

Salmon Run G.C. – Hole 3: Tributary & Wetland Restoration

Preliminary Project Design

December 23, 2014

Prepared By: Curry Soil and Water Conservation District & Swanson Ecological Services, LLC

Project Location: Salmon Run Golf Course Hole 3
T41S, R13W, Section 32
Latitude 42.061739, Longitude -124.216329

Project Ownership: Salmon Run Golf Course; Brookings, Oregon

Project Objectives:

- (1) Restore instream habitat within the Hole 3 tributary stream
- (2) Prevent fish stranding by eliminating non-returning out-of-bank flow
- (3) Increase winter rearing habitat by creating a hydrologic connection between wetland habitat and Jack Creek
- (4) Reduce golf course flooding by eliminating a segment of undersized, perched stream channel that runs along the margin of the Hole 3 fairway
- (5) Improve the quality of golf on Hole 3 by removing a constructed stormwater retention wetland from the fairway
- (6) Ensure a 'no net loss' of wetland habitat by constructing a new stormwater retention wetland and by enlarging an existing wetland
- (7) Interplant the riparian area along the new channel alignment and around the wetlands to increase ecological diversity and shade

Project Permits: A DSL/USACE Removal-Fill Permit is required

Implementation: Potential implementation in 2016

Funding: Salmon Run Golf Course
Grant(s) - unidentified

PROJECT OVERVIEW

When the Salmon Run Golf Course was constructed a small fish bearing tributary (82 acre watershed) was routed along the fairway of Hole 3, in what appears to be an artificial channel that was dug from the golf course driveway downstream to Jack Creek. This segment of channel is undersized relative to the morphology that we assessed in the "natural" channel upstream of the driveway crossing, and as a result it is unable to convey stream flow or bedload movement associated with relatively minor storm events (*less than the 1.5 year return interval discharge*). The tributary stream channel is partially perched above the fairway of Hole 3; as a result, out-of-bank flow diverts away from the stream corridor to river left (looking downstream) and ponds in the fairway, before draining back to Jack Creek via a long culvert that is buried under the fairway; and it diverts to river right, where it ponds in a small wetland and, if discharge is sufficient, drains back to Jack Creek via overland flow. Within this segment of channel instream habitat is highly simplified, and further degraded by runoff from the golf course and a lack of riparian vegetation. When combined, these factors render the tributary channel along Hole 3 virtually worthless for aquatic organisms, and more so, make it a liability for migrating fish, and for the management of the course.

When the golf course was built two small wetlands were constructed in close proximity to the Hole 3 tributary. One of these wetlands is located on the northwest margin of the fairway of Hole 3. It is approximately 0.20 acres in size, and was presumably constructed to receive stormwater runoff from the golf course driveway. An existing series of drainage culverts route ditch flow from the driveway under a cart path and into the wetland; from there an outlet drainage culvert routes overflow into the fairway, where it travels overland for approximately 50 feet before entering another drainage culvert that routes flow under the remainder of the fairway and into Jack Creek. Under the current scenario fish access into this wetland is limited to overland flood events, and when this occurs, there is a high probability that fish will be stranded in the wetland as the flood waters recede. Furthermore, the presence of this wetland within the fairway impacts the quality of golf by creating a “water hazard” in an area that would otherwise be a strategic location for a golfer’s tee shot. Salmon Run Golf Course would like to eliminate this “water hazard” to improve play. We concluded through our survey that, because the wetland has the potential to strand fish and therefore is not considered viable rearing habitat, and because the location of this wetland within the fairway has a high likelihood of degrading water quality within the wetland, relocating this wetland would also be in the best interest of the aquatic ecology. In our preliminary design we identified a location between the cart path and the driveway where the wetland could be reconstructed to both provide stormwater filtration and, because it would have a fluvial connection with the Hole 3 tributary, also act as overwintering habitat for salmonids.

The second wetland that was constructed when the golf course was built is situated between the golf course driveway and a cart path, approximately 100 feet to the west of where the tributary stream crosses the driveway. The wetland is roughly 0.1 acres in size, and is isolated from the tributary and Jack Creek except during overland flood events; at which point fish are at risk of stranding as the flood waters recede. The wetland is not within the playable course, and is partially surrounded by 20ft -30ft tall conifers that were planted to enhance the area.

