Hydraulic Analysis Report for Goldenstar Creek

RICK Job No. 19427
December 29, 2022
Revised: May 8, 2024

RICK

HYDRAULIC ANALYSIS REPORT
FOR
GOLDENSTAR CREEK

RICK Job No. 19427

-DRAFT-

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HYDRAULIC ANALYSIS
FOR
GOLDENSTAR CREEK

REVISION PAGE

May 8, 2024

This report presents revisions to the December 29, 2022 report pursuant to the emailed response c comments received as part of the 1st plan check review by Riverside County Flood Control and Water Conservation District on the Hydraulic Analysis for Goldenstar Creek. Responses by Rick Engineering are shown below **in bold.**

1. Per the provided cross-sections in the hydraulic report, it looks like there are multiple areas where grading is proposed within or very near to the creek. Due to the project's proximity to the floodplain and per our erosion hazard setback requirements for minor watercourses, with a 100-year flowrate less than 500 cfs, the setback shall be a minimum of 25 feet from the limits of the 100-year water surface elevation. Should you wish to build within the erosion hazard setback area, adequate scour protection such as riprap revetment shall be provided and shown on future exhibits. If proposing to armor the watercourse or channel banks, they shall be publicly maintained. Any such facility shall meet District standards including required maintenance access roads.
   o An erosion hazard zone can be defined as an area where erosion may potentially result in damage to a resource. A "resource" may be inclusive of private or public houses, buildings, apartments, fences, utilities, infrastructure, or other feature of appreciable value**.**

   Noted. Grading is not proposed in the 100-yr flood extents and no "resources" are proposed to be put in the erosion hazard zone.

2. Although the Hydraulic Report was adequate to address some of our concerns regarding the basin location and floodplain limits. In order to provide appropriate future administration of County Ordinance No. 458, the following items shall be submitted to the District for review and approval: a. A floodplain analysis consisting of HEC-RAS calculations, cross sections, maps, reports, and other data prepared to the satisfaction of the District for the purpose of revising the effective SFHA limits. b. Exhibits showing the pre-development and post-development SFHA limits. All hydrologic and hydraulic models, maps and mapping data must be submitted electronically to the District for review and approval.

Noted. The proposed and existing SFHA limits have been included on the hydraulic workmap included in Appendix 2. Electronic copies of the hydraulic models have been included as attachments. Hydrologic backup information for offsite bypass and onsite systems in included in the Drainage Study and Hydrologic backup information for Goldenstar Creek is included in Appendix 4 of the Hydraulic Analysis.

3. The proposed basins on Lot C and D should be revised to meet our LID Handbook requirements (https://rcwatershed.org/permittees/riverside-county-lid-bmp-handbook/#93-98-1-lid-bmp-design-handbook). The embankment side slopes proposed for Lot C and D are both shown as 2:1 slopes which is not acceptable for embankments constructed from fill and should be no steeper than 4:1.

   Basins have been revised to meet LID handbook requirements with 4:1 side slopes. See Appendix 6 of the WQMP for additional information.

4. The inlet structures for both proposed culverts beneath Chicago Ave and Street "E" shall be redesigned to meet the width of the 100-year floodplain limits upstream of the culvert crossings. This will adequately collect and funnel all flows into the proposed culverts. This redesign may increase the disturbed area within the creek.

   Noted. Culvert inlet structure design has been revised to adequately collect and funnel all flows into the proposed culverts.

5. Maintenance access ramps down to the inlet and outlet structures of both culverts should also be shown on any future submittals. Please provide information regarding the operation and maintenance of any proposed flood control facilities including basins and culverts. Adding the maintenance access may also increase the disturbed area within the creek.

   Maintenance access has been provided and will be included in future submittals.

INTRODUCTION

This report presents the hydrologic and hydraulic analysis of the future single-family development Arroyo Vista project. The project site is located north of Van Buren Boulevard on Iris Avenue, west of Chicago Ave, and south of Gentian Avenue in the County of Riverside, California. The site is approximately 140.8 acres. This area incorporates all onsite areas, including the portions of the creek that run through the site. The total offsite tributary area to the outlet of the site is approximately 335 acres. The Vicinity Map shown below as Figure 1 displays the location of the Development.

The reach of the waterbody referred to as Goldenstar Creek by the Santa Ana Regional Water Quality Control Board included in this study extends from the eastern site boundary to the northwestern, where it confluences with a larger unnamed drainage from the north. The primary purpose of this preliminary hydraulic analysis is to assess potential impacts to the water surface elevations within the Goldenstar Creek as a result of the project improvements and to size drainage structures for road crossings. The project has prepared and compared the results of the pre-project and post-project hydraulic capacity ("capacity run") hydraulic models for the project-specific reach of the Goldenstar Creek.

This document includes a summary of the hydrologic information for the site and hydraulic analysis of the proposed improvements adjacent to and across the channel. The calculations included in this document demonstrate the performance of the channel under conditions reflective of the proposed changes in comparison to the existing channel condition.

Design History

It is understood that the Goldenstar Creek in the vicinity of the Chicago Ave project area has historically been agricultural use and has remained undeveloped. The creek drops approximately 125 vertical feet along approximately 3,400 linear feet of channel through the project. Large rock outcroppings are visible via aerial imagery along the side slopes and bottom of the existing creek.

Topography

The topographic information used to develop the hydraulic model within the Chicago Ave Improvements is based project specific topography on the NVD-29 vertical datum developed from an aerial survey conducted by Rick Engineering Company. Cross sections for this hydraulic analysis were created using this topography for existing conditions. Cross sections for proposed conditions were created using this topography combined with project improvement grading elevations.

HYDROLOGIC DATA

Existing and proposed hydrologic calculations for the pre-project and post-project conditions have been conducted in the separate report titled “Drainage Study for Arroyo Vista,” dated May 8, 2024 (and any subsequent versions thereafter) prepared by Rick Engineering Company (Job Number 19427). Contributing offsite flows were also analyzed, resulting in a total tributary area of 335 acres and a peak 100-year flow rate at the end of the downstream project boundary of approximately 534 cubic feet per second (cfs) in the proposed condition. This area includes three flow paths entering the site on the eastern boundary and one flow path entering from the southern boundary. Offsite tributary flows associated with the project location confluence with Goldenstar Creek in both the existing and proposed condition before draining to the northwest corner. The peak flow rate in the Goldenstar Creek used for hydraulic analysis is relatively unchanged between existing and proposed conditions. Post-project Hydrology Maps and hydrologic calculations utilized for the Goldenstar Creek hydraulic model have been provided in Appendix 4.

HYDRAULIC ANALYSIS

The GeoHECRAS computer modeling software was used as a supplemental tool to help build the hydraulic model and the HEC-RAS v.6.2 computer program was used (as the main engine) to execute the hydraulic calculations. The HEC-RAS program is intended for calculating water surface elevations (WSELs) and velocities for supercritical, subcritical,

and mixed flow regimes in natural or man-made channels. The effects of the various obstructions such as culverts may be considered in the computations.

Analyses have been performed to determine the hydraulic characteristics of the existing and proposed conditions within the project-specific reach of Goldenstar Creek.

Manning's n Values

Manning's n-values for the model were based on observations of the channel condition upstream supplemented with site visits performed by Rick Engineering staff. The overbanks consist of light vegetation with many boulder sections. The bottom of the channel contains heavy vegetation with a few marshy habitats. Supporting photos of the channel in the existing condition are included as Appendix 1. The Manning's n value assigned to the cross-sections for hydraulic analysis as specified in the table below are considered to be reflective of a heavily vegetated condition to determine a conservative water surface elevation to check the freeboard provided for the proposed infrastructure and structures.

At this point, it is not known if or where onsite environmental mitigation areas would be proposed in the channel. It is anticipated that if environmental mitigation areas were to be designated in the future, the hydraulic analyses would not need to be revised as the Manning's n value used for the analysis reflects a condition where vegetation would not be cleared or mowed, consistent with an unmaintained channel bottom and/or environmental mitigation area.

Table 1 - Modeled Manning's "n" Values

	"Capacity Condition" Manning's n
Location	
Channel banks and bottom	0.15
Overbanks	0.15

Model Extents and Boundary Conditions

In effort to determine the impacts of proposed improvements of the Arroyo Vista development, the HEC-RAS model extends approximately 200 linear feet upstream of the eastern boundary of the proposed development. To determine the upstream starting water surface elevation, the initial cross section water surface elevation is determined via a normal depth calculation based on a slope of 0.03.

The downstream limit of the model terminates just upstream of the confluence of Goldenstar Creek and a larger tributary from the northeast of the site. To determine the downstream water surface elevation, a normal depth calculation based on a slope of 0.01 is assigned as a boundary condition. The limit of the model is sufficiently downstream to establish the water surface elevation throughout the project. The extent of the analysis is considered to be sufficient to estimate the water surface elevation and velocity through the project area and determine if there are impacts to upstream properties.

Existing Condition Model

The existing condition model reflects the most recently surveyed channel configuration and is intended to study the existing configuration of the portion of Goldenstar Creek running through the project.

a. Existing ***Condition Model – Capacity***

HEC-RAS Files:

The following HEC-RAS files reflect the Existing Capacity Condition hydraulic model for Goldenstar Creek at Arroyo Vista. It includes roughness values that reflect a heavily vegetated and unmaintained state of the channel, as presented by Table 1:

	File:	Title:
Project:	19427_TTLC.prj	19427_TTLC
Plan:	19427_TTLC.p02	Existing_Capacity
Geometry:	19427_TTLC.g02	Existing_Capacity
Flow:	19427_TTLC.f02	Goldenstar - Flow

Proposed Condition Models

The following models were created for design purposes where the adjacent banks have been redefined at varying side slopes and includes the proposed road crossings via culverts.

b. Proposed Condition Model –Capacity

HEC-RAS Files:

The following HEC-RAS files reflect the Proposed Capacity Condition hydraulic model for Goldenstar Creek at Arroyo Vista. It includes roughness values that reflect a heavily vegetated and unmaintained state of the channel, as presented by Table 1. The results of this model may be used to check the capacity of the channel.:

	File:	Title:
Project:	19427_TTLC.prj	19427_TTLC
Plan:	19427_TTLC.p05	Proposed_Capacity_Box
Geometry:	19427_TTLC.g05	Proposed _Capacity_Box
Flow:	19427_TTLC.f01	Goldenstar - Flow_Proposed_Undetained

HYDRAULIC RESULTS

As previously discussed, hydraulic models were created in the GeoHECRAS modeling software and the HEC-RAS v.6.2 program was used to evaluate the hydraulic impacts to Goldenstar Creek of the proposed improvements. The resulting 100-year storm event model output may be found in Appendix 3.

Freeboard

For the channel span adjacent to the proposed development, the minimum amount of freeboard protecting the adjacent properties is approximately 6.5 feet at cross section 4284. The proposed culvert crossings at river stations 4215 and 2159 are not overtopped and have a minimum amount of freeboard of approximately 4 feet and 5 feet, respectively.

Riprap Sizing

Tractive forces and velocities should be considered to determine the minimum riprap size with final design of the culverts and proposed slopes within the floodplain.

Downstream Impacts

Upon comparison of the existing and proposed models, the average channel velocity and WSE downstream of the proposed project is unchanged during the 100 year storm event. Therefore no adverse effects due to the proposed channel improvements are anticipated to the downstream channel from a hydraulic standpoint.

Upstream Impacts

The results of the Proposed Capacity Condition Model indicate that there would be a maximum increase to the water surface elevation of approximately 3.5 feet to the existing water surface elevation at the cross-section 4284 during a 100-year storm event. The proposed condition flow regime matches with the existing condition flow regime at cross-section 4453. The resulting change in water surface elevation does not impact existing upstream structures. Therefore, no adverse effects due to the proposed channel improvements are anticipated to the upstream channel from a hydraulic standpoint.

CONCLUSION

This report presents a hydraulic analysis for a reach of the Goldenstar Creek in support of the proposed Arroyo Vista development project. The HEC-RAS v.6.2 computer program was used (as the main engine) to execute the hydraulic calculations. A maximum increase to water surface elevation of approximately 3.5 feet is indicated by this analysis located within the project reach due to the proposed improvements, specifically the upstream culvert crossing. No adverse effects due to the proposed channel improvements are anticipated to the upstream or downstream channel from a hydraulic standpoint. Freeboard along the banks adjacent to the channel is anticipated to be in excess of 5 feet, and no overtopping is anticipated of the proposed culverts or the proposed pads.

Appendix 1

HEC-RAS Backup Information

Image Date: 1/26/2022

Existing Channel Photos – Arroyo Vista
JN 19427

Image Date: 1/26/2022

Existing Channel Photos – Arroyo Vista
JN 19427

Image Date: 1/26/2022

Existing Channel Photos – Arroyo Vista
JN 19427

Image Date: 1/16/2015

Existing Channel Photos – Arroyo Vista
JN 19427

Image Date: 1/16/2015

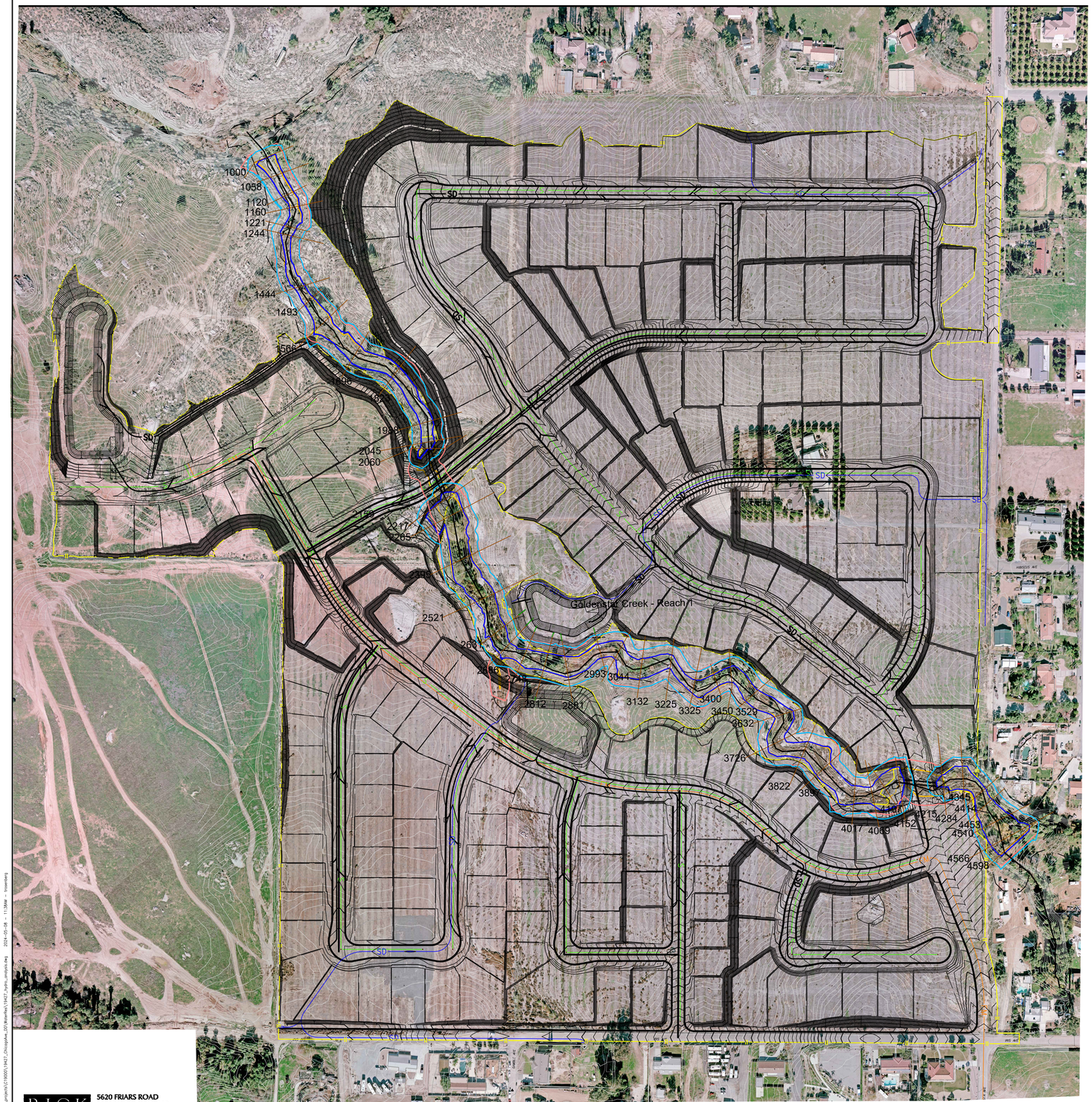
Existing Channel Photos – Arroyo Vista
JN 19427

Image Date: 1/16/2015

Existing Channel Photos – Arroyo Vista
JN 19427

Appendix 2

HEC-RAS Workmap



LEGEND:

- DWR AWARDNESS FLOODPLAIN
- APPROXIMATE HEC-RAS 100-YEAR FLOODPLAIN
- APPROXIMATE HEC-RAS 100-YEAR PRE-PROJECT FLOODPLAIN
- HEC-RAS CROSS SECTION
- CHANNEL BANK STATION
- APPROXIMATE PRE-PORJECT HEC-RAS100-YEAR FLOODPLAIN 25 FT OFFSET
- APPROXIMATE HEC-RAS 100-YEAR FLOODPLAIN 25 FT OFFSET
- PROPOSED GRADING DAYLIGHT LINE
- INEFFECTIVE FLOW AREA

N

150 75 0 150 300 450

GRAPHIC SCALE: 1"=150'

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HYDRAULIC MAP FOR ARROYO VISTA PRELIMINARY ENGINEERING

(PRE & POST-PROJECT)

