	7.07	21018.31	1563.82	0.22
Reach 1	431631	1% ACE	86791.00	663.50	698.71		699.12	0.000648	6.09	19799.53	1149.50	0.20
Reach 1	430804	1% ACE	86791.00	662.05	698.03		698.58	0.000627	6.69	17626.24	976.99	0.21
Reach 1	429757	1% ACE	86791.00	659.79	697.35		697.94	0.000607	6.50	16411.47	946.75	0.21
Reach 1	428966	1% ACE	86791.00	660.22	696.67		697.37	0.000933	8.13	17012.05	1091.78	0.26
Reach 1	428447	1% ACE	86791.00	655.39	696.31		696.97	0.000842	7.91	17600.31	1104.76	0.24
Reach 1	427784	1% ACE	86791.00	657.72	695.61		696.42	0.000912	8.09	15742.55	1354.06	0.25
Reach 1	427183	1% ACE	86791.00	658.56	695.14		695.88	0.000854	7.81	17395.57	1465.37	0.24
Reach 1	426517	1% ACE	86791.00	658.35	693.57		694.97	0.001543	10.35	13491.88	1726.09	0.33
Reach 1	425901	1% ACE	86791.00	658.89	692.66		694.01	0.001490	9.78	11944.60	1823.36	0.32
Reach 1	425293	1% ACE	86791.00	657.30	691.32		692.91	0.001912	11.13	11674.04	1309.34	0.36
Reach 1	424714	1% ACE	99926.00	656.85	689.55		691.50	0.002581	12.30	11743.42	1014.39	0.42
Reach 1	424187	1% ACE	99926.00	655.55	687.40		689.74	0.003931	13.70	11114.45	1727.32	0.47
Reach 1	423625	1% ACE	99926.00	653.68	686.08		687.57	0.002622	11.43	14768.42	2343.20	0.39
Reach 1	422995	1% ACE	99926.00	651.65	685.66		686.27	0.001298	8.21	21717.76	2895.79	0.27
Reach 1	422251	1% ACE	99926.00	651.19	683.89		685.01	0.002224	10.61	17479.55	2623.14	0.36
Reach 1	421444	1% ACE	99926.00	651.00	681.94		683.14	0.002420	11.12	17377.94	2736.33	0.37
Reach 1	420481	1% ACE	99926.00	650.01	679.82		680.85	0.002270	10.59	19929.20	3080.70	0.36
Reach 1	419470	1% ACE	99926.00	649.95	677.34		678.56	0.002379	10.18	18439.85	3058.46	0.36
Reach 1	418854	1% ACE	99926.00	647.17	673.65	669.51	675.94	0.006766	14.95	14866.47	3220.08	0.55
Reach 1	418726	1% ACE	99926.00	645.66	673.16		674.47	0.004275	12.13	18134.65	2987.08	0.47
Reach 1	418630	1% ACE	99926.00	646.57	673.02		673.92	0.002825	10.06	20290.60	2916.43	0.38
Reach 1	418516	1% ACE	99926.00	645.77	672.91		673.55	0.002067	8.78	22416.47	2924.63	0.33
Reach 1	418186	1% ACE	99926.00	646.00	671.63		672.69	0.003618	11.74	18578.21	2782.56	0.43
Reach 1	417994	1% ACE	99926.00	646.22	671.06		671.93	0.003361	10.79	19101.93	2394.25	0.39
Reach 1	417303	1% ACE	99986.00	641.33	670.18		670.61	0.000819	6.50	22003.86	1458.88	0.22
Reach 1	415588	1% ACE	99986.00	642.08	669.19		669.34	0.000576	4.31	36540.39	3494.53	0.17
Reach 1	413959	1% ACE	99986.00	639.83	668.36		668.52	0.000467	4.23	35303.62	2983.66	0.16
Reach 1	412994	1% ACE	99986.00	638.91	668.04		668.17	0.000370	3.62	38670.32	3239.86	0.13
Reach 1	412056	1% ACE	99986.00	638.83	667.80		667.88	0.000269	3.10	46699.70	3143.43	0.11
Reach 1	411408	1% ACE	99986.00	637.92	667.67		667.77	0.000315	3.42	44141.79	2987.15	0.12
Reach 1	410660	1% ACE	99986.00	634.42	667.29		667.50	0.000395	5.15	35082.88	2425.33	0.18
Reach 1	409107	1% ACE	99986.00	633.83	666.16		666.68	0.000548	6.73	22106.07	1237.07	0.22
Reach 1	408599	1% ACE	99986.00	631.17	666.00		666.38	0.000494	5.43	22324.77	972.68	0.17
Reach 1	408038	1% ACE	99986.00	623.97	665.78		666.14	0.000379	4.90	21923.51	800.76	0.15
Reach 1	407323	1% ACE	99986.00	625.42	662.33		664.91	0.002816	14.57	9429.65	497.60	0.44
Reach 1	406437	1% ACE	99986.00	626.75	661.14		662.21	0.001111	8.67	13701.45	733.70	0.28
Reach 1	405800	1% ACE	99986.00	625.19	661.04		661.51	0.000414	5.60	19732.68	886.29	0.17
Reach 1	405065	1% ACE	99986.00	623.87	659.43		660.82	0.002263	10.91	12846.01	878.94	0.36
Reach 1	404559	1% ACE	99986.00	624.37	658.99		659.84	0.001392	8.88	15229.21	1004.11	0.29
Reach 1	403683	1% ACE	99986.00	622.00	658.45		659.06	0.000544	6.69	18975.00	946.22	0.20
Reach 1	403073	1% ACE	99986.00	622.00	657.82		658.60	0.000993	7.72	17770.07	1259.70	0.24
Reach 1	402516	1% ACE	99986.00	620.02	656.92		657.98	0.001147	8.50	13724.62	852.64	0.26
Reach 1	402110	1% ACE	99986.00	620.86	656.77		657.58	0.000595	7.58	17020.93	1085.75	0.23
Reach 1	401658	1% ACE	99986.00	617.34	656.80		657.19	0.000548	5.88	23325.47	2225.77	0.18
Reach 1	400921	1% ACE	99986.00	618.50	654.83		656.36	0.002107	11.35	16223.88	2700.76	0.35
Reach 1	399722	1% ACE	100009.00	614.28	653.98		654.56	0.000718	6.73	23307.04	2741.70	0.21
Reach 1	398748	1% ACE	100009.00	610.94	652.50		653.56	0.001221	8.60	15688.75	2166.98	0.27
Reach 1	398061	1% ACE	100009.00	612.67	651.63		652.62	0.001446	8.88	17301.69	1963.04	0.29
Reach 1	397096	1% ACE	100009.00	611.67	650.05		651.19	0.001564	9.29	17392.15	2784.85	0.30
Reach 1	396117	1% ACE	100009.00	612.77	648.24		649.48	0.001924	10.12	16344.35	2012.64	0.33
Reach 1	395546	1% ACE	99891.00	612.04	644.73	637.89	647.69	0.004710	14.88	10450.21	1851.83	0.51
Reach 1	394958	1% ACE	99891.00	611.70	642.25		645.00	0.004263	13.86	9204.11	1083.55	0.49

HEC-RAS Plan: Plan 08 River: Cibolo Creek Reach: Reach 1 Profile: 1% ACE (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	394251	1% ACE	99891.00	609.16	640.69		642.38	0.002586	10.67	10801.75	896.97	0.38
Reach 1	393283	1% ACE	99891.00	605.09	640.57		640.89	0.000407	4.71	24071.05	1971.50	0.15
Reach 1	392124	1% ACE	99891.00	603.00	639.29		640.09	0.000925	7.32	16874.11	2662.65	0.23
Reach 1	391531	1% ACE	99891.00	600.99	638.24		639.36	0.001235	8.73	14879.74	3221.31	0.29
Reach 1	390995	1% ACE	99891.00	601.37	637.85		638.68	0.000852	7.90	19133.87	2997.43	0.24
Reach 1	390516	1% ACE	99891.00	597.90	637.61		638.09	0.000859	7.02	27225.53	3852.98	0.24
Reach 1	390125	1% ACE	99891.00	597.14	637.67		637.80	0.000145	3.46	49860.83	4814.63	0.10
Reach 1	388545	1% ACE	99891.00	596.19	637.17		637.44	0.000352	4.56	36416.35	5373.90	0.14
Reach 1	387329	1% ACE	99891.00	597.51	636.48		636.84	0.000718	5.65	31583.87	4631.85	0.20
Reach 1	386808	1% ACE	99891.00	600.00	635.44		636.25	0.001411	8.97	26523.83	5095.13	0.28
Reach 1	386042	1% ACE	99891.00	600.00	635.30		635.61	0.000271	4.91	37662.01	6497.65	0.17
Reach 1	384847	1% ACE	99891.00	594.65	633.95	617.85	634.89	0.000901	9.09	27736.11	6078.30	0.28

BECK LANDFILL
APPENDIX C2-C
FEMA Correspondence

July 18, 2023

Adam W. Mehevec, P.E.
Civil and Environmental Consultants, Inc.
3711 South Mopac Expressway
Building 1, Suite 550
Austin, TX 78745

IN REPLY REFER TO:
Case No.: 22-06-2567P
Communities: City of Schertz and Unincorporated Areas of Bexar County, Texas
Community Nos.: 480269 and 480035

316-AD

Dear Adam Mehevec:

This is in regard to your request dated August 5, 2022, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for the above-referenced communities. Pertinent information about the request is listed below.

Identifier:	Beck Landfill
Flooding Source:	Cibolo Creek
FIRM Panel Affected:	48187C0220F and 48029C0295F

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the attached summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited if the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program (NFIP), please contact the FEMA Mapping and Insurance eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, M. Tariq Makhdoom, Ph.D., CFM, by e-mail at TMakhdoom@taylorengineering.com or by telephone at (904) 553-5760, or the Revisions Coordinator for your state, Sushban Shrestha, P.E., CFM, by e-mail at sushban.shrestha@aecom.com or by telephone at (682) 316-7670.

Sincerely,

Benjamin Kaiser, P.E., CFM
Revisions Manager
Compass PTS JV

Attachments:
Summary of Additional Data

cc: Doug Letbetter, CFM
Floodplain Administrator
City of Schertz, Texas

Robert Brach, P.E., CFM
Development Services Engineer / Floodplain Administrator
Bexar County

Summary of Additional Data Required to Support a
Letter of Map Revision (LOMR)

Case No.: 22-06-2567P

Requester: Adam W. Mehevec, P.E.

Communities: City of Schertz, and
Unincorporated Areas of
Bexar County, Texas

Community Nos.: 480269 and 480035

The issues listed below must be addressed before we can continue the review of your request.

1. Subparagraph 65.6(a)(2) of the National Flood Insurance Program (NFIP) regulations states that to avoid discontinuities between revised and unrevised flood data, hydraulic analyses must have a logical transition between revised elevations of the 1-percent-annual chance (base) flood and those developed previously for areas not affected by the revision. Therefore, revised base flood elevation (BFE) must tie-in to the effective BFE within 0.5 feet, or within 0.0 feet if practical, at the upstream and downstream ends of the revised reach. The graphical tie-in between the post-project and effective delineations of the base floodplain, 0.2-percent-annual-chance floodplain and regulatory floodway can be shown at, or just upstream and downstream of, the BFE tie-in locations at both ends.

   Our review of the submitted post-project conditions model revealed no BFE tie-in at the upstream end. The submitted topographic work map showed limits of the revised reach at the upstream end at Cross Section 446236, which is located at the downstream side of FM 78 Bridge. However, there was no BFE tie-in within 0.5 feet until Cross Section 454165.

   A revised post-project conditions hydraulic analysis was submitted on July 10, 2023, in response to our e-mail of July 7, 2023. Our review of the submitted revised post-project conditions model indicates that:

   a. The limit of the revised reach at the upstream end is shown at Cross Section 446478 which is located just upstream of FM 78 Bridge, where the difference between post-project and effective BFE is 0.49 feet. However, BFE difference between the post-project and effective BFEs are 0.53 and 0.93 feet, respectively, at the upstream cross sections, which are located just downstream and upstream of the Southern Pacific Railroad, respectively.
   b. The revised hydraulic analysis used effective topography for all cross sections upstream of Cross Section 445335.
   c. The revised hydraulic analysis used higher flow compared to the effective flows at all cross sections except two downstream cross sections where the revised analysis used lower flows compared to the effective.