INVESTIGATIONS

- (1) **Fish Usage:** On January 17, 2014 ODFW’s Gold Beach Assistant District Fish Biologist and the Curry Soil and Water Conservation District’s (SWCD) Project Manager used an electro-fisher to conduct a presence-absence fish survey on the Hole 3 tributary stream. No fish were observed downstream of the golf course driveway, and only sparse numbers of coastal cutthroat trout were observed upstream of the driveway. These findings confirm that the tributary channel downstream of the driveway provides little or no habitat, and that it most likely has a negative effect on fish use upstream of the crossing.
- (2) **Instream Habitat:** A visual assessment of the character and morphology of the channel was made by ODFW and the Curry SWCD on January 17, 2014. As discussed above, the channel downstream of the golf course driveway is undersized, lacks complexity and pool habitat, and is exposed to solar radiation. Upstream of the driveway the channel is slightly perched because the road culvert constricts flood discharge, but the stream quickly regains a stable gradient and is characterized at first by lateral pool-riffle habitat, and then as the gradient increases, by plunge pool-riffle habitat. Fish habitat ends approximately 350 feet upstream of the driveway at a natural boulder cascade. Riparian vegetation is dominated by hardwoods and shrubs, though Himalayan blackberry are encroaching from river right where a spur road runs a short distance to a rock quarry on South Coast Lumber Company property. If the company was agreeable, the spur road could provide access for a small instream wood project, to improve pool and spawning habitat.

(3) **Total Station Coordinate Survey:** On February 5, 2014 the SWCD's Project Manager and Data Management Specialist conducted a coordinate survey using a Total Station survey instrument. An arbitrary datum was used to survey longitudinal and cross-sectional profiles of the Hole 3 tributary channel and both wetlands, and spatial data was collected to develop a planview of the project area. The Data Management Specialist plotted the coordinate data using drafting software, and generated a longitudinal thalweg profile and channel cross-sections of the tributary channel, profiles of the wetland, a planview map of the existing layout, and a planview map and longitudinal profile of the proposed reconstruction (*see attached drawings*).

PRELIMINARY DESIGN

Using the Total Station survey and input from the General Manager of Salmon Run Golf Course, the Curry SWCD generated a preliminary design that would reroute the tributary stream channel between the golf course driveway and Jack Creek; relocate the fairway wetland; and enlarge the other existing wetland. The design would also require a segment of the existing cart path to be relocated, including the cart path bridge over the tributary stream. The project should qualify for an US Army Corps of Engineer's Nationwide Permit, but it is unclear whether the proposed activities, specifically rerouting the stream channel, will be covered by SLOPES V Restoration; if not, the project would require NOAA to conduct an individual review, which could take 6-12 months.

The preliminary design will require additional engineering before it can be permitted and implemented. Specifically, further hydraulic analysis is needed to determine the geometry of the new stream channel; the proposed alignment of that channel must be reviewed and confirmed in the field; the use of grade-control needs to be further investigated; and fill-removal volumes must be calculated. These tasks can be accomplished in-house by SWCD personnel or via a contract with an engineering firm.

The individual design components are as follows:

Tributary Stream Channel Reconstruction and Wetland Enlargement: Downstream of the golf course driveway the existing tributary stream channel, which is 329 feet in length, will be abandoned and filled, and a new channel measuring approximately 426 feet in length will be constructed. The alignment of the new channel will extend downstream from the driveway culvert, through the existing wetland located to the west of that culvert, and into Jack Creek approximately 150 feet downstream of the existing confluence. The new channel will be divided into three segments.

- Segment 1 will extend from the driveway culvert downstream to the wetland, at a slope of approximately 2%. This will eliminate an existing slope break at the outlet of culvert, which will increase the capacity of the channel to transport bedload through the driveway crossing.
- Segment 2 will extend from the start of the wetland downstream to a point approximately 50 feet upstream of Jack Creek, where alluvial deposition would naturally create a sharp increase in gradient. Through this segment an inset floodway will be excavated into the Jack Creek floodplain that includes and expands the existing wetland. The slope of Segment 2 will be approximately 1.1%, and the channel geometry will decrease in size to promote out-of-bank flow at intervals less than the 1.5-year discharge. Routing the new channel through the existing wetland will change the habitat from an isolated, seasonally flooded palustrine wetland, into an intermittently flooded riverine wetland that has a hydrologic connection to Jack Creek.