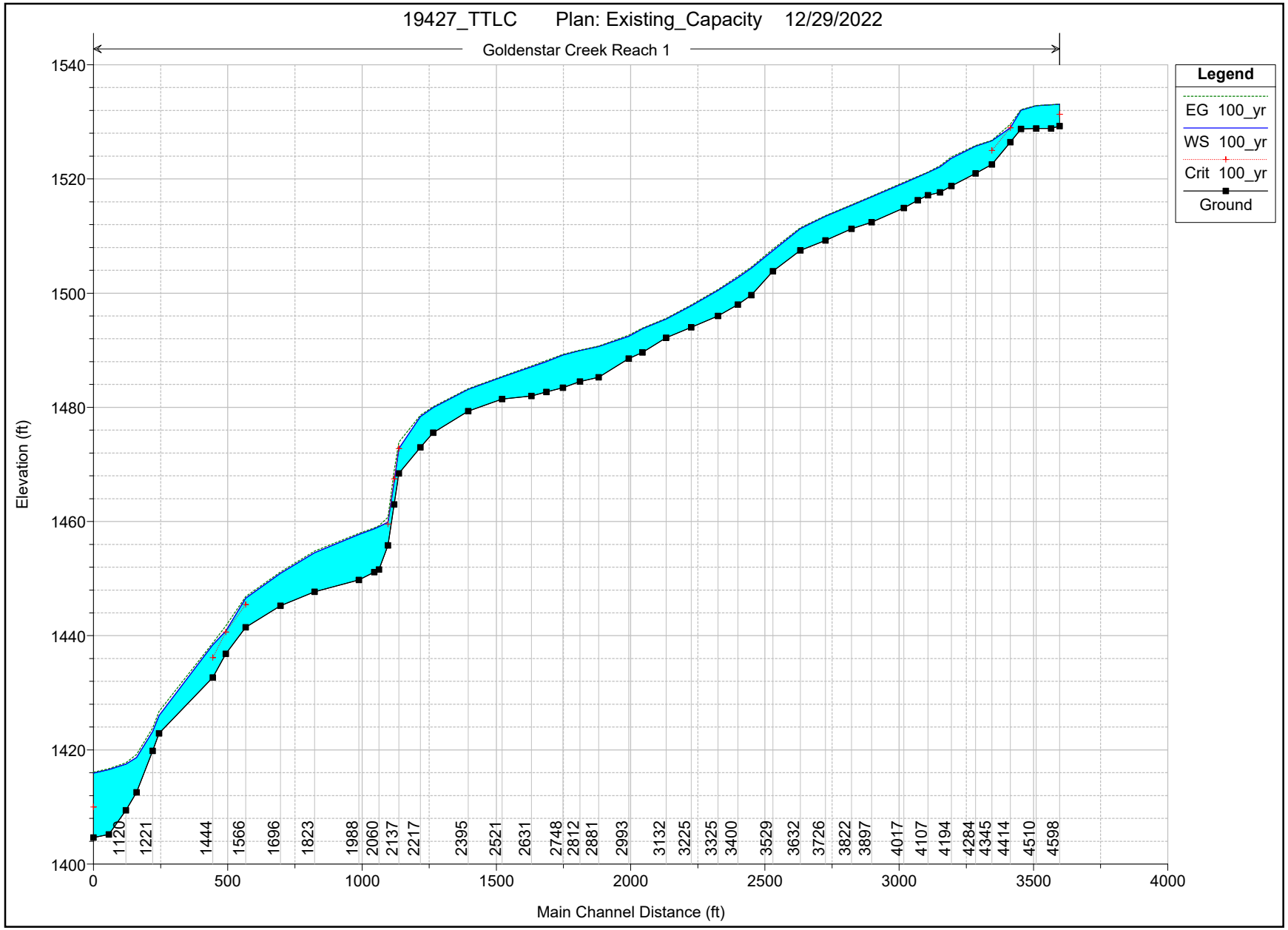
J-19427

DATE: 02/12/2022
REVISED: 05/08/2024

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY REPORT ONLY

Appendix 3

HEC-RAS Output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Goldenstar Creek Reach 1
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
Ground
Elevation (ft)
Main Channel Distance (ft)
1540
1520
1500
1480
1460
1440
1420
1400
0
500
1000
1500
2000
2500
3000
3500
4000
1120
1221
1444
1566
1696
1823
1988
2060
2137
2217
2395
2521
2631
2748
2812
2881
2993
3132
3225
3325
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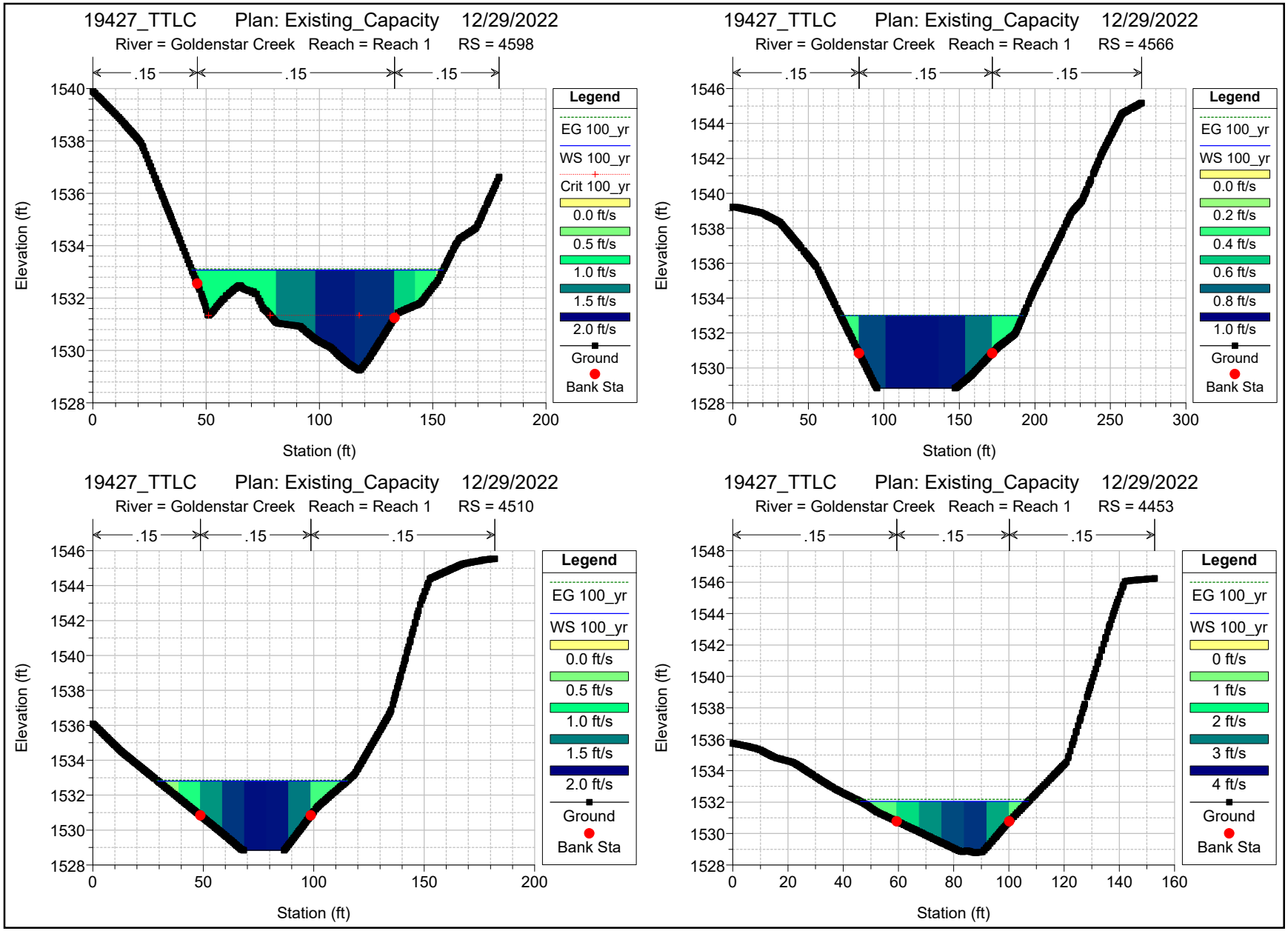
4345
4414
4510
4598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River = Goldenstar Creek Reach = Reach 1 RS = 4598
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 4566
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
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River = Goldenstar Creek Reach = Reach 1 RS = 4510
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta
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River = Goldenstar Creek Reach = Reach 1 RS = 4453
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Elevation (ft)
Station (ft)
Legend
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WS 100_yr
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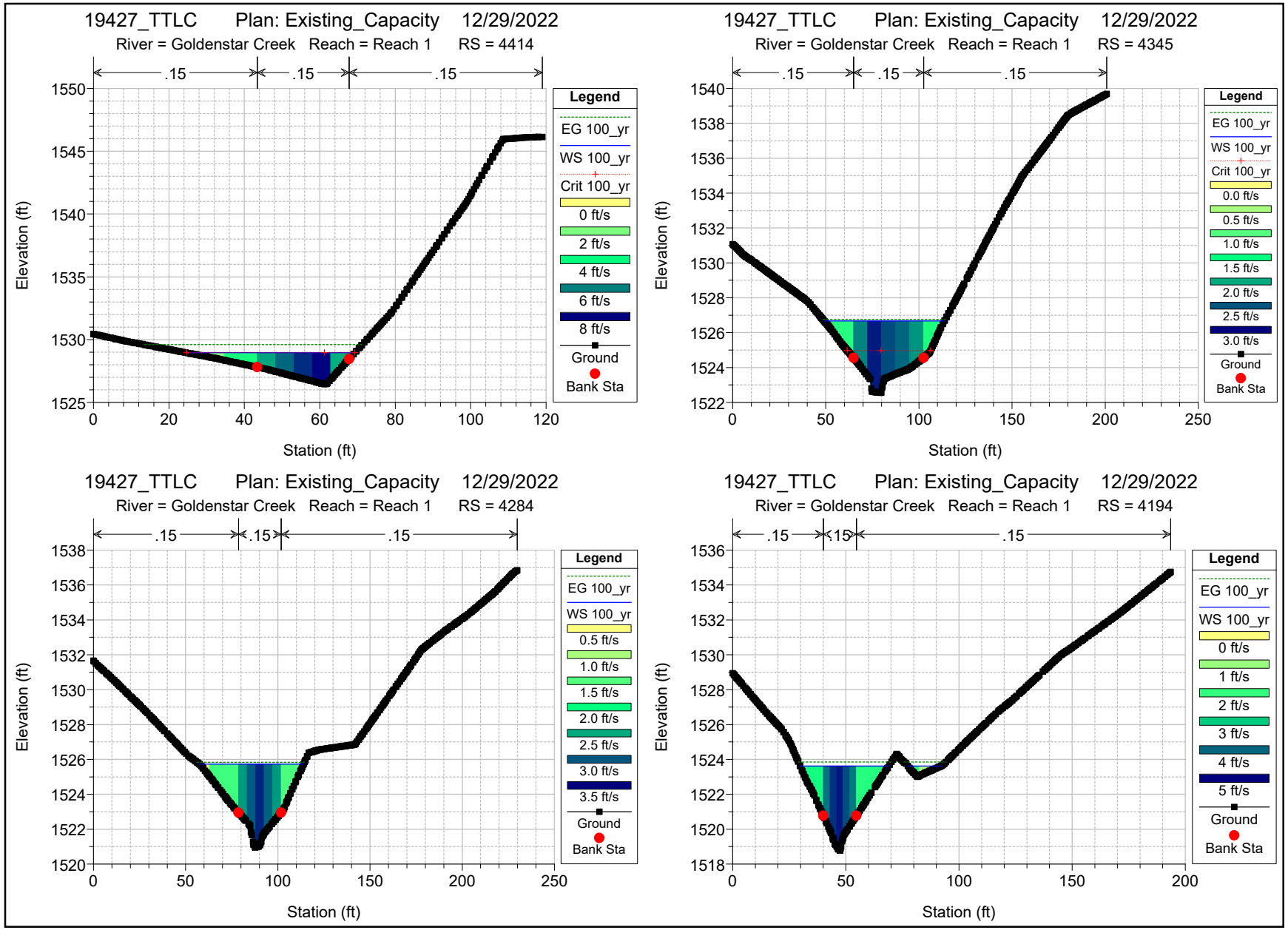
3 ft/s
4 ft/s
Ground
Bank Sta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Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
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Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
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0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
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2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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Elevation (ft)
Station (ft)
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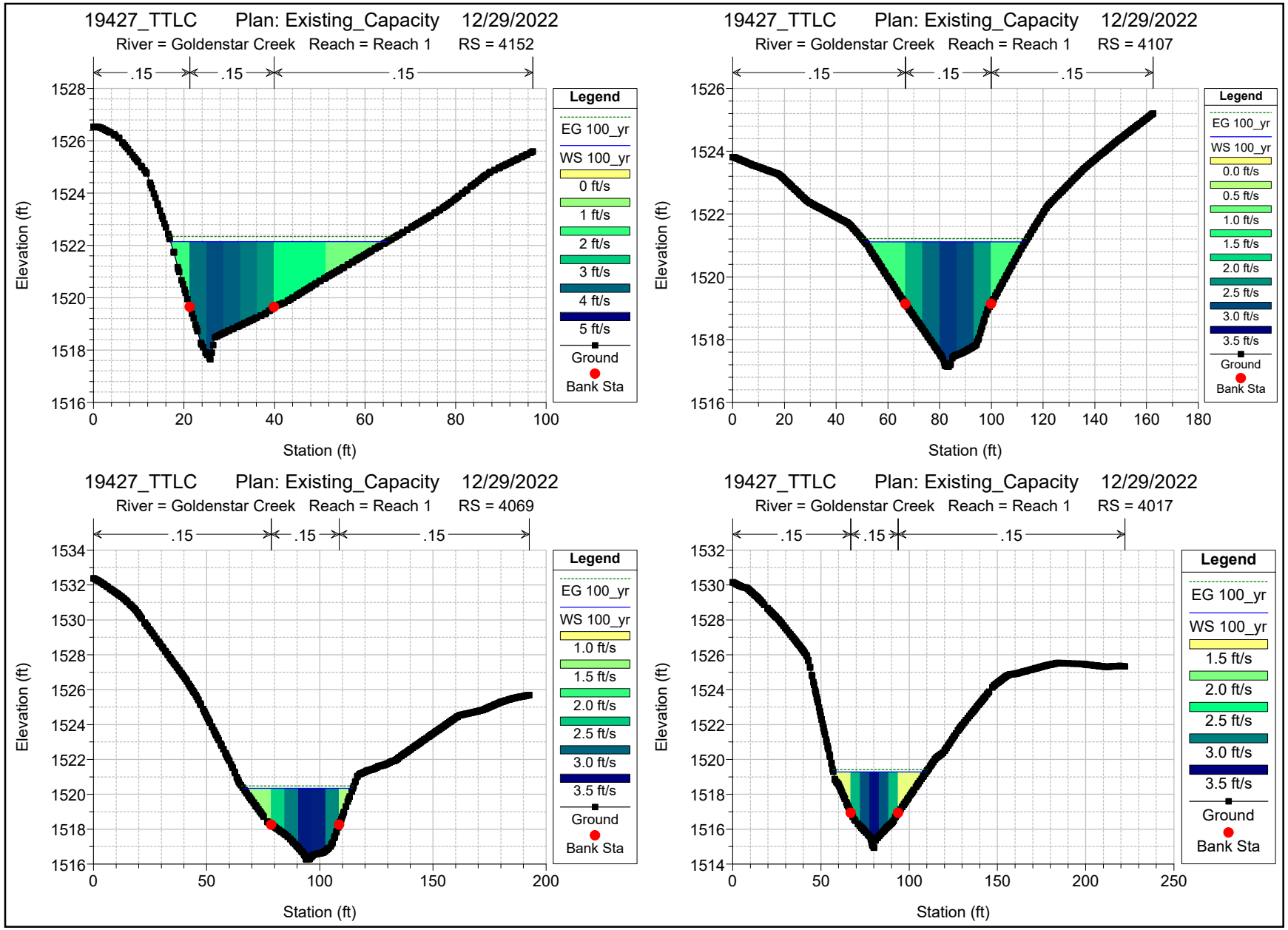
Ground
Bank Sta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Station (ft)
Legend
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WS 100_yr
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1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
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River = Goldenstar Creek Reach = Reach 1 RS = 4107
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Elevation (ft)
Station (ft)
Legend
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WS 100_yr
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0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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River = Goldenstar Creek Reach = Reach 1 RS = 4017