   Please extend the limit of the revised reach to Cross Section 454165, where there is a BFE tie-in as indicated above and submit revised post-project conditions hydraulic analyses or provide justification for using lower or higher flows compared to the effective flows without providing any supporting hydrologic analysis and use of old effective topographic data upstream of Cross Section 445335 instead of new topography.

2. Please submit a revised copy of the topographic work map and annotated Flood Insurance Rate Map (FIRM). Please also provide a copy of the Geographic Information System (GIS) data that reflects the revised topographic work map.

3. Please note that the submitted copy of the draft property owner notification will be reviewed after all technical comments have been addressed. Please do not distribute the final notification letters until we have approved the revised draft notice.

Please upload the required data using the Online LOMC website at https://hazards.fema.gov/femaportal/onlinelomc/signin.

For identification purposes, please include the case number referenced above on all correspondence.

Mehevec, Adam

From: Tariq Makhdoom <TMakhdoom@taylorengineering.com>
Sent: Friday, June 2, 2023 4:00 PM
To: Mehevec, Adam
Cc: Lokulutu, Bosulu; Shrestha, Sushban
Subject: Additional Data Received for the City of Schertz and Bexar County, Texas, LOMR Case Number (22-06-2567P) – Response Requested

Dear Adam Mehevec:

We have received your submittal of additional data for Case Number (22-06- 2567P). This case number is for a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for the City of Schertz and Bexar County, Texas. This e-mail is being sent to officially acknowledge the receipt of your additional data for the above-referenced case number and replaces the paper copy acknowledgement letters previously issued by FEMA. We ask that you please respond directly to this e-mail to verify that it has been received.

We are reviewing your submitted data and will contact you if additional information is required to process your request.

If additional information is not required, we will issue a final letter of determination within 90 days of receiving your submittal.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program, please call the FEMA Mapping and Insurance eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact the case reviewer using the information listed below, or the Revisions Coordinator for your request, Mr. Sushban Shrestha, P.E., CFM, by e-mail at sushban.shrestha@aecom.com or by telephone at (682) 316-7670.

Please be assured we will do our best to respond to all inquiries in a timely manner.

Thank you,

M. Tariq Makhdoom, Ph.D., CFM
Taylor Engineering, Inc., a member of **Compass PTS JV**
10199 Southside Blvd., Suite 310, Jacksonville, FL 32256
Main: 904-731-7040 | Direct: 904 -553 - 5760
TMakhdoom@Taylorengineering.Com

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change	☐ Improved Methodology/Data	☐ Regulatory Floodway Revision	☐ Base Map Changes
☐ Coastal Analysis	☐ Hydraulic Analysis	☒ Hydrologic Analysis	☐ Corrections
☐ Weir-Dam Changes	☐ Levee Certification	☐ Alluvial Fan Analysis	☐ Natural Changes
☒ New Topographic Data	☐ Other (Attach Description)		

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $ 8,000

☐ No, Attach Explanation

- Please see the DHS-FEMA Web site at http://www.fema.gov/forms-documents-and-software/flood-map-related-fees for Fee Amounts and Exemptions.

D. SIGNATURES

1. REQUESTOR'S SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Adam Mehevec	Company: Civil and Environmental Consultants, Inc.	
Mailing Address: 1221 S. Mopac Expressway, Suite 350 Austin, TX 78746	Daytime Telephone: 512-225-8103	Fax No.: 512-329-0096
	E-mail Address: amehevec@cecinc.com	
	Date: MAY, 2023	

Signature of Requestor (required): [signature]

2. COMMUNITY CONCURRENCE

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Robert Brach, P.E., CFM

Mailing Address: 1948 Probandt Street San Antonio, TX 78214	Community Name: Bexar County	
	Daytime Telephone: 210-335-~~2011~~ 1243	Fax No.:
	E-mail Address: RBrach@bexar.org	
Community Official's Signature (required): Robert Brach	Date: 5/12/23	

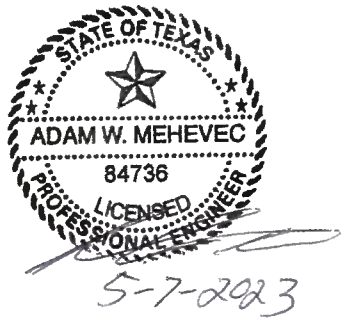
3. CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Adam W. Mehevec, PE		License No.: 84736	Expiration Date: 12/31/2023
Company Name: Civil and Environmental Consultants, Inc.		Mailing Address: 1221 S. Mopac Expressway, Suite 350 Austin, TX 78746	
Telephone No.: 512-225-8103	Fax No.: 512-329-0096		
E-mail Address: amehevec@cecinc.com			
Signature:			Date: 5-7-2023

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans



Seal (Optional)

LETTER OF MAP REVISION REQUEST FOR CIBOLO CREEK FIRM PANELS 48029C0295F AND 48187C0210F

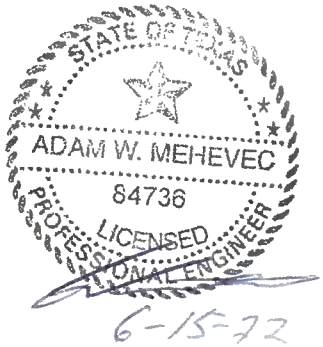
BECK LANDFILL
550 FARM TO MARKET ROAD 78
SCHERTZ, GUADALUPE COUNTY, TEXAS

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
AUSTIN, TEXAS (TEXAS P.E. FIRM F-38)

CEC Project 311-653

JUNE 2022



Civil & Environmental Consultants, Inc.

Austin 3711 S. MoPac Expy, Building I, Suite 550 | Austin, TX 78746 | p: 512-329-0006 f: 512-329-0096 | www.cecinc.com

DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency

OVERVIEW & CONCURRENCE FORM

OMB Control Number: 1660-0016
Expiration: 1/31/2024

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472 , Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.
PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).
ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.
DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72). All CLOMRs require documentation of compliance with the Endangered Species Act. Refer to the Instructions for details.

☒ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72).

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
480269	City of Schertz; Guadalupe County	TX	48187C	0220F	11/2/07
480035	Unincorporated Bexar County	TX	48029C	0295F	9/29/10

2. a. Flooding Source: Cibolo Creek

b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH) ☐ Alluvial Fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Beck Landfill

4. FEMA zone designations (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

a. Effective: AE

b. Revised: AE

COUNTY OF BEXAR

PUBLIC WORKS DEPARTMENT

1948 Probandt
San Antonio, Texas 78214
Main 210-335-6700

To: Civil & Environmental Consultants, Inc.
10101 Reunion Place, Suite 400
San Antonio, TX 78216

Date: May 12, 2023

Attention: Adam W. Mehevec, P.E.

Re: Letter of Map Revision
Beck Landfill – Cibolo Creek

DESCRIPTION

Attached is the Bexar County endorsed FEMA MT-2 FORMS.

WITH THE FOLLOWING EXHIBITS:

Beck Landfill – Cibolo Creek

Digital Files Submitted 5/12/2023

Endorsed with the following exceptions:

1. There are increases in Water Surface Elevations greater than allowed by FEMA and Bexar County Court order due to the following:
    a. FEMA has different flow rates and water surface elevations for both communities for the SAME creek (Cibolo Creek)
    b. There are topography changes in Beck Landfill since the (SARA) Best Available Models were modeled.

TJ

FROM: TERRANCE JACKSON, P.E., PhD CIVIL ENGINEER (210) 335-3048

NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

February 13, 2023

Adam W. Mehevec, P.E.
Civil and Environmental Consultants, Inc.
3711 South Mopac Expressway
Building 1, Suite 550
Austin, TX 78745

IN REPLY REFER TO:
Case No.: 22-06-2567P
Communities: City of Schertz and Unincorporated Areas of Bexar County, Texas
Community Nos.: 480269 and 480035

316-AD

Dear Adam Mehevec:

This is in regard to your request dated August 5, 2022, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for the above-referenced communities. Pertinent information about the request is listed below.

Identifier:	Beck Landfill
Flooding Source:	Cibolo Creek
FIRM Panel Affected:	48187C0220F

The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the attached summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited if the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program (NFIP), please contact the FEMA Mapping and Insurance eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, M. Tariq Makhdoom, Ph.D., CFM, by e-mail at TMakhdoom@Taylorengineering.com or by telephone at (904) 553-5760, or the Revisions Coordinator for your state, Mr. Bosulu Lokulutu, E.I.T, CFM, by e-mail at bosulu.lokulutu@aecom.com or by telephone at (972) 735-7093.

Sincerely,

Benjamin Kaiser, P.E., CFM
Revisions Manager
Compass PTS JV

Attachments:
Summary of Additional Data
Legal Notification Templates

cc: Dough Letbetter, CFM
Floodplain Administrator
City of Schertz, Texas

Robert Brach
Development Services Engineer / Floodplain Administrator
Bexar County

Summary of Additional Data Required to Support a
Letter of Map Revision (LOMR)

Case No.: 22-06-2567P

Requester: Adam W. Mehevec, P.E.

Communities: City of Schertz, and
Unincorporated Areas of
Bexar County, Texas

Community Nos.: 480269 and 480035

The issues listed below must be addressed before we can continue the review of your request.

1. As indicated previously, please submit a copy of MT-2 Application/Certification Form 1, entitled "Overview and Concurrence Form," where the second signature block has been signed by a Bexar County official (preferably the Floodplain Administrator). Alternatively, please provide documentation that the corporate limits shown on the Flood Insurance Rate Map (FIRM) are not accurate and Bexar County is not actually affected by this revision. Acceptable documentation includes a current corporate limits map provided by the community along with an annexation agreement, if applicable.

2. As indicated by you in your e-mail dated February 3, 2023, Bexar County is withholding its concurrence because they would like you to use revised hydrology to match the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rainfall data, which would cause a significant increase in the 1-percent-annual-chance (base) flood elevation (BFE) and implementing this level of change in the BFE for just a small portion of Cibolo Creek located within Bexar County would not allow for a smooth transition back to the existing BFE at the upstream and downstream limits of study. You believe that you can work out the current Bexar County comments in the next 45 to 90 days, so you would like to request that we issue another round of comments and allow 90 days to acquire the Bexar County concurrence and adequately respond to our comment.

3. You have also indicated in your e-mail above, you might end up revising hydrology which would result in revised hydraulic analyses, topographic work map, and annotated FIRM. Please submit revised hydrologic and hydraulic analyses, topographic work map, and annotated FIRM, if the resolution of our comment 1 above results in revised hydrology as indicated by you.

4. Please provide a copy of the Geographic Information System (GIS) data that reflects the revised topographic work map.

5. Please submit a copy of the newspaper notice distributed by the City of Schertz and Bexar County stating their intent to revise the flood hazard information (i.e., revise or establish BFEs, the base floodplain, and regulatory floodway) along Cibolo Creek. Alternatively, please submit documentation that individual legal notices were sent to all property owners affected by any changes in the flood hazard information. Documentation of legal notice may take the form of a signed copy of the letter sent and either a mailing list or certified mailing receipts. Individual notices that are not sent on community letterhead must also include certification from the community that all affected property owners have been notified of the floodway revision. The newspaper notices or the

individual legal notices must include the extent of revision and contact information for any interested parties and must also mention the community's intent to revise the regulatory floodway. **Please submit a draft copy of the notification for verification of content, prior to publication or distribution.** One of the attached templates may be used to prepare the draft notification.

Please note that the draft property owner notification or newspaper notification will be reviewed after the hydraulic model and work map are finalized. Please do not distribute the final notification until we have approved the draft notice.

Please upload the required data using the Online LOMC website at https://hazards.fema.gov/femaportal/onlinelomc/signin.

For identification purposes, please include the case number referenced above on all correspondence.