- Segment 3 will extend downstream from the end of Segment 2 to the confluence with Jack Creek. The inset terrace will widen and deepen to create space for a semi-natural alluvial fan to develop at the mouth of the new Hole 3 tributary. Within this segment the stream will fluctuate vertically and horizontally in response to the cyclical deposition, and remobilization, of bedload. The average stream gradient will be 7%, but this will vary as the morphology of the alluvial fan varies.

Grade Control Wood Structures: As the gradient and morphology vary between the new stream segments, the fluvial mechanics of the channel will change to achieve specific functions. In Segment 1 the primary design objective is to convey flow and bedload downstream of the driveway crossing, to increase the capacity of the existing culvert and reduce upstream deposition. In Segment 2 the primary design objective is to create high flow refugia for juvenile fish overwintering in Jack Creek. The primary design objective of Segment 3 is to create a dynamic confluence with Jack Creek that provides fish passage in a manner comparable to the tributary's historic conditions. The slope breaks that define the new channel segments generally correlate with the geomorphic principals that govern the integration of a primary and secondary stream valley, but because this integration is naturally complex wood structures will be installed to stabilize the change in slope. These structures will be built by burying one or more sill logs across the stream at the design elevation of the channel invert, and by securing logs along the outside of the channel and on the inset terraces to prevent the stream from outflanking the sill logs.

Habitat Wood Structures: Wood should be incorporated into the new section of tributary channel to increase the complexity of instream habitat; particularly within Segment 2 where the creation of high water refugia is the primary objective. These placements must be secured, either by pinning, partial burial, ballast, etc., because the entire Jack Creek valley is prone to flooding. Wood should also be added to the tributary channel upstream of the golf course driveway if South Coast Lumber Company is agreeable. When the wood is sourced, priority should be given to the durability (i.e. cedar, redwood) and complexity (i.e. rootwads attached, segments of limb) of the logs rather than to diameter and length. Wood placements will be a relatively minor cost (5% - 10%) of the overall project budget.

Relocation of the Fairway Wetland: The wetland that was constructed within the fairway of Hole 3 should be relocated to eliminate the risk of fish stranding and to improve the quality of golf. In our preliminary design we've identified an area immediately to the north-northeast that is between the cart path and the golf course driveway. Presently this area is a series of grass mounds that were most likely built from the excavation spoils that were generated when the fairway wetland was constructed. Moving the wetland to this location has the following advantages:

- It will generally be out of play for the golf course, which means trees and shrubs can be established around the perimeter of the wetland to enhance its ecological value and improve water quality
- Runoff from the golf course driveway can still be routed into the wetland to filter sediment and promote infiltration
- An outflow channel can be constructed to create a hydrologic connection between the wetland and the new tributary stream channel (in Segment 1), which will eliminate the risk of fish stranding and make the wetland accessible to overwintering juvenile salmonids and other aquatic organisms

Eliminating the wetland from the fairway of Hole 3 will lead to a loss of approximately 0.2 acres of wetland habitat. In our preliminary design we propose to off-set this loss by constructing the new

wetland described above and by enlarging the existing wetland habitat in Segment 2 of the new stream channel. By mitigating for the loss of the Hole 3 wetland this component of the project should fit within a Corps of Engineers' Nationwide permit and the SLOPES V Restoration criteria, but because road runoff is currently routed into the existing Hole 3 wetland, and will be routed into the new wetland, DEQ and/or NOAA will likely require an in-depth stormwater management plan. Depending on their requirements, development of this plan may require engineering assistance.

Revegetation: Removing the tributary channel and wetland habitat from the playable area of the golf course will allow both features to be revegetated with a mix of herbaceous wetland plants, and woody shrubs and trees. This will improve water quality by increasing shade and the filtration of overland flow, and it will improve the aquatic ecosystem by diversifying the food chain and by adding to the complexity of instream habitat. Although the project area will be outside the playable course, it is still within the "viewshed" of the golf course driveway and the Hole 3 cart path, so aesthetics should be taken into account when selecting species for revegetation. Once the project design is finalized a planting plan should be developed, and included in the project's permit and funding applications.

