

Clackamas Whitewater Features

Site Reconnaissance Supplemental Narrative



Prepared For:

We Love Clean Rivers

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Part 1 – Purpose and Background

A study was commissioned by We Love Clean Rivers (WLCR) in Winter 2013 to identify feasible man-made whitewater waves or play feature locations on the Lower Clackamas River. The report was finalized in Spring 2014, which summarized possible locations, economic benefits, permitting issues, and possible design concepts for two locations. This report is titled, “Clackamas Whitewater Features Pre-Design Report”, dated May 28, 2014. This report will be referenced in this supplemental narrative as “Report”.

Due to the fact that the authors of the Report were not able to visit the sites during the design flows (approximately 1,000 CFS versus the approximately 10,000 CFS during the visit), there remained speculation of actual elevation drop in the identified rapids during typical summer flows. This is a critical piece of information that is necessary as a next step in determining feasibility to create a whitewater feature. Page 5 of the Report mentions needing at least 1.5’ of drop across the rapid, and this is usually the minimum drop based on typical boater “rule of thumb”.

The purpose of this supplemental narrative to the original Report is as follows:

- To visit the sites mentioned in the Report at design flows and measure actual water surface elevation (WSE) drop.
- To visit known playspot sites and measure WSE drop in order to better understand design parameters needed on the Clackamas River at design flows.
- To visit additional potential playspot locations in order to quantify WSE drop should further investigation become warranted on additional sites.
- To briefly review and summarize construction access issues for the possible locations reviewed.
- To create an independent review and rating matrix for the possible sites using WLCR members to objectively rate the sites.

Please note that this supplemental narrative is to assist with the pre-design effort and to be included as background information with the Report. The assumptions mentioned in this narrative are solely for the purposes of consideration of sites to the next level of investigation and are not a final hydraulics analysis, geomorphology study, or construction access estimate. Final design and contractor input will dictate actual construction location, staging plan, and access strategy. Under no circumstances should the assumptions outlined in this report be considered as plans for actual construction access or determination of site for final design.

Part 2 – Objectives

The objective of the site reconnaissance and final deliverable of this supplemental narrative will be to quantify the information mentioned above. At the time of the Report, actual drop in the sites was unknown, thereby creating ongoing confusion regarding feasibility. The key objective of this report is to document WSE drop so that others can determine the most feasible site to pursue. Additionally, should different sites warrant future discussion, some background WSE data will be readily available to assist in understanding the feasibility of those locations.

Construction access is often a key item in the feasibility of a construction project. This is not only due to agreements with property owners but due to the potential of increased construction costs rendering a site

unfeasible. Since actual construction access was not reviewed or summarized in the Report, this supplemental narrative will take a very schematic “10,000 ft. elevation” review of possible construction access and staging points. Should a site that has construction access issues be selected for further study, those early conversations, temporary construction access agreements, and contractor estimates can be identified as critical to the project success.

Finally, an independent review and objective scoring of the sites will create useful discussion about the pros and cons of the different sites. By highlighting key scoring attributes, the team can assign meaningful weightings to the scores and objectively rank the sites. Should site selection issues change in the future through key stakeholders input, those weightings can easily be modified for updated rankings.

Part 3 – Methodology



Water Surface Elevations

The methodology for obtaining the WSE was consistent at each site. A Topcon Laser Level RLHISa was secured for the work and used for each site measured. The purpose of the laser level was to accurately measure vertical drop along the site in order to determine change in WSE. The accuracy of this unit in the fashion of our field work was under a tenth of an inch. Typically, the laser unit was set in the middle of the rapid, and WSE’s were measured at each significant feature level WSE. In order to obtain more accurate information, some shots were required from the other side of the river. In this case, a second surveyor in a kayak was utilized.

Flows occurring during the WSE surveys were between 1,170 CFS and 1,130 CFS taken the week of June 23rd, primarily on the 28th and 29th. These levels are representative of summer design flows. The high summer baseline flow was also representative of a range to determine drop from lowest summer flows to mid-season spring flows.

Laser Level and Local Paddler - Ken Hooker on the Rod

Construction Access

Construction access review was completed through site visits and Google Earth mapping. Issues considered for the construction access review and scoring were construction staging locations, haul road locations, and direct access to the site or rapid. Construction access issues were discussed with two contractors, Emily Alcot with Interfluve and Justin Hibbs with Cipriano and Sons Construction. Justin Hibbs has done extensive in-water work including the recently installed bladder system at the lip of Willamette Falls. Emily Alcot is a geomorphologist and in-water construction manager / excavator. The viewpoints of these contractors and my own experience with construction access and staging were combined for the final short summaries for each site.