November 30, 2022

Tariq Makhdoom
Taylor Engineering, Inc.
10199 Southside Blvd., Ste.310
Jacksonville, FL 32256

Dear Mr. Makhdoom :

Subject: City of Schertz, and Unincorporated Areas of Bexar County
LOMR Case No.: 22-06-2567P
Community Nos.: 480269 and 480035
CEC Project 311-653

We received your comments related to LOMR Case No. 22-06-2567P on September 1, 2022 and have addressed them as follows:

1. From our review of the submitted annotated Flood Insurance Rate Map (FIRM), it appears that the Unincorporated Areas of Bexar County are also affected by this LOMR. Please submit a copy of MT-2 Application/Certification Form 1, entitled "Overview and Concurrence Form," where the second signature block has been signed by a Bexar County official (preferably the Floodplain Administrator). Alternatively, please provide documentation that the corporate limits shown on the FIRM are not accurate and Bexar County is not actually affected by this revision. Acceptable documentation includes a current corporate limits map provided by the community along with an annexation agreement, if applicable.
   - We contacted the floodplain administrator at Bexar County on September 4th to determine the submittal requirements necessary to obtain their concurrence. We submitted a concurrence request package on October 12th, but have not received approval from Bexar County as of this date. We will provide the requested concurrence form as soon as we receive it from Bexar County.

2. Our review revealed that the submittal does not include floodway analysis for the duplicate effective and as-built plan for Cibolo Creek. Please submit floodway analysis for Cibolo Creek. Please ensure that the surcharges do not exceed the 1.0-foot maximum allowed and there are no surcharges that are less than 0.0 feet. Also please ensure that the encroachment stations are located in the flood fringe, the area between the channel banks and the boundary of the base floodplain.
   - A floodway analysis is included for Cibolo Creek. The floodway is outside of the area where the updated topography has been provided, so there is no difference between the floodway for the duplicate effective and the as-built plans. The floodway was delineated between cross-sections 446236 and 433181. The largest surcharge calculated in the studied section is 0.9 feet at section 446236. The minimum surcharge calculated is 0.01 feet at

section 434453. The encroachment stations do not infringe into the main channel bank area. The HEC-RAS analysis with the floodway delineation is included in the file labelled "floodway.prj".

3. The submitted topographic work map, entitled "Topographic Work Map – Beck Landfill Expansion, 600 FM 78, Schertz, Texas 78154, Guadalupe County, Texas," prepared by Civil & Environmental Consultants, Inc., certified dated June 15, 2022, does not provide some of the essential information required to complete our review of this request. Please submit a revised topographic work map, certified by a registered Professional Engineer (P.E.), which shows all applicable items listed in Section C of Application/Certification Form 2, entitled "Riverine Hydrology and Hydraulics Form," including the following information. Please ensure that there is consistency between the work map,
revised hydraulic model and the annotated FIRM.
   - A revised topographic work map has been provided.

   a. Please show the boundary delineations of the revised conditions base 0.2-percent-annual- chance floodplain, and regulatory floodway. The floodplain boundaries should generally follow the proposed contours and should be delineated to the elevations calculated in the revised conditions hydraulic model. It is helpful to use different colored lines as well as line types to distinguish the boundary delineations.
      - The edge of the 0.2% annual chance floodplain is shown in brown on the topographic work map and the regulatory floodway is shown as a magenta border with cross-hatching.

   b. Please show smooth graphical tie-ins between the revised and effective flood hazard boundary delineations at the upstream and downstream ends of the revised reach. Please ensure that the revised delineations tie-in directly to the effective delineations and that the tie-ins occur a short distance upstream of the upstream most cross section in the revised conditions hydraulic model and a short distance downstream of the downstream most cross section, where there is a base flood elevation (BFE) tie-in between the revised and effective conditions. Please label tie-in locations.
      - The 1% and 0.2% floodplains and the regulated floodway tie-ins have been shown on the revised topographic work map.

   c. The work map does not seem to be created on the scale shown on the map. Please create the map on the scale shown on the work map and also indicate the scale (1 inch = x feet).
      - The scale bar shown on the map is correct and we have added text stating that the scale is 1 inch=300 feet, as requested.

   d. In view of the above comment, we could not verify top widths of the base floodplain, 0.2- percent-annual-chance floodplain, and regulatory floodway, as shown on the

above-referenced work map. We could also not verify reach lengths between the revised cross section as shown on the above referenced work map.

- Comment acknowledged

4. Please provide a copy of the Geographic Information System (GIS) data that reflects the revised topographic work map. Please ensure the digital data are spatially referenced and cite what projection (coordinate system, example: Universal Transverse Mercator [UTM]/State Plane) was used, so that the data may be used for accurate mapping. The important data to show on the digital work map are the contour information, the stream centerline, the cross section lines, the road crossings and hydraulic structures, the preliminary and proposed flood hazard delineations, and the tie-in locations. Everything should be clearly labeled, and all information should be contained within the drawing and not externally referenced.
   The submitted digital data must be spatially referenced and include what projection (coordinate system, e.g., UTM/State Plane) was used. The submitted digital data do not contain a projection and cannot be used for accurate mapping. Please resubmit Computed-Aided Design (CAD)/ GIS data that are correctly referenced and projected.
   - The topographic work map is spatially referenced to the TX83-SCF: NAD83 Texas State Planes, South Central Zone and the units are US foot. This reference information also appears on the drawing.

5. Based on any changes to the work map due to the resolution of the items at comment 4 above, please submit an updated annotated FIRM that shows the revised boundary delineations of the 1-percent- annual-chance (base) floodplain, 0.2-percent-annual-chance floodplain, and regulatory floodway as shown on the updated work map and how they tie-in to the boundary delineations shown on the effective FIRM at the downstream and upstream ends of the revised reach. Please use different colors to differentiate the proposed and effective boundary delineations. Also, please show the title block of the effective FIRM on the annotated FIRM.
   - Revised annotated FIRM panels 48187C0220F and 48029C0295F have been provided.

6. Please submit a copy of the newspaper notice distributed by the City of Schertz and Bexar County stating their intent to revise the flood hazard information (i.e., revise or establish base flood elevations [BFEs], the base floodplain, and regulatory floodway) along Cibolo Creek. Alternatively, please submit documentation that individual legal notices were sent to all the property owners affected by any changes in the flood hazard information. Documentation of legal notice may take the form of a signed copy of the letter sent and either a mailing list or certified mailing receipts. Individual notices that are not sent on community letterhead must also include certification from the community that all affected property owners have been notified of the floodway revision. The newspaper notices or the individual legal notices must include the extent of revision and contact information for any interested parties and must also mention the community's intent to revise the regulatory floodway. **Please submit a draft copy of the notification for verification of content, prior to publication or distribution.** One of the attached templates may be used to prepare the draft notification.

- Draft templates of both the newspaper notice and individual legal notice letter are attached. Based on final input from the community(s), we will determine whether to publish the newspaper notice or mail the individual legal notices.

If you have any questions or comments, please contact me directly at amehevec@cecinc.com or at 512-329-0006.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

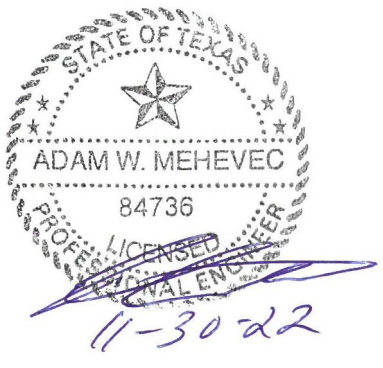
Adam Mehevec, PE
Principal

Enclosures:

cc:

HEC-RAS Plan: Updated Revised Blocked Locations: User Defined

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Cibolo Creek	Reach 1	446236	1% ACE	83554.00	686.27	716.12		718.00	0.002356	12.35	12083.89	1951.03	0.40
Cibolo Creek	Reach 1	446236	0.2% ACE	99095.00	686.27	718.06		719.76	0.002154	12.33	16415.88	2318.70	0.39
Cibolo Creek	Reach 1	446037	1% ACE	83554.00	685.26	716.14		717.43	0.001662	10.38	14568.45	2171.55	0.34
Cibolo Creek	Reach 1	446037	0.2% ACE	99095.00	685.26	718.08		719.24	0.001500	10.30	18941.32	2313.16	0.32
Cibolo Creek	Reach 1	445573	1% ACE	83554.00	683.27	715.47		716.64	0.001635	10.24	13853.91	1272.36	0.34
Cibolo Creek	Reach 1	445573	0.2% ACE	99095.00	683.27	717.33		718.52	0.001615	10.61	16286.39	1335.62	0.34
Cibolo Creek	Reach 1	445235	1% ACE	74844.00	683.27	715.46		716.09	0.000839	7.38	14446.55	819.21	0.24
Cibolo Creek	Reach 1	445235	0.2% ACE	81545.00	683.27	717.36		717.98	0.000761	7.33	16055.63	866.11	0.23
Cibolo Creek	Reach 1	444777	1% ACE	74844.00	683.27	714.34		715.55	0.001357	9.41	9324.66	418.29	0.31
Cibolo Creek	Reach 1	444777	0.2% ACE	81545.00	683.27	716.25		717.47	0.001272	9.50	10142.33	431.62	0.30
Cibolo Creek	Reach 1	444240	1% ACE	74844.00	683.14	712.59		714.56	0.002177	11.70	7112.57	303.76	0.39
Cibolo Creek	Reach 1	444240	0.2% ACE	81545.00	683.14	714.51		716.53	0.002059	11.88	7703.66	317.53	0.38
Cibolo Creek	Reach 1	443555	1% ACE	74844.00	682.52	712.24		713.19	0.001159	8.05	9943.71	424.81	0.28
Cibolo Creek	Reach 1	443555	0.2% ACE	81545.00	682.52	714.25		715.22	0.001069	8.13	10812.30	441.60	0.27
Cibolo Creek	Reach 1	442891	1% ACE	74844.00	679.79	711.58		712.49	0.000944	7.77	10195.40	409.13	0.25
Cibolo Creek	Reach 1	442891	0.2% ACE	81545.00	679.79	713.64		714.57	0.000884	7.87	11058.46	425.44	0.25
Cibolo Creek	Reach 1	442214	1% ACE	74844.00	678.90	709.72		711.43	0.002485	12.16	8711.94	548.33	0.40
Cibolo Creek	Reach 1	442214	0.2% ACE	81545.00	678.90	712.18		713.66	0.001982	11.48	10069.67	557.25	0.37
Cibolo Creek	Reach 1	441476	1% ACE	74844.00	678.52	708.12		709.76	0.001991	10.59	7947.43	421.93	0.36
Cibolo Creek	Reach 1	441476	0.2% ACE	81545.00	678.52	710.80		712.32	0.001646	10.26	9107.17	446.61	0.33
Cibolo Creek	Reach 1	440762	1% ACE	74844.00	677.76	705.81		707.89	0.002707	11.80	6709.83	304.53	0.42
Cibolo Creek	Reach 1	440762	0.2% ACE	81545.00	677.76	708.85		710.78	0.002152	11.38	7655.50	318.80	0.38
Cibolo Creek	Reach 1	439971	1% ACE	74844.00	677.96	705.51		705.71	0.000410	4.27	22216.60	1144.96	0.16
Cibolo Creek	Reach 1	439971	0.2% ACE	81545.00	677.96	708.70		708.87	0.000299	3.99	25887.58	1156.97	0.14
Cibolo Creek	Reach 1	438740	1% ACE	74844.00	675.84	705.30		705.41	0.000223	3.38	33040.49	1844.11	0.12
Cibolo Creek	Reach 1	438740	0.2% ACE	81545.00	675.84	708.56		708.65	0.000156	3.07	39078.01	1860.54	0.10
Cibolo Creek	Reach 1	437996	1% ACE	74844.00	674.71	705.21		705.29	0.000189	3.18	35176.72	1824.69	0.11
Cibolo Creek	Reach 1	437996	0.2% ACE	81545.00	674.71	708.50		708.57	0.000136	2.92	41200.72	1839.25	0.10
Cibolo Creek	Reach 1	437265	1% ACE	74844.00	674.32	705.03		705.18	0.000290	3.98	27754.92	1486.97	0.14
Cibolo Creek	Reach 1	437265	0.2% ACE	81545.00	674.32	708.36		708.49	0.000207	3.65	32756.35	1513.77	0.12
Cibolo Creek	Reach 1	436536	1% ACE	74844.00	673.98	704.27		704.82	0.000810	6.89	15281.89	921.79	0.23
Cibolo Creek	Reach 1	436536	0.2% ACE	81545.00	673.98	707.80		708.23	0.000557	6.20	18580.31	943.67	0.20
Cibolo Creek	Reach 1	435810	1% ACE	74844.00	672.59	703.05		703.98	0.001244	8.45	10535.21	526.54	0.29
Cibolo Creek	Reach 1	435810	0.2% ACE	81545.00	672.59	706.85		707.63	0.000882	7.77	12568.74	544.12	0.25
Cibolo Creek	Reach 1	435043	1% ACE	74844.00	672.92	702.40		703.12	0.000674	7.03	11817.77	513.44	0.24
Cibolo Creek	Reach 1	435043	0.2% ACE	81545.00	672.92	706.38		707.00	0.000496	6.60	13907.23	529.56	0.21
Cibolo Creek	Reach 1	434453	1% ACE	74844.00	672.90	701.08		702.28	0.001688	9.93	10304.78	657.11	0.34
Cibolo Creek	Reach 1	434453	0.2% ACE	81545.00	672.90	705.67		706.50	0.000994	8.46	13433.79	702.88	0.27
Cibolo Creek	Reach 1	433730	1% ACE	74844.00	668.74	700.47		701.07	0.001006	7.16	14270.50	937.56	0.24
Cibolo Creek	Reach 1	433730	0.2% ACE	81545.00	668.74	705.38		705.77	0.000555	5.93	19135.51	1044.01	0.18
Cibolo Creek	Reach 1	433539	1% ACE	74844.00	667.11	700.39		700.85	0.000790	6.40	16157.71	1041.30	0.21
Cibolo Creek	Reach 1	433539	0.2% ACE	81545.00	667.11	705.34		705.64	0.000430	5.26	21676.32	1150.69	0.16
Cibolo Creek	Reach 1	433408	1% ACE	74844.00	667.31	700.34		700.73	0.000749	6.22	17384.43	1111.20	0.21
Cibolo Creek	Reach 1	433408	0.2% ACE	81545.00	667.31	705.32		705.57	0.000394	5.03	23061.25	1358.07	0.15
Cibolo Creek	Reach 1	433181	1% ACE	86791.00	667.56	700.20		700.53	0.000716	5.98	23132.56	1884.55	0.20
Cibolo Creek	Reach 1	433181	0.2% ACE	122463.00	667.56	705.14		705.44	0.000557	5.90	32834.44	2085.55	0.18