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
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WS 100_yr
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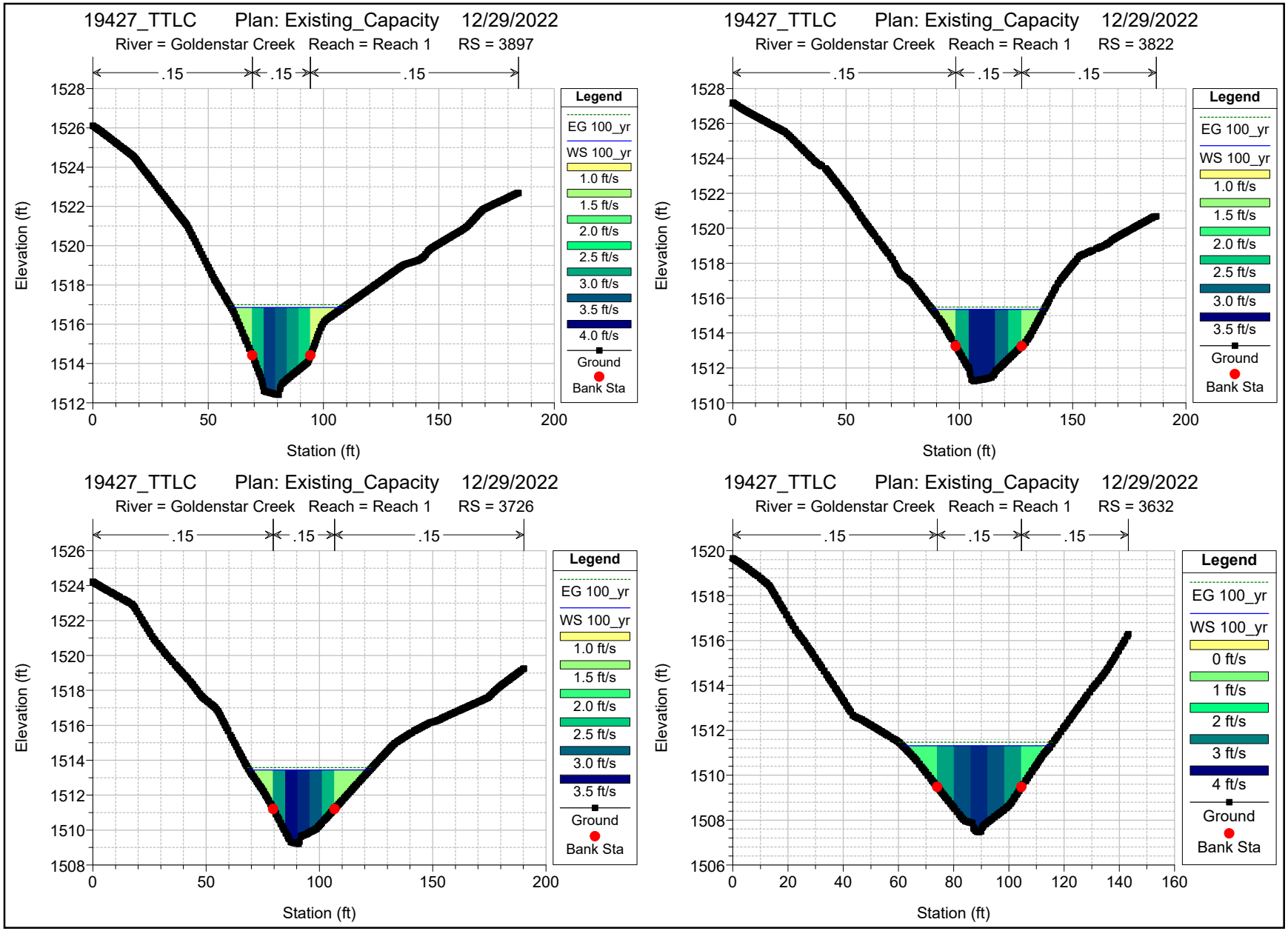
3.5 ft/s
Ground
Bank Sta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2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
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Elevation (ft)
Station (ft)
Legend
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WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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River = Goldenstar Creek Reach = Reach 1 RS = 3726
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Elevation (ft)
Station (ft)
Legend
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WS 100_yr
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2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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Elevation (ft)
Station (ft)
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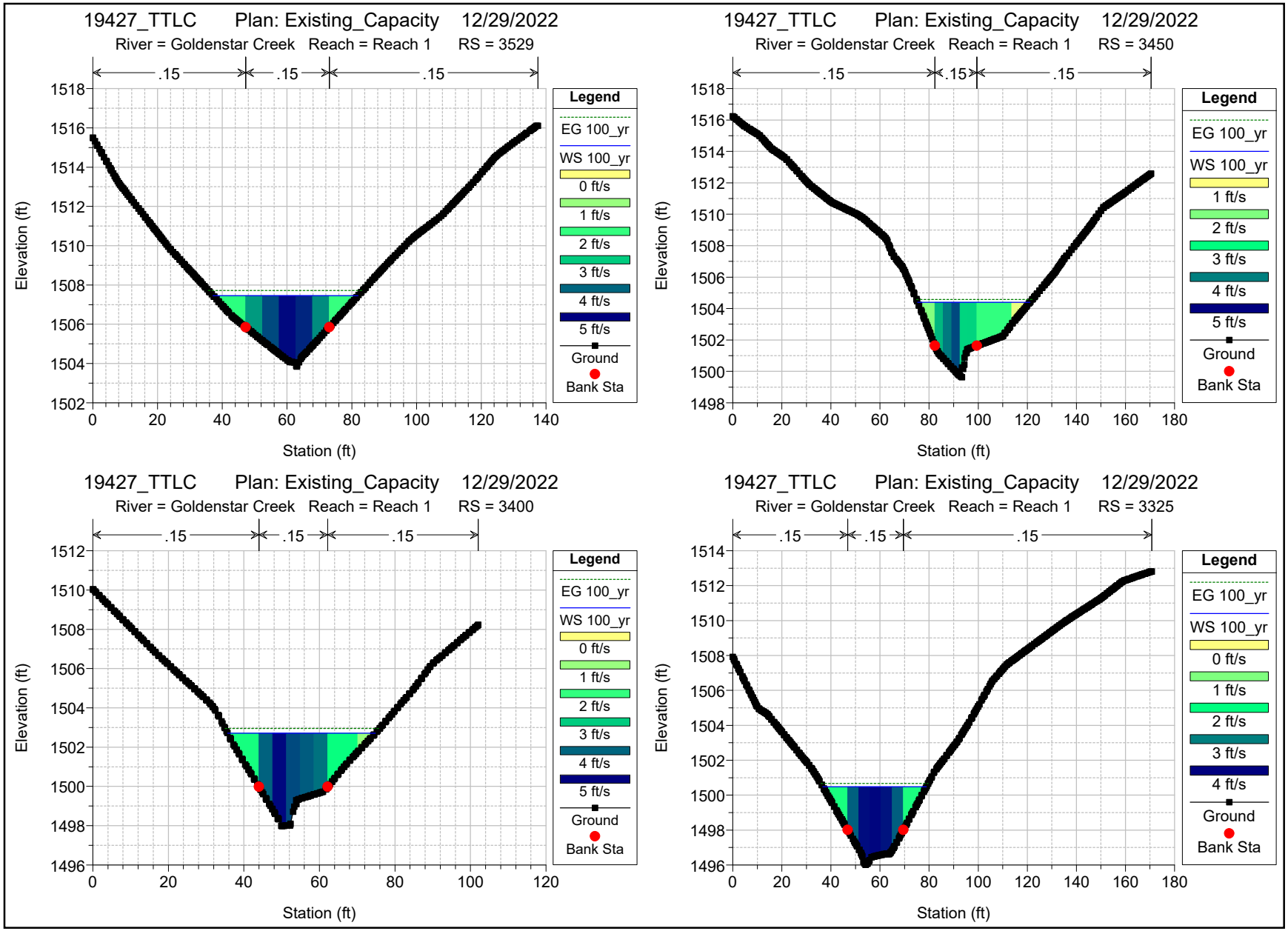
4 ft/s
Ground
Bank Sta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3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
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.15 .15 .15
Elevation (ft)
Station (ft)
Legend
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WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
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Station (ft)
Legend
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3 ft/s
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Ground
Bank Sta
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Elevation (ft)
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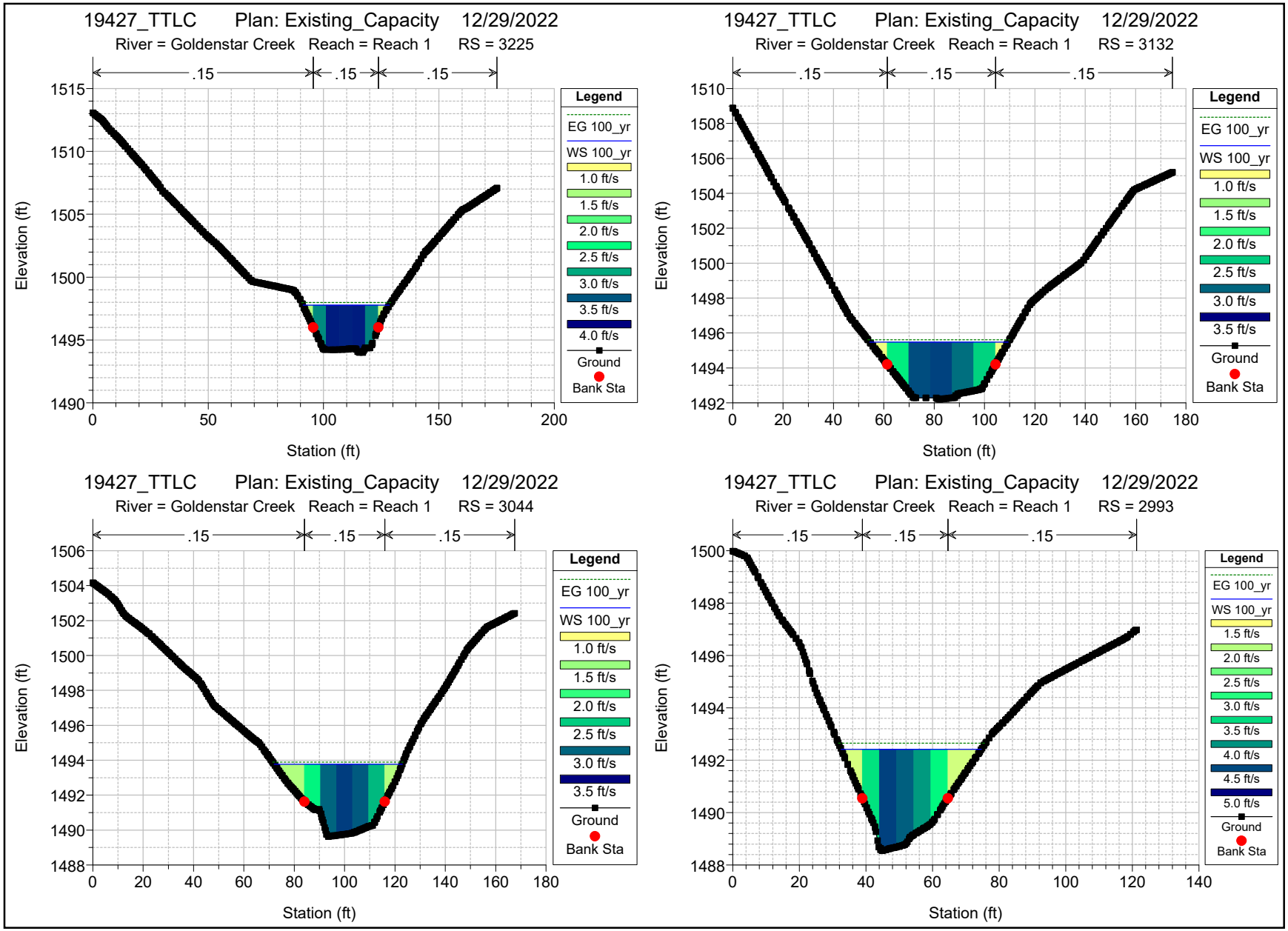
Ground
Bank Sta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Station (ft)
Legend
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WS 100_yr
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2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
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.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
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1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
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.15 .15 .15
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Station (ft)
Legend
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WS 100_yr
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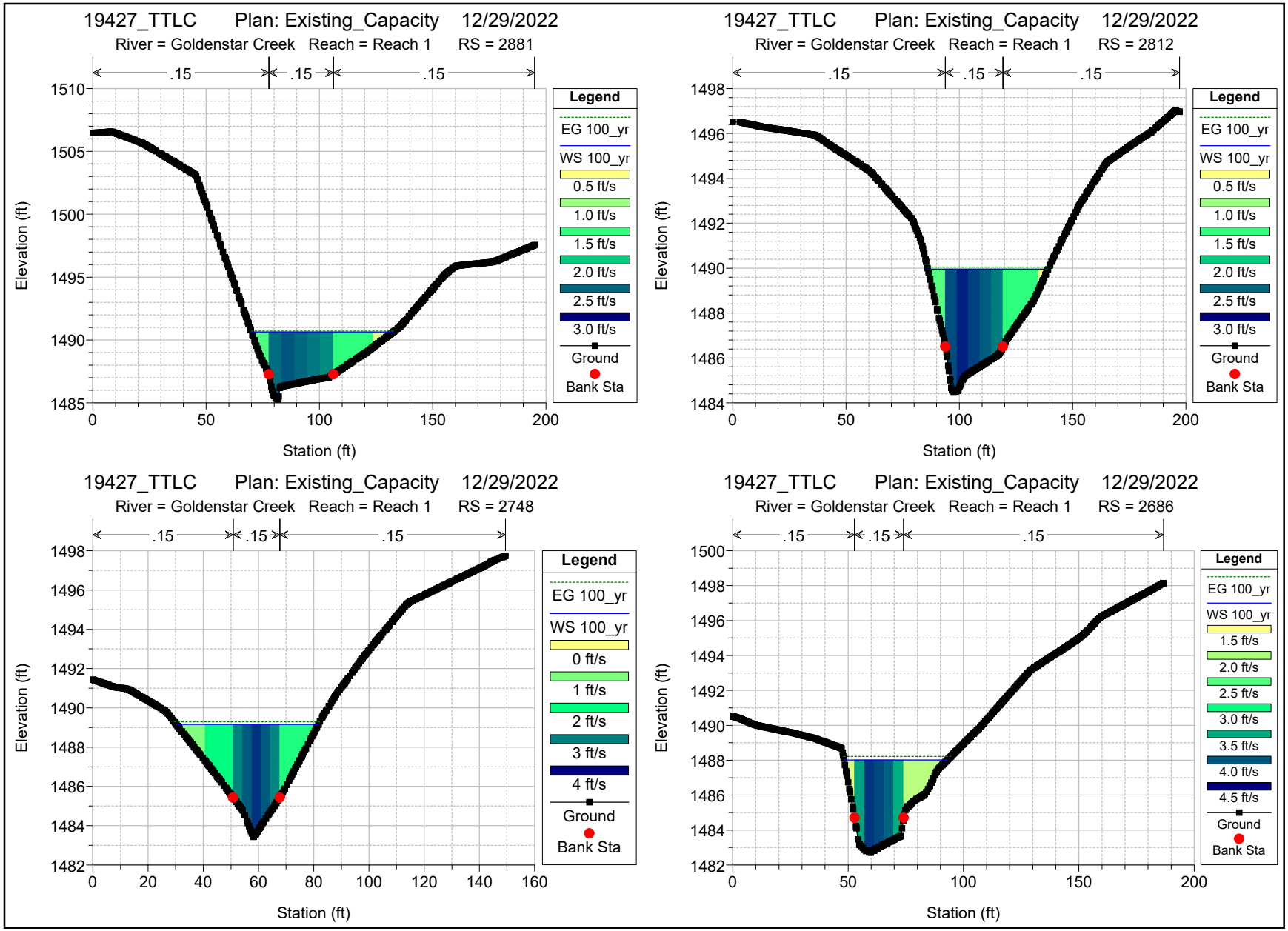
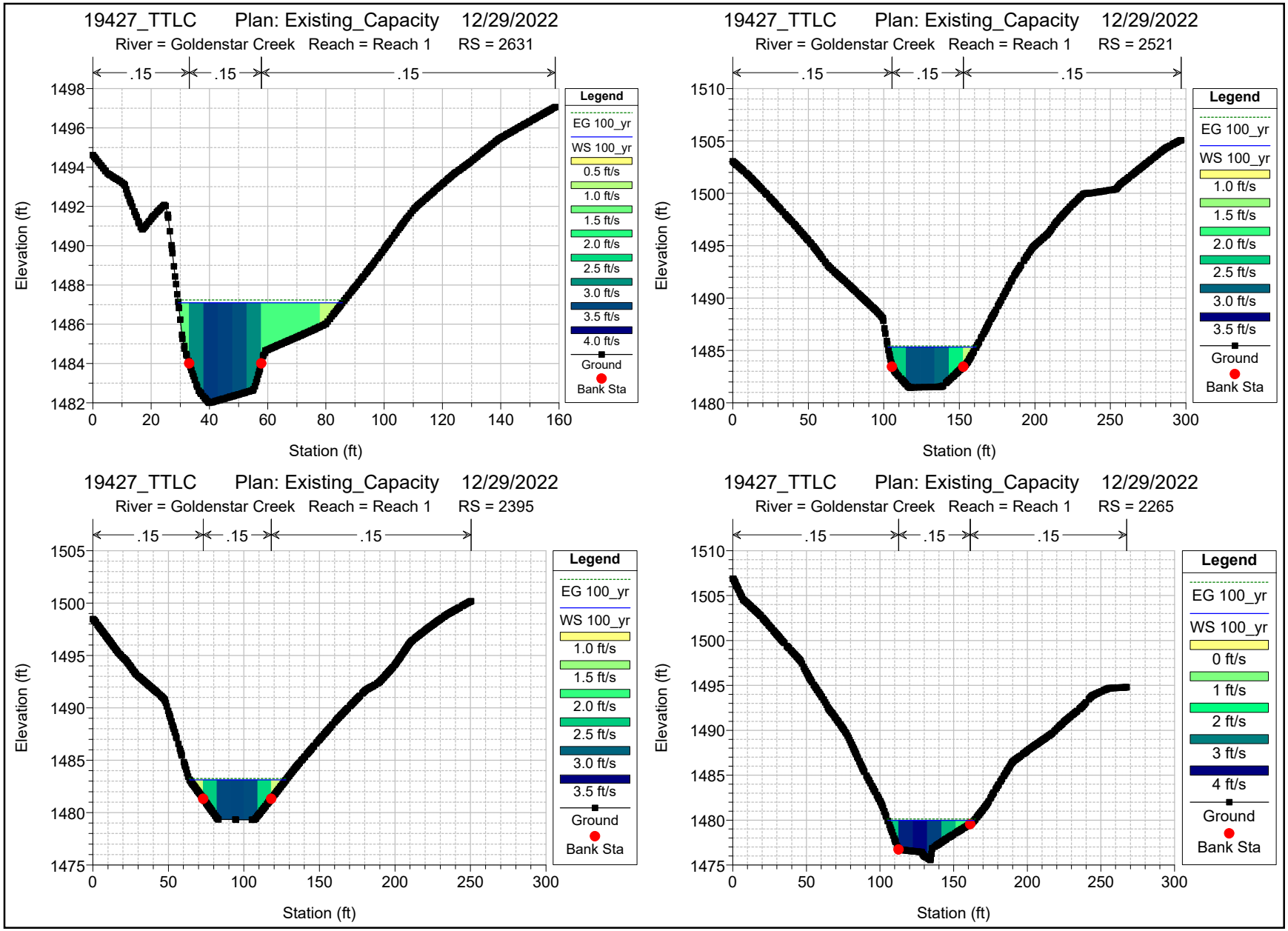
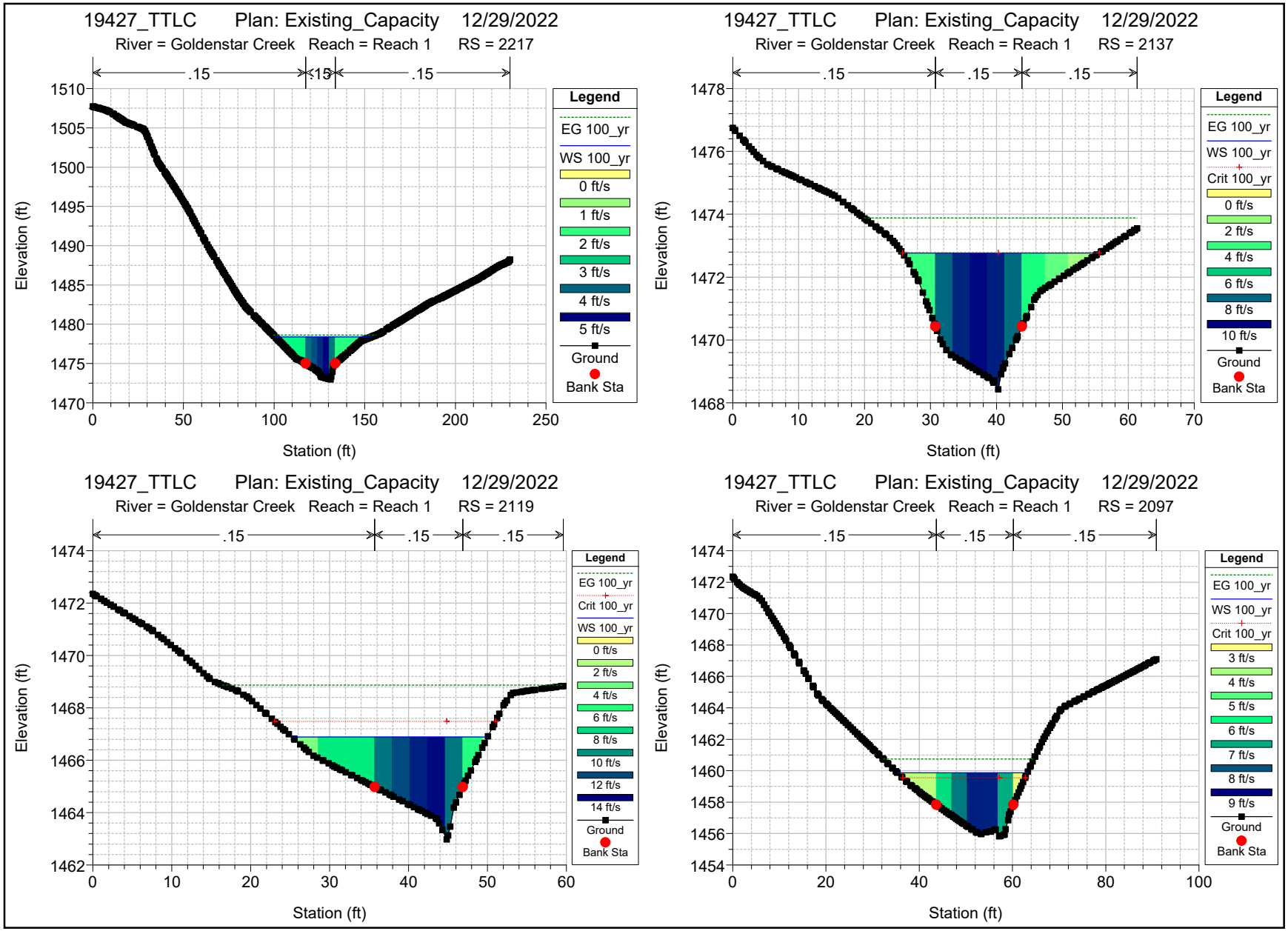
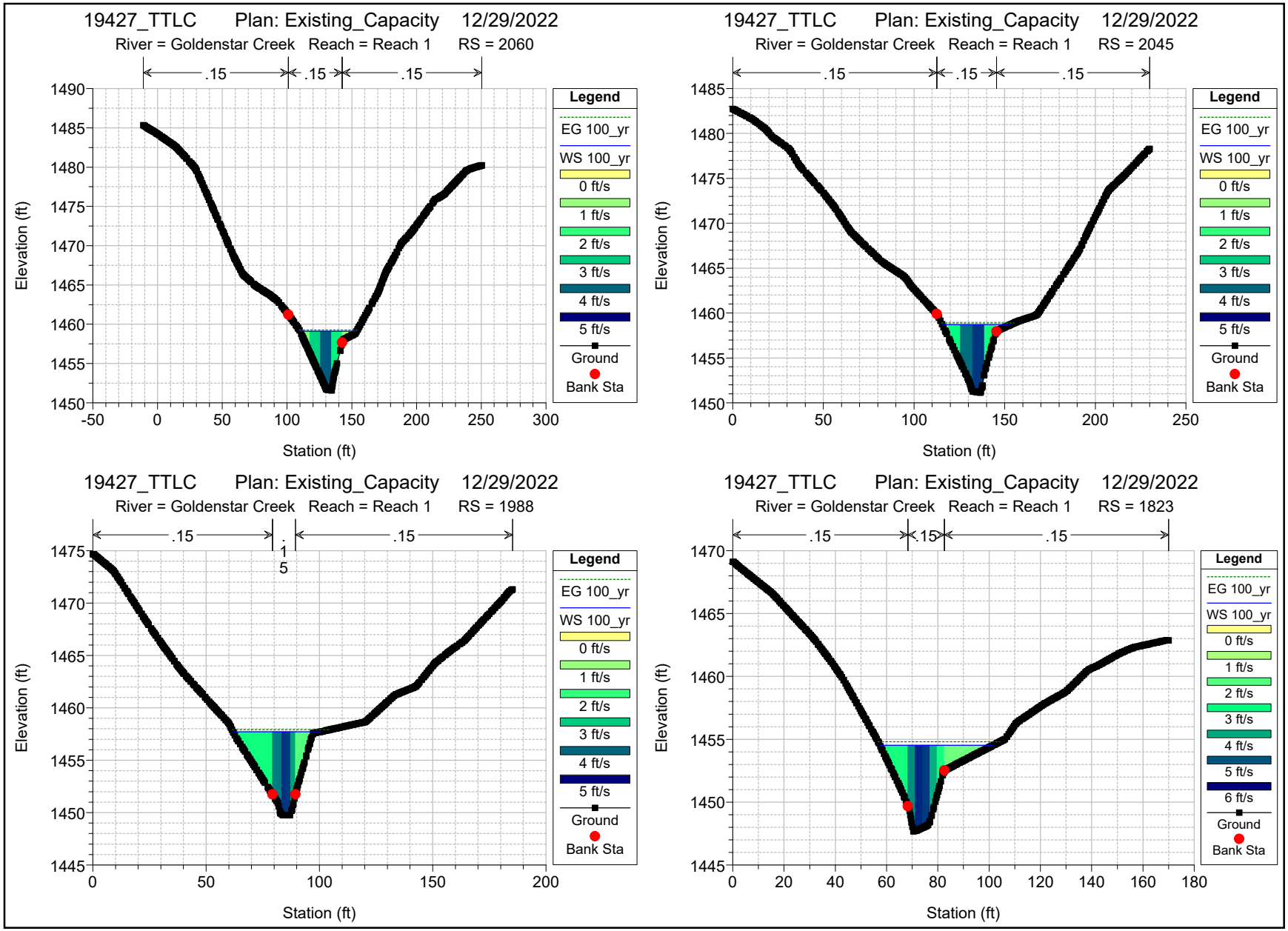
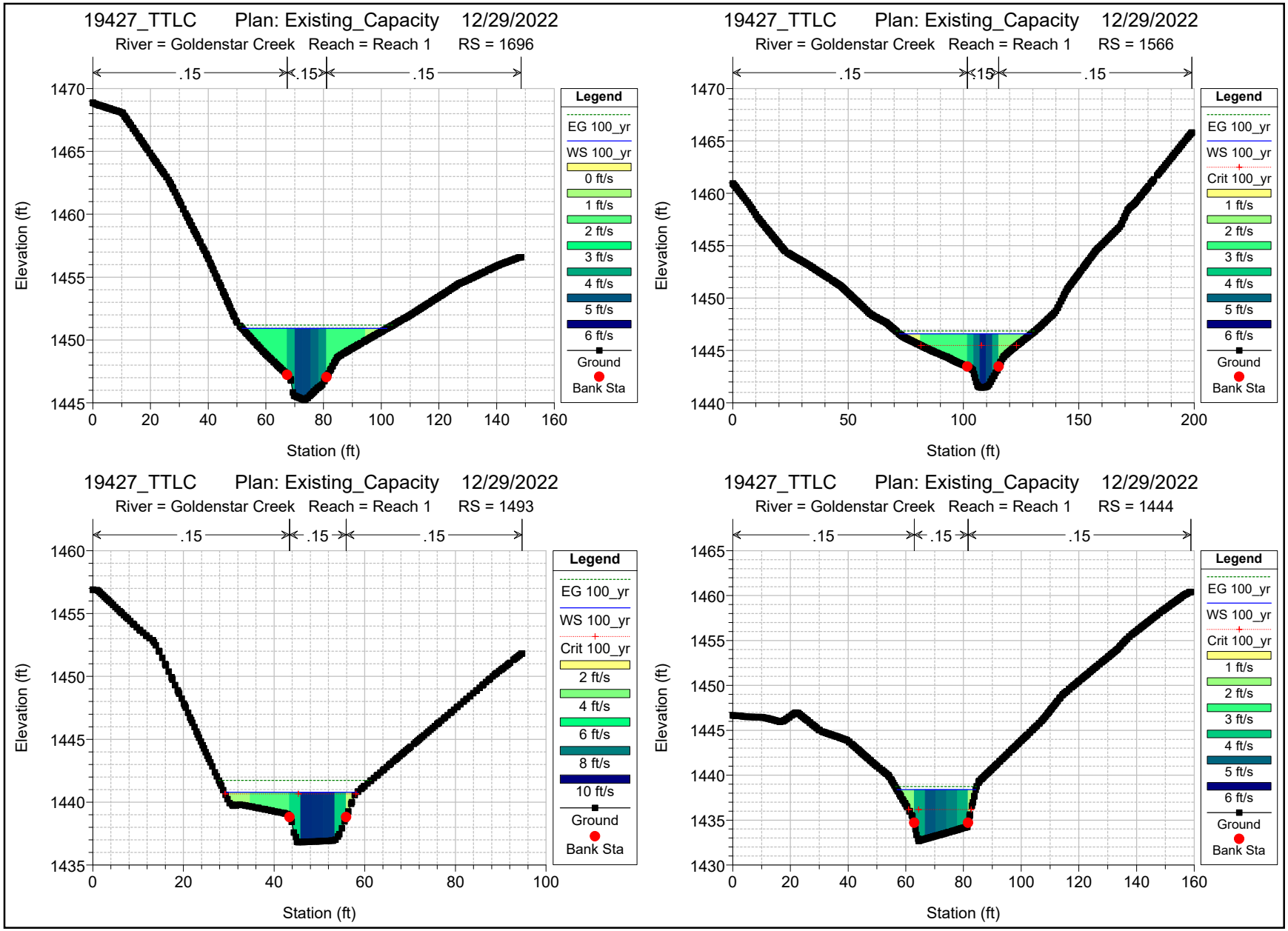
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
5.0 ft/s
Ground
Bank Sta

