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October 16, 2025

Brandi Neider, Project Manager – Stream and Riparian Coordinator
Lake County Umbrella Watershed Council
PO Box 848
Lakeview, Oregon 97630
Submitted via email: bneider@lakecountywsc.com

Re: Starveout Diversion Screening Project – Status Memorandum

Dear Brandi:

Thank you for retaining SWCA Environmental Consultants, Inc. to assist the Lake County Umbrella Watershed Council (LCUWC), the Adel Water Improvement District (AWID), and the Warner Basin Aquatic Habitat Partnership (WBAHP) with a fish screen design for the Starveout Diversion on Deep Creek near Adel, Oregon. The following memo summarizes our work completed to date and the remaining work that will be necessary to reach the goal of a 90% design for the Starveout Diversion fish screen.

INTRODUCTION

The Starveout Diversion was built following the excavation of the Deep Creek reclamation channel in the early 1900s. The reclamation channel was developed to bypass streamflow around the historical Crump Lake lakebed which now provides pasture ground for private ranches. Based on similar irrigation diversions in other areas of Lake County, the east diversion weir was likely built to stabilize the channel and provide irrigation water to the floodplain pasture. The west diversion weir was installed after the 1964 flood when a headcut progressed up the floodplain and threatened the stability of the diversion. The west takeout is a 36-inch culvert with a headgate that delivers irrigation water to the remnant reclamation channel that parallels Deep Creek. The east takeout is a 60-inch culvert with a headgate that delivers irrigation water to a broad channel network that includes natural channel segments and excavated ditches.

The interaction of irrigation infrastructure and the spawning migration corridor is problematic for Warner Sucker and was largely the reason for the species listing by the USFWS in 1985. Irrigation season begins April 1 and ends July 1, which also corresponds with the Warner Sucker spawning migration window. Water rights associated with the lower Deep Creek diversions have priority dates in the late 1800s. Therefore, the spawning migration corridor has been affected for over 100 years.

The goal of the project is to develop a fish screen solution for the Starveout Diversion that meets ODFW fish screening criteria and that is approved by AWID and WBAHP. Restoring the connection and preventing fish entrapment between stream and lake environments also increases system resiliency and increases the long-term potential for fish species persistence.

EXISTING SITE CONDITIONS

The Starveout Diversion is located on the east side of Deep Creek, and delivers water to irrigated pastures east and north of the diversion (Figure 1). River Design Group, Inc. (RDG) completed the Starveout Diversion Fish Passage Project in 2020. The fish passage project included building two roughened channels at the existing diversion weir locations. The roughened channels are designed to provide fish passage for Warner Sucker, Warner Lakes Redband Trout, and other native fish species that inhabit Deep Creek. The eastern roughened channel crest was set at an elevation of 4,493.0 ft, the western roughened channel crest was set at an elevation of 4,494.0 ft. The elevation of the eastern crest approximated the top of board elevation for the former diversion weir at the same location. The western crest was set higher than the eastern crest so that more water would flow adjacent to the Starveout Diversion intake and the eastern roughened channel was also the preferred route for fish passage given that the channel thread is the primary Deep Creek channel.

A concrete sluiceway was added to the eastern boundary of the eastern roughened channel at the time of the 2020 construction project. The sluiceway has an inlet elevation of 4,489.0 ft and the structure is adapted with steel channels that allow for installing board in the sluiceway to control flow conveyance. The water users are able to add boards to the sluiceway to raise the Deep Creek water surface elevation to provide fish passage and hydraulic head for the diversion, or remove boards to facilitate sediment evacuation from Deep Creek in the vicinity of the Starveout Diversion intake. The water users typically remove boards in advance of higher flood events to increase flow conveyance and sediment transport capacity, and install the boards in advance of the fish passage window so water flows over the roughened channels to meet fish passage goals. We do not anticipate Warner Suckers can pass upstream through the sluiceway given the sluiceway length and elevated water velocities.

A gravel maintenance ramp was also constructed during the 2020 project. The maintenance ramp is located upstream and adjacent to the Starveout Diversion intake. The ramp provides equipment access in the event the water users would like to mechanically remove sediment or debris from the intake area.

The existing intake is a three-sided concrete vault fronted with steel trash rack. A 6 ft diameter headgate located at the back of the concrete vault controls flow into a 6 ft diameter corrugated metal pipe (CMP) that spans the gravel access road before the pipe outlets into the Starveout Diversion canal. The CMP emerges from a timber headwall that retains the road fill. The road also serves as an earthen embankment that separates Deep Creek from the irrigated pasture located east of the road/embankment.

The Starveout Diversion irrigation canal is an excavated open channel that has a secondary diversion weir approximately 475 ft downstream from the CMP outlet. The secondary diversion weir is managed by the water users to flood irrigate pasture ground to the east and north. When water users request irrigation water, the irrigation manager will install boards in the secondary diversion weir and open the Starveout Diversion headgate. The inflow will increase in stage until the water level is sufficient to enter the two risers and an open channel that deliver water to the irrigated pastures. Once the pasture water needs have been satisfied, the headgate will be closed and the boards removed from the secondary diversion weir to send water north to flood irrigate more distant pastures. Once water needs are satisfied, the Starveout Diversion headgate is closed. This process occurs multiple times over the irrigation season with the frequency dependent on climatic conditions, water availability, and water user needs. From our monitoring, this cycle seems to occur five to ten times over one irrigation season.

DEEP CREEK AND STARVEOUT DITCH HYDROLOGY

Deep Creek’s hydrology is variable, influenced by the winter snowpack, rain-on-snow events, and dry summer conditions. Peak floods are typically associated with rain on mid and higher elevation snowpack. Above average runoff years typically have beneficial snowpack, cool and wet springs, and moderate climatic conditions. Below average years are typified by poor snowpack, and the early onset of warm and dry conditions. NOAA-Northwest River Forecast Center’s weather station at Dismal Swamp (DMLC1, elevation 7,000 ft) is used by water users to track the snow-water equivalent as a predictor of future runoff. The Oregon Water Resources Department’s Deep Creek stream gage (#10371500) is located upstream of the primary Deep Creek diversions.

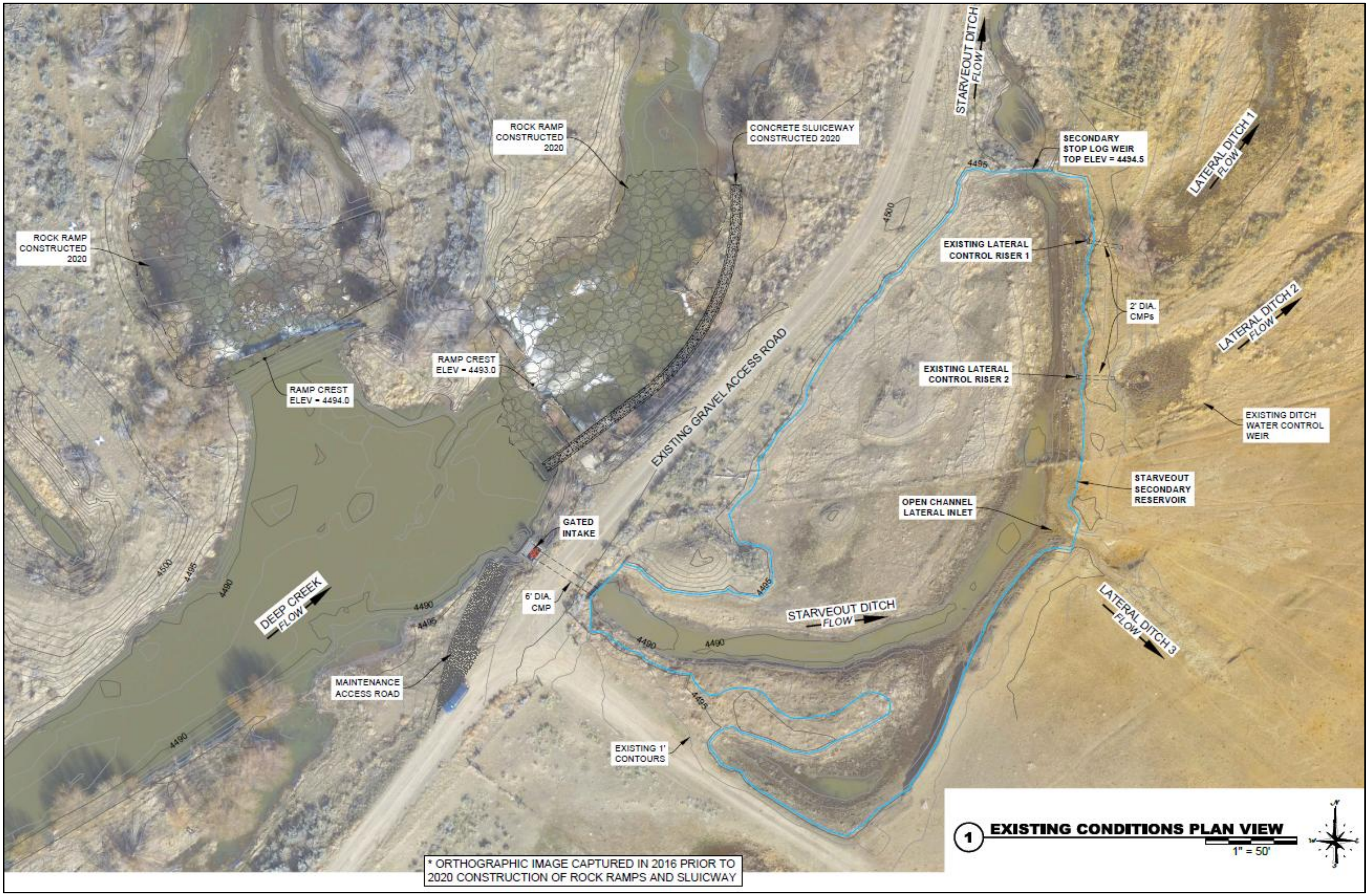


Figure 1. Deep Creek and the Starveout Diversion project area.

The Starveout Diversion is the fifth-most downstream diversion on lower Deep Creek (i.e., downstream from Deep Creek Falls). The Deep Creek – Town Diversion, the largest of the preceding diversions, is located approximately 1.6 miles upstream from the Starveout Diversion. Peak diversion flows on the Town Diversion are approximately 150 cfs, and when streamflow at the Deep Creek gage is less than 100 cfs, nearly all of the flow is diverted by the Town Diversion. Groundwater upwelling between the Town Diversion and the Starveout Diversion maintains channel inundation in the reach.

Figure 2 includes the Deep Creek hydrograph for mid-April through the end of June for 2022, 2024, and 2025. Seasonal precipitation was 50-70% of normal in 2022 and followed the severe drought of 2021. Seasonal precipitation was 70-90% of normal in 2024, and 110-130% of normal in 2025. In short, 2022 was a poor water year while 2024 and 2025 were slightly below and above normal, respectively.

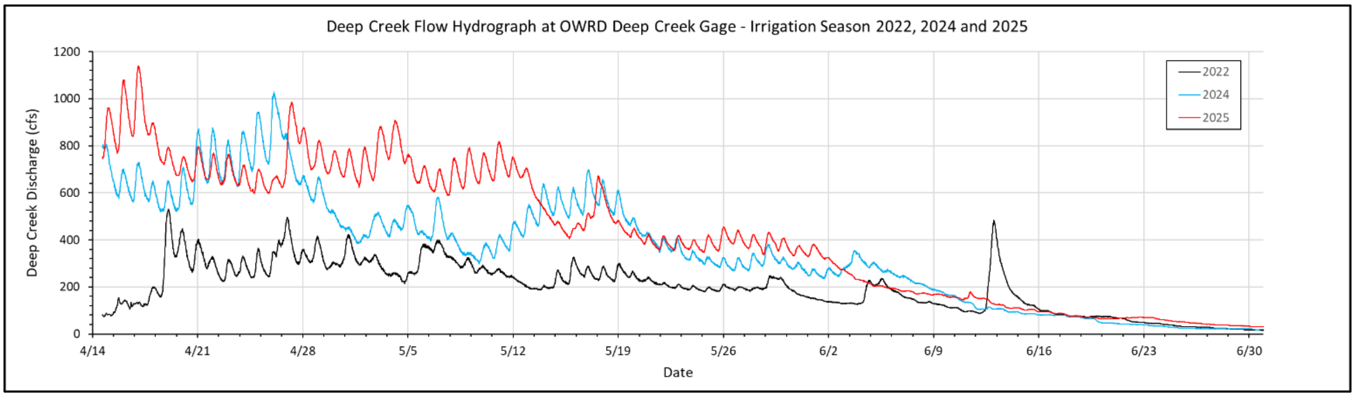


Figure 2. Deep Creek hydrographs for 2022, 2024, and 2025 based on the OWRD gage upstream from Starveout Diversion.