HEC-RAS Plan: Updated Revised Blocked Locations: User Defined

River	Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
				(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
Cibolo Creek	Reach 1	446236	1% ACE	716.12		718.00	1951.03	4900.10	65683.06	12970.84		903.73	1087.06	
Cibolo Creek	Reach 1	446236	Floodway	717.02	0.90	718.81	1002.17	5877.34	64922.15	12754.51	172.87	903.73	1087.06	1175.04
Cibolo Creek	Reach 1	446037	1% ACE	716.14		717.43	2171.55	4782.71	63702.82	15068.46		943.50	1153.19	
Cibolo Creek	Reach 1	446037	Floodway	716.69	0.55	718.38	454.83	777.42	70137.90	12638.68	929.35	943.50	1153.19	1384.18
Cibolo Creek	Reach 1	445573	1% ACE	715.47		716.64	1272.36	6390.85	57313.04	19850.11		1349.41	1542.79	
Cibolo Creek	Reach 1	445573	Floodway	716.32	0.85	717.45	555.54	6769.31	56620.63	20164.06	1201.92	1349.41	1542.79	1757.46
Cibolo Creek	Reach 1	445235	1% ACE	715.46		716.09	819.21	10421.24	51523.95	12898.82		1717.02	1956.28	
Cibolo Creek	Reach 1	445235	Floodway	716.26	0.80	716.96	565.82	9028.64	54081.38	11733.98	1577.28	1717.02	1956.28	2143.10
Cibolo Creek	Reach 1	444777	1% ACE	714.34		715.55	418.29	2154.21	63308.85	9380.94		2348.62	2577.53	
Cibolo Creek	Reach 1	444777	Floodway	714.49	0.15	716.28	246.91		73171.14	1672.86	2348.62	2348.62	2577.53	2595.53
Cibolo Creek	Reach 1	444240	1% ACE	712.59		714.56	303.76	2666.21	67828.48	4349.30		2814.71	3018.07	
Cibolo Creek	Reach 1	444240	Floodway	713.33	0.75	715.19	306.32	2801.47	67618.69	4423.84	0.00	2814.71	3018.07	3300.15
Cibolo Creek	Reach 1	443555	1% ACE	712.24		713.19	424.81	1499.44	69577.54	3767.02		2931.67	3262.25	
Cibolo Creek	Reach 1	443555	Floodway	712.82	0.58	713.87	348.46		73164.02	1679.99	2931.67	2931.67	3262.25	3280.13
Cibolo Creek	Reach 1	442891	1% ACE	711.58		712.49	409.13	1348.93	72058.54	1436.54		3204.30	3524.42	
Cibolo Creek	Reach 1	442891	Floodway	712.23	0.65	713.12	365.04	1056.15	72652.52	1135.35	3181.31	3204.30	3524.42	3546.35
Cibolo Creek	Reach 1	442214	1% ACE	709.72		711.43	548.33	787.75	51439.71	22616.54		3677.07	3827.83	
Cibolo Creek	Reach 1	442214	Floodway	710.23	0.52	712.04	461.28		52965.77	21878.23	3677.07	3677.07	3827.83	4138.35
Cibolo Creek	Reach 1	441476	1% ACE	708.12		709.76	421.93	966.24	69857.55	4020.21		4342.78	4591.52	
Cibolo Creek	Reach 1	441476	Floodway	708.47	0.35	710.20	288.58		71677.22	3166.78	4342.78	4342.78	4591.52	4631.36
Cibolo Creek	Reach 1	440762	1% ACE	705.81		707.89	304.53	365.99	71254.79	3223.23		4983.33	5228.52	
Cibolo Creek	Reach 1	440762	Floodway	706.45	0.65	708.42	306.91	396.81	71160.34	3286.85	0.00	4983.33	5228.52	5956.00
Cibolo Creek	Reach 1	439971	1% ACE	705.51		705.71	1144.96	34854.49	38552.44	1437.07		5578.80	5988.60	
Cibolo Creek	Reach 1	439971	Floodway	706.20	0.69	706.39	1147.63	34986.38	38383.43	1474.19	0.00	5578.80	5988.60	6814.76
Cibolo Creek	Reach 1	438740	1% ACE	705.30		705.41	1844.11	44777.09	28058.68	2008.24		6282.64	6619.35	
Cibolo Creek	Reach 1	438740	Floodway	706.02	0.72	706.12	1847.61	45151.82	27671.04	2021.14	0.00	6282.64	6619.35	7054.13
Cibolo Creek	Reach 1	437996	1% ACE	705.21		705.29	1824.69	51836.41	21598.66	1408.93		6407.33	6675.95	
Cibolo Creek	Reach 1	437996	Floodway	705.94	0.73	706.02	1827.73	52081.36	21343.22	1419.42	0.00	6407.33	6675.95	7062.49
Cibolo Creek	Reach 1	437265	1% ACE	705.03		705.18	1486.97	44260.34	30391.10	192.55		6061.46	6357.85	
Cibolo Creek	Reach 1	437265	Floodway	705.28	0.25	705.75	747.42	26180.06	48663.94		5610.44	6061.46	6357.85	6357.85
Cibolo Creek	Reach 1	436536	1% ACE	704.27		704.82	921.79	22511.71	52046.61	285.67		5441.48	5719.48	
Cibolo Creek	Reach 1	436536	Floodway	704.78	0.52	705.30	925.29	23063.72	51479.22	301.05	0.00	5441.48	5719.48	5951.68
Cibolo Creek	Reach 1	435810	1% ACE	703.05		703.98	526.54	16563.79	58081.49	198.72		4685.27	4939.04	
Cibolo Creek	Reach 1	435810	Floodway	703.14	0.09	704.34	366.56	11157.48	63686.52		4572.48	4685.27	4939.04	4939.04
Cibolo Creek	Reach 1	435043	1% ACE	702.40		703.12	513.44	4279.59	68559.70	2004.70		3712.57	4066.13	
Cibolo Creek	Reach 1	435043	Floodway	702.48	0.08	703.20	467.01	4203.83	68716.49	1923.67	3650.42	3712.57	4066.13	4117.43
Cibolo Creek	Reach 1	434453	1% ACE	701.08		702.28	657.11	9617.22	55027.95	10198.83		3142.32	3348.79	
Cibolo Creek	Reach 1	434453	Floodway	701.09	0.01	702.33	509.31	9406.53	55451.41	9986.06	2993.92	3142.32	3348.79	3503.24
Cibolo Creek	Reach 1	433730	1% ACE	700.47		701.07	937.56	14895.09	52078.04	7870.86		2634.02	2896.74	
Cibolo Creek	Reach 1	433730	Floodway	700.50	0.03	701.11	938.27	14923.74	52033.67	7886.59	0.00	2634.02	2896.74	3861.55
Cibolo Creek	Reach 1	433539	1% ACE	700.39		700.85	1041.30	18641.81	48790.01	7412.17		2235.56	2507.18	
Cibolo Creek	Reach 1	433539	Floodway	700.42	0.04	700.88	1042.00	18684.49	48745.86	7413.66	0.00	2235.56	2507.18	3619.57
Cibolo Creek	Reach 1	433408	1% ACE	700.34		700.73	1111.20	25890.60	39223.45	9729.95		2028.53	2253.30	
Cibolo Creek	Reach 1	433408	Floodway	700.37	0.04	700.76	1111.26	25934.34	39175.76	9733.89	0.00	2028.53	2253.30	3444.80
Cibolo Creek	Reach 1	433181	1% ACE	700.20		700.53	1884.55	36801.04	42484.07	7505.90		1629.56	1890.52	
Cibolo Creek	Reach 1	433181	Floodway	700.23	0.04	700.56	1885.10	36882.98	42402.05	7505.96	0.00	1629.56	1890.52	3197.20

NATIONAL FLOOD INSURANCE PROGRAM

FEMA PRODUCTION AND TECHNICAL SERVICES CONTRACTOR

September 1, 2022

Adam W. Mehevec, P.E.
Civil and Environmental Consultants, Inc.
3711 South Mopac Expressway
Building 1, Suite 550
Austin, TX 78745

IN REPLY REFER TO:
Case No.: 22-06-2567P
Communities: City of Schertz and Unincorporated Areas of Bexar County, Texas
Community Nos.: 480269 and 480035

316-AD

Dear Adam Mehevec:

This is in regard to your request dated August 5, 2022, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for the above-referenced communities. Pertinent information about the request is listed below.

Identifier:	Beck Landfill
Flooding Source:	Cibolo Creek
FIRM Panel Affected:	48187C0220F

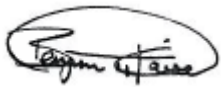
The data required to complete our review, which must be submitted within 90 days of the date of this letter, are listed on the attached summary.

If we do not receive the required data within 90 days, we will suspend our processing of your request. Any data submitted after 90 days will be treated as an original submittal and will be subject to all submittal/payment procedures.

FEMA receives a very large volume of requests and cannot maintain inactive requests for an indefinite period of time. Therefore, we are unable to grant extensions for the submission of required data/fee for revision requests. If a requester is informed by letter that additional data are required to complete our review of a request, the data **must** be submitted within 90 days of the date of the letter. Any fees already paid will be forfeited if the requested data are not received within 90 days.

If you have general questions about your request, FEMA policy, or the National Flood Insurance Program (NFIP), please contact the FEMA Mapping and Insurance eXchange (FMIX), toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please contact your case reviewer, M. Tariq Makhdoom, Ph.D., CFM, by e-mail at TMakhdoom@Taylorengineering.com or by telephone at (904) 553-5760, or the Revisions Coordinator for your state, Mr. Bosulu Lokulutu, E.I.T, CFM, by e-mail at bosulu.lokulutu@aecom.com or by telephone at (972) 735-7093.