In general, typical excavation equipment must be used in order to keep construction costs down. While there are exotic methods to use such as “Spider Hoe”, these nonconventional methods will only drive up construction costs. A typical excavator around the size of a 329 (normally seen on road or other excavation projects) is required in order to move the large boulders typical for stream projects. These excavators can move up and down very rough river rock banks as found on the Clackamas and work in-water up to the cab. However, there still must be access to staging equipment such as dump trucks. Assuming the net removal/fill is negligible (in order to get environmental permitting approved), the most important aspect is simply getting the excavator down to the site.



Typical 329 Type Excavator (Above) – “Spider Hoe” (Below)



Review Matrix and Scoring

Due to the fact that the WLCR team was not directly involved in the Report's rankings, and that additional sites have been analyzed, this was revisited as a group effort. The sites were evaluated based on a set of attributes and associated weightings. 4 people were present for this discussion and ranking session. The ranking session was that of a typical Value Engineering exercise, standardized under the ASTM-E1699, which identifies scoring attributes, assigns a weighting through paired comparison, and then scores accordingly.

Part 4 – Pre-Design Report Locations

Part 4 of this report will summarize the site reconnaissance for the site locations mentioned in the original Report. These sites were referenced in the Report, but not all sites were recommended for further consideration during future preliminary design. Please see the Report for the methodology behind these site selections and their associated summary. Please note that the original site visit for the Report was at over 10,000 CFS. The site reconnaissance associated with this report was at summer design flows near 1,000 CFS.

4.1 - McIver Park – Upper Rapid

Description (1,130 CFS, 6-29-2014):

The “Upper Rapid” is the first rapid below River Mill Dam. Please see Figure 10, page 13 in the Report and Exhibit 1 of this narrative. This is a dynamic rapid with diagonal shelves. Worth noting at this rapid is a typical wave train scenario at the bottom of the drop.



McIver Upper Rapid at 1,130 CFS – River Mill Dam in Background

WSE Drop:

The drop in the Upper Rapid is approximately 2.5 ft. This is enough drop for one or two designed features. Please see Exhibit 1 on the next page of this narrative for more detail.

Construction Access:

Construction access is challenging if not cost prohibitive and unfeasible for this site. The rapid is approximately 1,600 LF upstream of the McIver boat ramp with a long riffle and the Middle Rapid below it. Due to low summer flows and the distance from the ramp, this eliminates the possibility of “barging” material upriver from the boat ramp.

Neither sides of the river at this site are conducive or feasible for construction access. There is an approximate 100’ elevation change across a very heavily forested section of land before access roads are encountered. In addition to these issues, there does not appear to be an area where an excavator could be used during construction due to the rocky cliffs surrounding the site. Due to these conditions, this site is not feasible for typical construction access.

See next page for Exhibit 1



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 2.5' DROP OVER 320 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- NO FEASIBLE ACCESS FROM NORTH DUE TO HIGH CLIFF
- NO FEASIBLE ACCESS FROM SOUTH DUE TO HIGH CLIFF

UPPER MCIVER RAPID EXHIBIT 1



SCHEMATIC



DESIGNED:	TAK
DRAWN:	TAK
CHECKED:	WLCR
DATE:	JULY 2015

UPPER MCIVER RAPID
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OREGON

SHEET NO.	EX.1
JOB NO.	WLCR-01

4.2 - Mclver Park – Middle Rapid

Description (1,130 CFS, 6-29-2014):

The “Middle Rapid” is the first rapid above the upper Mclver boat ramp. It is visible from the boat ramp. The rapid is formed by exposed bedrock and is very “pool – drop” in nature. Please see Figure 10, page 13 in the Report and Exhibit 2 of this narrative.