Cart Path Relocation: The current alignment of the Hole 3 cart path crosses the existing tributary channel approximately 100 feet downstream of the golf course driveway, and then it runs along the perimeter of the existing wetland as it routes golfers to a bridge crossing over Jack Creek that is used to access an intermediate segment of fairway. The location of this alignment is a limiting factor on the project design because it constricts the area that is available to reroute the tributary channel and expand the footprint of the existing wetland. In our preliminary design we propose to move the cart path to better facilitate the restoration components of the project. This will be a fairly expensive task, but justifiable when considering the project's restoration objectives, and given the fact that the existing tributary bridge structure will have to be moved regardless of whether the cart path is relocated, to provide a crossing over the new tributary channel.

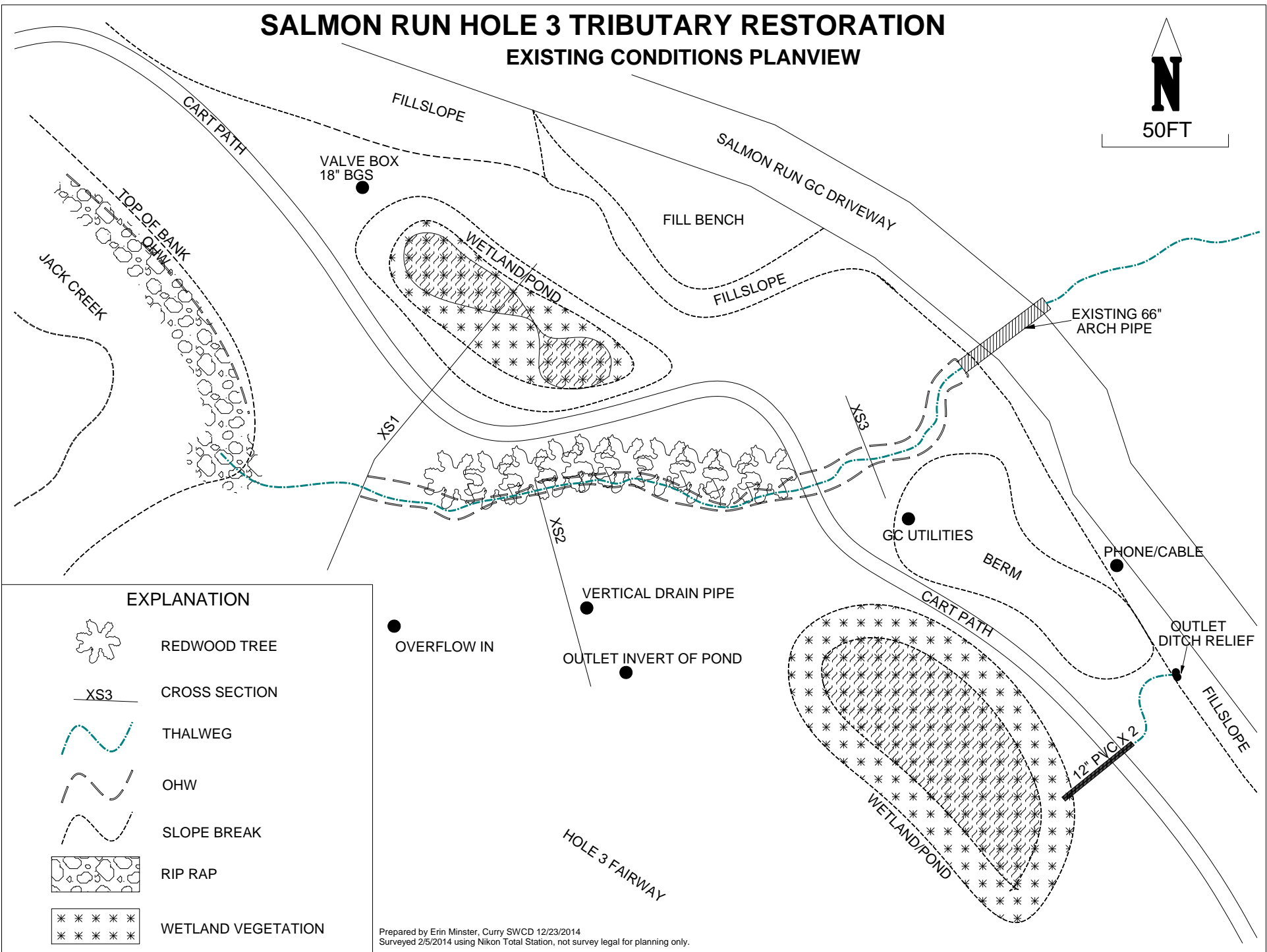
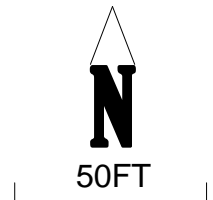
PRE-IMPLEMENTATION