Sincerely,



Benjamin Kaiser, P.E., CFM
Revisions Manager
Compass PTS JV

Attachments:
Summary of Additional Data
Legal Notification Templates

cc: Dough Letbetter, CFM
Floodplain Administrator
City of Schertz, Texas

Robert Brach
Development Services Engineer / Floodplain Administrator
Bexar County

Summary of Additional Data Required to Support a
Letter of Map Revision (LOMR)

Case No.: 22-06-2567P

Requester: Adam W. Mehevec, P.E.

Communities: City of Schertz, and Unincorporated Areas of Bexar County, Texas

Community Nos.: 480269 and 480035

The issues listed below must be addressed before we can continue the review of your request.

1. From our review of the submitted annotated Flood Insurance Rate Map (FIRM), it appears that the Unincorporated Areas of Bexar County are also affected by this LOMR. Please submit a copy of MT-2 Application/Certification Form 1, entitled "Overview and Concurrence Form," where the second signature block has been signed by a Bexar County official (preferably the Floodplain Administrator). Alternatively, please provide documentation that the corporate limits shown on the FIRM are not accurate and Bexar County is not actually affected by this revision. Acceptable documentation includes a current corporate limits map provided by the community along with an annexation agreement, if applicable.

2. Our review revealed that the submittal does not include floodway analysis for the duplicate effective and as-built plan for Cibolo Creek. Please submit floodway analysis for Cibolo Creek. Please ensure that the surcharges do not exceed the 1.0-foot maximum allowed and there are no surcharges that are less than 0.0 feet. Also, please ensure that the encroachment stations are located in the flood fringe, the area between the channel banks and the boundary of the base floodplain.

3. The submitted topographic work map, entitled "Topographic Work Map – Beck Landfill Expansion, 600 FM 78, Schertz, Texas 78154, Guadalupe County, Texas," prepared by Civil & Environmental Consultants, Inc., certified dated June 15, 2022, does not provide some of the essential information required to complete our review of this request. Please submit a revised topographic work map, certified by a registered Professional Engineer (P.E.), which shows all applicable items listed in Section C of Application/Certification Form 2, entitled "Riverine Hydrology and Hydraulics Form," including the following information. Please ensure that there is consistency between the work map, revised hydraulic model and the annotated FIRM.
    a. Please show the boundary delineations of the revised conditions base 0.2-percent-annual-chance floodplain, and regulatory floodway. The floodplain boundaries should generally follow the proposed contours and should be delineated to the elevations calculated in the revised conditions hydraulic model. It is helpful to use different colored lines as well as line types to distinguish the boundary delineations.
    b. Please show smooth graphical tie-ins between the revised and effective flood hazard boundary delineations at the upstream and downstream ends of the revised reach. Please ensure that the revised delineations tie-in directly to the effective delineations and that the tie-ins occur a short distance upstream of the upstream most cross section in the revised conditions hydraulic model and a short distance downstream of the downstream most cross section, where there is a base flood elevation (BFE) tie-in between the revised and effective conditions. Please label tie-in locations.

c. The work map does not seem to be created on the scale shown on the map. Please create the map on the scale shown on the work map and also indicate the scale (1 inch = x feet).
d. In view of the above comment, we could not verify topwidths of the base floodplain, 0.2-percent-annual-chance floodplain, and regulatory floodway, as shown on the above-referenced work map. We could also not verify reach lengths between the revised cross section as shown on the above referenced work map.

4. Please provide a copy of the Geographic Information System (GIS) data that reflects the revised topographic work map. Please ensure the digital data are spatially referenced and cite what projection (coordinate system, example: Universal Transverse Mercator [UTM]/State Plane) was used, so that the data may be used for accurate mapping. The important data to show on the digital work map are the contour information, the stream centerline, the cross section lines, the road crossings and hydraulic structures, the preliminary and proposed flood hazard delineations, and the tie-in locations. Everything should be clearly labeled, and all information should be contained within the drawing and not externally referenced.
   The submitted digital data must be spatially referenced and include what projection (coordinate system, e.g., UTM/State Plane) was used. The submitted digital data do not contain a projection and cannot be used for accurate mapping. Please resubmit Computed-Aided Design (CAD)/ GIS data that are correctly referenced and projected.

5. Based on any changes to the work map due to the resolution of the items at comment 4 above, please submit an updated annotated FIRM that shows the revised boundary delineations of the 1-percent-annual-chance (base) floodplain, 0.2-percent-annual-chance floodplain, and regulatory floodway as shown on the updated work map and how they tie-in to the boundary delineations shown on the effective FIRM at the downstream and upstream ends of the revised reach. Please use different colors to differentiate the proposed and effective boundary delineations. Also, please show the title block of the effective FIRM on the annotated FIRM.

6. Please submit a copy of the newspaper notice distributed by the City of Schertz and Bexar County stating their intent to revise the flood hazard information (i.e., revise or establish base flood elevations [BFEs], the base floodplain, and regulatory floodway) along Cibolo Creek. Alternatively, please submit documentation that individual legal notices were sent to all the property owners affected by any changes in the flood hazard information. Documentation of legal notice may take the form of a signed copy of the letter sent and either a mailing list or certified mailing receipts. Individual notices that are not sent on community letterhead must also include certification from the community that all affected property owners have been notified of the floodway revision. The newspaper notices or the individual legal notices must include the extent of revision and contact information for any interested parties and must also mention the community's intent to revise the regulatory floodway. **Please submit a draft copy of the notification for verification of content, prior to publication or distribution.** One of the attached templates may be used to prepare the draft notification.

   Please note that the draft property owner notification or newspaper notification will be reviewed after the hydraulic model and work map are finalized. Please do not distribute the final notification until we have approved the draft notice.

Please upload the required data using the Online LOMC website at
https://hazards.fema.gov/femaportal/onlinelomc/signin.

For identification purposes, please include the case number referenced above on all correspondence.

MUNICIPAL SOLID WASTE PERMIT
MAJOR AMENDMENT

PART III-ATTACHMENT C3
DRAINAGE SYSTEM PLANS AND DETAILS

NAME OF PROJECT: Beck Landfill

MSW PERMIT APPLICATION NO.: 1848A

OWNER: Nido, LTD (CN603075011)

OPERATOR: Beck Landfill (RN102310968)

CITY, COUNTY: Schertz, Guadalupe County

Major Amendment: Revised September 2023

Prepared by:

Civil & Environmental Consultants, Inc.

Texas Registration Number F-38
3711 S MoPac Expressway
Building 1 Suite 550,
Austin, Texas 78746
(512) 329-0006

LIST OF FIGURES

NORTH

SCALE IN FEET

0 100 200

TOP OF BERM

770 760 750 740 730 710 670 680 690 700 700 690

10+00 9+00 8+00 7+00 6+00 5+00 4+00 3+00 2+00 1+00

1 C3-2

1 C3-2

POND OUTLETS–SEE CROSS–SECTION THIS SHEET.

INTERIM OR FINAL DOWNCHUTE, SEE DETAIL ON FIGURE C3–4 OR C3–2

STORMWATER POND INLET PROTECTION. GABION MATTRESS SLOPE PROTECTION, SEE DETAIL ON FIGURE C3–2

STORMWATER POND OUTLET PROTECTION. GABION MATTRESS SLOPE PROTECTION, SEE DETAIL ON FIGURE C3–2

PROPOSED STORMWATER POND

TOP OF BERM

775 750 725 700 675 650

LANDFILL CAP DRAINAGE CHUTE

PROPOSED BERM: 718.6

PROPOSED 10' HIGH SOIL BERM

EXISTNG BERM: 709.0±

PEAK 100 YR WATER SURFACE=705.9

PEAK 25 YR WATER SURFACE=705.0

GABION MATTRESS EMBEDDED INTO BERM SLOPE, SEE FIGURE C3–2 FOR CONSTRUCTION DETAILS

EXISTING LANDFILL BERM

WASTE

10' LONG GABION MATTRESS LANDING AT TOE OF EMBANKMENT SLOPE

TOP OF BERM: 709.0

48"ø OUTFALL PIPE FL=703.0

12"ø OUTFALL PIPE FL=698.0

POND OUTLET 02

POND OUTLET 01

GABION MATTRESS EMBEDDED INTO BERM SLOPE, SEE FIGURE C3–2 FOR CONSTRUCTION DETAILS

10' LONG GABION MATTRESS LANDING AT TOE OF EMBANKMENT SLOPE

POND BERM

10+00 9+00 8+00 +50 7+00 6+00 5+00 4+00 3+00 +50 2+00 1+00

PROFILE VIEW

SCALE H:1"=100'; V:1"=20'

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED PROFESSIONAL ENGINEER
9-15-23

REVISION RECORD		
NO	DATE	DESCRIPTION
1	09/15/23	RESPONSE TO TECH NOD 4
2		
3		
4		
5		

REFERENCE

TOPOGRAPHIC INFORMATION FROM AERIAL SURVEY BY FIRMATEK: (SEPTEMBER 15, 2021) AUGMENTED WITH A PORTION OF THE EXISTING GROUND SURFACE PREPARED BY CEC.

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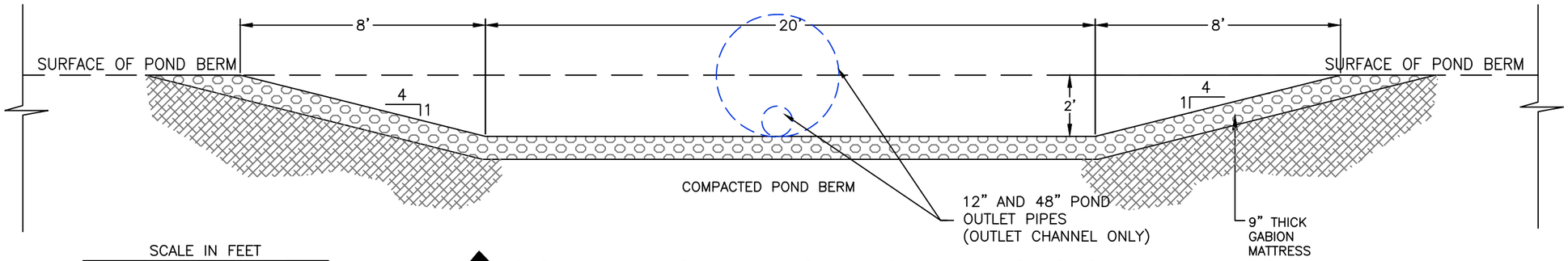
www.cecinc.com
Texas Registered Engineering Firm F-38

NIDO, LTD
BECK LANDFILL
GUADALUPE COUNTY, TEXAS

DETENTION POND PLAN

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM	FIGURE NO.:	C3-1
DATE:	08/2022	DWG SCALE:	1" = 100'	PROJECT NO:	311-653		

P:\310-000\311-653\-CADD\Dwg\SW01\311653-BECK LANDFIL POND PLAN C3-1.dwg[C3-1] LS:(9/11/2023 - amehevec) - LP: 9/11/2023 2:26 PM

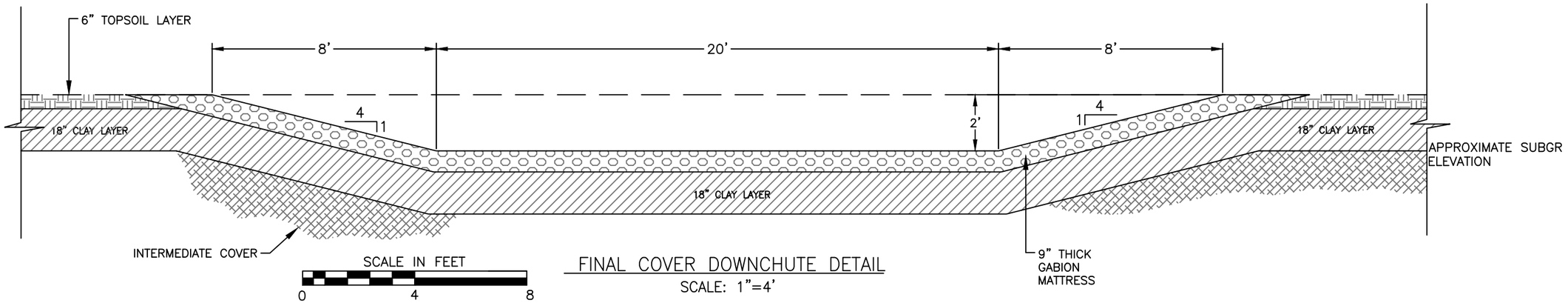


SCALE IN FEET

0 4 8

STORM WATER POND INLET / OUTLET CHANNEL PROTECTION

SCALE: 1"=4'