RDG-SWCA has maintained water level logger sensors in Deep Creek and in the Starveout Diversion canal since 2019. We evaluated the stage in Deep Creek and the Starveout Diversion canal to assess water surface elevations and how elevations change with declining streamflow and diversion management. Figure 3 shows the water surface elevations in Deep Creek near the diversion intake for the same years shown in Figure 2.

In the normal water years of 2024 and 2025, water levels in Deep Creek exceed the roughened channel crest elevations by two to three feet and water surface elevations eclipsed 4,495.0 ft until early June. In 2022, low stream flows are apparent in the stage data. Water surface elevations were more sensitive to the diversion operation and water surface elevations remained below 4,495 ft for much of the irrigation season. The tail of the irrigation season in each of the three years exhibits different irrigation management. In 2022, it appears the last irrigation withdrawal took place June 8-12th when the headgate was closed and the creek level rose. In 2024, the last irrigation withdrawal too place from June 4-12th when the headgate was closed and the creek level rebounded to about 4,493.5 ft. In 2025, the headgate appears to have been opened around June 9th and left open through the end of June as suggested by the lower water surface elevation of approximately 4,491.4 ft. As Deep Creek streamflow declines, the headgate has an increasing influence on the Deep Creek stage.

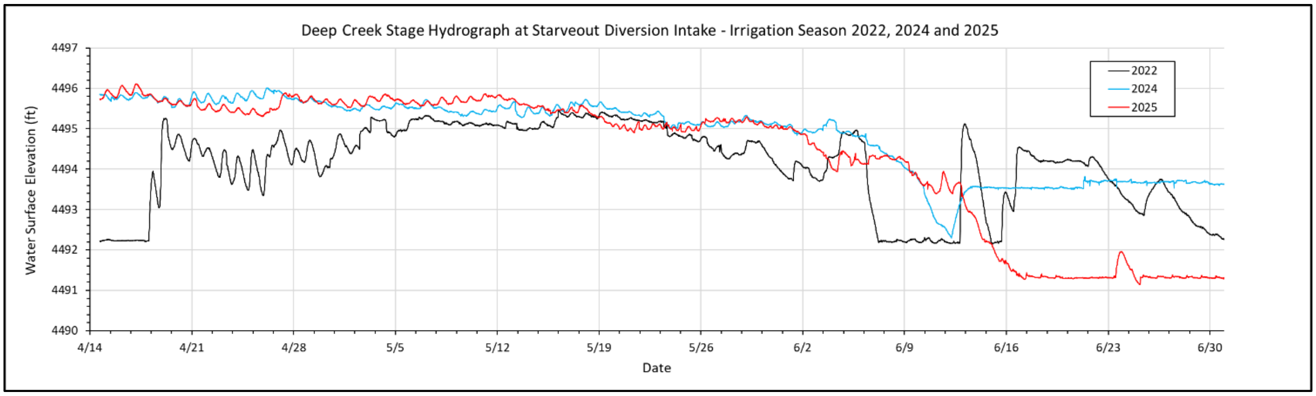


Figure 3. Deep Creek stage hydrographs for 2022, 2024, and 2025 for Deep Creek at the Starveout Diversion intake.

DIVERSION MANAGEMENT

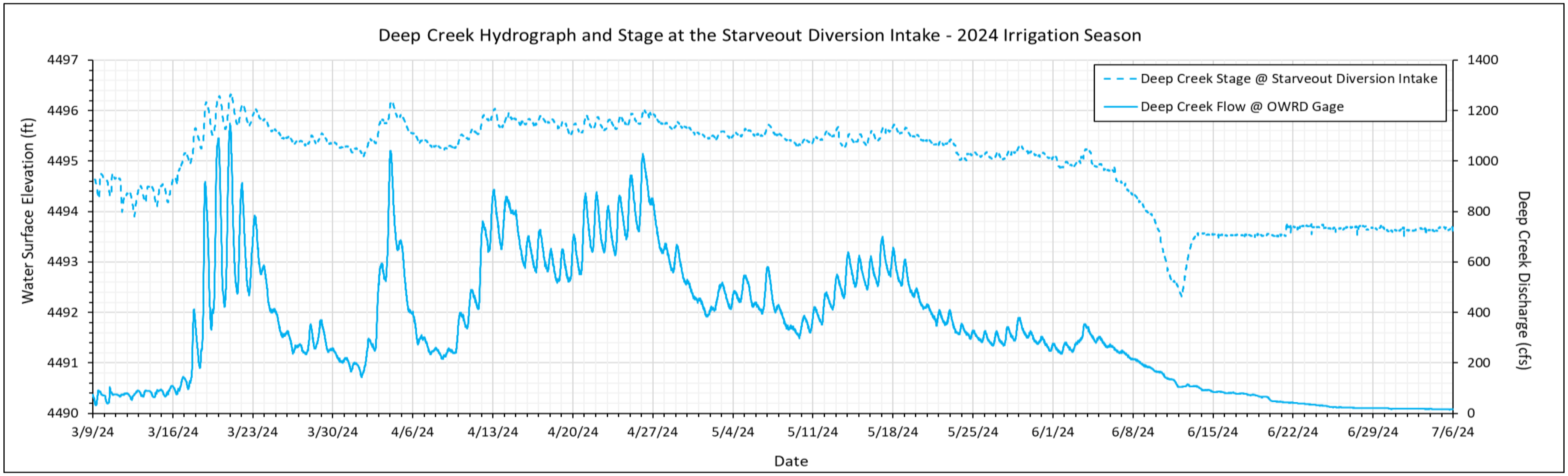
The AWID irrigation manager tracked headgate management during the 2024 irrigation season while we had water level loggers installed in both Deep Creek and the Starveout Diversion canal. The manager's notes and the water surface elevation data allowed us to better understand how the headgate and secondary diversion weir are managed, and how the management affects water surface elevations and water delivery (Figure 4). When boards are in the secondary diversion and the headgate is opened, the channel and near floodplain between the headgate and the secondary diversion weir form a secondary reservoir. The elevation of the secondary reservoir is important for supplying water via the three laterals to the irrigated pasture east of the Starveout Diversion canal. The volume of water stored behind the secondary diversion weir is important for delivering a head of water to the irrigated pastures north of the secondary diversion weir (i.e., north and east of the Highway 140 crossing). The maximum board elevation of 4,494.5 ft is higher than the crest elevations of the roughened channels on Deep Creek.

We calculated the storage capacity of the secondary reservoir based on observed water surface elevations recorded by the water level logger and our surveyed topography of the secondary reservoir area. We then assessed the drawdown rate of the secondary reservoir based on the observed water surface elevation changes recorded during the 2024 irrigation season. This information is important for understanding how quickly the secondary reservoir can both be drained and refilled. We were able to estimate the flow rate out of and into the secondary reservoir according to the following equation.

$$Q \text{ (flow)} = \Delta V \text{ (change in volume)} \div \Delta T \text{ (change in time)}$$

We assessed change in storage over three time intervals: 15 min, 30 min, and 60 min. The maximum estimated drop in storage over each of the time intervals are reported Table 1. Figure 5 includes an example drawdown from April 15, 2024. In summary, over a 15-minute period the change in secondary reservoir volume equated to a maximum outflow rate of 31 cfs. Extending to a 30-minute period, the reservoir drawdown maximum flow rate was 29 cfs. Over 60 minutes, the reservoir had a maximum drawdown rate of 20 cfs. The longer the time period, the lower the maximum drawdown discharge as the storage volume and hydraulic head decrease. Based on these data, when the headgate is closed and the boards are then removed, the maximum drawdown rate is 31 cfs. Instantaneous drawdown rates at the beginning of the drawdown are higher, but peak drawdown rates quickly change as the secondary reservoir drains.

The maximum inflow rate when the Secondary Reservoir is at base water surface elevation, boards are in place in the Secondary Diversion Weir, and the Starveout Diversion headgate is opened, is estimated to be 48 cfs over a 15-minute time interval (see Table 1). Like the drawdown condition, instantaneous filling rates are higher but are short-lived.



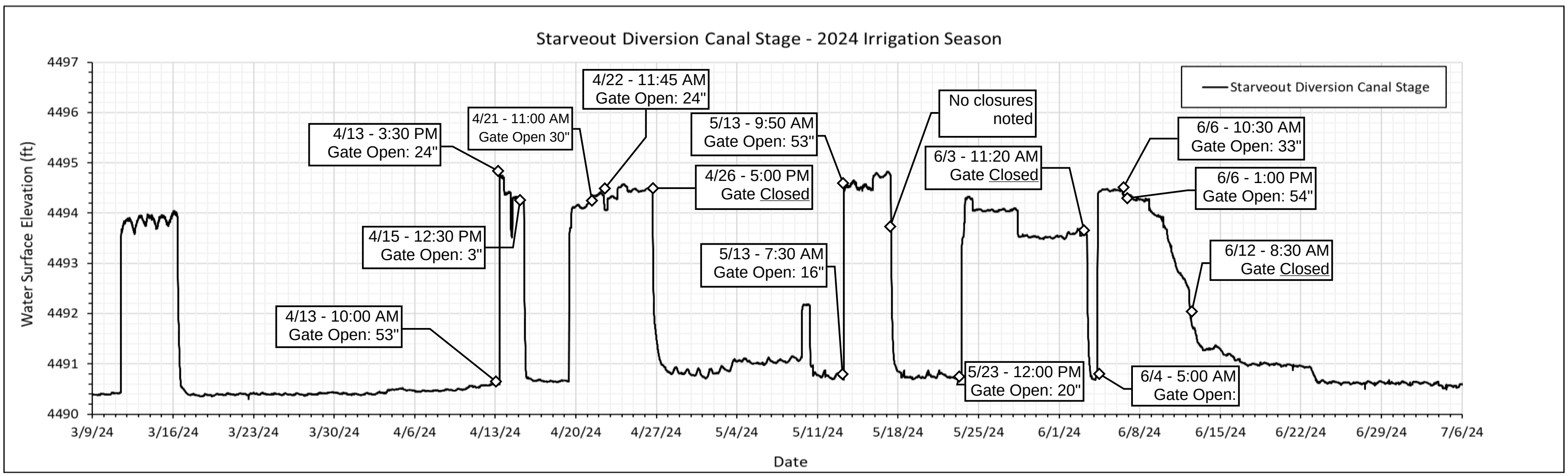


Figure 4. Deep Creek stage hydrograph and flow at the Deep Creek gage during the 2024 irrigation season (above), and the Starveout Diversion canal stage and management notes (below). Water surface elevation peaks represent periods when boards are placed in the secondary diversion and the secondary reservoir water surface elevation increases to supply water to the three laterals. Minimal water surface elevations are associated with secondary reservoir drawdown and headgate closure.

Table 1. Maximum outflow and inflow rates over three time intervals for the Starveout Diversion's Secondary Reservoir.