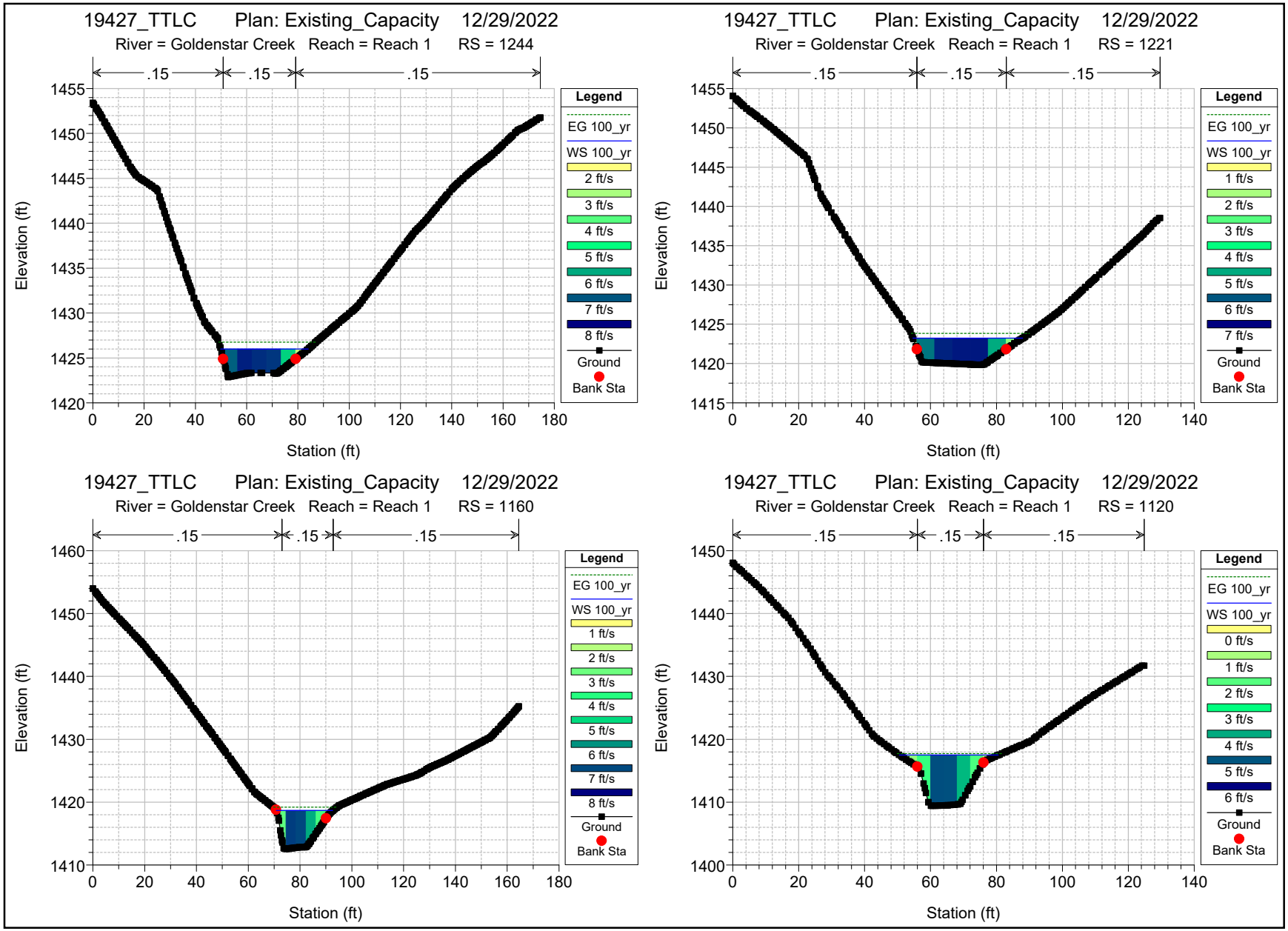

19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2881
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2812
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2748
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2686
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Bank Sta

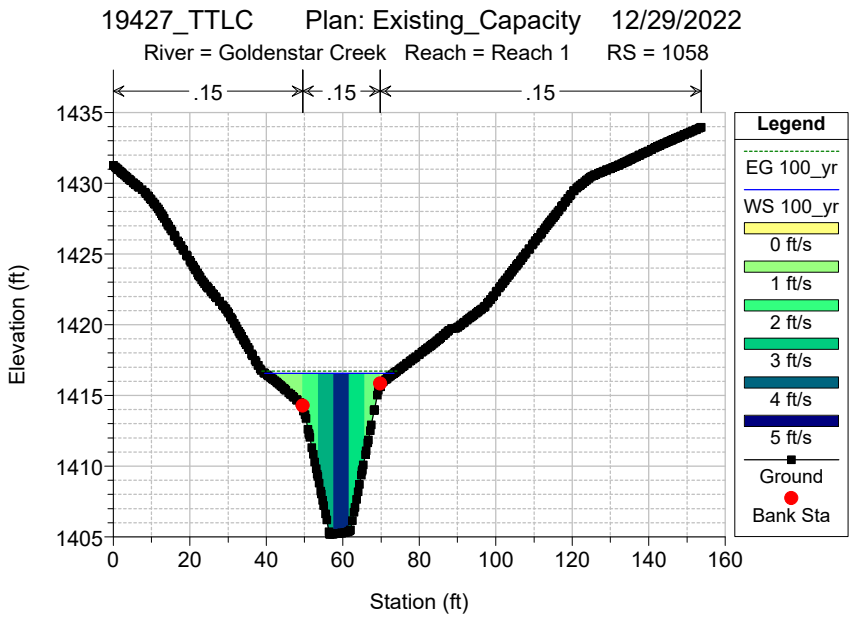

19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2631
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2521
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2395
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2265
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta

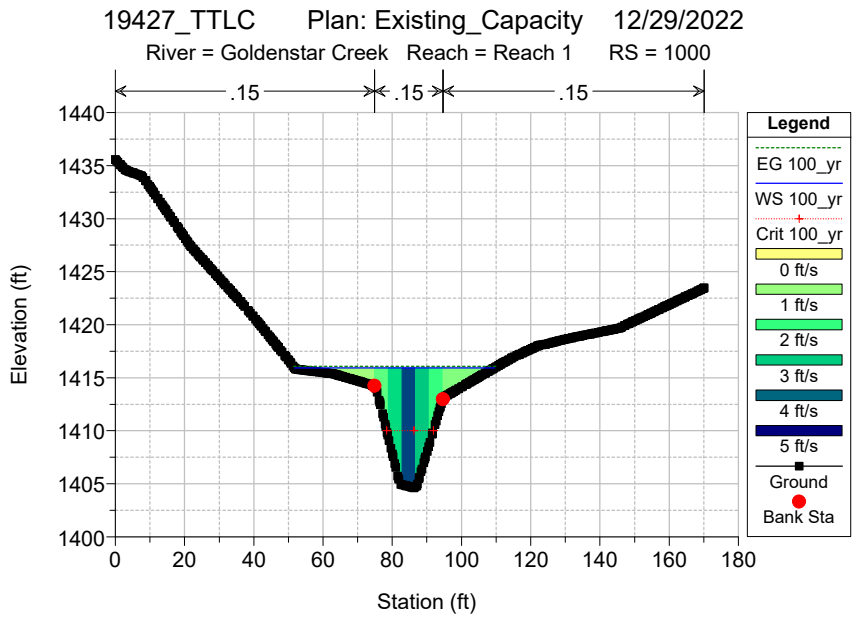

19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2217
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2137
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2119
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
Crit 100_yr
WS 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
14 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2097
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
9 ft/s
Ground
Bank Sta


19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2060
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 2045
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1988
.15
.1
5
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1823
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta


19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1696
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1566
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1493
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1444
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta

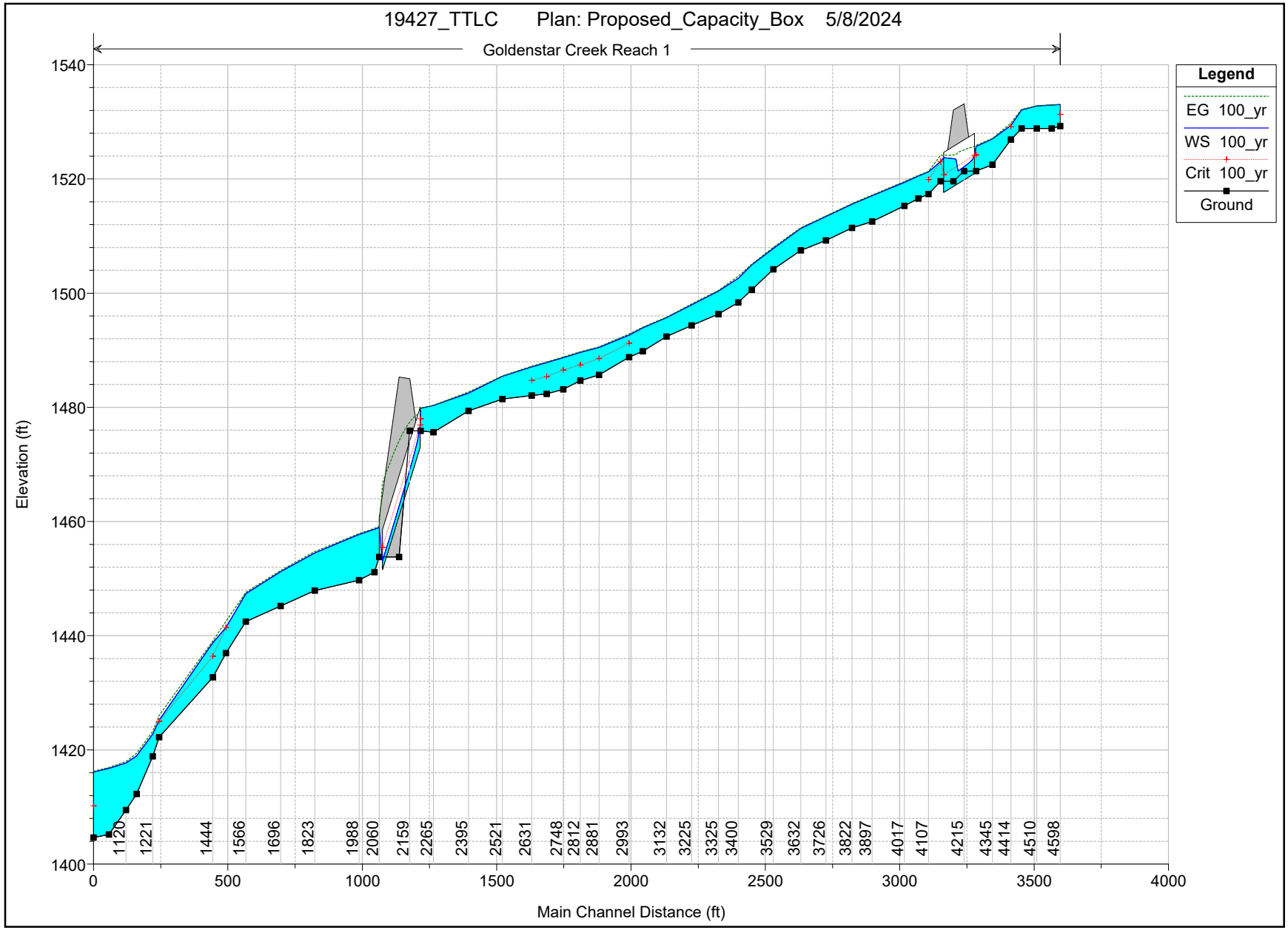

19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1244
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1221
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1160
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
8 ft/s
Ground
Bank Sta
19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1120
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta


19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1058
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta


19427_TTLC Plan: Existing_Capacity 12/29/2022
River = Goldenstar Creek Reach = Reach 1 RS = 1000
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta

HEC-RAS Plan: Exist_Capacity River: Goldenstar Creek Reach: Reach 1 Profile: 100_yr

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	4598	100_yr	315.00	1529.24	1533.05	1531.33	1533.09	0.009531	1.58	207.54	110.63	0.19
Reach 1	4566	100_yr	315.00	1528.84	1532.97		1532.98	0.001444	0.91	368.66	120.59	0.08
Reach 1	4510	100_yr	315.00	1528.84	1532.79		1532.83	0.006296	1.74	199.51	85.32	0.17
Reach 1	4453	100_yr	315.00	1528.78	1532.02		1532.16	0.029950	3.06	110.47	60.51	0.35
Reach 1	4414	100_yr	315.00	1526.45	1528.93	1528.93	1529.58	0.227288	6.73	52.43	44.18	0.90
Reach 1	4345	100_yr	345.00	1522.55	1526.81	1525.05	1526.90	0.014362	2.53	152.80	66.39	0.25
Reach 1	4284	100_yr	345.00	1520.95	1525.86		1525.98	0.016007	2.99	139.49	58.75	0.27
Reach 1	4194	100_yr	345.00	1518.77	1523.75		1523.98	0.033528	4.38	101.74	56.80	0.39
Reach 1	4152	100_yr	345.00	1517.65	1522.27		1522.47	0.033833	4.02	104.61	49.29	0.38
Reach 1	4107	100_yr	345.00	1517.14	1521.24		1521.36	0.017378	2.83	139.10	64.37	0.28
Reach 1	4069	100_yr	345.00	1516.26	1520.48		1520.62	0.020321	3.11	122.27	49.62	0.30
Reach 1	4017	100_yr	345.00	1514.93	1519.42		1519.56	0.020551	3.18	125.30	53.96	0.30
Reach 1	3897	100_yr	345.00	1512.41	1516.98		1517.14	0.019858	3.30	119.60	50.90	0.30
Reach 1	3822	100_yr	345.00	1511.25	1515.48		1515.62	0.019986	3.13	123.02	50.74	0.30
Reach 1	3726	100_yr	345.00	1509.21	1513.56		1513.70	0.020026	3.17	125.35	54.73	0.30
Reach 1	3632	100_yr	345.00	1507.47	1511.44		1511.60	0.025661	3.32	116.82	55.50	0.33
Reach 1	3529	100_yr	345.00	1503.85	1507.53		1507.82	0.056318	4.48	86.12	45.61	0.48
Reach 1	3450	100_yr	345.00	1499.63	1504.40		1504.58	0.028951	3.79	109.27	45.72	0.35
Reach 1	3400	100_yr	345.00	1497.98	1502.70		1502.95	0.036722	4.30	93.60	39.11	0.40
Reach 1	3325	100_yr	345.00	1496.01	1500.48		1500.67	0.026028	3.69	105.88	42.19	0.34
Reach 1	3225	100_yr	345.00	1494.00	1497.77		1497.97	0.028295	3.61	100.23	37.47	0.35
Reach 1	3132	100_yr	345.00	1492.20	1495.48		1495.61	0.022364	2.87	125.01	55.04	0.31
Reach 1	3044	100_yr	345.00	1489.63	1493.77		1493.89	0.017057	2.89	130.37	50.84	0.28
Reach 1	2993	100_yr	345.00	1488.54	1492.36		1492.61	0.039898	4.09	92.42	41.59	0.41
Reach 1	2881	100_yr	345.00	1485.26	1490.48		1490.56	0.010131	2.42	166.23	61.11	0.22
Reach 1	2812	100_yr	345.00	1484.50	1489.79		1489.88	0.010071	2.58	154.76	51.95	0.22
Reach 1	2748	100_yr	370.00	1483.43	1488.82		1488.98	0.019891	3.64	126.24	48.28	0.31
Reach 1	2686	100_yr	370.00	1482.70	1487.66		1487.82	0.017734	3.43	123.55	41.62	0.29
Reach 1	2631	100_yr	370.00	1482.00	1486.91		1487.02	0.012081	2.86	153.08	55.28	0.24
Reach 1	2521	100_yr	460.00	1481.45	1485.31		1485.44	0.016951	2.85	167.66	58.40	0.28
Reach 1	2395	100_yr	460.00	1479.32	1483.13		1483.25	0.017651	2.92	167.29	63.77	0.28
Reach 1	2265	100_yr	460.00	1475.56	1479.95		1480.13	0.034485	3.42	138.49	58.73	0.38
Reach 1	2217	100_yr	460.00	1473.00	1478.39		1478.62	0.028566	4.35	134.00	53.12	0.36
Reach 1	2137	100_yr	460.00	1468.43	1472.76	1472.76	1473.89	0.174250	8.97	60.14	29.82	0.86
Reach 1	2119	100_yr	460.00	1462.98	1466.89	1467.48	1468.87	0.467064	12.20	44.02	24.77	1.31
Reach 1	2097	100_yr	460.00	1455.83	1459.88	1459.55	1460.74	0.139128	7.75	65.70	27.90	0.76
Reach 1	2060	100_yr	460.00	1451.59	1459.11		1459.27	0.017323	3.22	147.96	43.84	0.27
Reach 1	2045	100_yr	460.00	1451.14	1458.70		1458.90	0.023041	3.62	129.22	37.44	0.31
Reach 1	1988	100_yr	460.00	1449.75	1457.73		1457.91	0.013521	4.01	150.50	38.87	0.26
Reach 1	1823	100_yr	460.00	1447.67	1454.52		1454.80	0.028158	4.64	121.63	44.08	0.35
Reach 1	1696	100_yr	460.00	1445.23	1450.94		1451.20	0.028307	4.66	129.58	50.49	0.37
Reach 1	1566	100_yr	470.00	1441.46	1446.60	1445.50	1446.88	0.039471	5.00	126.11	57.38	0.42
Reach 1	1493	100_yr	470.00	1436.81	1440.88		1441.78	0.141018	8.20	67.74	29.75	0.75
Reach 1	1444	100_yr	470.00	1432.69	1438.35	1436.22	1438.70	0.032046	4.85	105.35	27.24	0.39
Reach 1	1244	100_yr	470.00	1422.88	1425.88		1426.60	0.157198	6.85	70.34	33.64	0.78
Reach 1	1221	100_yr	470.00	1419.83	1423.08		1423.64	0.099821	6.08	79.49	32.55	0.64
Reach 1	1160	100_yr	470.00	1412.55	1418.41		1418.91	0.063399	5.68	83.42	20.93	0.48
Reach 1	1120	100_yr	470.00	1409.41	1417.20		1417.44	0.022005	3.98	121.67	27.82	0.29
Reach 1	1058	100_yr	470.00	1405.18	1416.28		1416.43	0.011688	3.11	157.10	30.96	0.20
Reach 1	1000	100_yr	470.00	1404.63	1415.67	1409.79	1415.80	0.010006	3.01	175.63	52.39	0.19


19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
Goldenstar Creek Reach 1
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
Ground
Elevation (ft)
Main Channel Distance (ft)
1540
1520
1500
1480
1460
1440
1420
1400
0
500
1000
1500
2000
2500
3000
3500
4000
1120
1221
1444
1566
1696
1823
1988
2060
2159
2265
2395
2521
2631
2748
2812
2881
2993
3132
3225
3325
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3529
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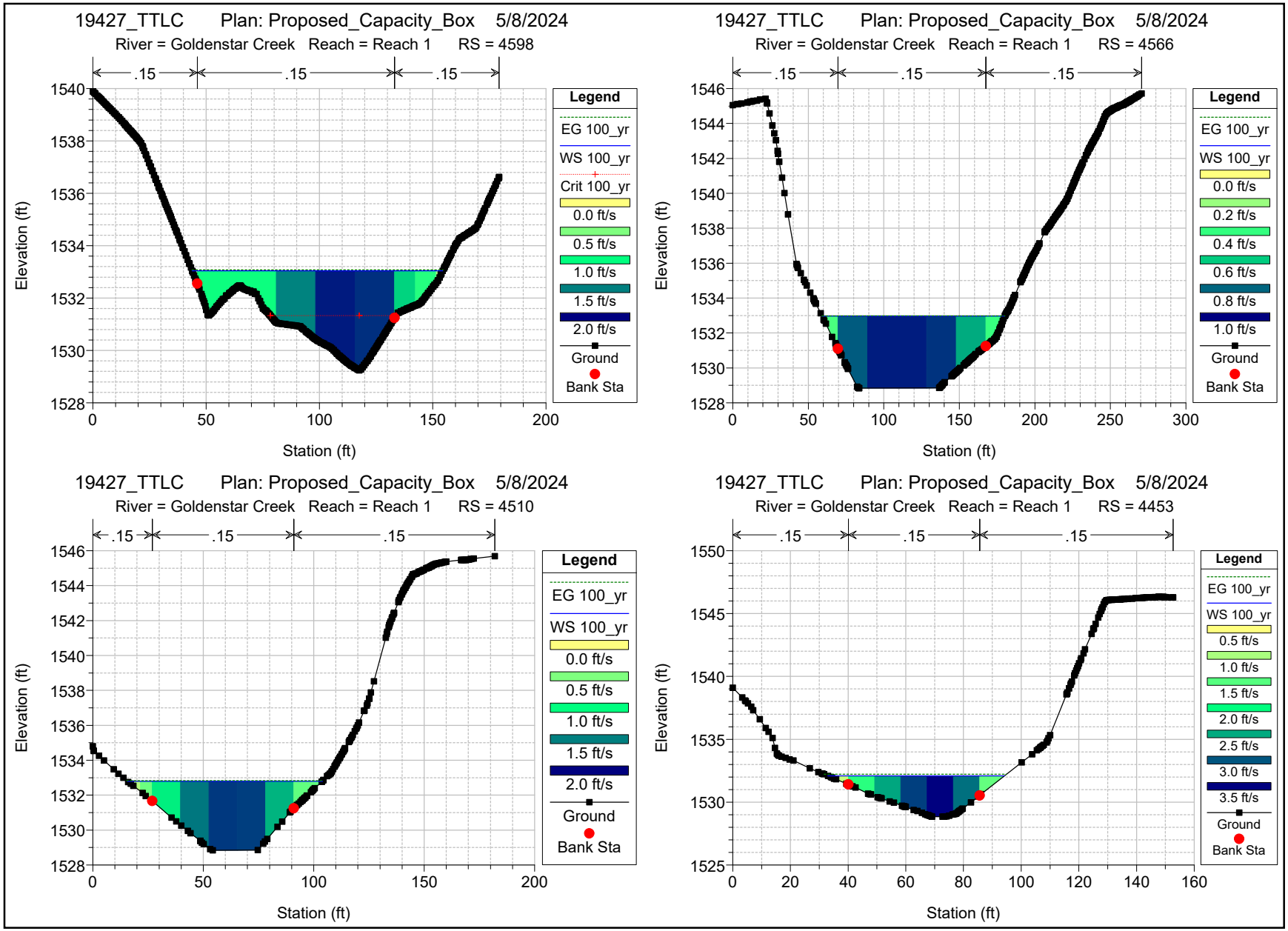
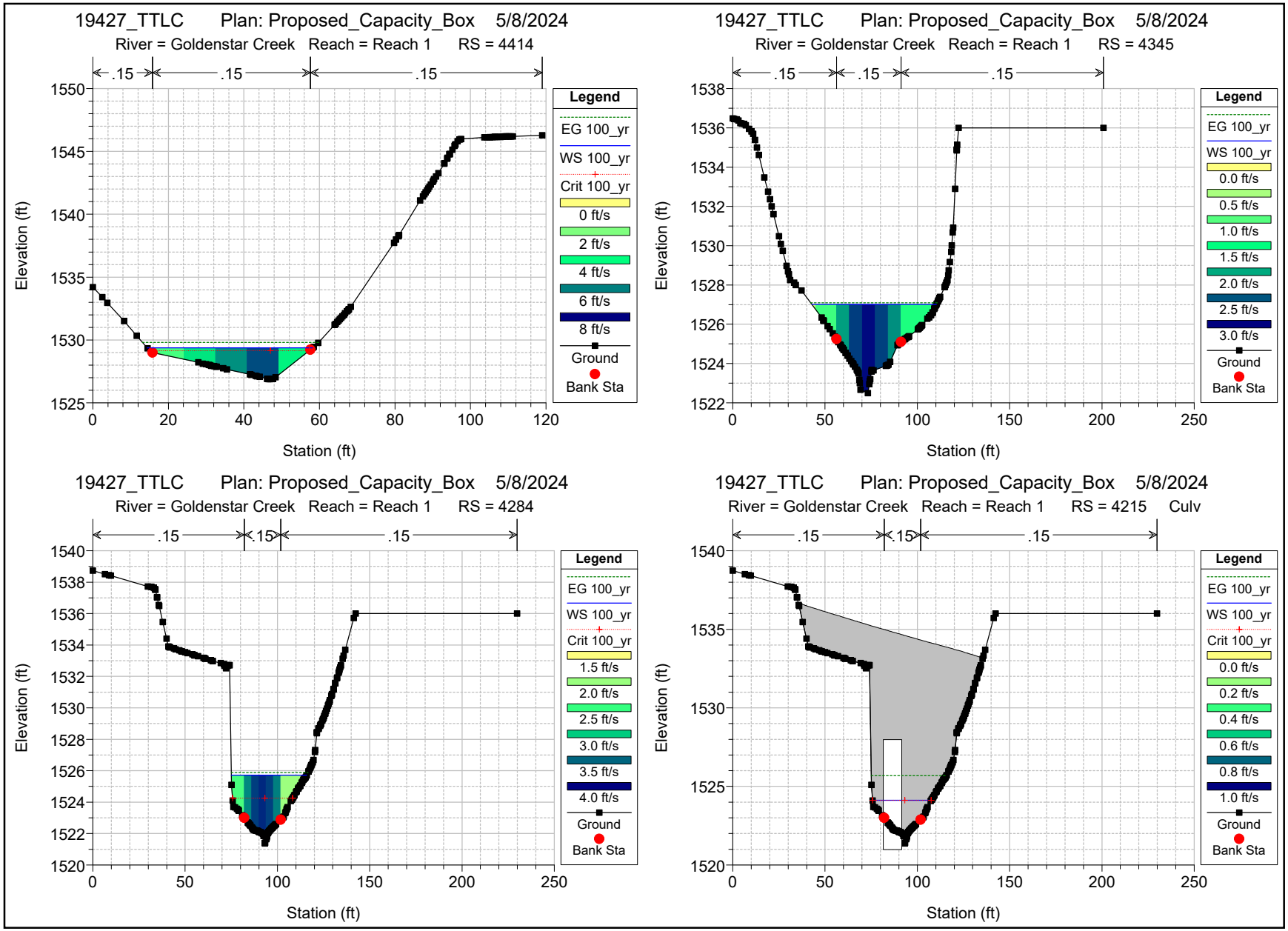
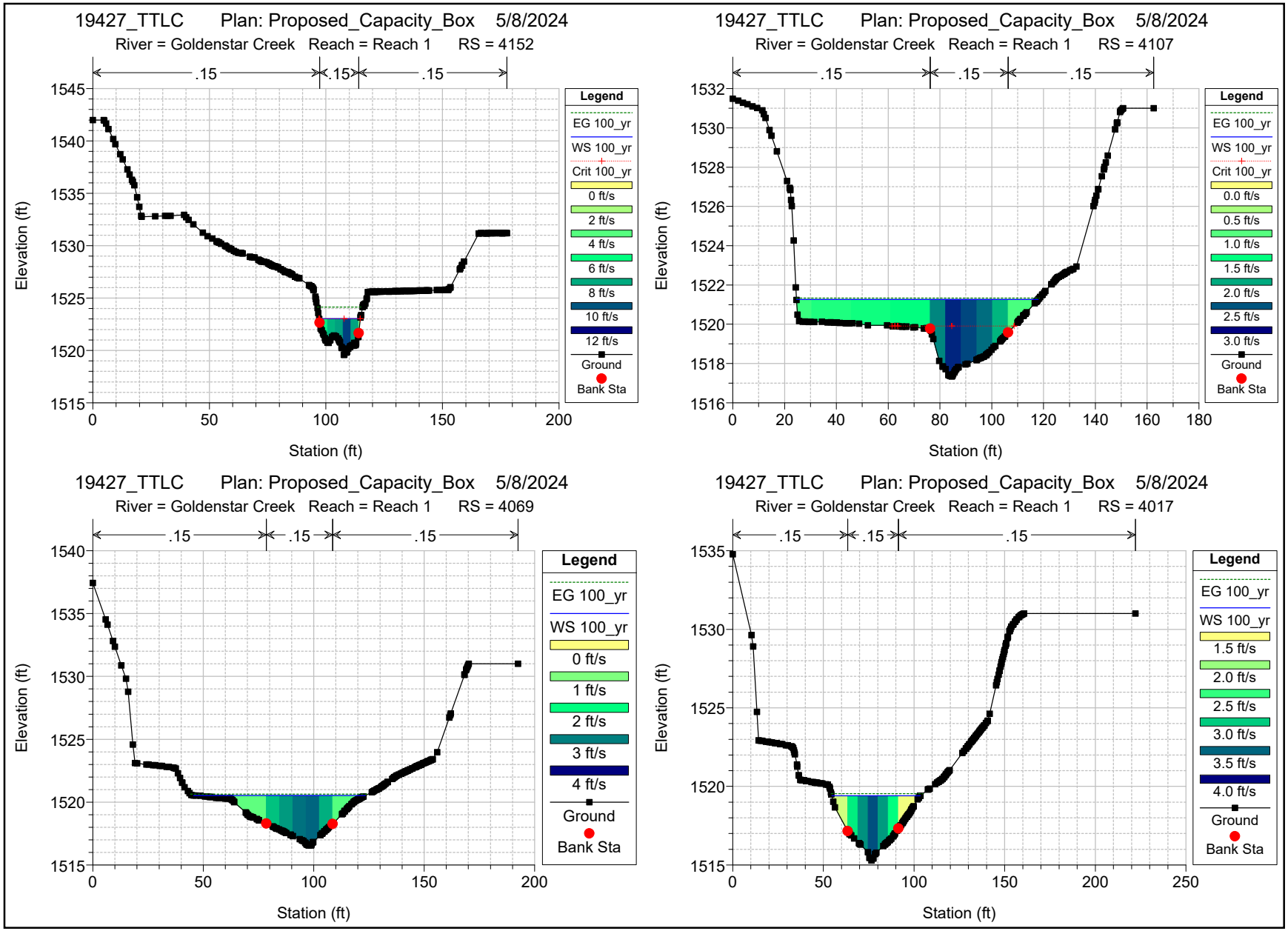
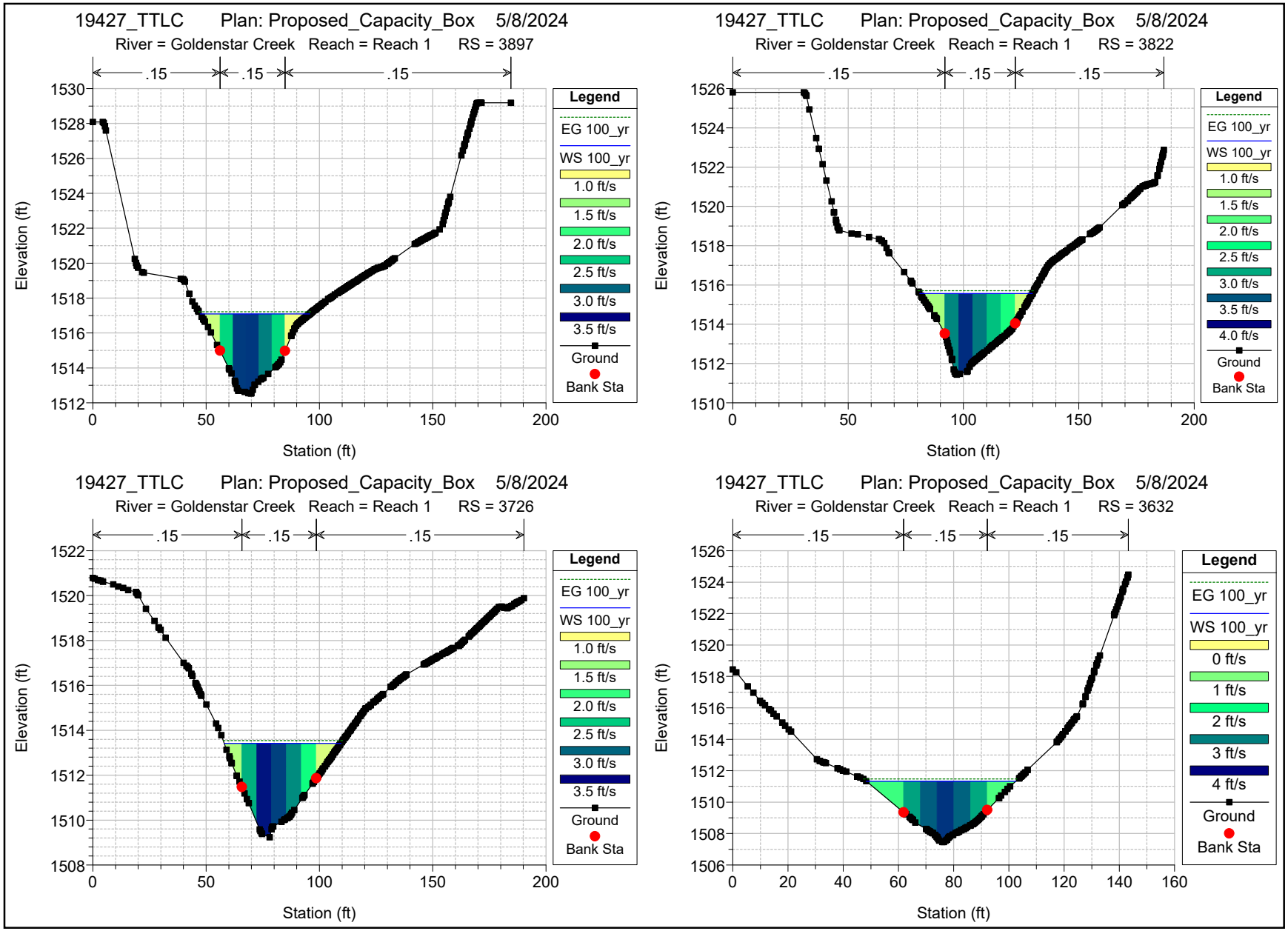
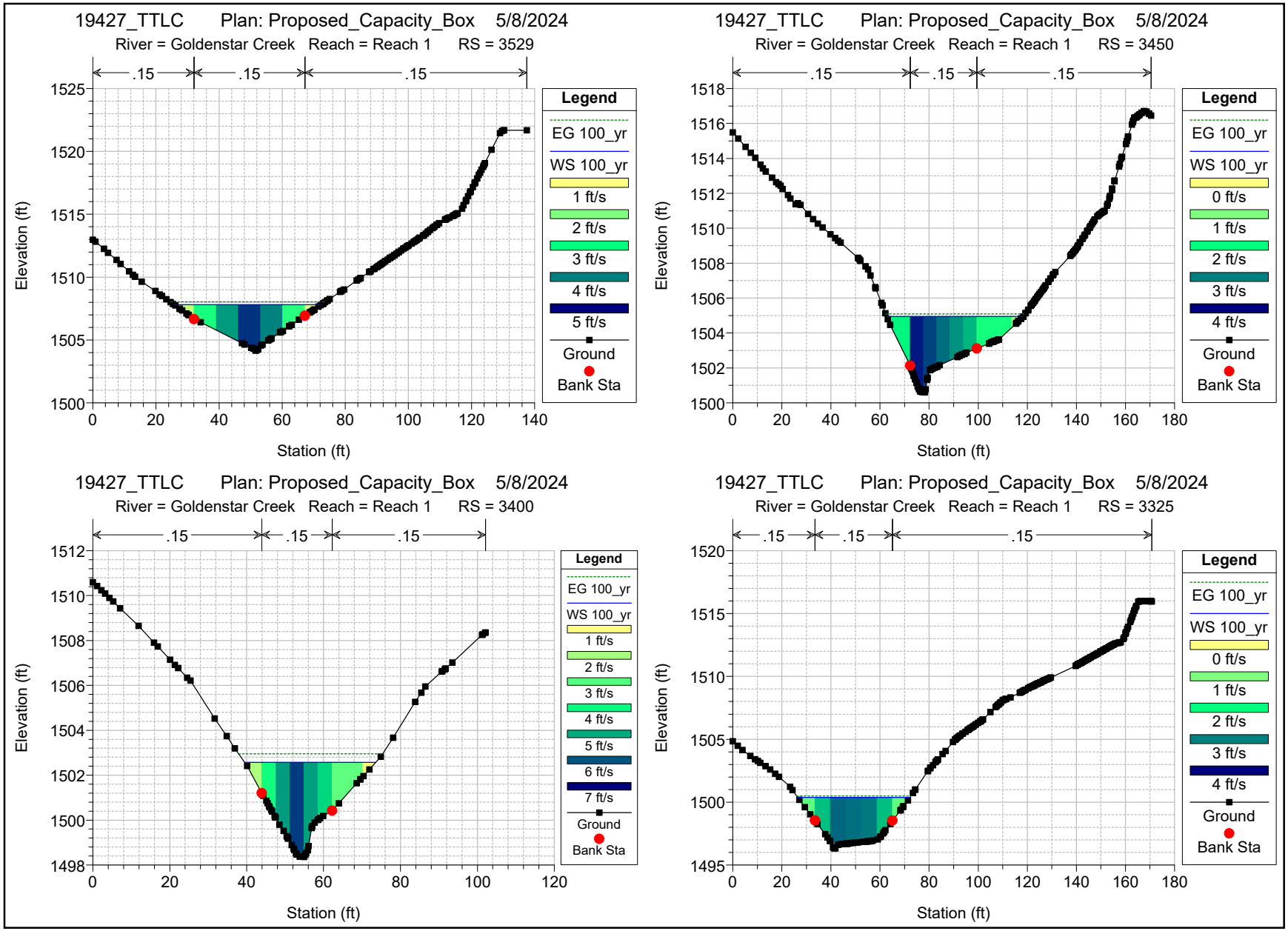
3897
4017
4107
4215
4345
4414
4510
4598