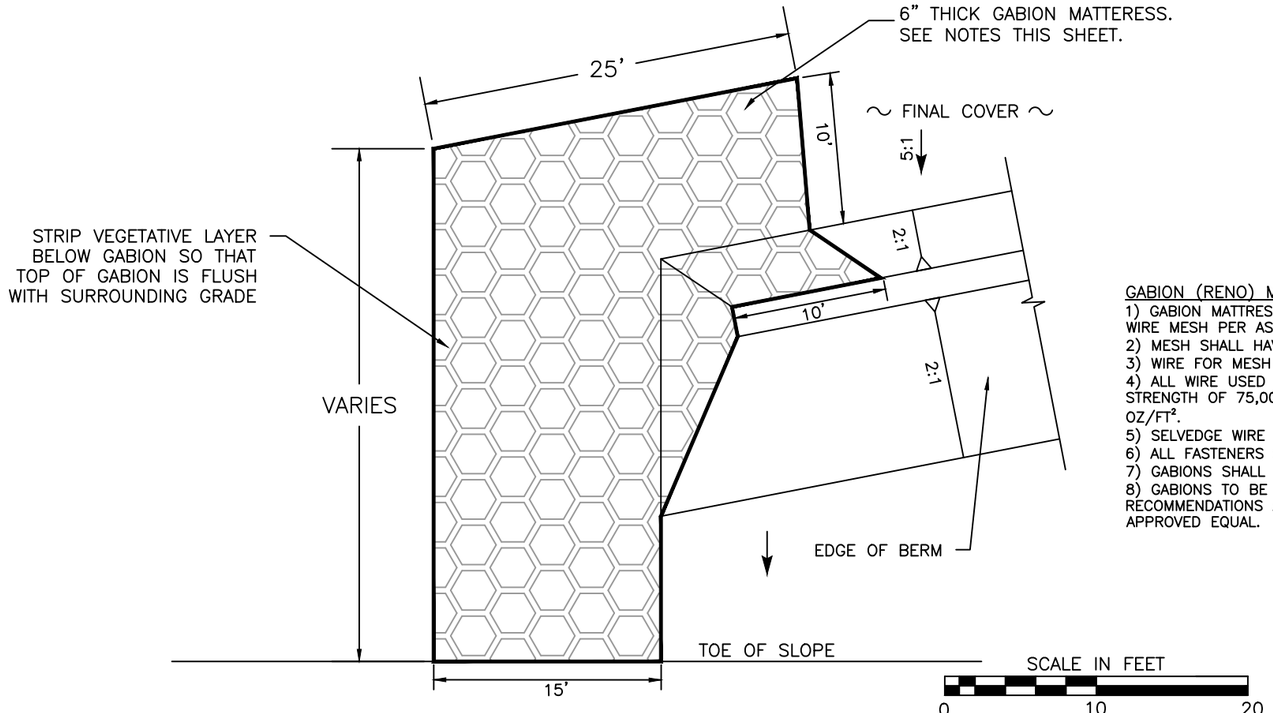


SCALE IN FEET

0 4 8

FINAL COVER DOWNCHUTE DETAIL

SCALE: 1"=4'

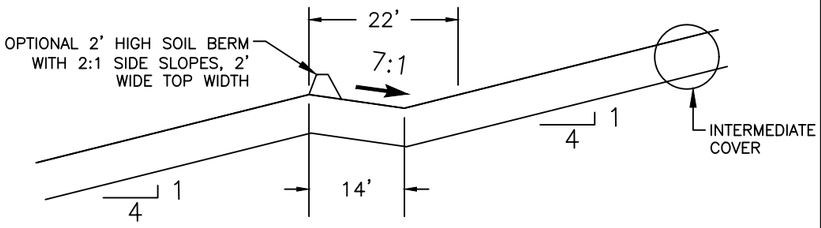


SCALE IN FEET

0 10 20

FINAL COVER PERIMETER BERM TOE OF SLOPE TERMINATION DETAIL

SCALE: 1"=10'



TYPICAL INTERIM COVER BENCH

N.T.S.

GABION (RENO) MATTRESS NOTES:

1) GABION MATTRESSES SHALL BE MADE OF 6x8 DOUBLE TWISTED HEXAGONAL WOVEN STEEL WIRE MESH PER ASTM A975–97.
2) MESH SHALL HAVE A NOMINAL OPENING SIZE OF 2.5 INCHES.
3) WIRE FOR MESH SHALL HAVE A MINIMUM DIAMETER OF 0.087.
4) ALL WIRE USED IN GABION MATTRESS CONSTRUCTION SHALL HAVE A MINIMUM TENSILE STRENGTH OF 75,000 PSI AND SHALL BE GALVANIZED WITH A MINIMUM ZINC COATING OF 0.7 OZ/FT^2.
5) SELVEDGE WIRE FOR GABION ASSEMBLY SHALL HAVE A MINIMUM DIAMETER OF 0.106 INCHES.
6) ALL FASTENERS SHALL COMPLY WITH ASTM A975–97.
7) GABIONS SHALL BE FILLED WITH 3" TO 5" LIMESTONE AGGREGATE.
8) GABIONS TO BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND SHALL BE AS MANUFACTURED BY MACCAFERRI, INC. OR ENGINEER APPROVED EQUAL.

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED
PROFESSIONAL ENGINEER
9-15-23

REVISION RECORD		
NO	DATE	DESCRIPTION
1	03/17/2023	TECH NOD 2
2	07/05/2023	ADD BAR SCALES TO DETAILS
3	09/15/2023	REVISE POND INLET/OUTLET PROTECTION DETAIL FOR NOD4
4		

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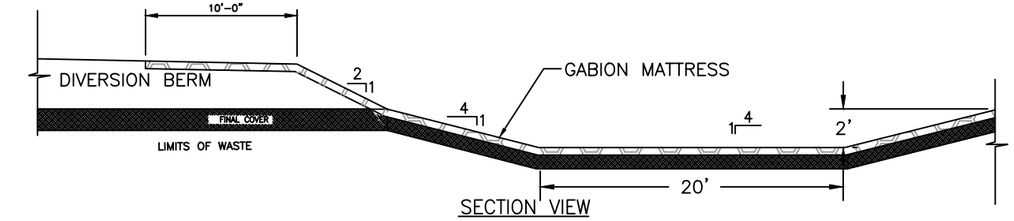
Texas Registered Engineering Firm F-38

NIDO, LTD
BECK LANDFILL
GUADALUPE COUNTY, TEXAS

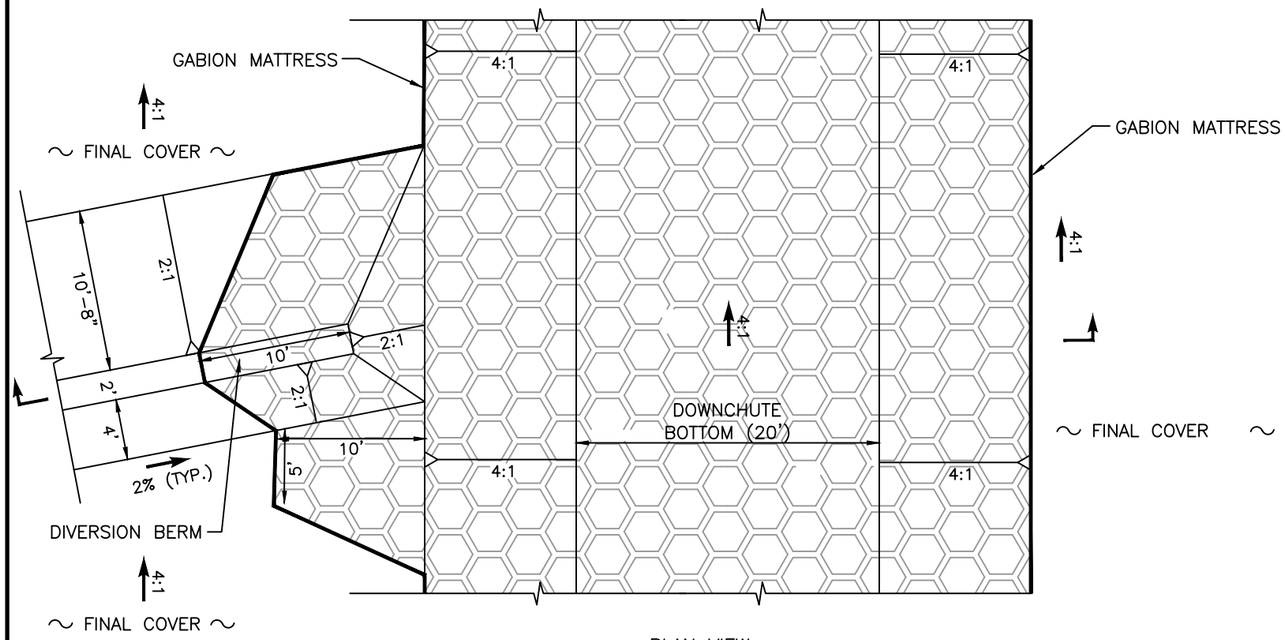
DRAINAGE DETAILS

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM
DATE:	08/2022	DWG SCALE:	AS SHOWN	PROJECT NO:	311-653

FIGURE NO.: C3-2



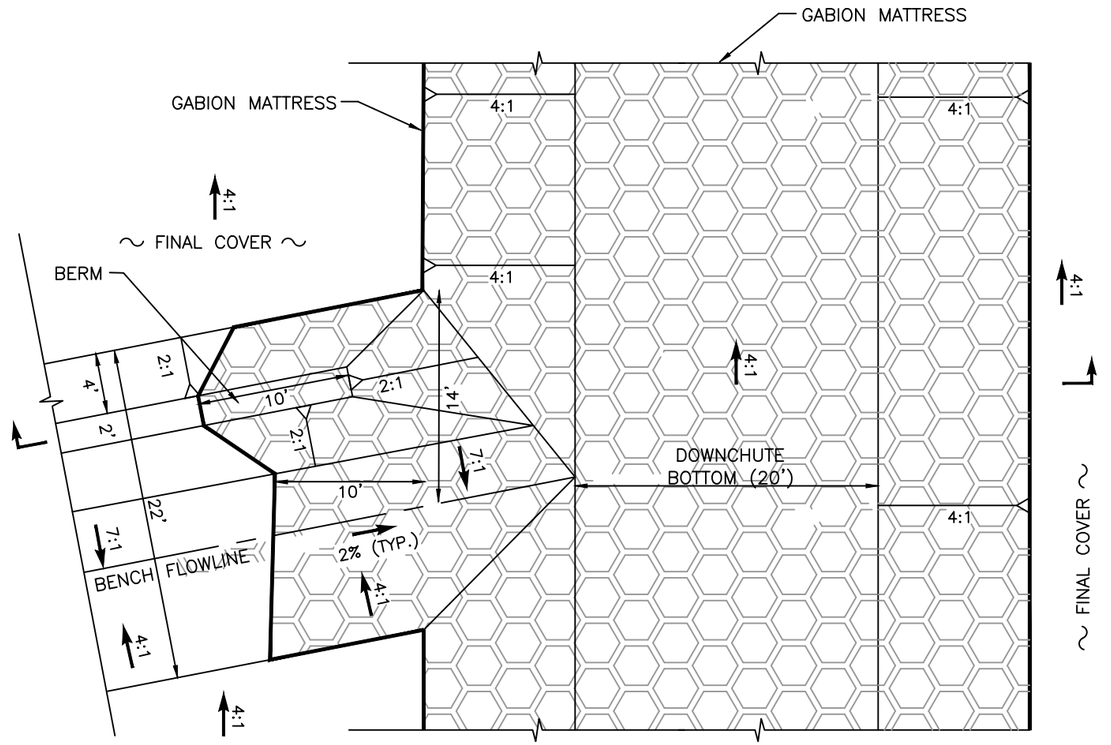
SECTION VIEW



PLAN VIEW

PERIMETER BERM/DOWNCHUTE TIE-IN DETAIL

SCALE: 1"=10'