Condition	Max Flow Over 15 min Interval	Max Flow Over 30 min Interval	Max Flow Over 60 min Interval
Outflow from Secondary Reservoir	31 cfs	29 cfs	20 cfs
Inflow to Secondary Reservoir	48 cfs	43 cfs	33 cfs

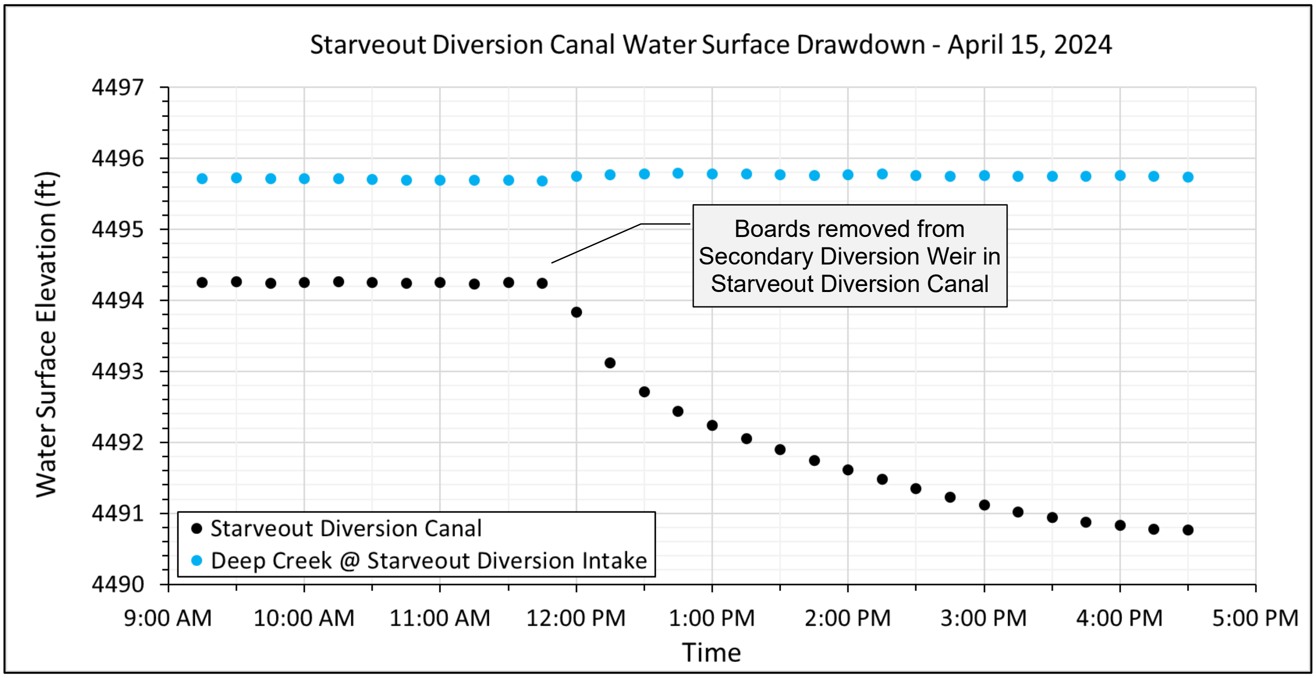


Figure 5. The change in water surface elevation in the Starveout Diversion canal with the removal of the boards from the Secondary Diversion Weir in the Starveout Diversion Canal. The Deep Creek water surface elevation remained consistent as the Starveout Diversion headgate was only slightly opened during the drawdown and Deep Creek flows exceeded 500 cfs.

FISH SCREEN ALTERNATIVES

Based on our hydrologic and ditch management analysis, we evaluated two screening alternatives that could accommodate diversion flows in excess of 50 cfs. The first alternative was a vertical panel, wire power-driven cleaning system, the second alternative was a cone screen. The following information provides an overview of the two alternatives.

OPTION 1 – VERTICAL PANEL SCREEN

The vertical panel screen would be located in the diversion canal downstream from the Starveout Diversion headgate. The screen could be a single or double panel system screen, the double panel system screen would reduce the length of the screen but increase the screen width. Wire power would be brought to the project site to run the brush cleaning system. There is overhead power approximately 700 ft (straight line distance) from the project area. A fish return pipe would return fish that enter the fish screen, to Deep Creek downstream from the roughened channel. The fish return pipe would also facilitate fine sediment and debris removal from the screen bay. Since the canal is accessible to equipment, an excavator or backhoe could periodically be used to remove sediment from the alcove. Fine sediment would also have to be removed at least annually from the screen forebay by using water pressure or manual shoveling.

There are several advantages of the vertical panel screen including water user familiarity (similar screens on Honey Creek), screen protection from high flows given proposed canal location, screen access for cleaning and maintenance, and the vertical panel screen is a proven technology supported by the ODFW Screen Shop. Screen disadvantages include the need for a fish return pipe, sediment and fine debris deposition in the screen bay, and the screen size.

OPTION 2 – CONE SCREEN

The second alternative we evaluated is an ISI Intake Screens, Inc. cone screen. We assessed two screen locations, in Deep Creek and in the Starveout Diversion canal. Like the vertical panel screen, the cone screen would have a wire powered-brush system. A cone screen located in the canal would require a secondary headwall to block fish from entering the Starveout Diversion canal, a fish return pipe would be located between the existing Starveout Diversion headgate and the secondary headwall. The secondary headwall would create an alcove-like intake zone that would be prone to sediment and fine debris deposition. The fish return pipe would allow fish to return to Deep Creek and could assist with clearing fine sediment from the screen area.

Screen placement in Deep Creek would be less prone to sediment fouling as sediment and fine debris are less likely to deposit in the vicinity of the screen given the sweeping flows of Deep Creek. The sluiceway located on the east side of the east roughened channel could also be managed to reduce the potential for sediment deposition at the screen. If sediment does become an issue, the water users could periodically use the equipment access ramp to mobilize an excavator to remove deposited sediment from the screen area. Debris deflectors could also be added to the headwall upstream from the cone screen to provide debris strike protection for the screen.

There are several advantages of the cone screen placed in Deep Creek including relying on sweeping flows to clear sediment and fine debris, the structural simplicity of the cone screen, and the range of operational flows. Cone screens are also proven technology supported by the ODFW Screen Shop. Screen disadvantages are similar to the vertical panel screen including sediment and fine debris deposition are the screen, and the screen size.

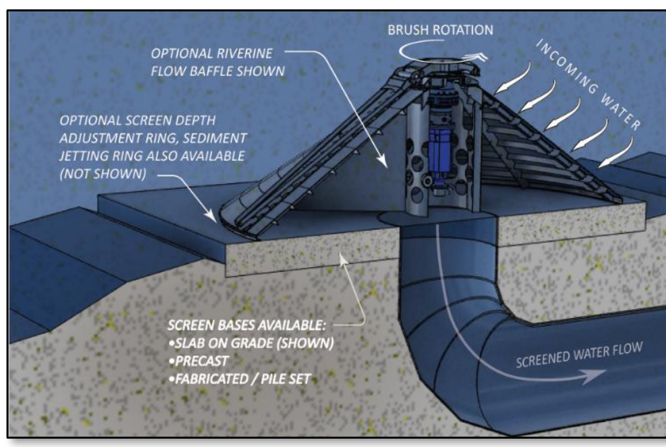


Figure 6. Cone screen exhibit from ISI Intake Screens, Inc. brochure.

After reviewing the screen alternatives with AWID, LCUWC, ODFW Screen Shop personnel, and ISI Intake Screens staff, we determined that a 14 ft diameter cone screen set in Deep Creek would have the best possibility of success in meeting water user needs, minimizing diversion maintenance, and having the least effect on Warner Sucker. We have developed three cone screen options for the stakeholders' review and comment.

ALTERNATIVE #1 – RETROFIT THE EXISTING DIVERSION INTAKE

Alternative #1 includes maintaining the diversion intake and related infrastructure in its current location (see Attachment A, Sheet 3.1.1 – 3.1.3). A steel water collection structure would be fabricated and affixed to the front of the intake structure. The collection structure would include two orifices, the cone screen plenum (i.e., rectangular conduit that conveys water from the screen) would connect with the lower orifice, the upper orifice would serve as a bypass in the event the screen was disabled and unable to pass flow. A control gate would be attached to the front of the bypass orifice to control flow into the bypass. The existing headgate on the back wall of the intake would remain in place and control flow from the intake to the existing culvert that supplies water to the Starveout Diversion canal. The cone screen would be set on a pre-cast concrete or steel platform that is secured to two piles and supported by the cone screen plenum. Two removable expanded steel ramps and a fixed expanded steel platform would allow for water user access to the screen for debris removal. The ramps could be removed in advance of an anticipated large flood or remain in place for extra screen protection. The fixed platform would be fabricated in a dimension for additional debris deflection. The removable steel ramps could also be removed if the screen needed to be removed from the foundation platform.

ALTERNATIVE #2 – REPLACE THE EXISTING DIVERSION INTAKE IN EXISTING LOCATION

Alternative #2 includes replacing the diversion intake and related infrastructure in its current location (see Attachment A, Sheet 3.2.1 – 3.2.2). A concrete vault would be designed as the water collection structure and would include the two-orifice arrangement as described for Option 1. The cone screen and access structures would also be similar to Alternative #1. The existing culvert would be removed and replaced with an HDPE pipe. The downstream timber headwall could either be maintained or replaced with a steel sheet pile or concrete headwall.

ALTERNATIVE #3 – REPLACE THE EXISTING DIVERSION INTAKE AND RELOCATE

Alternative #3 includes replacing the diversion intake and related infrastructure (see Attachment A, Sheet 3.3.1). The new intake would be placed closer to the existing sluiceway on the east side of the east roughened channel. The new intake would be constructed similar to Alternative #2.

APPURTENANT STRUCTURES

The design alternatives include elements to improve operational access and safety, as well as to improve debris deflection. An expanded steel catwalk would be fixed to the support piles and removable ramps would provide access from the vault to the fixed platform. The ramps when secured, would also protect the screen from debris. The ramps could be removed to allow removal of the cone screen for maintenance. Fixed catwalks and railings would also be installed on top of the intake vault to facility access and diversion operation.

Under Alternative #2 and #3, the existing timber headwall would be replaced with a concrete headwall. The existing corrugated metal pipe would be replaced with a similarly sized 6 ft diameter HDPE pipe.

ALTERNATIVES SUMMARY

Alternative #1 would be the most cost-effective alternative as it would rely on using the existing infrastructure. The fabricated steel collection structure would be designed to sleeve over the outside concrete walls of the intake structure to extend the life of the concrete intake. Option 1 would also reuse the existing culvert and timber headwall. Alternative #2 would replace the existing infrastructure but maintain the diversion intake in its current location. Alternative #2 would have an intermediate cost. Alternative #3 would replace and relocate the diversion intake approximately 30 ft downstream from the existing intake location to benefit from closer proximity to the sluiceway inlet. However, relocating the screen to be closer to the sluiceway inlet is not expected to result in substantial improvement in screen performance.

CONE SCREEN PERFORMANCE

Cone screen efficiency is maximized when the water level is at the top of the cone screen, screen conveyance does not increase with increasing water depth, or hydraulic head, greater than the top of the screen. Figure 7 shows the screen performance for the 14 ft diameter screen. Based on our review Deep Creek water surface elevations from the 2022, 2024, and 2025 irrigation seasons, a Deep Creek water surface elevation of 4495.0 ft was met or exceeded for much of the 2024 and 2025 irrigation seasons and was met during May of the 2022 irrigation season (Figure 8). The 14 ft diameter cone screen requires 51 inches of submergence to meet the maximum allowable flow rate of 70.2 cfs. To achieve this depth, the screen base would be set at 4490.75 ft. The cone screen would be secured to a steel or pre-cast concrete mounting plate that would be supported by two support piles and the underlying steel plenum. Although the plenum dimensions will be determined following further hydraulic analysis, the bottom of the plenum will be set above the floor of the intake structure and diversion pipe’s invert elevation.

Based on the current diversion operation, we anticipate that when there is between 200 cfs and 300 cfs measured at the OWRD gage, there should be sufficient water to meet water needs. When flow at the gage is less than 200 cfs, the upstream diversions, most notably the Town Diversion, take sufficient water that flow into the Starveout Diversion forebay may be insufficient to maintain a continuous ~70 cfs supply to the Starveout Diversion. When streamflow declines to these levels, nearly all flow will go to the Starveout Diversion canal when the headgate is open. Based on our water level logger data and recent diversion operations, this condition tends to occur in early to mid-June.

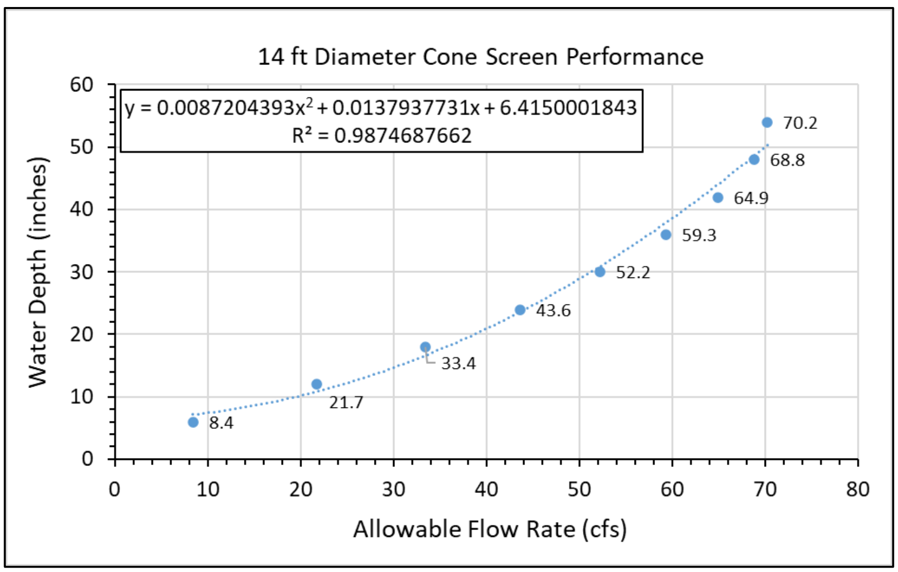


Figure 7. The ISI Intake Screens’ performance curve for the 14 ft diameter cone screen. Data labels represent the allowable flow rate for a cone screen designed with a 0.4 ft/sec approach velocity.