There are multiple tasks that must be completed before this preliminary project design can be implemented.





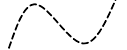


- (a) Request an on-site consultation with Federal and State regulatory personnel (DEQ, Corps, DSL, NOAA) to (i) determine if the preliminary design can be processed through standard 'restoration' permits (i.e. GA, SLOPES V), and if not, identify what changes are needed; (ii) determine the caliber of engineering that is required (i.e. Is hydrologic modeling needed?); and (iii) determine what level of stormwater management is acceptable
- (b) After regulatory feedback has been incorporated, confirm that the landowner is agreeable with the preliminary design, and negotiate a cost-share agreement
- (c) Finalize the preliminary design with (i) the geometry of the new channel; (ii) a coordinate layout of the channel alignment, location of grade control wood structures, the wetland grading, and the relocation of the cart path; (iii) cut and fill volumes; and (iv) a stormwater management plan
- (d) Develop a planting plan for the revegetation of the wetlands and stream channel
- (e) Develop a monitoring plan
- (f) Prepare a removal-fill permit application for the DSL and Army Corps of Engineers
- (g) Develop an implementation and monitoring budget
- (h) Develop an implementation timeline
- (i) Submit funding applications

SALMON RUN HOLE 3 TRIBUTARY RESTORATION

EXISTING CONDITIONS PLANVIEW



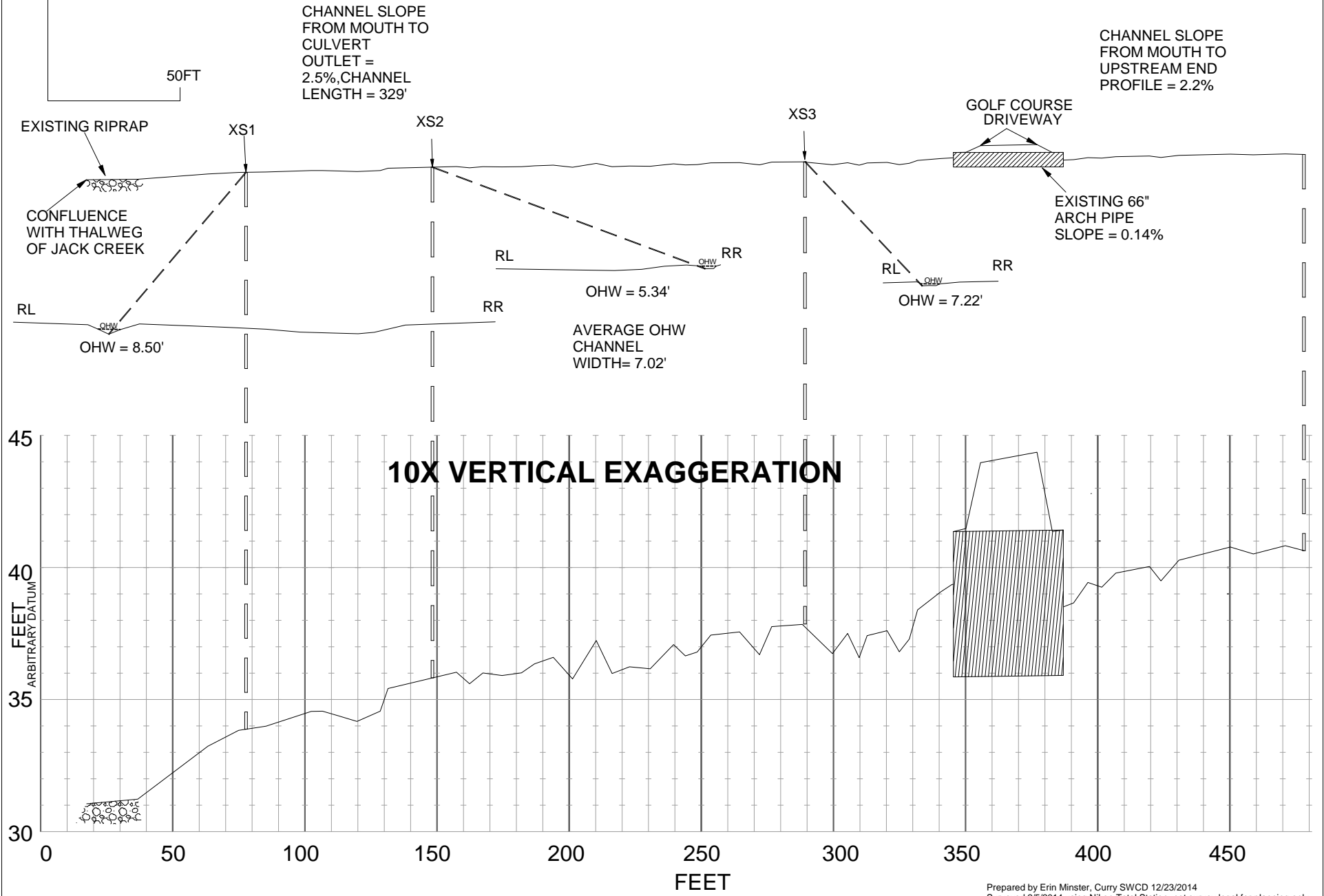
EXPLANATION

-  REDWOOD TREE
-  CROSS SECTION
-  THALWEG
-  OHW
-  SLOPE BREAK
-  RIP RAP
-  WETLAND VEGETATION

Prepared by Erin Minster, Curry SWCD 12/23/2014
 Surveyed 2/5/2014 using Nikon Total Station, not survey legal for planning only.

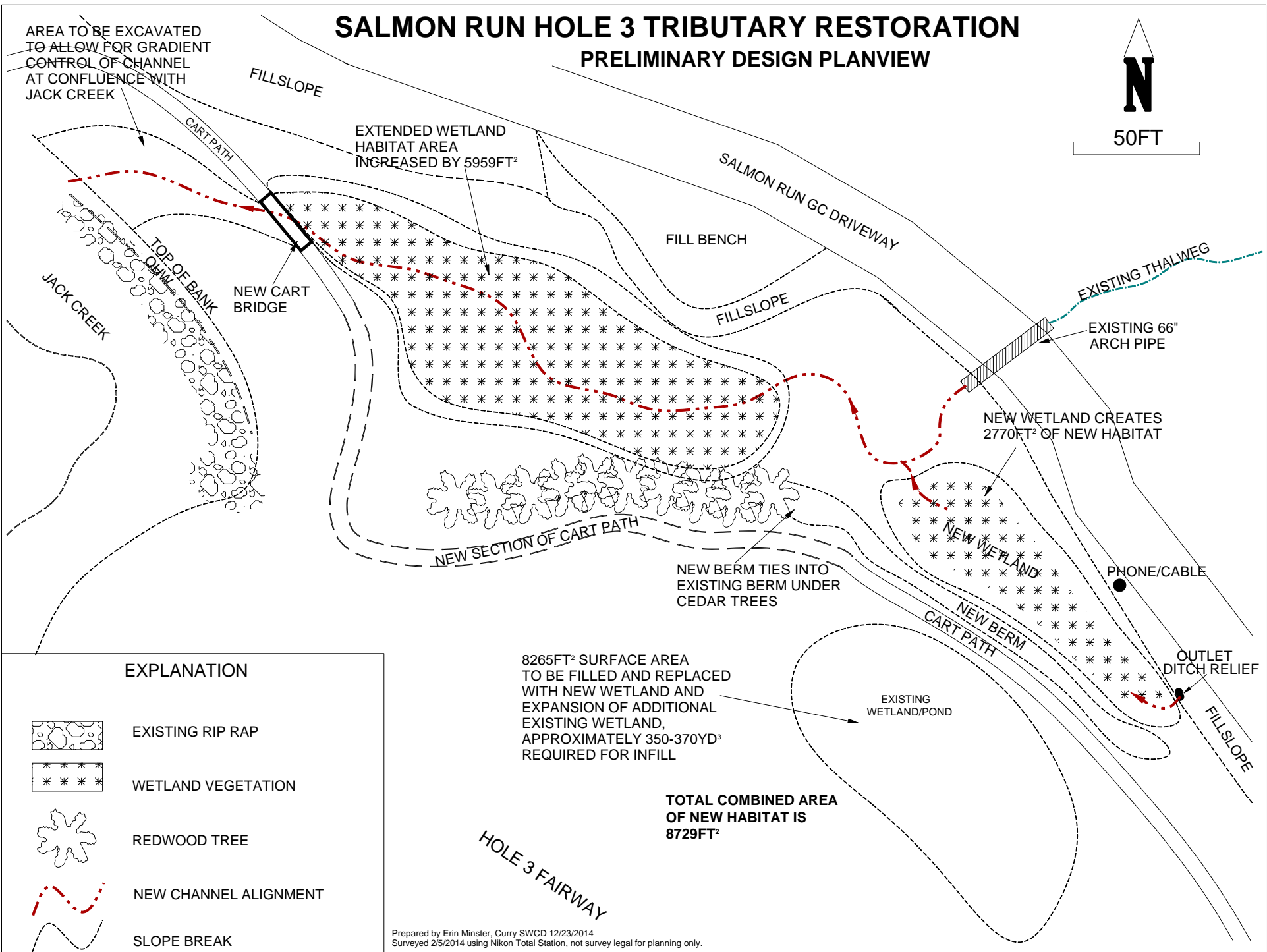
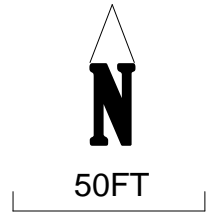
SALMON RUN HOLE 3 TRIBUTARY RESTORATION