PLAN VIEW

BENCH/DOWNCHUTE TIE-IN DETAIL

SCALE: 1"=10'

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED
PROFESSIONAL ENGINEER
7-5-23

SCALE IN FEET

0 10 20

REVISION RECORD		
NO	DATE	DESCRIPTION
1	03/17/2023	TECHNICAL NOD 2
2	07/05/2023	TECHNICAL NOD 3-ADD SCALE BAR AND ADJUST BOTTOM OF DOWNCHUTE
3		
4		
5		

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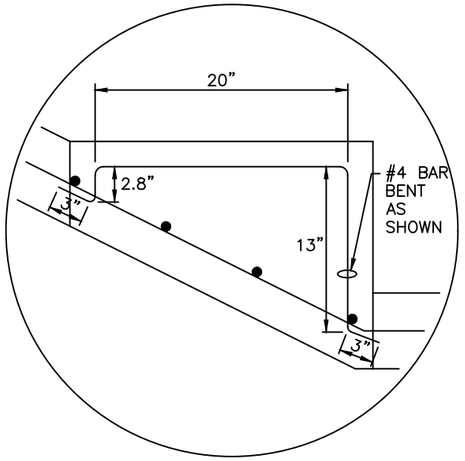
NIDO, LTD
BECK LANDFILL
GUADALUPE COUNTY, TEXAS

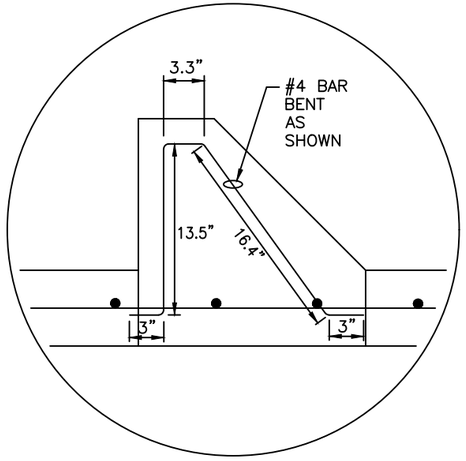
DRAINAGE DETAILS

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM	FIGURE NO.:	C3-2A
DATE:	03/2023	DWG SCALE:	AS SHOWN	PROJECT NO:	311-653		



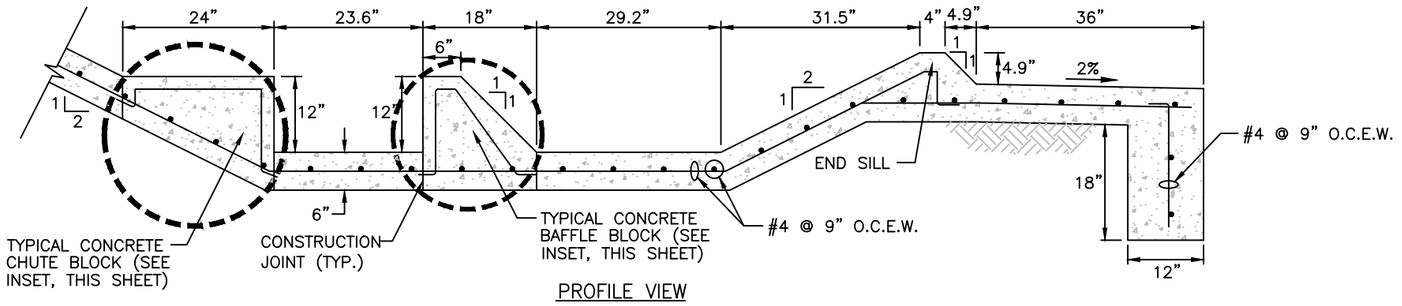
CHUTE BLOCK INSET

SCALE: 1"=1'

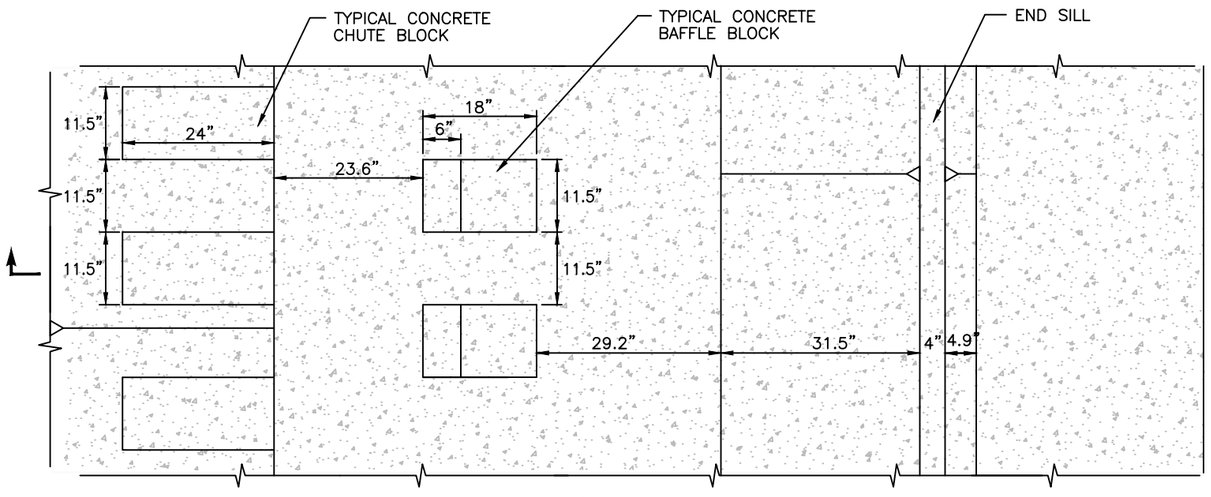


BAFFLE BLOCK INSET

SCALE: 1"=1'



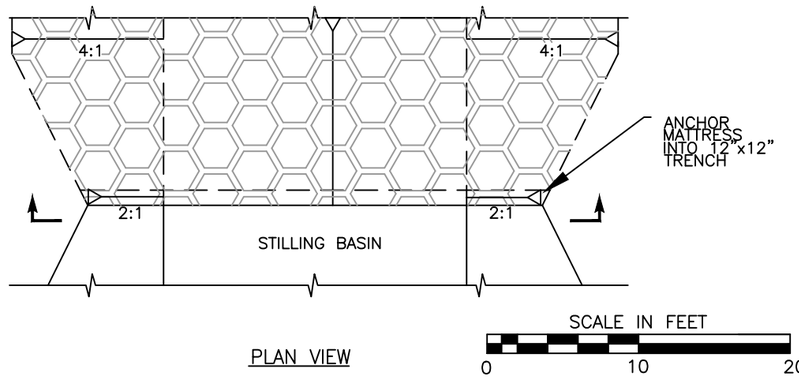
PROFILE VIEW



PLAN VIEW

TYPICAL CHUTE AND BAFFLE BLOCK DETAIL

SCALE: 1"=2'



PLAN VIEW

GABION MATTRESS CONNECTION TO CONCRETE

SCALE: 1"=10'

STATE OF TEXAS
ADAM W. MEHEVEC
84736
LICENSED
PROFESSIONAL ENGINEER
1-5-23

REVISION RECORD		
NO	DATE	DESCRIPTION
1	07/05/2023	TECHNICAL NOD 3
2		
3		
4		

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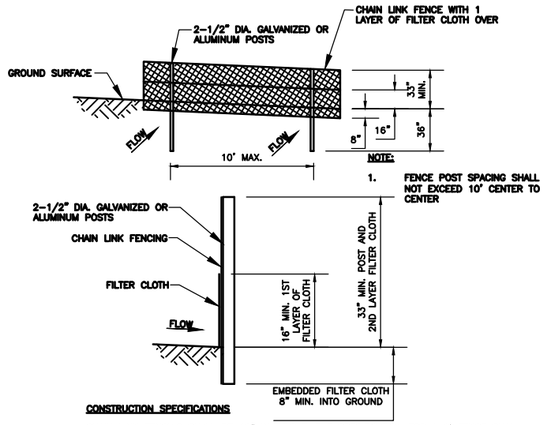
NIDO, LTD
BECK LANDFILL
GUADALUPE COUNTY, TEXAS

DRAINAGE DETAILS

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM
DATE:	03/2023	DWG SCALE:	AS SHOWN	PROJECT NO:	311-653

FIGURE NO.: C3-2B



NOTE:

1. FENCE POST SPACING SHALL NOT EXCEED 10' CENTER TO CENTER

CONSTRUCTION SPECIFICATIONS

CHAIN LINK FENCING SHALL BE 42" IN HEIGHT. THE SPECIFICATION FOR A 6' FENCE SHALL BE USED SUBSTITUTING 42" FABRIC AND 6' LENGTH POSTS.

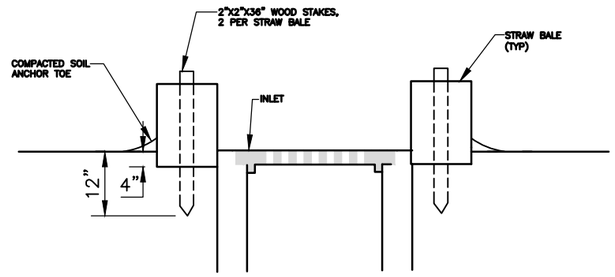
1. THE POLES DO NOT NEED TO SET IN CONCRETE.
2. CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES.
3. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH TIES SPACED EVERY 24" AT THE TOP AND MID SECTION.
4. FILTER CLOTH SHALL BE EMBEDDED A MINIMUM OF 8" INTO THE GROUND.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND SILT BUILDUPS REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

SUPER SILT FENCE

NOT TO SCALE

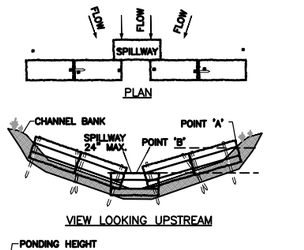


NOTES:

1. PLACE STRAW BALES AROUND PERIMETER OF INLET. WEDGE LOOSE STRAW BETWEEN BALES AND PACK TIGHTLY.
2. THE TOP OF THE BARRIER SHALL ENCIRCLE THE INLET AND BE LEVEL AND UNIFORM.
3. THE STRAW BALES SHALL BE ANCHORED WITH MINIMUM 36-INCH LONG WOOD OR STEEL STAKES THAT EXTEND 18 INCHES BELOW THE GROUND SURFACE. WHERE STAKING IS NOT PRACTICAL, THE CONTRACTOR SHALL TIE THE BALES TOGETHER TO PREVENT MOVEMENT OR OPENINGS IN THE BARRIER.
4. THE CONTRACTOR SHALL REPLACE THE STRAW BALES EVERY 3 MONTHS OR MORE OFTEN IF THE BALES DETERIORATE AND BECOME INEFFECTIVE.
5. THE CONTRACTOR SHALL INSPECT THE STRAW BALES AFTER EVERY PRECIPITATION EVENT. DISLODGED STRAW BALES SHALL BE RESET, STAKED AND BACKFILLED AS REQUIRED. THE CONTRACTOR SHALL REPLACE ALL CLOGGED OR INOPERATIVE STRAW BALES.
6. THE CONTRACTOR SHALL REMOVE ACCUMULATED SEDIMENTS AS REQUIRED TO KEEP THE BARRIER FUNCTIONAL. IN ALL CASES, THE CONTRACTOR SHALL REMOVE DEPOSITS WHERE ACCUMULATIONS REACH ONE-THIRD THE ABOVE GROUND HEIGHT OF THE BARRIER.
7. THE CONTRACTOR SHALL REPAIR ALL UNDERCUTTING AND EROSION OF THE ANCHOR TOE IMMEDIATELY WITH COMPACTED BACKFILL MATERIAL.
8. EXISTING CURB INLETS SHALL HAVE STRAW BALE BARRIERS PLACED BEHIND THE CURB. NO BARRIERS ARE TO BE PLACED ON THE ROADWAY.