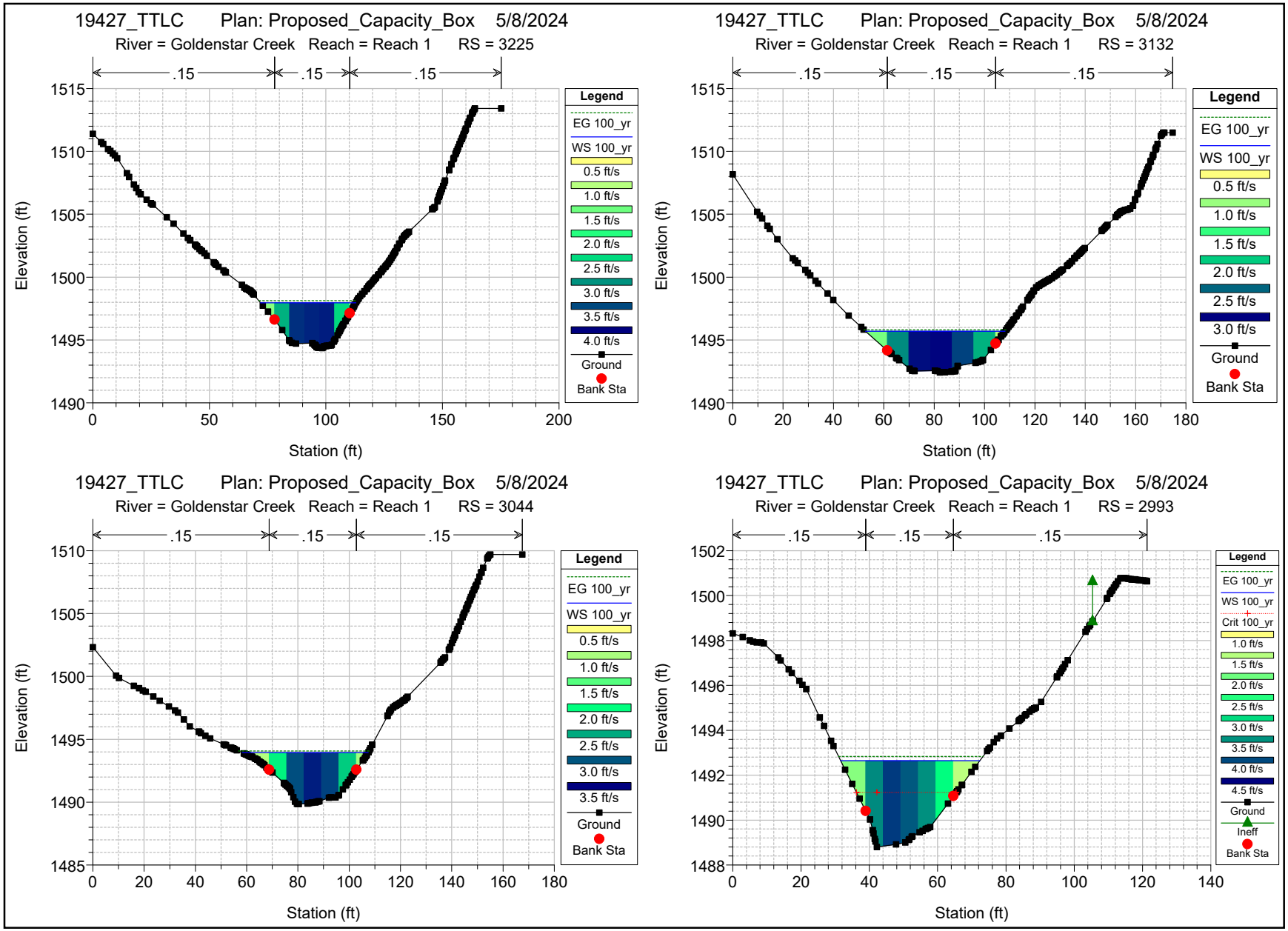

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4598
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4566
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4510
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4453
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta

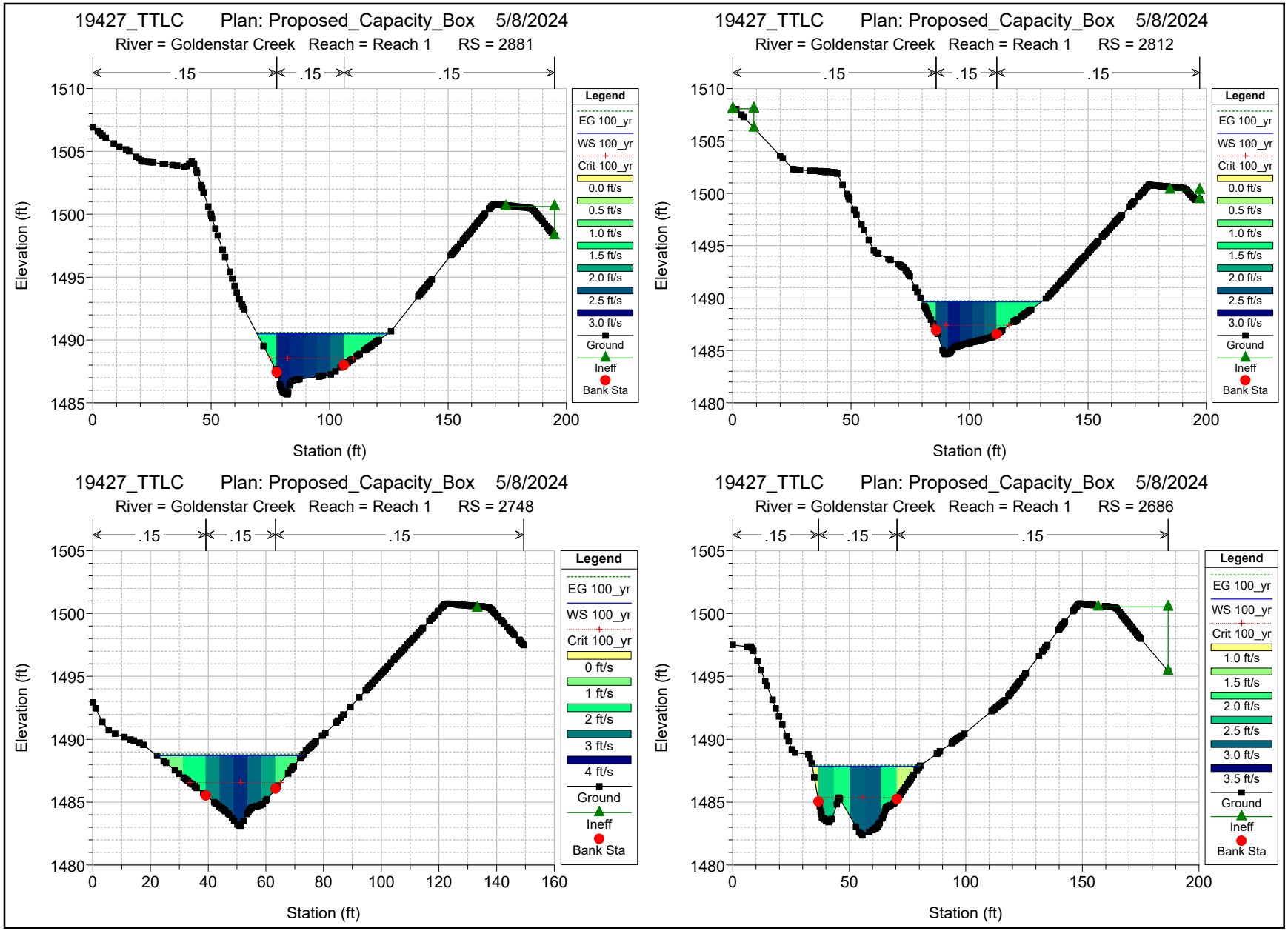

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4414
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4345
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4284
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4215 Culv
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta

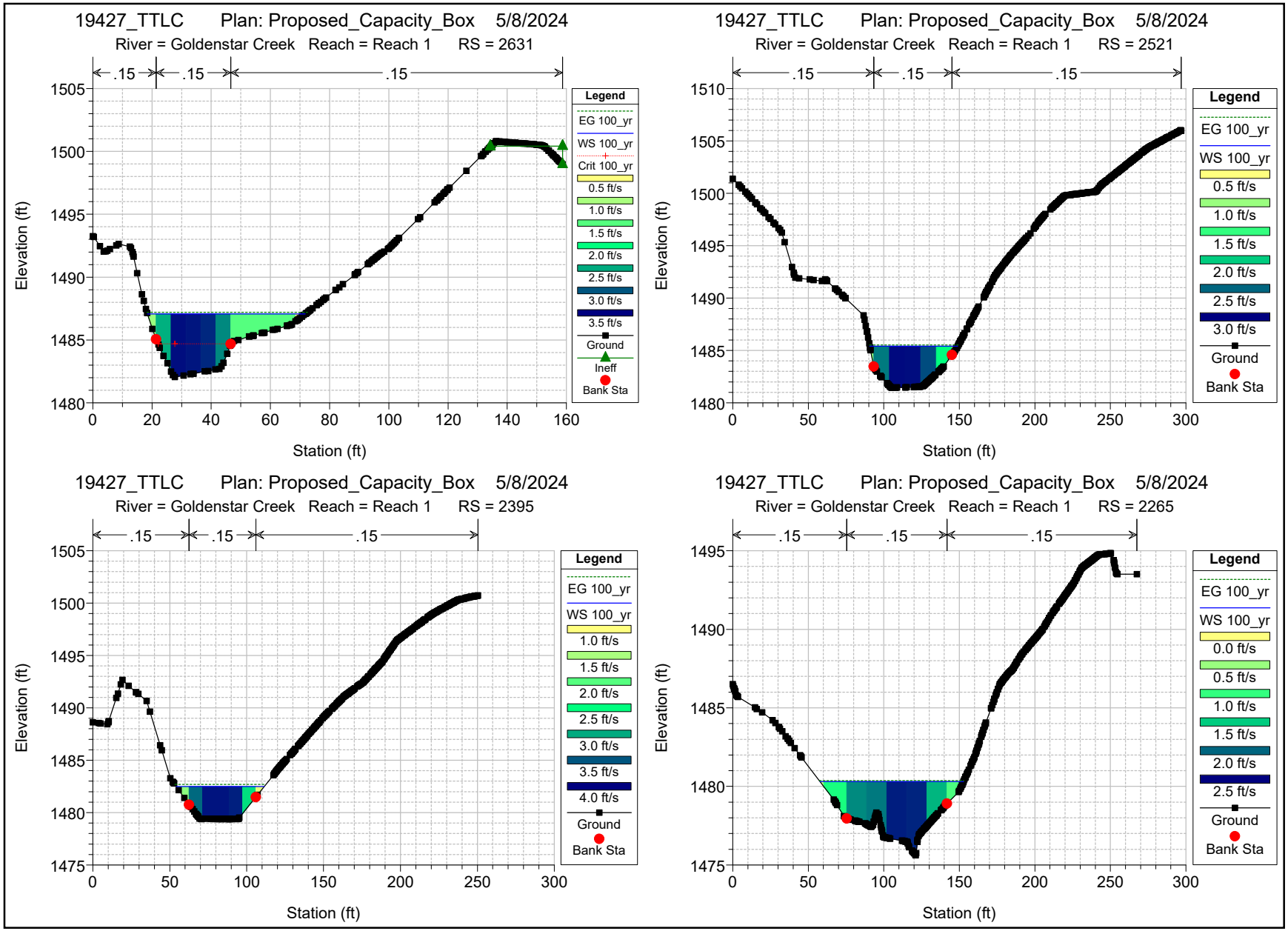

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4152
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4107
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4069
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 4017
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta

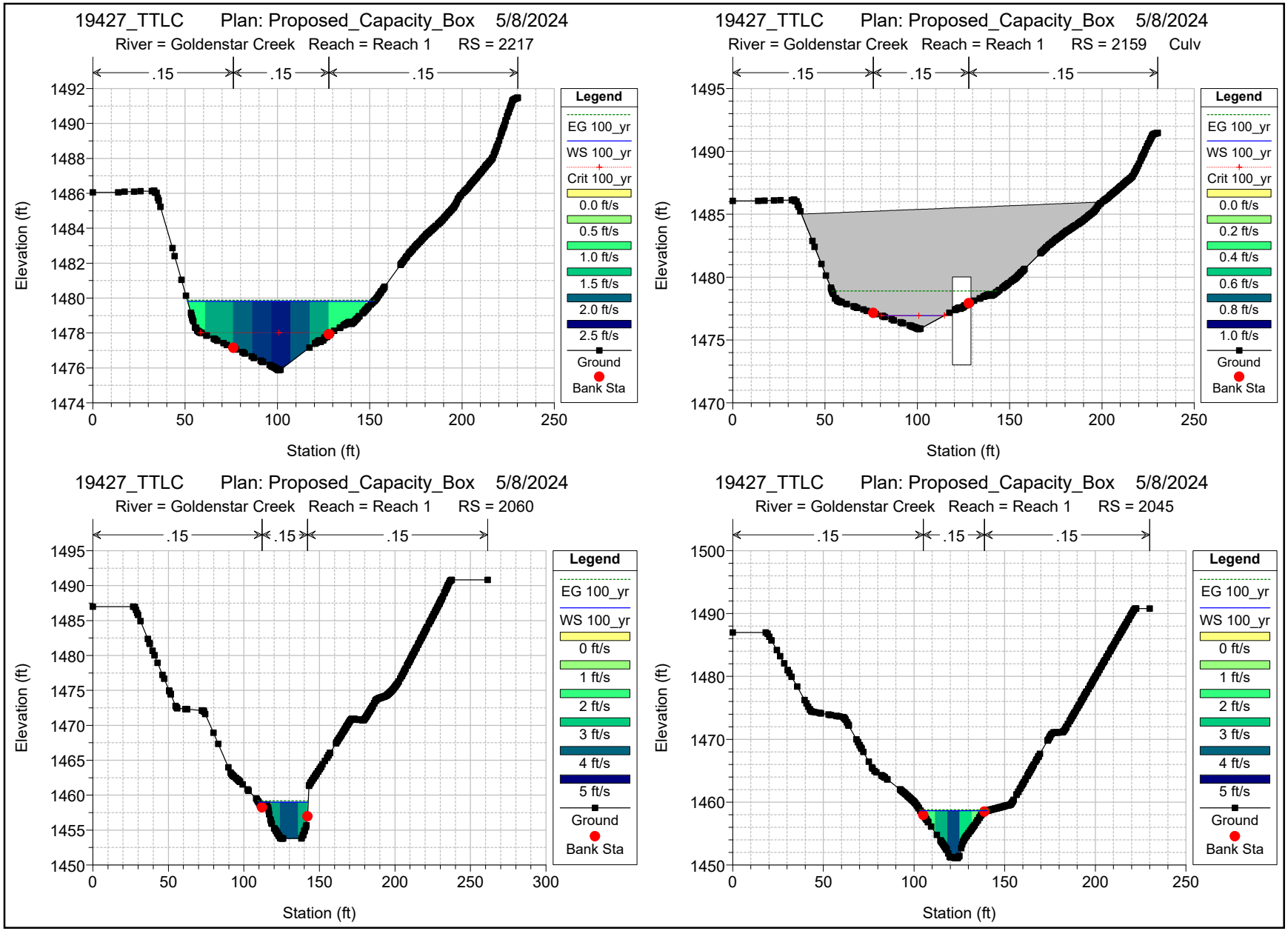

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3897
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3822
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3726
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3632
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta

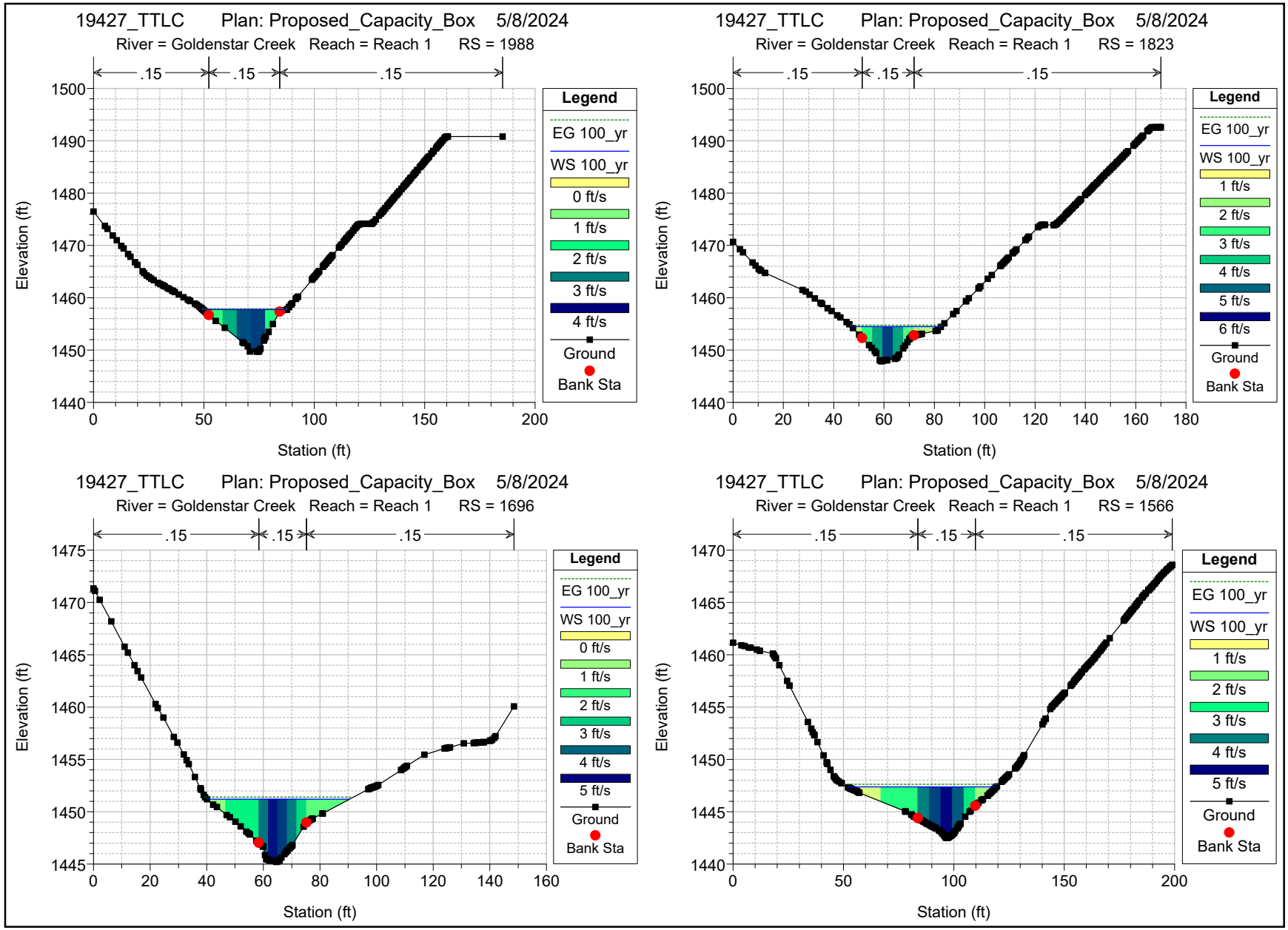

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3529
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3450
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3400
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3325
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta

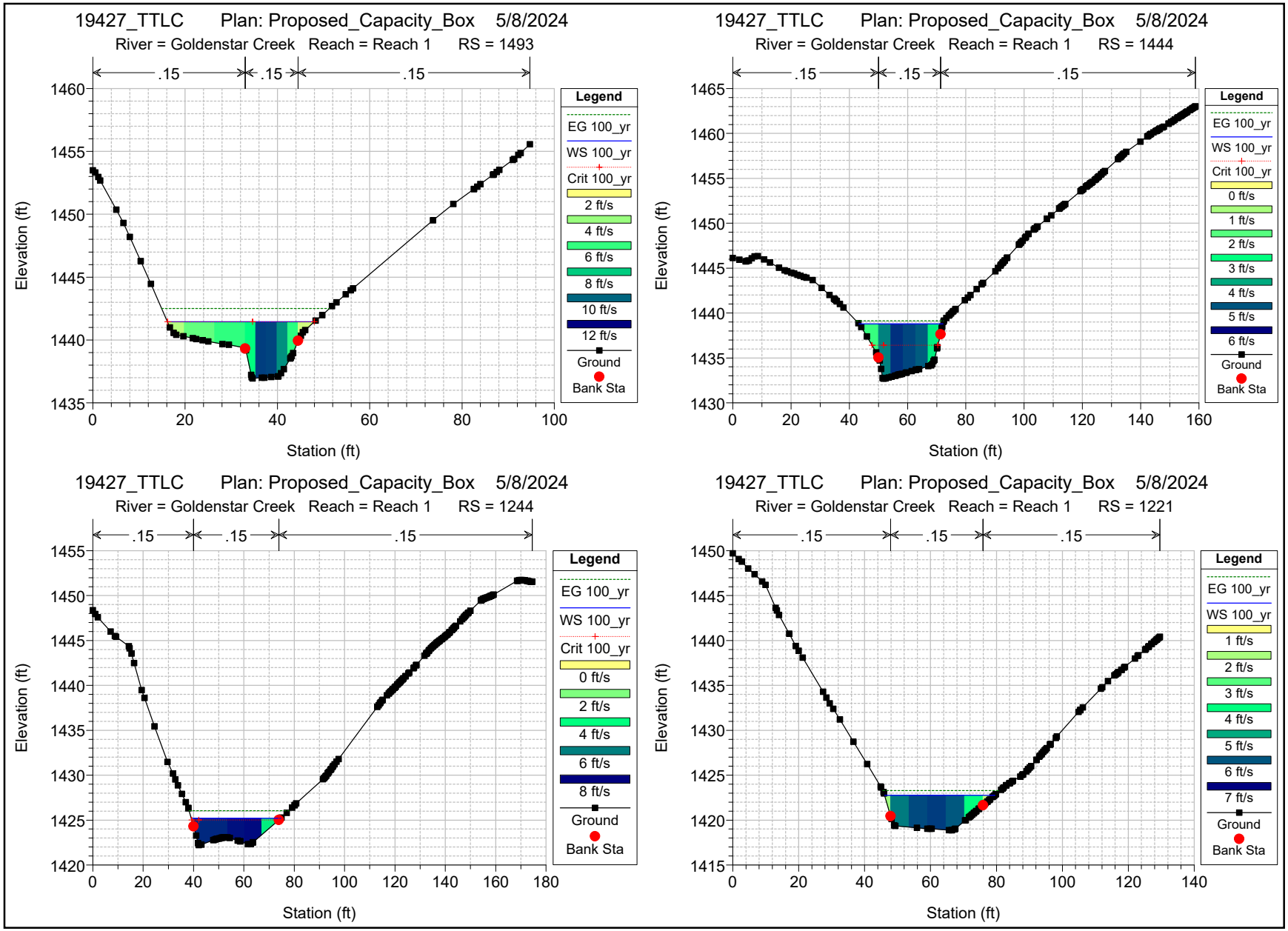

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3225
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3132
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 3044
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2993
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
4.5 ft/s
Ground
Ineff
Bank Sta

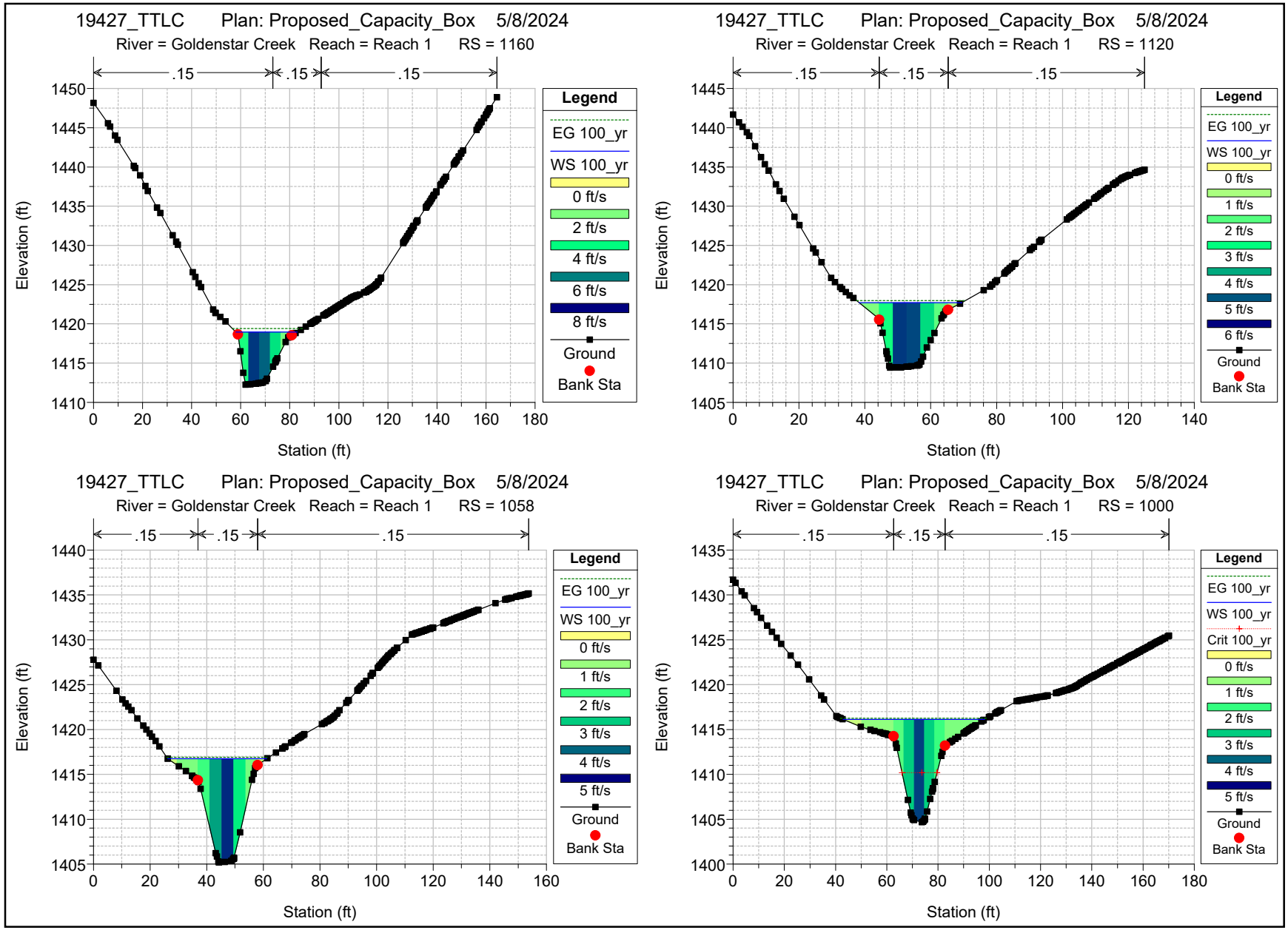

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2881
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2812
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Ineff
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2748
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Ineff
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2686
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta


19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2631
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
Ground
Ineff
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2521
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2395
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
3.0 ft/s
3.5 ft/s
4.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2265
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta


19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2217
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.5 ft/s
1.0 ft/s
1.5 ft/s
2.0 ft/s
2.5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2159 Culv
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0.0 ft/s
0.2 ft/s
0.4 ft/s
0.6 ft/s
0.8 ft/s
1.0 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2060
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 2045
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta


19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1988
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1823
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1696
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1566
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta


19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1493
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
2 ft/s
4 ft/s
6 ft/s
8 ft/s
10 ft/s
12 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1444
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1244
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1221
.15 .15 .15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
7 ft/s
Ground
Bank Sta

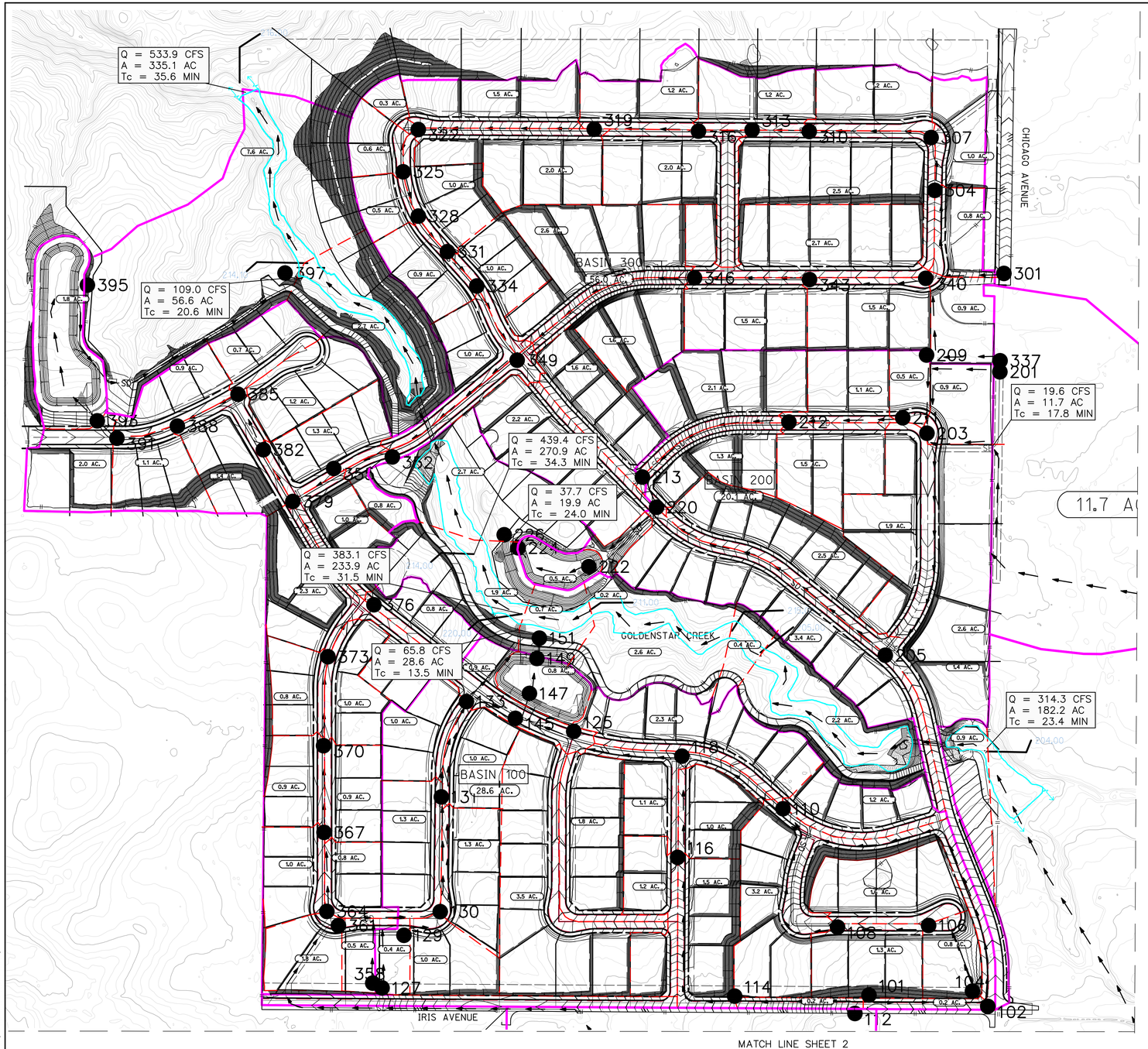

19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1160
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
2 ft/s
4 ft/s
6 ft/s
8 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1120
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
6 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1058
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta
19427_TTLC Plan: Proposed_Capacity_Box 5/8/2024
River = Goldenstar Creek Reach = Reach 1 RS = 1000
.15
.15
.15
Elevation (ft)
Station (ft)
Legend
EG 100_yr
WS 100_yr
Crit 100_yr
0 ft/s
1 ft/s
2 ft/s
3 ft/s
4 ft/s
5 ft/s
Ground
Bank Sta