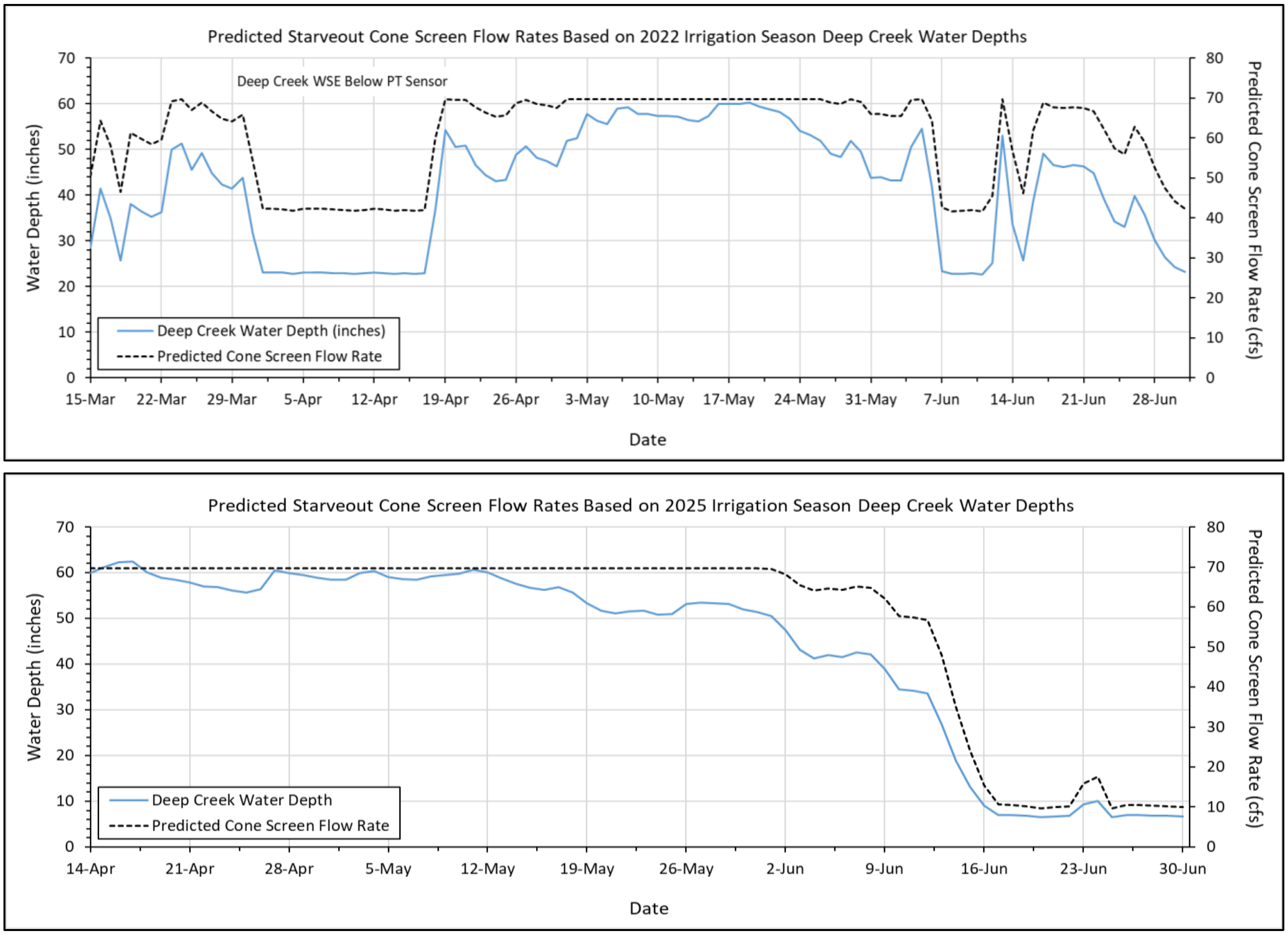


Figure 8. Deep Creek water depth and predicted cone screen flow rate during the 2022 (above) and 2025 (lower) irrigation seasons. The presented shorter 2025 time period is due to a briefer data collection period. Full water delivery occurs until Deep Creek streamflow declines in early June during average years.

FURTHER ANALYSIS

With delivery of this document, we foresee the tasks below as the next steps for developing the project.

- Select preferred alternative and implement modifications requested by AWID and WBAHP.
- Further develop preferred alternative to 30% design with additional details for cone screen and appurtenant structures. Details will include connections, materials, volumes, layout, and elevations.
- More intensive hydraulic analysis to determine potential hydraulic losses and expected water delivery.
- Progress to 60% and 90% designs.

SUMMARY

SWCA completed site surveys and compiled water surface elevation data over three irrigation seasons using water level loggers installed in Deep Creek and in the Starveout Diversion canal. We also used OWRD's Deep Creek gage to approximate the streamflow at the Starveout Diversion. Headgate management notes recorded by the AWID's irrigation manager during the 2024 irrigation season were instrumental in understanding diversion management in 2024 and we were able to apply that understanding to changes in Deep Creek and Starveout Diversion canal stages for the 2022 and 2025 irrigation periods. AWID uses the Starveout Diversion headgate and a secondary stoplog diversion on the canal to manage water levels to supply water to the three laterals between the headgate and secondary diversion, and to deliver water to irrigated pastures north of the secondary diversion. Based on the observed drawdown rates, we estimated maximum outflow and inflow rates over 15-minute, 30-minute, and 1-hour periods. These maximum rates were used to assess fish screen alternatives.

We evaluated a vertical panel and cone screen, with options to locate the screen in the Starveout Diversion canal and in Deep Creek. After discussions with the water users and project partners, we chose to proceed with further developing cone screen alternatives located in Deep Creek. We developed three alternatives focused on a 14 ft diameter cone screen manufactured by ISI Intake Screens. Alternative #1 would retrofit the existing intake structure, Alternative #2 would replace the intake structure, and Alternative #3 would replace and relocate the intake structure to be closer to the existing sluiceway.

Sincerely,

Troy Brandt, FP-C
Project Manager/Senior Fisheries Biologist
(503) 307-8367 | Troy.Brandt@swca.com

Liam Christman, EIT
Project Engineer
Liam.Christman@swca.com

ATTACHMENT A
FISH SCREEN ALTERNATIVES

DEEP CREEK - STARVEOUT DIVERSION

DIVERSION CANAL FISH SCREEN DESIGN

ADEL, OR

ALTERNATIVES

PROJECT PARTNERS

Lake County Umbrella WATERSHED COUNCIL

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

U.S. FISH & WILDLIFE SERVICE

OREGON WATERSHED ENHANCEMENT BOARD OWEB

ADEL WATER IMPROVEMENT DISTRICT

PROJECT DESCRIPTION

THE PROJECT PARTNERS COMPLETED A FISH PASSAGE PROJECT ON DEEP CREEK AT THE STARVEOUT DIVERSION IN 2020. THE PROJECT INCLUDED BUILDING TWO ROUGHENED CHANNELS AND A SEDIMENT SLUICEWAY ADJACENT TO THE EASTERN ROUGHENED CHANNEL. THE ENCLOSED PLANS INCLUDE THREE CONE SCREEN CONCEPTS PREPARED BY SWCA ENVIRONMENTAL CONSULTANTS. THE CONE SCREEN DESIGN IS INTENDED TO MEET AWID IRRIGATION WATER NEEDS AND MINIMIZE THE POTENTIAL FOR FUTURE WARNER SUCKER AND WARNER LAKES REDBAND TROUT ENTRAINMENT INTO THE STARVEOUT DIVERSION IRRIGATION NETWORK. THE CONCEPTS INCLUDE ALTERNATIVE #1 - RETROFIT, ALTERNATIVE #2 - REPLACE, AND ALTERNATIVE #3 - RELOCATE. ALTERNATIVE #1 WOULD RETROFIT THE EXISTING DIVERSION INTAKE WITH A CONE SCREEN AND FACE-MOUNTED WATER COLLECTION STRUCTURE. THE EXISTING HEADWALLS, INTAKE, AND DIVERSION PIPE WOULD REMAIN IN PLACE. ALTERNATIVE #2 WOULD INSTALL A CONE SCREEN AND REPLACE ALL EXISTING INTAKE INFRASTRUCTURE INCLUDING THE CONCRETE BOX, HEADWALLS, AND DIVERSION PIPE. ALTERNATIVE #3 WOULD REMOVE THE EXISTING INFRASTRUCTURE AND BUILD A CONE SCREEN, NEW INTAKE INFRASTRUCTURE, AND DIVERSION PIPE. THE CONE SCREEN AND INTAKE WOULD BE LOCATED CLOSER TO THE EXISTING SLUICEWAY TO ASSIST WITH SEDIMENT ROUTING. SWCA, AWID, AND THE OTHER PROJECT PARTNERS WILL REVIEW THE PROPOSED ALTERNATIVES AND SELECT A PREFERRED ALTERNATIVE THAT WILL BE ADVANCED THROUGH A SUBSEQUENT DESIGN PROCESS.

SPATIAL REFERENCE

SURVEY CONTROL USED FOR THE PROJECT IS PROVIDED ON DRAWING 2.0 AND COORDINATES CORRESPOND TO THE TOP CENTER OF CONTROL MARKERS.

LIDAR, GPS RTK, AND TOTAL STATION:

HORIZONTAL PROJECTION: OREGON STATE PLANE SOUTH — SURVEY DATE: 8/20/2024, 4/17/2024

HRZ DATUM: NAD83 — UNITS: US SURVEY FT — LiDAR COLLECTED: N/A

VRT DATUM: NAVD88 — UNITS: US SURVEY FT

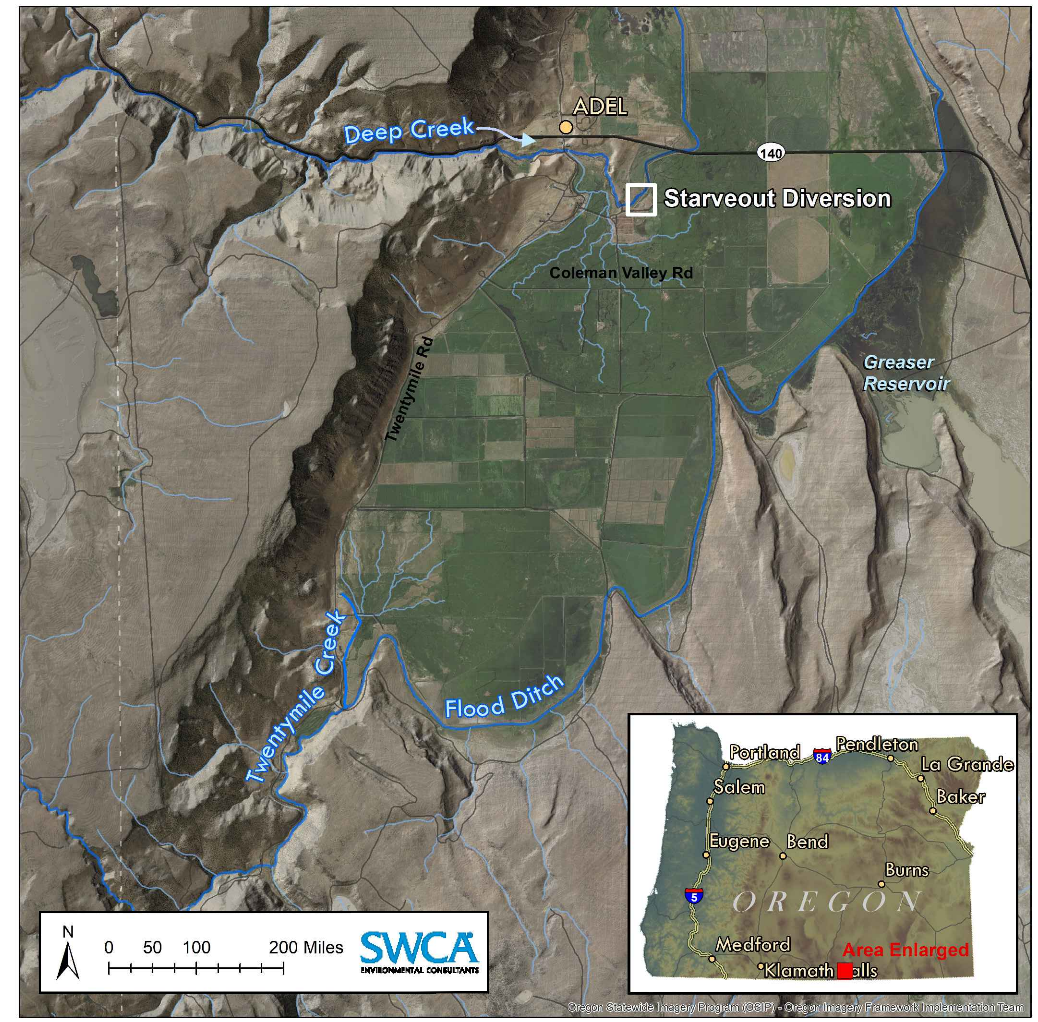
STANDARD OF PRACTICE

SWCA EMPLOYS THE MOST CURRENT AND ACCEPTED PRACTICES AVAILABLE FOR PLANNING AND DESIGN OF FISH PASSAGE, SCREENING, RESTORATION AND CHANNEL ENHANCEMENT PROJECTS. THE ANALYSIS FOR THIS WORK RELIED ON A COLLABORATIVE DATA COLLECTION EFFORT AND CURRENT FISH PASSAGE CRITERIA FROM ODFW AND NMFS/NOAA. ALL WORK WAS PERFORMED OR DIRECTED BY A REGISTERED PROFESSIONAL ENGINEER WITH RELEVANT EXPERIENCE

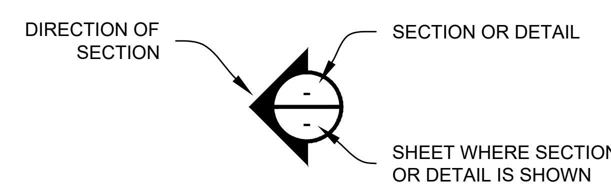
REUSE OF DRAWINGS

DRAWING INDEX

PROJECT VICINITY MAP



SE 1/4 OF THE SW 1/4 OF SECTION 22, T.39S., R.24E.
WILLAMETTE MERIDIAN
LAKE COUNTY, OREGON
USGS QUADRANGLE: ADEL, OR



CROSS-SECTION SHEET REFERENCE

NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
RDG RIVER DESIGN GROUP
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

COVER SHEET AND NOTES

DEEP CREEK - STARVEOUT DIVERSION

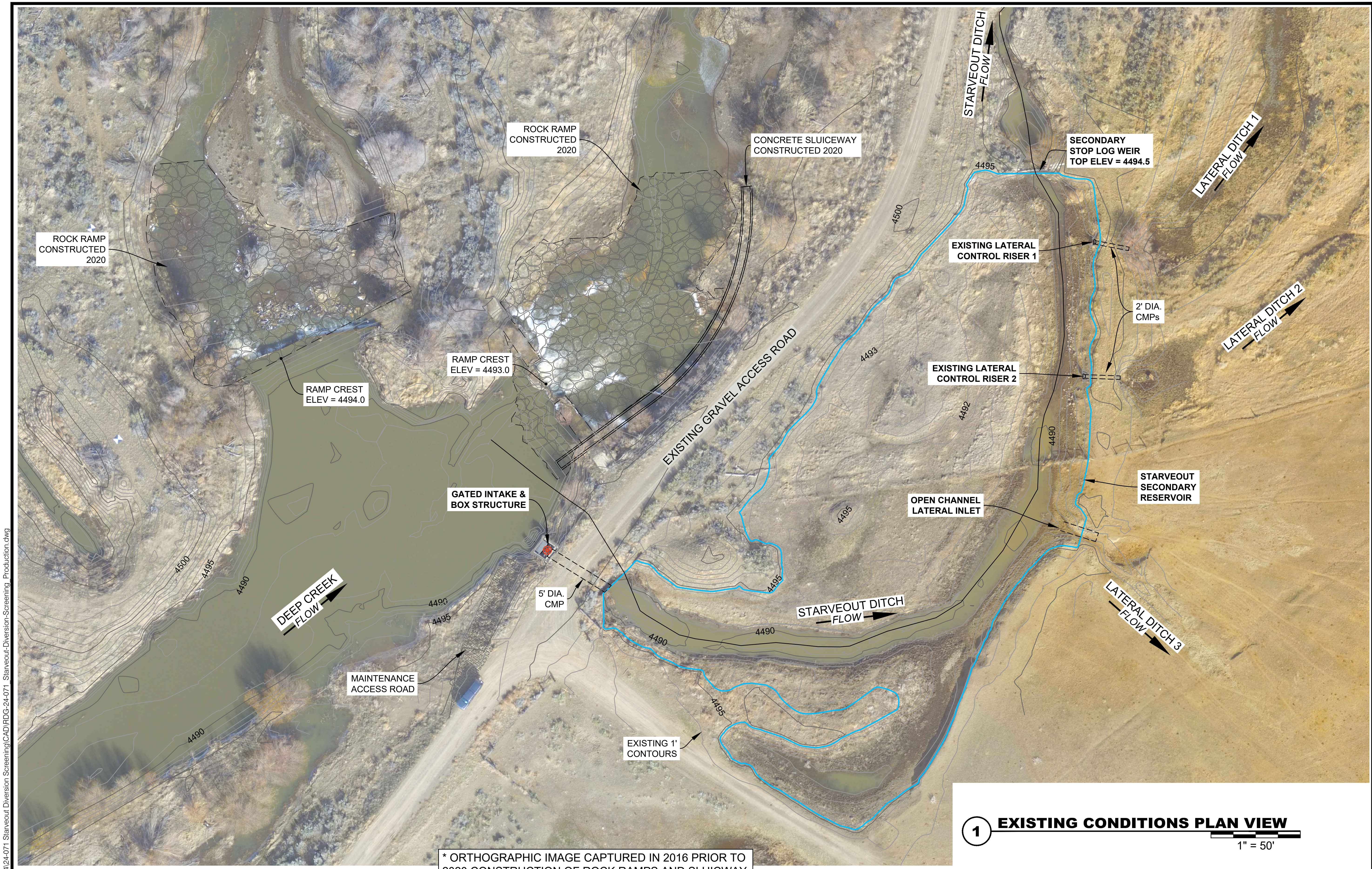
ADEL, OR

NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER 91494-000-CRB

DRAWING NUMBER 1.0

Oct 16, 2025 - 4:10pm M:\Projects\2024\24-071 Starveout Diversion Screening\CAD\RDG-24-071_Starveout-Diversion-Screening_Production.dwg



1 EXISTING CONDITIONS PLAN VIEW

1" = 50'

* ORTHOGRAPHIC IMAGE CAPTURED IN 2016 PRIOR TO 2020 CONSTRUCTION OF ROCK RAMPS AND SLUICWAY

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EXISTING CONDITIONS - OVERVIEW

DEEP CREEK - STARVEOUT DIVERSION

ADEL, OR

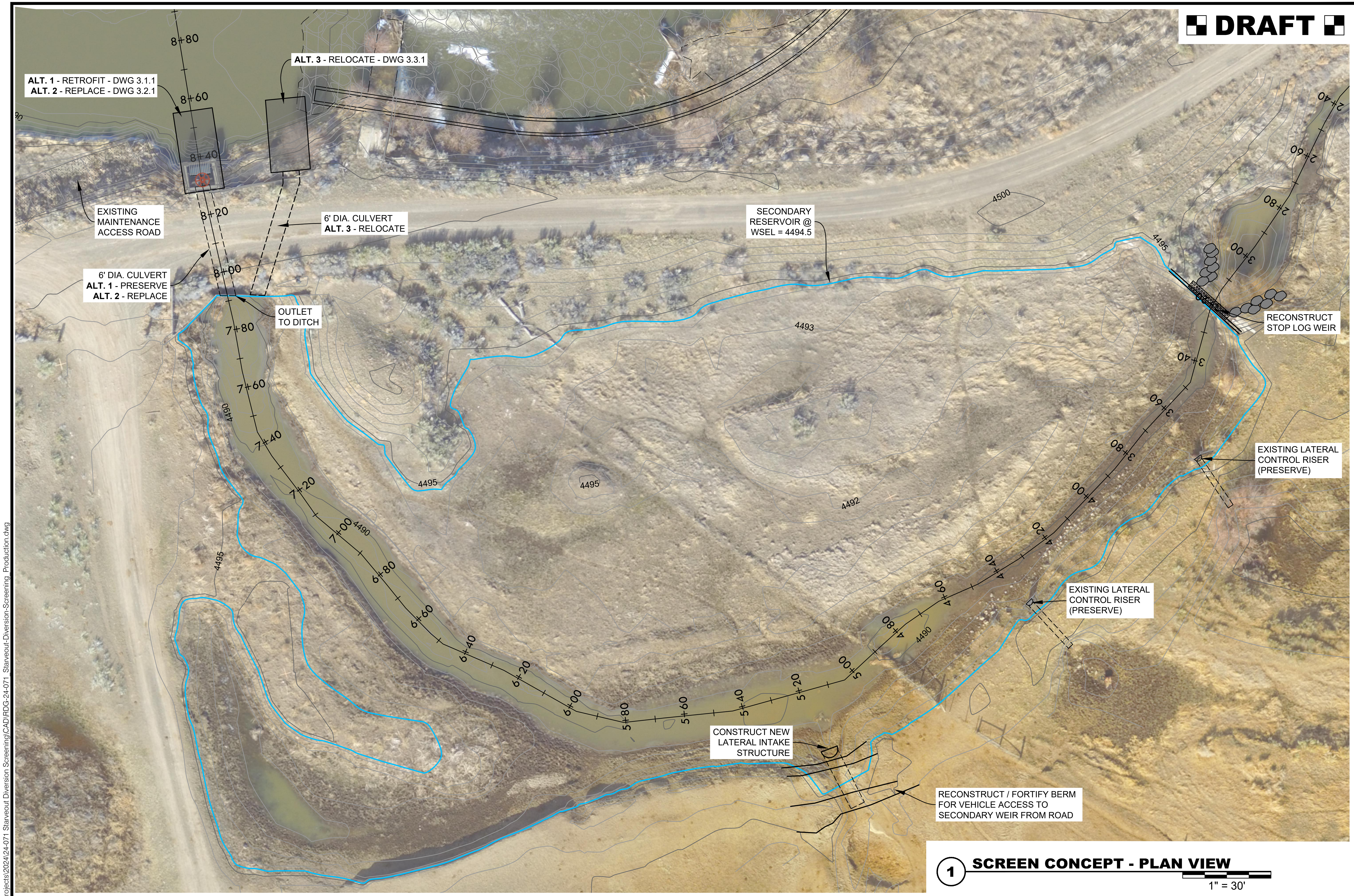
NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
2.0

Drawing 2 of 10

M:\Projects\2024\24-071 Starveout Diversion Screening\CAD\RDG-24-071_Starveout-Diversion-Screening_Production.dwg



1 SCREEN CONCEPT - PLAN VIEW

1" = 30'

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SCREENING CONCEPTS OVERVIEW

NO.	DATE	BY	DESCRIPTION	CHK
*	8/20/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.0