STRAW BALE INLET PROTECTION

NOT TO SCALE

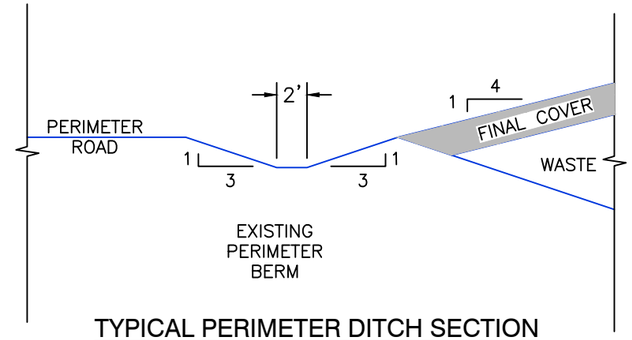


NOTES:

1. EMBED BALES 4" INTO THE SOIL AND "KEY" BALES INTO THE CHANNEL BANKS.
2. POINT 'A' MUST BE HIGHER THAN POINT 'B'. (SPILLWAY HEIGHT)
3. PLACE BALES PERPENDICULAR TO THE FLOW WITH ENDS TIGHTLY ABUTTING. USE STRAW, ROCKS OR FILTER FABRIC TO FILL ANY GAPS AND TAMP BACKFILL MATERIAL TO PREVENT EROSION OR FLOW AROUND THE BALES.
4. SPILLWAY HEIGHT SHALL NOT EXCEED 24". 5. INSPECT AFTER EACH SIGNIFICANT STORM, MAINTAIN AND REPAIR PROMPTLY.

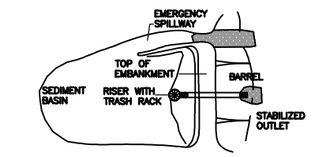
STRAW BALE CHECK DAM

NOT TO SCALE



TYPICAL PERIMETER DITCH SECTION

N.T.S.

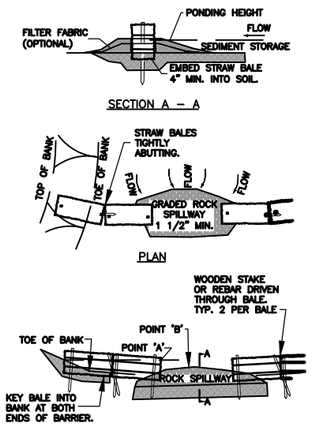


NOTES:

1. THE TEMPORARY SEDIMENT BASIN, DESIGNED BY A QUALIFIED PROFESSIONAL IS REQUIRED FOR DISTURBED AREAS GREATER THAN 5 ACRES WITHIN A DRAINAGE AREA LESS THAN 100 ACRES.
2. THE SEDIMENT BASIN WILL BE REMOVED WITHIN 3 YEARS.

SEDIMENT BASIN

NOT TO SCALE



NOTES:

1. PLACE BALES PERPENDICULAR TO FLOW.
2. EMBED THE BALE 4" INTO THE SOIL AND "KEY" THE END BALES INTO THE BANKS. CHANNEL.
3. BALES PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING. USE STRAW, ROCKS OR FILTER FABRIC TO FILL ANY GAPS BETWEEN BALES AND TAMP BACKFILL MATERIALS TO PREVENT EROSION OR FLOW AROUND THE BALES.
4. POINT "A" SHALL BE HIGHER THAN POINT "B".
5. SPILLWAY SHALL NOT EXCEED 24".

SEMI-PERVIOUS STRAW BALE SEDIMENT BARRIER

NOT TO SCALE

NOTES:

1. EROSION PROTECTION WILL BE PROVIDED WHERE SPECIFIED IN THE FORM OF ROCK RIP RAP, GABION MATTRESSES, OR ARTICULATED REVETMENT MATS.
2. EROSION PROTECTION TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
3. ALL MATERIALS USED SHALL BE INSTALLED AS SPECIFIED IN THE PROJECT SPECIFICATIONS.
4. TYPE II ADD-ON BERM CHANNELS ADJACENT TO LANDFILL CROWN REQUIRE AN ADDITIONAL 2 INCHES OF BERM HEIGHT TO MAINTAIN 6 INCHES OF FREEBOARD ALONG THE LAST 100 FEET OF CHANNEL.
5. DETENTION POND OUTLET CULVERTS TO BE FITTED WITH WATERMAN F-10 DRAINAGE GATE OR ENGINEER-APPROVED EQUAL AT OUTLET AND TRASH RACK AT INLET.
6. ADD-ON BERM CHANNELS WITH FLOW LESS THAN 2.0 CFS SHALL HAVE A MINIMUM DEPTH OF 1.0 FT; ALL OTHER CHANNEL PARAMETERS ARE AS SHOWN FOR ADD-ON BERM CHANNEL TYPE I.
7. FLOODPLAIN PROTECTION/PERIMETER LEVEE ELEVATION AROUND SECTOR 1 IS 15.0.
8. ACCESS ROADS SHALL BE SURFACED WITH CRUSHED STONE, GRAVEL OR A EQUIVALENT ALL-WEATHER SURFACE. ACCESS ROADS MAY BE CONSTRUCTED ON THE FLOODPLAIN PROTECTION/PERIMETER LEVEES ADJACENT TO THE LANDFILL, ON THE POND/PERIMETER CHANNEL LEVEES OR OUTSIDE OF THE LEVEES AS SHOWN ON THIS CROSS SECTION.
9. FLOODPLAIN PROTECTION AND PERIMETER LEVEES SHALL BE TIED TO EXISTING CONTOURS. NATURAL GROUND ELEVATIONS VARY.

REVISION RECORD

NO	DATE	DESCRIPTION
1	--	-
2		
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4		

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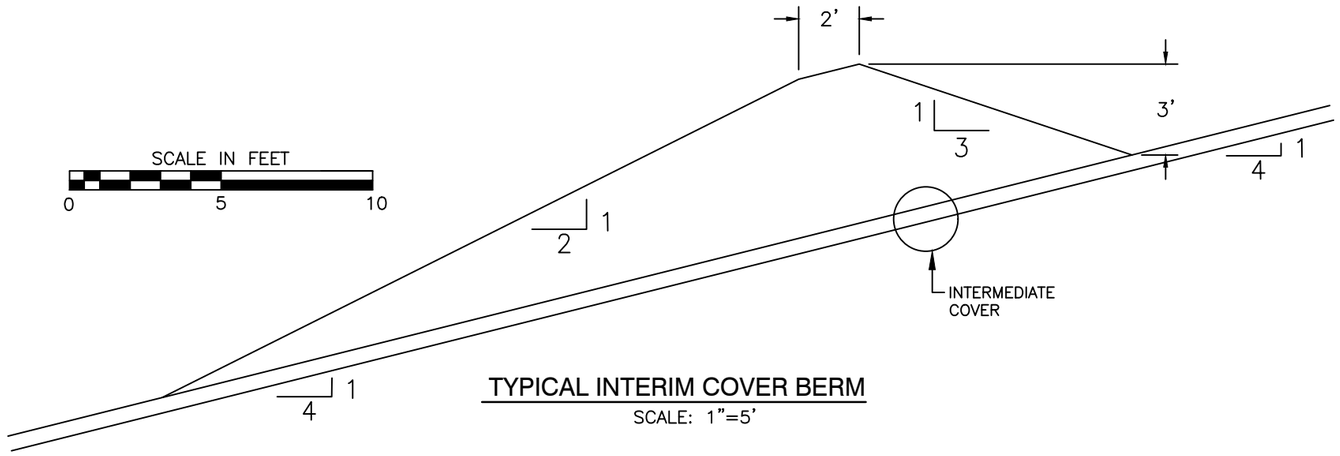
BECK LANDFILL
GUADALUPE COUNTY, TEXAS

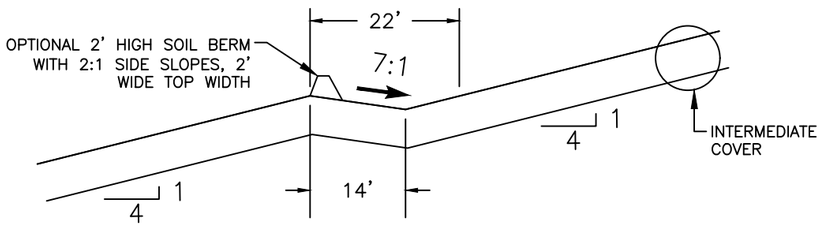
DRAINAGE DETAILS

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM	FIGURE NO.:
DATE:	08/2022	DWG SCALE:	AS SHOWN	PROJECT NO:	311-653	C3-3



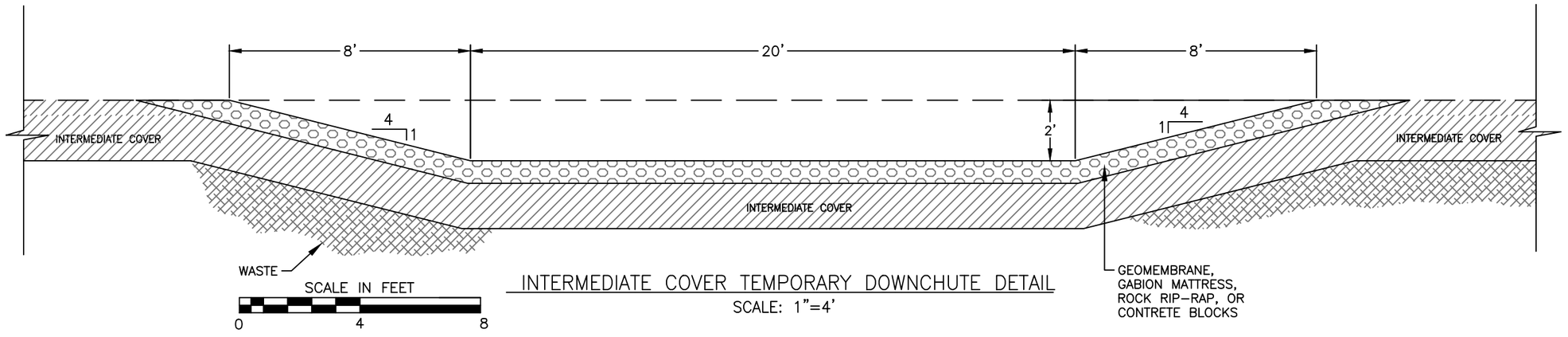
TYPICAL INTERIM COVER BERM

SCALE: 1"=5'



TYPICAL INTERIM COVER BENCH

N.T.S.



INTERMEDIATE COVER TEMPORARY DOWNCHUTE DETAIL

SCALE: 1"=4'

GABION (RENO) MATTRESS NOTES:

1) GABION MATTRESSES SHALL BE MADE OF 6x8 DOUBLE TWISTED HEXAGONAL WOVEN STEEL WIRE MESH PER ASTM A975-97.
2) MESH SHALL HAVE A NOMINAL OPENING SIZE OF 2.5 INCHES.
3) WIRE FOR MESH SHALL HAVE A MINIMUM DIAMETER OF 0.087.
4) ALL WIRE USED IN GABION MATTRESS CONSTRUCTION SHALL HAVE A MINIMUM TENSILE STRENGTH OF 75,000 PSI AND SHALL BE GALVANIZED WITH A MINIMUM ZINC COATING OF 0.7 OZ/FT^2.
5) SELVEDGE WIRE FOR GABION ASSEMBLY SHALL HAVE A MINIMUM DIAMETER OF 0.106 INCHES.
6) ALL FASTENERS SHALL COMPLY WITH ASTM A975-97.
7) GABIONS SHALL BE FILLED WITH 3" TO 5" LIMESTONE AGGREGATE.
8) GABIONS TO BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND SHALL BE AS MANUFACTURED BY MACCAFERRI, INC. OR ENGINEER APPROVED EQUAL.

REVISION RECORD		
NO	DATE	DESCRIPTION
1	09/15/2023	TECH MOD 4
2		
3		
4		

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INTERIM DRAINAGE DETAILS

DRAWN BY:	MFV	CHECKED BY:	AWM	APPROVED BY:	AWM
DATE:	09/2022	DWG SCALE:	AS SHOWN	PROJECT NO:	311-653

FIGURE NO.: **C3-4**