HEC-RAS Plan: Cap_Box River: Goldenstar Creek Reach: Reach 1 Profile: 100_yr

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	4598	100_yr	315.00	1529.24	1533.04	1531.33	1533.08	0.009621	1.59	206.92	110.57	0.19
Reach 1	4566	100_yr	315.00	1528.84	1532.97		1532.98	0.001427	0.87	373.95	121.07	0.08
Reach 1	4510	100_yr	315.00	1528.84	1532.80		1532.84	0.005616	1.56	212.36	88.35	0.16
Reach 1	4453	100_yr	315.00	1528.84	1532.08		1532.21	0.029398	2.93	112.71	61.24	0.34
Reach 1	4414	100_yr	315.00	1526.88	1529.37	1529.15	1529.81	0.187073	5.35	59.11	43.79	0.80
Reach 1	4345	100_yr	315.00	1522.50	1527.00		1527.10	0.015539	2.56	140.01	67.42	0.26
Reach 1	4284	100_yr	315.00	1521.37	1525.71	1524.26	1525.88	0.026600	3.60	101.45	40.85	0.34
Reach 1	4215		Culvert									
Reach 1	4152	100_yr	315.00	1519.59	1523.03	1523.03	1524.14	0.298815	8.48	37.50	17.66	1.01
Reach 1	4107	100_yr	315.00	1517.34	1521.26	1519.91	1521.33	0.014781	2.43	163.02	93.36	0.25
Reach 1	4069	100_yr	315.00	1516.56	1520.53		1520.64	0.019138	2.88	132.01	76.79	0.29
Reach 1	4017	100_yr	315.00	1515.28	1519.40		1519.54	0.023505	3.19	110.22	48.80	0.32
Reach 1	3897	100_yr	315.00	1512.54	1517.09		1517.21	0.016314	2.90	119.07	48.42	0.27
Reach 1	3822	100_yr	315.00	1511.43	1515.56		1515.71	0.024832	3.19	107.59	48.81	0.33
Reach 1	3726	100_yr	315.00	1509.24	1513.41		1513.54	0.020240	2.94	116.49	51.46	0.30
Reach 1	3632	100_yr	315.00	1507.47	1511.33		1511.47	0.024371	3.16	111.84	54.15	0.32
Reach 1	3529	100_yr	315.00	1504.17	1507.81		1508.03	0.048959	3.79	86.79	46.73	0.44
Reach 1	3450	100_yr	315.00	1500.60	1504.94		1505.09	0.028222	3.27	111.04	55.65	0.34
Reach 1	3400	100_yr	315.00	1498.36	1502.58		1502.95	0.069834	5.17	68.66	34.20	0.53
Reach 1	3325	100_yr	315.00	1496.32	1500.37		1500.49	0.018549	2.92	115.37	45.71	0.29
Reach 1	3225	100_yr	315.00	1494.36	1497.95		1498.13	0.031345	3.43	95.08	40.92	0.36
Reach 1	3132	100_yr	315.00	1492.41	1495.69		1495.80	0.019976	2.67	122.96	55.47	0.29
Reach 1	3044	100_yr	315.00	1489.84	1493.94		1494.07	0.019347	2.89	114.96	49.17	0.29
Reach 1	2993	100_yr	315.00	1488.80	1492.65	1491.23	1492.84	0.030686	3.64	94.24	40.75	0.36
Reach 1	2881	100_yr	315.00	1485.68	1490.50	1488.55	1490.59	0.013910	2.65	135.57	55.06	0.25
Reach 1	2812	100_yr	315.00	1484.67	1489.63	1487.40	1489.72	0.011837	2.63	137.30	50.16	0.23
Reach 1	2748	100_yr	385.00	1483.13	1488.68	1486.56	1488.82	0.016329	3.21	139.05	50.23	0.28
Reach 1	2686	100_yr	385.00	1482.35	1487.83	1485.37	1487.94	0.012136	2.67	152.75	45.99	0.23
Reach 1	2631	100_yr	385.00	1482.06	1487.07	1484.70	1487.20	0.015180	3.10	143.79	53.38	0.27
Reach 1	2521	100_yr	440.00	1481.44	1485.41		1485.52	0.015371	2.64	169.23	58.11	0.26
Reach 1	2395	100_yr	440.00	1479.39	1482.49		1482.69	0.035652	3.62	127.43	57.20	0.39
Reach 1	2265	100_yr	440.00	1475.62	1480.31		1480.37	0.010392	2.07	227.55	95.05	0.21
Reach 1	2217	100_yr	440.00	1475.88	1479.82	1478.02	1479.88	0.010118	2.11	234.70	100.99	0.21
Reach 1	2159		Culvert									
Reach 1	2060	100_yr	440.00	1453.79	1458.98		1459.20	0.024939	3.69	120.32	32.84	0.33
Reach 1	2045	100_yr	440.00	1451.12	1458.62		1458.79	0.019131	3.24	136.31	36.62	0.28
Reach 1	1988	100_yr	440.00	1449.72	1457.74		1457.88	0.013273	2.94	151.35	38.07	0.24
Reach 1	1823	100_yr	440.00	1447.89	1454.48		1454.76	0.028761	4.31	111.89	35.61	0.35
Reach 1	1696	100_yr	440.00	1445.20	1451.20		1451.41	0.023834	4.09	132.89	50.32	0.33
Reach 1	1566	100_yr	535.00	1442.48	1447.38		1447.62	0.034956	4.31	150.38	67.52	0.40
Reach 1	1493	100_yr	535.00	1436.94	1441.45	1441.45	1442.51	0.180497	9.09	70.48	31.82	0.82
Reach 1	1444	100_yr	535.00	1432.70	1438.78	1436.41	1439.12	0.031970	4.75	118.98	28.81	0.37
Reach 1	1244	100_yr	535.00	1422.23	1425.21	1425.02	1426.04	0.203158	7.29	73.80	35.63	0.87
Reach 1	1221	100_yr	535.00	1418.87	1422.77		1423.28	0.072029	5.75	95.84	33.43	0.56
Reach 1	1160	100_yr	535.00	1412.26	1418.95		1419.42	0.057196	5.50	97.88	25.03	0.46
Reach 1	1120	100_yr	535.00	1409.44	1417.71		1417.97	0.023286	4.19	133.42	31.20	0.30
Reach 1	1058	100_yr	535.00	1405.19	1416.75		1416.91	0.012105	3.26	172.85	34.99	0.21
Reach 1	1000	100_yr	535.00	1404.66	1416.13	1410.18	1416.27	0.010015	3.11	199.33	55.30	0.20

Appendix 4

Hydrologic Backup Information



LEGEND

- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- FLOWPATH
- ACREAGE — 2.5 AC.
- NODE
- ONSITE DRAINAGE NODE ID — 301
- BASIN ID — BASIN 300
- PROPOSED 100-YEAR WSE OF GOLDENSTAR CREEK — 204.00
- GOLDENSTAR CREEK DRAINAGE NODE/ID

150 75 0 150 300 450

GRAPHIC SCALE: 1"=150'

NOTES

1. SEE PRE-PROJECT DRAINAGE EXHIBIT FOR OFFSITE HYDROLOGY.
2. SEE POST-PROJECT DRAINAGE EXHIBIT FOR ONSITE HYDROLOGY.

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DRAINAGE STUDY MAP FOR
GOLDENSTAR CREEK

PRELIMINARY ENGINEERING
POST-PROJECT

SHEET 1 OF 2 DATE: 05/08/2024
J-19427

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY REPORT ONLY

Q100 = 533.9 CFS
A = 335.1 AC
Tc = 35.6 MIN

Q100 = 109.0 CFS
A = 56.6 AC
Tc = 20.6 MIN

Q100 = 439.4 CFS
A = 270.9 AC
Tc = 34.3 MIN

Q100 = 37.7 CFS
A = 19.9 AC
Tc = 24.0 MIN

Q100 = 383.1 CFS
A = 233.9 AC
Tc = 31.5 MIN

Q100 = 65.8 CFS
A = 28.6 AC
Tc = 13.5 MIN

BASIN 300
56.6 AC.

BASIN 200
20.1 AC.

BASIN 100
28.6 AC.

OFFSITE BY-PASS
TO NODE 220
Q100 = 19.6 CFS
A = 11.7 AC
Tc = 17.8 MIN

11.7 A

GOLDENSTAR CREEK
UPSTREAM BOUNDARY
CONDITION
Q100 = 314.3 CFS
A = 182.2 AC
Tc = 23.4 MIN

CHICAGO AVENUE

GOLDENSTAR CREEK

IRIS AVENUE

MATCH LINE SHEET 2

MATCH LINE SHEET 2

LEGEND

MAJOR DRAINAGE BOUNDARY	
MINOR DRAINAGE BOUNDARY	
FLOWPATH	
ACREAGE	2.5 AC.
NODE	
ONSITE DRAINAGE NODE ID	301
BASIN ID	BASIN 300
PROPOSED 100-YEAR WSE OF GOLDENSTAR CREEK	
GOLDENSTAR CREEK DRAINAGE NODE/ID	204.00

150 75 0 150 300 450
GRAPHIC SCALE: 1"=150'

NOTES

1. SEE PRE-PROJECT DRAINAGE EXHIBIT FOR OFFSITE HYDROLOGY.
2. SEE POST-PROJECT DRAINAGE EXHIBIT FOR ONSITE HYDROLOGY.

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DRAINAGE STUDY MAP FOR
GOLDENSTAR CREEK

PRELIMINARY ENGINEERING
POST-PROJECT

SHEET 1 OF 2 DATE: 05/08/2024
J-19427

NOT FOR CONSTRUCTION – EXHIBIT FOR DRAINAGE STUDY REPORT ONLY

```
******************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* CHICAGO AVENUE                                                        *
* PROPOSED CONDITION RATIONAL METHOD FOR  GOLDENSTAR CREEK 100 YEAR EVENT  *
* JN# 19427 05/08/2024                                                  *
 ************************************************************************

  FILE NAME: CAGSCP00.RAT
  TIME/DATE OF STUDY: 09:10 05/08/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.630
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.704
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.840
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.240
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4685655
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4625021
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.240
  SLOPE OF INTENSITY DURATION CURVE = 0.4625
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   25.0     18.5    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth = -0.10 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  23.40   RAIN INTENSITY(INCH/HOUR) =  1.92
  TOTAL AREA(ACRES) =   182.20   TOTAL RUNOFF(CFS) =    314.30

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1529.00  DOWNSTREAM(FEET) =   1509.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   803.00   CHANNEL SLOPE =  0.0249
  CHANNEL BASE(FEET) =    7.00   "Z" FACTOR =   4.300
  MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.798
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7216
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     316.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.85
  AVERAGE FLOW DEPTH(FEET) =   3.63   TRAVEL TIME(MIN.) =   3.48
  Tc(MIN.) =   26.88
  SUBAREA AREA(ACRES) =     3.10       SUBAREA RUNOFF(CFS) =    4.02
  TOTAL AREA(ACRES) =      185.3         PEAK FLOW RATE(CFS) =     318.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.64   FLOW VELOCITY(FEET/SEC.) =   3.86
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    205.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    215.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1509.00  DOWNSTREAM(FEET) =   1503.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   110.00   CHANNEL SLOPE =  0.0545
  CHANNEL BASE(FEET) =    4.50   "Z" FACTOR =   5.400
  MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.786
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7207
 SOIL CLASSIFICATION IS "D"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     318.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.92
 AVERAGE FLOW DEPTH(FEET) =   3.07   TRAVEL TIME(MIN.) =   0.37
 Tc(MIN.) =   27.25
 SUBAREA AREA(ACRES) =     0.40       SUBAREA RUNOFF(CFS) =    0.51
 TOTAL AREA(ACRES) =      185.7         PEAK FLOW RATE(CFS) =     318.84

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  3.07   FLOW VELOCITY(FEET/SEC.) =   4.93
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    215.00 =     913.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    215.00 TO NODE    211.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1503.00  DOWNSTREAM(FEET) =   1492.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   447.00   CHANNEL SLOPE =  0.0246
 CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   4.200
 MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.731
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7161
 SOIL CLASSIFICATION IS "D"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     320.45
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.87
 AVERAGE FLOW DEPTH(FEET) =   3.78   TRAVEL TIME(MIN.) =   1.92
 Tc(MIN.) =   29.18
 SUBAREA AREA(ACRES) =     2.60       SUBAREA RUNOFF(CFS) =    3.22
 TOTAL AREA(ACRES) =      188.3         PEAK FLOW RATE(CFS) =     322.06

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  3.79   FLOW VELOCITY(FEET/SEC.) =   3.88
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    211.00 =    1360.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    220.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1492.00  DOWNSTREAM(FEET) =   1488.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.0211
 CHANNEL BASE(FEET) =    3.20   "Z" FACTOR =   5.300
 MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.706
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7140
```

```
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     322.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.48
  AVERAGE FLOW DEPTH(FEET) =   3.89   TRAVEL TIME(MIN.) =   0.91
  Tc(MIN.) =   30.08
  SUBAREA AREA(ACRES) =     0.70       SUBAREA RUNOFF(CFS) =    0.85
  TOTAL AREA(ACRES) =      189.0         PEAK FLOW RATE(CFS) =     322.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.89   FLOW VELOCITY(FEET/SEC.) =   3.48
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    220.00 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   30.08
  RAINFALL INTENSITY(INCH/HR) =   1.71
  TOTAL STREAM AREA(ACRES) =   189.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    322.91

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  13.50   RAIN INTENSITY(INCH/HOUR) =  2.47
  TOTAL AREA(ACRES) =    28.60   TOTAL RUNOFF(CFS) =     56.80

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.50
  RAINFALL INTENSITY(INCH/HR) =   2.47
  TOTAL STREAM AREA(ACRES) =    28.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     56.80

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
```

```
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  19.00   RAIN INTENSITY(INCH/HOUR) =  2.11
  TOTAL AREA(ACRES) =    14.40   TOTAL RUNOFF(CFS) =     23.20

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   19.00
  RAINFALL INTENSITY(INCH/HR) =   2.11
  TOTAL STREAM AREA(ACRES) =    14.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.20

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      322.91    30.08        1.706        189.00
      2       56.80    13.50        2.472         28.60
      3       23.20    19.00        2.111         14.40

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      218.19    13.50       2.472
      2      275.63    19.00       2.111
      3      380.88    30.08       1.706

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     380.88   Tc(MIN.) =   30.08
  TOTAL AREA(ACRES) =      232.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    220.00 =    1550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    214.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1488.00  DOWNSTREAM(FEET) =   1484.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   273.00   CHANNEL SLOPE =  0.0147
  CHANNEL BASE(FEET) =    3.20   "Z" FACTOR =   5.300
  MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.670
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7108
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     382.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.17
  AVERAGE FLOW DEPTH(FEET) =   4.48   TRAVEL TIME(MIN.) =   1.44
  Tc(MIN.) =   31.52
  SUBAREA AREA(ACRES) =     1.90       SUBAREA RUNOFF(CFS) =    2.26
  TOTAL AREA(ACRES) =      233.9         PEAK FLOW RATE(CFS) =     383.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.48   FLOW VELOCITY(FEET/SEC.) =   3.17
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    214.00 =    1823.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   31.52
  RAINFALL INTENSITY(INCH/HR) =   1.67
  TOTAL STREAM AREA(ACRES) =   233.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    383.13

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==========================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  24.00   RAIN INTENSITY(INCH/HOUR) =  1.89
  TOTAL AREA(ACRES) =    19.90   TOTAL RUNOFF(CFS) =     37.70

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   24.00
  RAINFALL INTENSITY(INCH/HR) =   1.89
  TOTAL STREAM AREA(ACRES) =    19.90
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.70

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  22.80   RAIN INTENSITY(INCH/HOUR) =  1.94
  TOTAL AREA(ACRES) =    11.70   TOTAL RUNOFF(CFS) =     19.60

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.80
  RAINFALL INTENSITY(INCH/HR) =   1.94
  TOTAL STREAM AREA(ACRES) =    11.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      383.13    31.52        1.670        233.90
      2       37.70    24.00        1.894         19.90
      3       19.60    22.80        1.940         11.70

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      332.56    22.80       1.940
      2      348.57    24.00       1.894
      3      433.24    31.52       1.670

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     433.24   Tc(MIN.) =   31.52
  TOTAL AREA(ACRES) =      265.5
```

```
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    214.00 =    1823.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    214.00 TO NODE    214.10 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1484.00  DOWNSTREAM(FEET) =   1448.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   913.00   CHANNEL SLOPE =  0.0394
 CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   2.800
 MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.606
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7049
 SOIL CLASSIFICATION IS "D"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     436.30
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.43
 AVERAGE FLOW DEPTH(FEET) =   4.39   TRAVEL TIME(MIN.) =   2.80
 Tc(MIN.) =   34.32
 SUBAREA AREA(ACRES) =     5.40       SUBAREA RUNOFF(CFS) =    6.11
 TOTAL AREA(ACRES) =      270.9         PEAK FLOW RATE(CFS) =     439.35

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  4.41   FLOW VELOCITY(FEET/SEC.) =   5.44
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    214.10 =    2736.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    214.10 TO NODE    214.10 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   34.32
 RAINFALL INTENSITY(INCH/HR) =   1.61
 TOTAL STREAM AREA(ACRES) =   270.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    439.35

****************************************************************************
 FLOW PROCESS FROM NODE    214.10 TO NODE    214.10 IS CODE =   7
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN) =  20.60   RAIN INTENSITY(INCH/HOUR) =  2.03
 TOTAL AREA(ACRES) =    56.60   TOTAL RUNOFF(CFS) =    109.00

****************************************************************************
 FLOW PROCESS FROM NODE    214.10 TO NODE    214.10 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   20.60
  RAINFALL INTENSITY(INCH/HR) =   2.03
  TOTAL STREAM AREA(ACRES) =    56.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    109.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      439.35    34.32        1.606        270.90
      2      109.00    20.60        2.033         56.60

 **********************************WARNING**********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ***************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      372.71    20.60       2.033
      2      525.43    34.32       1.606

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     525.43   Tc(MIN.) =   34.32
  TOTAL AREA(ACRES) =      327.5
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    214.10 =    2736.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    214.10 TO NODE    216.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1448.00  DOWNSTREAM(FEET) =   1402.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   556.00   CHANNEL SLOPE =  0.0827
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   2.800
  MANNING'S FACTOR = 0.100   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.580
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7024
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     529.65
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.53
  AVERAGE FLOW DEPTH(FEET) =   4.05   TRAVEL TIME(MIN.) =   1.23
  Tc(MIN.) =   35.55
  SUBAREA AREA(ACRES) =     7.60       SUBAREA RUNOFF(CFS) =    8.43
  TOTAL AREA(ACRES) =      335.1         PEAK FLOW RATE(CFS) =     533.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.07   FLOW VELOCITY(FEET/SEC.) =   7.54
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    216.00 =    3292.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      335.1  TC(MIN.) =     35.55
  PEAK FLOW RATE(CFS)   =     533.87
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```