Drawing 3 of 10

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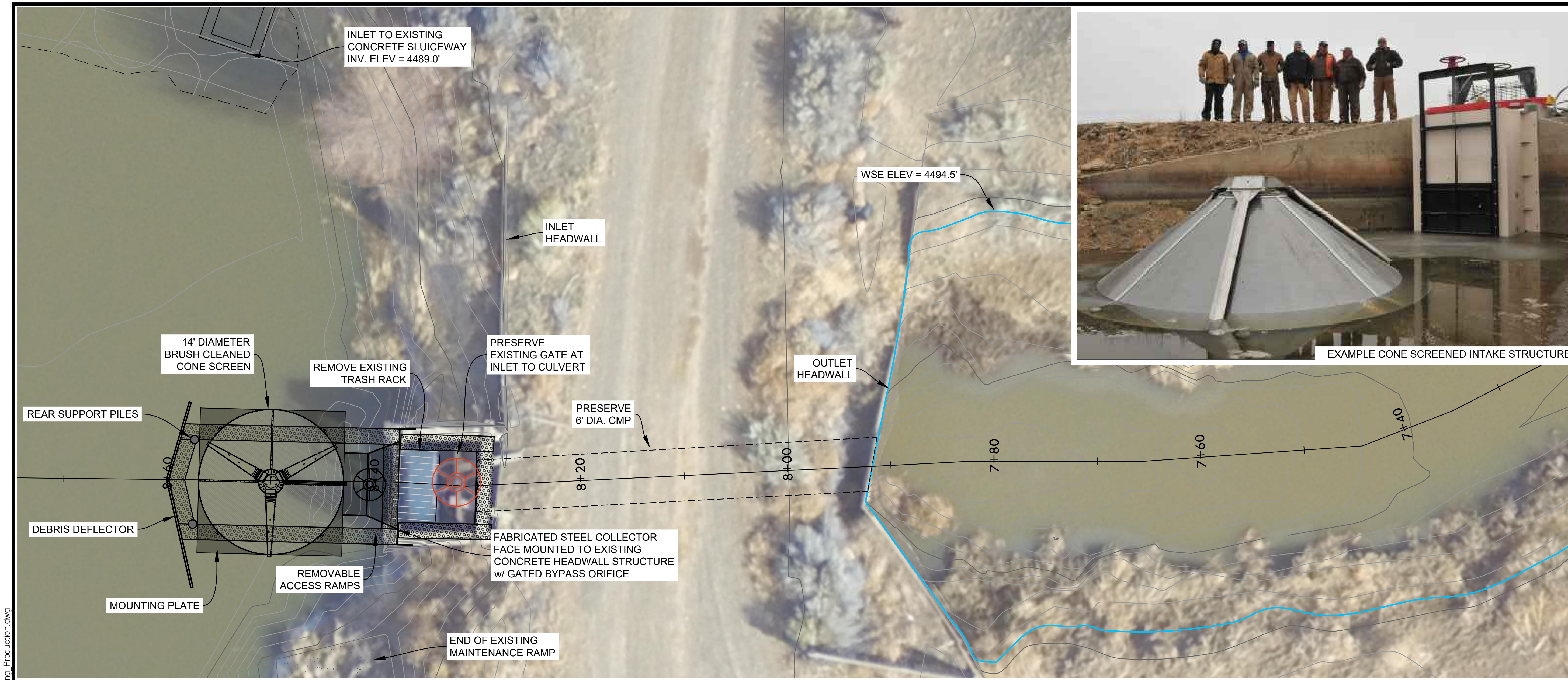
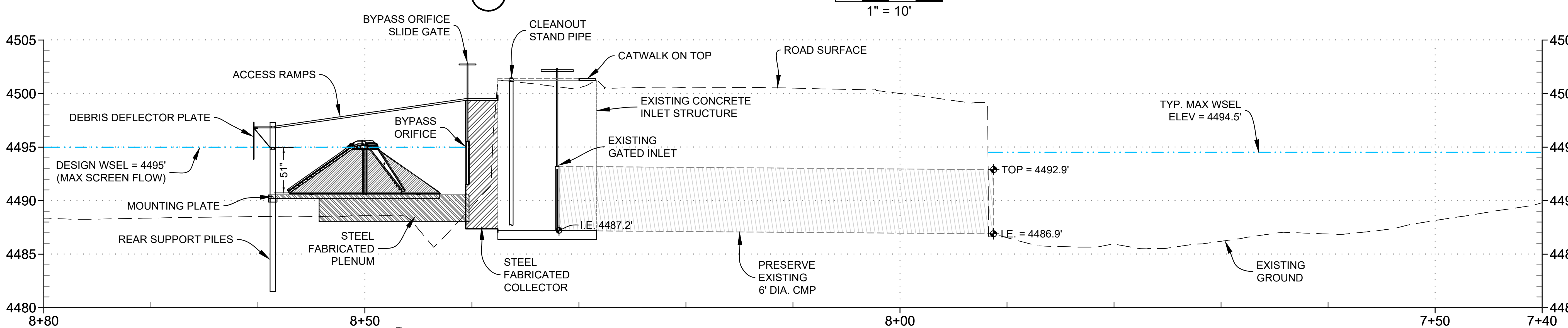


EXAMPLE CONE SCREENED INTAKE STRUCTURE

1 PROPOSED INTAKE RETROFIT - PLAN VIEW

1" = 10'



2 PROPOSED INTAKE RETROFIT - PROFILE VIEW

1" = 10'

DRAFT

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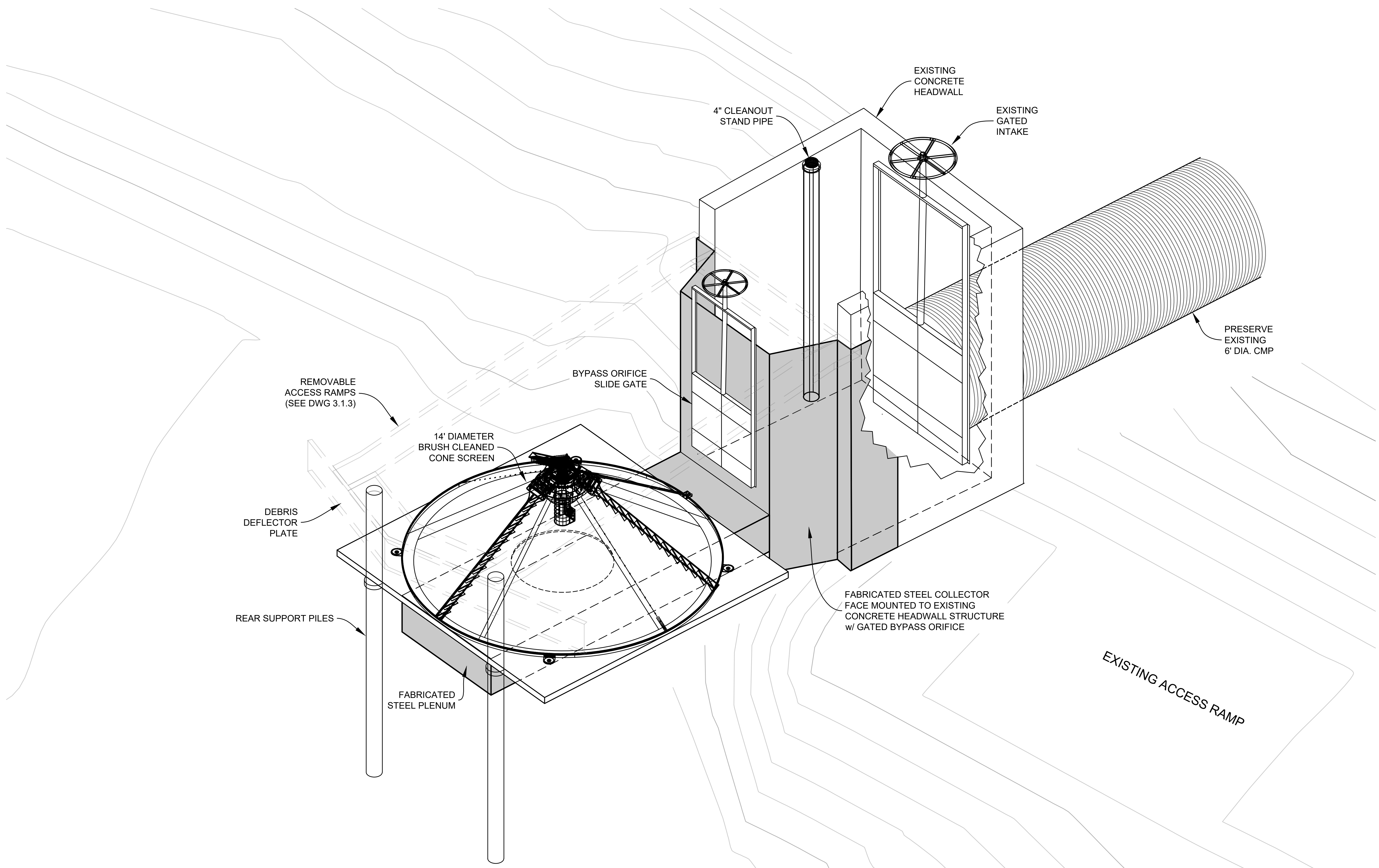
SCREEN ALT. #1 - RETROFIT PLAN & PROFILE

DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.1.1



1 **PROPOSED CONE SCREEN W/ INTAKE RETROFIT - ISOMETRIC VIEW**

N.T.S

DRAFT

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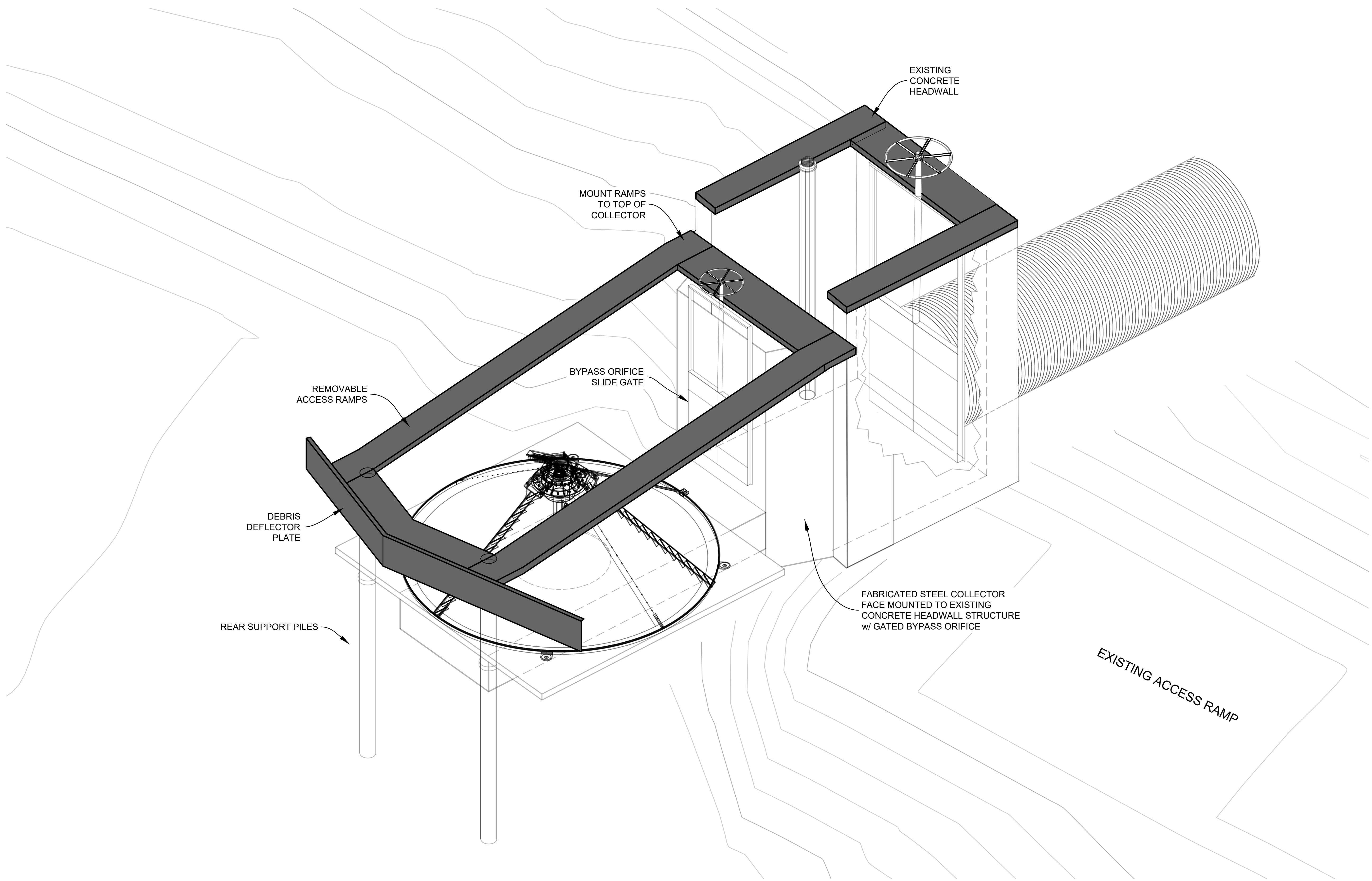
SCREEN ALT. #1 - RETROFIT ISOMETRIC

DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.1.2



1 **PROPOSED CONE SCREEN W/ INTAKE RETROFIT - ISOMETRIC VIEW**

N.T.S

DRAFT

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TYPICAL ACCESS RAMP - ISOMETRIC

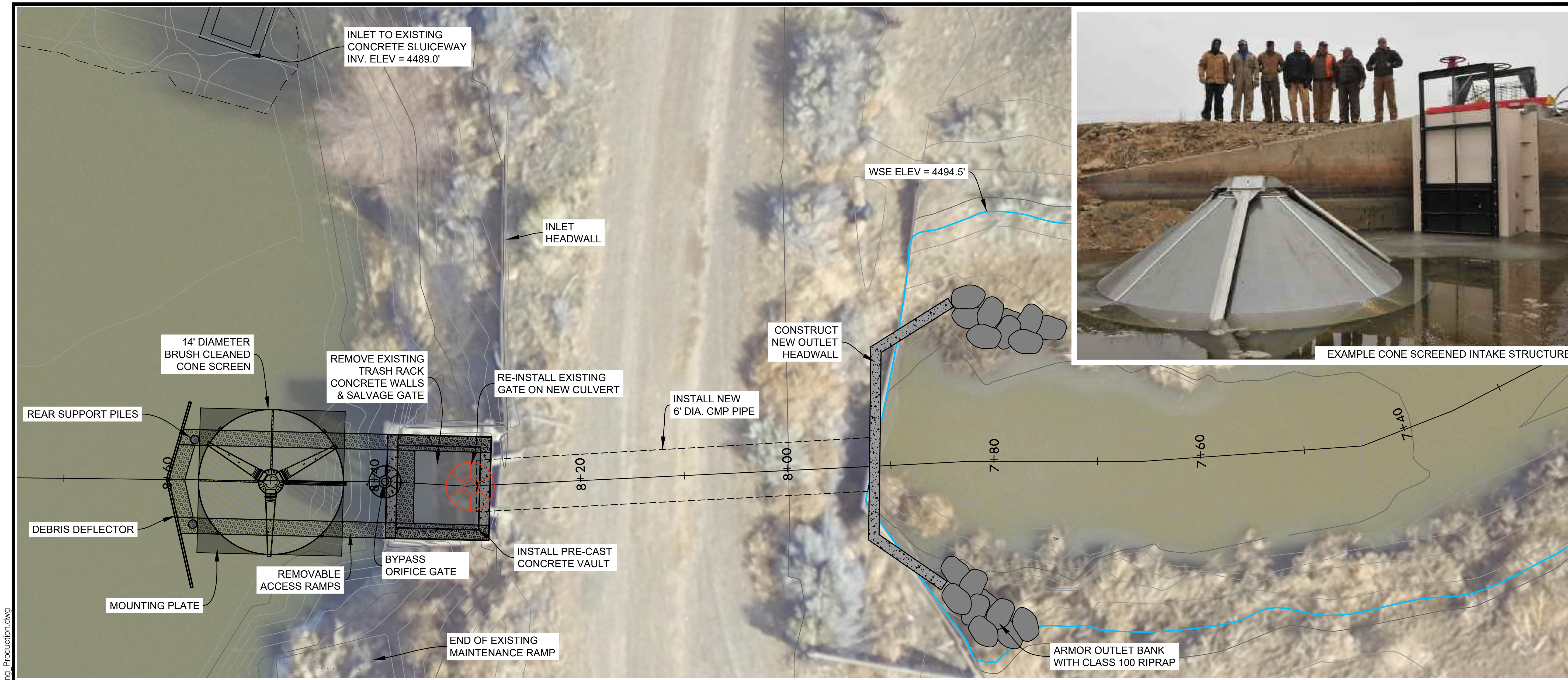
DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.1.3

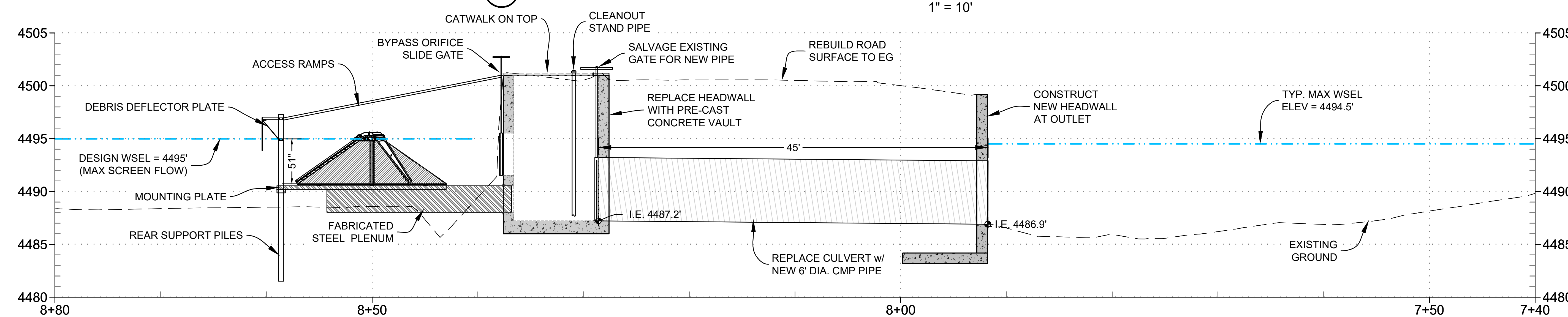
Drawing 6 of 10



EXAMPLE CONE SCREENED INTAKE STRUCTURE

1 PROPOSED INTAKE REPLACEMENT - PLAN VIEW

1" = 10'



2 PROPOSED INTAKE REPLACEMENT - PROFILE VIEW

1" = 10'

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NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

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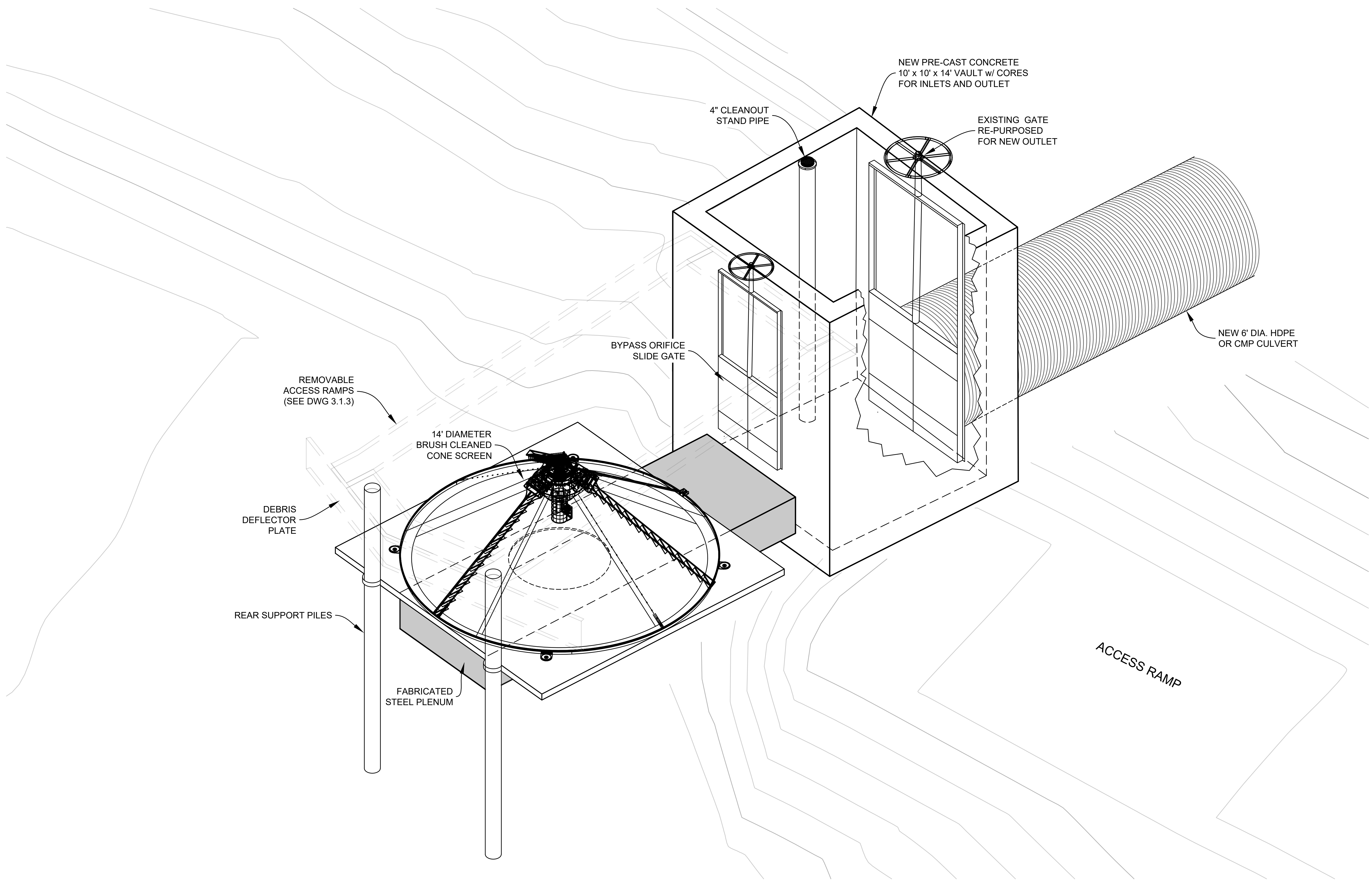
SCREEN ALT. #2 - REPLACE PLAN & PROFILE

DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.2.1



① **PROPOSED CONE SCREEN W/ INTAKE RETROFIT - ISOMETRIC VIEW**

N.T.S

DRAFT

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SCREEN ALT. #2 - REPLACE ISOMETRIC

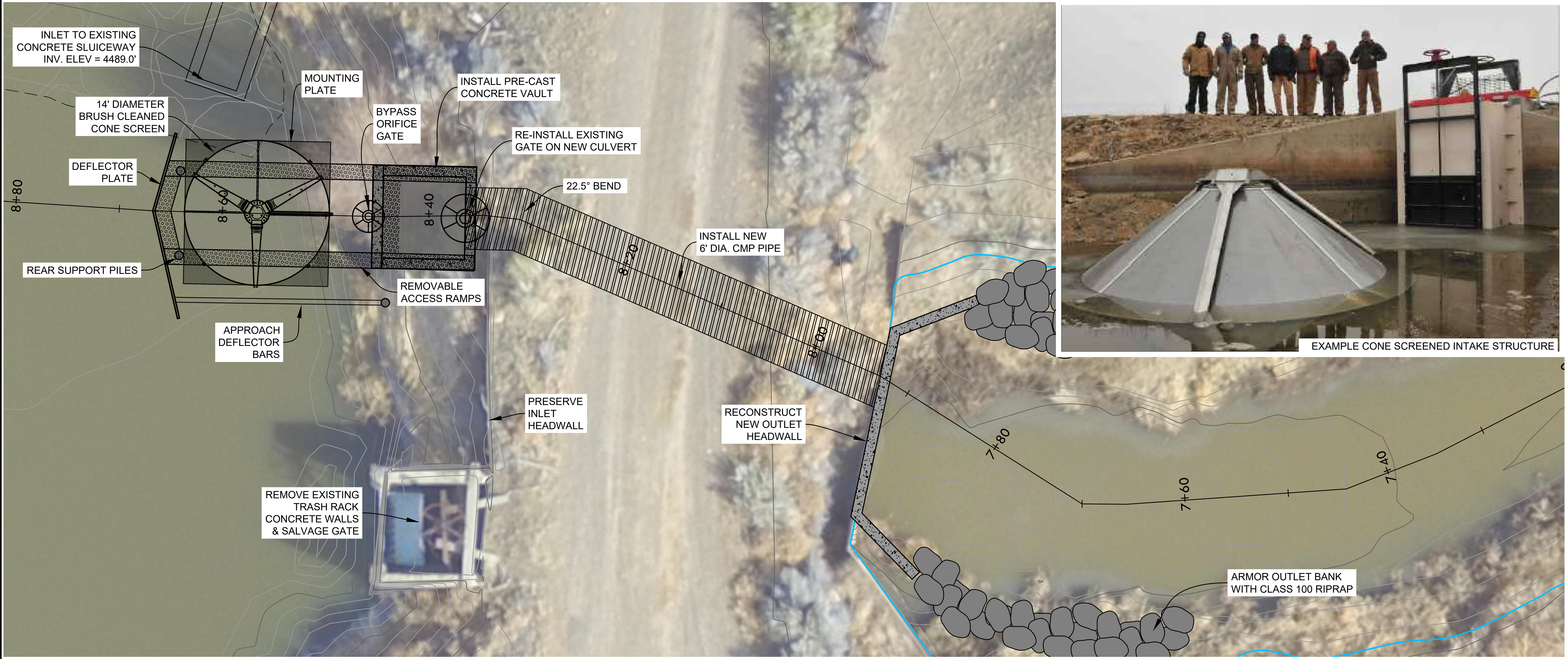
DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