THALWEG PROFILE



Prepared by Erin Minster, Curry SWCD 12/23/2014
 Surveyed 2/5/2014 using Nikon Total Station, not survey legal for planning only.

SALMON RUN HOLE 3 TRIBUTARY RESTORATION PRELIMINARY DESIGN PLANVIEW



AREA TO BE EXCAVATED TO ALLOW FOR GRADIENT CONTROL OF CHANNEL AT CONFLUENCE WITH JACK CREEK





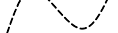
EXTENDED WETLAND HABITAT AREA INCREASED BY 5959FT²

NEW WETLAND CREATES 2770FT² OF NEW HABITAT

8265FT² SURFACE AREA TO BE FILLED AND REPLACED WITH NEW WETLAND AND EXPANSION OF ADDITIONAL EXISTING WETLAND, APPROXIMATELY 350-370YD³ REQUIRED FOR INFILL

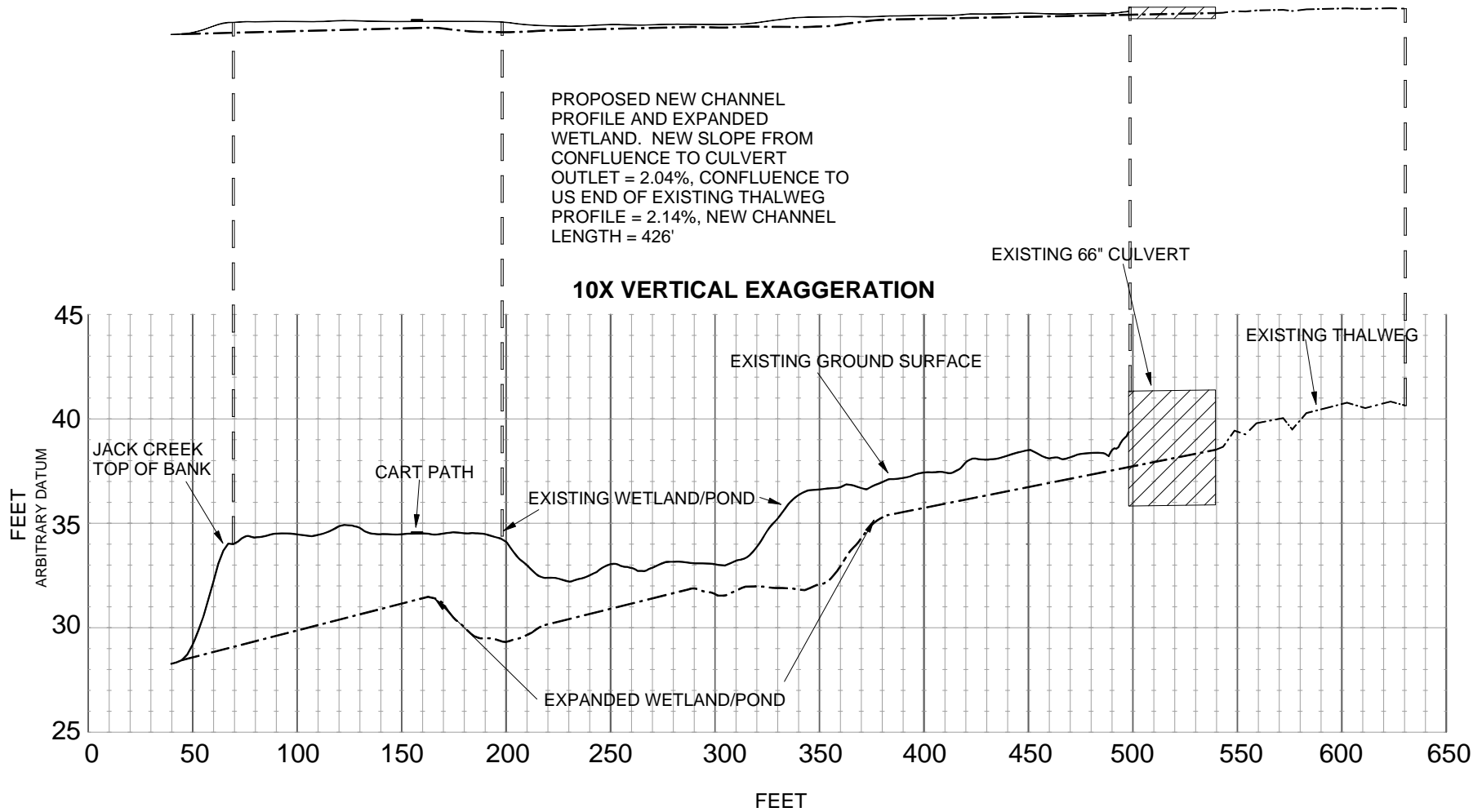
TOTAL COMBINED AREA OF NEW HABITAT IS 8729FT²

EXPLANATION

-  EXISTING RIP RAP
-  WETLAND VEGETATION
-  REDWOOD TREE
-  NEW CHANNEL ALIGNMENT
-  SLOPE BREAK

Prepared by Erin Minster, Curry SWCD 12/23/2014
Surveyed 2/5/2014 using Nikon Total Station, not survey legal for planning only.

SALMON RUN HOLE 3 TRIBUTARY RESTORATION PRELIMINARY DESIGN NEW CHANNEL PROFILE



Prepared by Erin Minster, Curry SWCD 12/23/2014
 Existing thalweg Surveyed 2/5/2014 using Nikon Total Station,
 not survey legal for planning only. Existing ground surface
 profile derived from Lidar data, DOGAMI 2008.

Salmon Run Hole 3 Restoration: Top photo was taken from the golf course driveway crossing during a high flow event, and shows the existing channel on the left side of the photo and the proposed reroute alignment on the right side. Bottom photo shows a close up of the existing channel from the cart path bridge—notice how the stream diverts out of the its corridor to both the right and left—this creates potential fish stranding as the water recedes.



Salmon Run Hole 3 Restoration: Top photo shows the smaller existing wetland that the new channel would be routed through. In the preliminary design the cart path will be relocated so the wetland can be enlarged and the channel can be elongated. The bottom photo shows the larger existing wetland which is located in the fairway of Hole 3 — during a high flow event, such as the one shown in these photos, fish are at risk of being stranded in both of these wetlands.



Salmon Run Hole 3 Restoration: The top photo shows the proposed new channel alignment from the driveway crossing downstream to the top of the existing wetland — the cart path will be relocated to make adequate room for the new channel and to maximize wetland habitat. The bottom photo shows the tributary channel upstream of the golf course driveway—wood placements and riparian enhancement would improve instream habitat within this reach.