PROJECT NUMBER
91494-000-CRB

DRAWING NUMBER
3.2.2

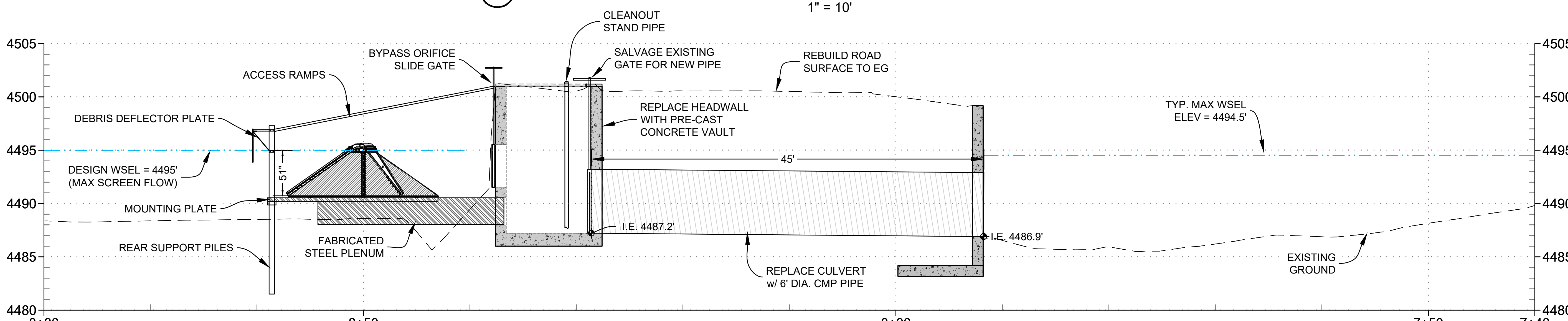
Drawing 8 of 10



EXAMPLE CONE SCREENED INTAKE STRUCTURE

1 EXISTING INTAKE - PLAN VIEW

1" = 10'



2 EXISTING INTAKE - PROFILE VIEW

1" = 10'

DRAFT

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SCREEN ALT. #3 - RELOCATE PLAN & PROFILE

DEEP CREEK - STARVEOUT DIVERSION
ADEL, OR

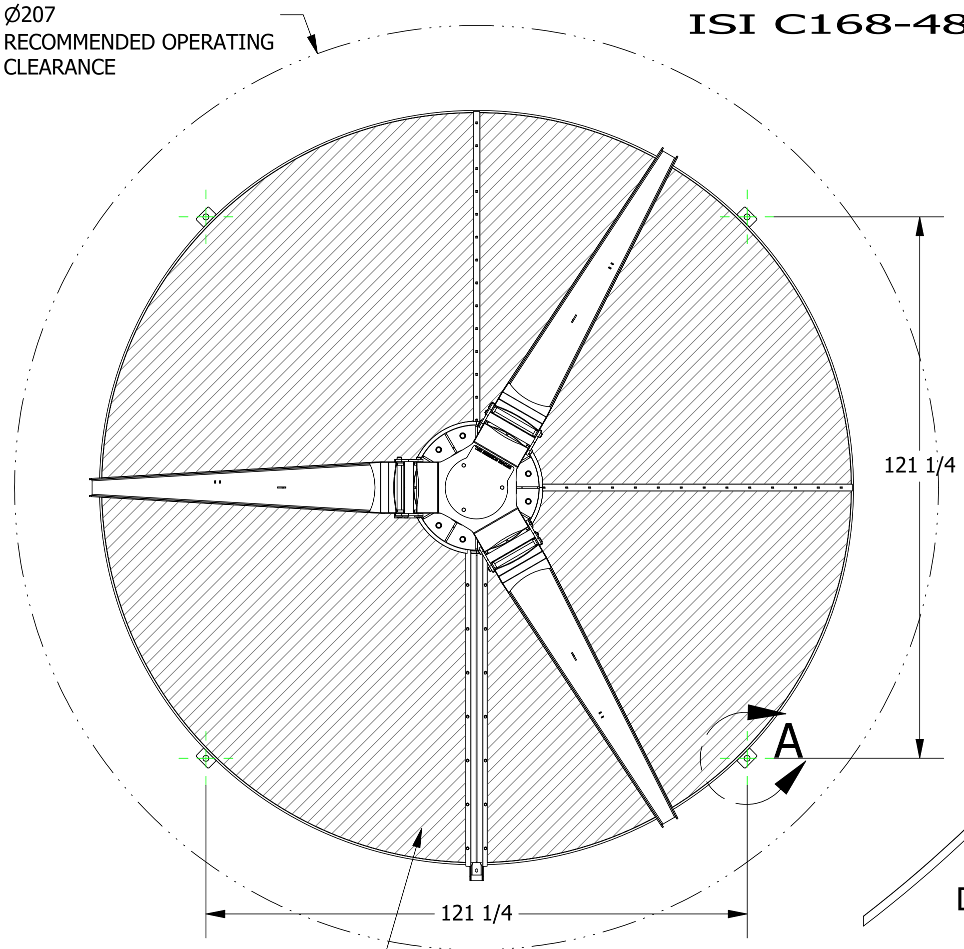
NO.	DATE	BY	DESCRIPTION	CHK
*	10/1/25	LC	ALTERNATIVES	GV

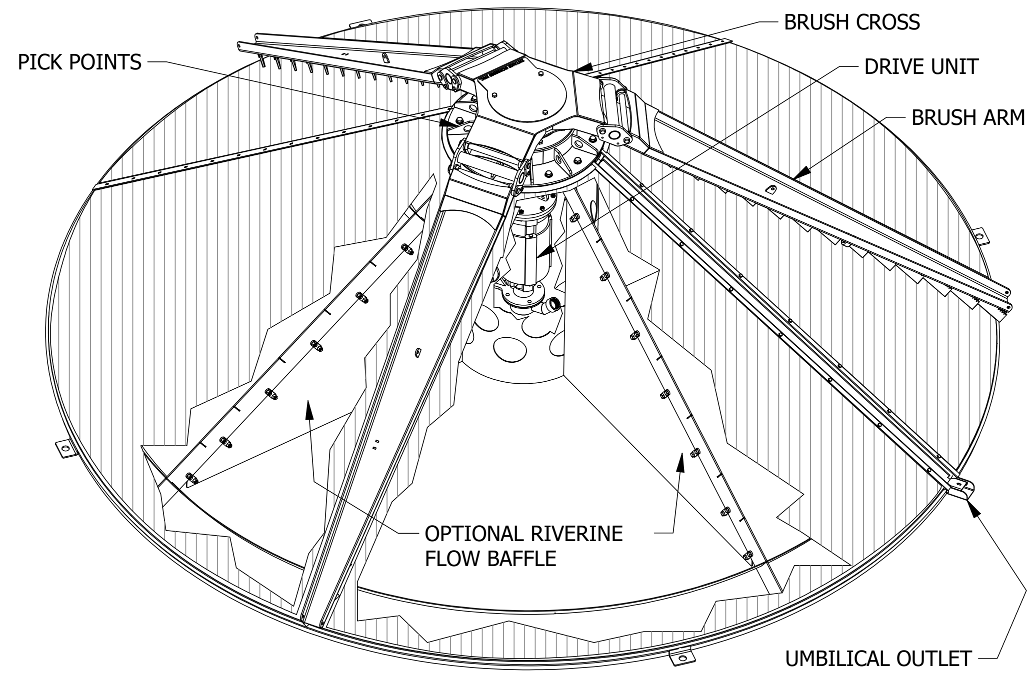
PROJECT NUMBER
91494-000-CRB

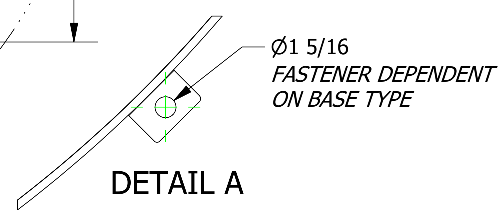
DRAWING NUMBER
3.3.1

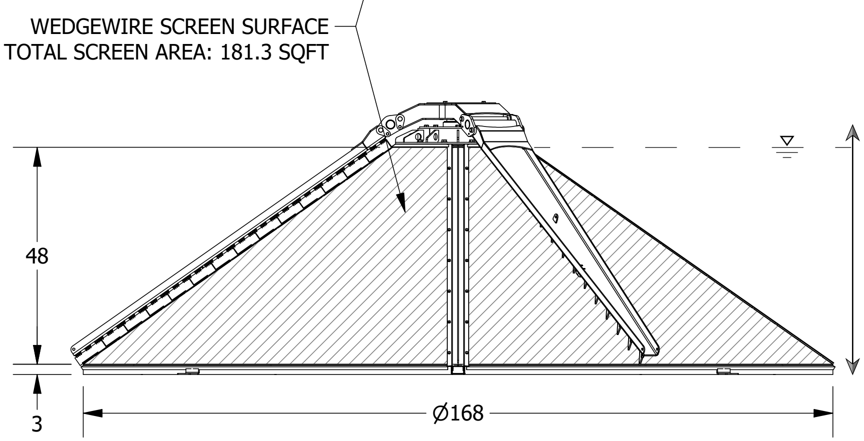
Drawing 9 of 10

ISI C168-48 CONE SCREEN

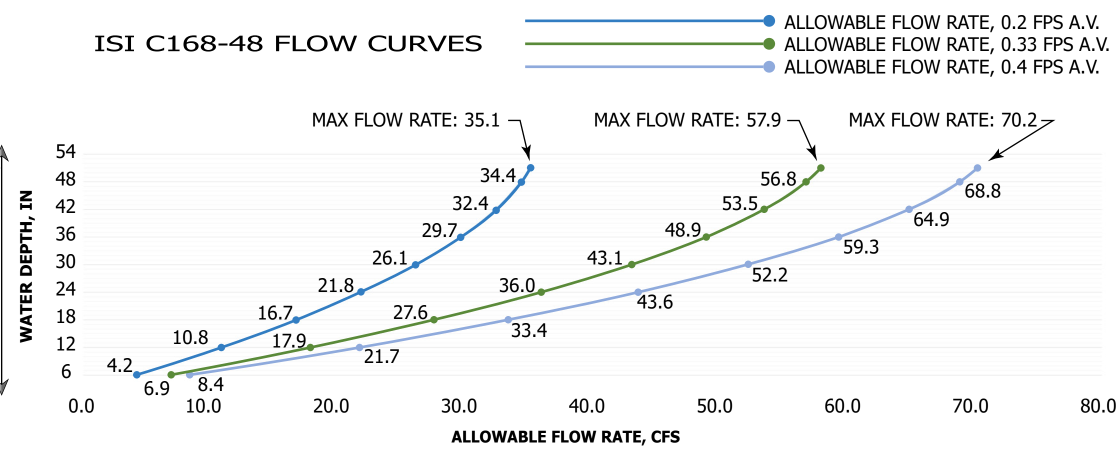








ISI C168-48 FLOW CURVES



Intake Screens, Inc.			MODEL No.	MATERIAL	WEDGEWIRE	DRIVE TYPE	WEIGHT	SUPPLY POWER	
	DATE	3-7-2022	C168-48	☐ 304 SS	☐ 69V, 1.75 mm SLOT SIZE, 50% OA	☑ ELECTRIC	2650 - 3200 lb	☐ 460 VAC	☐ 120 VAC
	REV	A		☐ 316 SS	☐ OTHER	☐ HYDRAULIC		☐ 240 VAC	☐ 24 VDC
	BY	MAR		☐ OTHER		☐ OTHER		☐ 208 VAC	☐ NO POWER