Middle Mclver Rapid Primary Drop at 1,130 CFS

WSE Drop

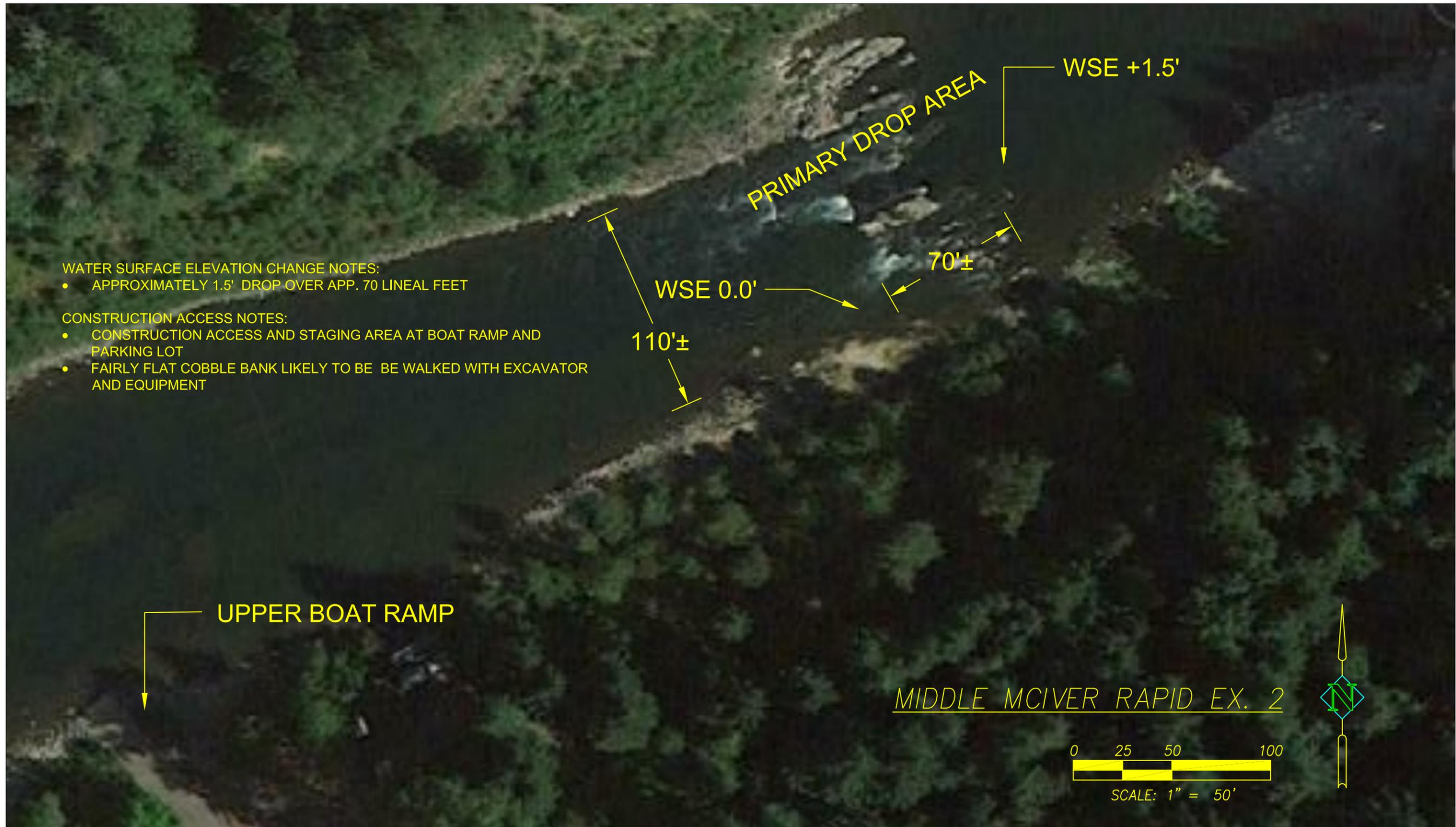
The drop in the Middle Rapid is approximately 1.5 ft. This would limit the drop to one whitewater feature. Please see Exhibit 2 of this narrative.

Construction Access:

The site is within 400 LF of the upper Mclver boat ramp. The water is also fairly deep and slow between the ramp and the site. This opens up the options for use of construction equipment and materials being moved by construction “barge” type boats and floating docks. This is typical for bridge construction on large waterways. Depending on the size of boulders and rip rap required to handle the shear stresses associated with high flows, this type of construction and construction access may be feasible using the smaller variety of excavator. This type of construction would require extensive use, if not complete closure, of the public boat ramp, thereby creating conflicts with park users.

On the North side of the river, there would be perfect access through a rock quarry, but it sits at a much higher elevation, essentially a sheer cliff above the site. Access is not feasible from this location. One option would be to use the site in conjunction with a crane, but this arrangement is cost prohibitive. There is an existing access road / trail that parallels the river near the site. This may be used during construction, but a new access route would need to be cut through the heavily wooded and unrealistically steep connection to the river. Construction access to this site is questionable at best and would create very high construction costs.

See next page for Exhibit 2



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 1.5' DROP OVER APP. 70 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS AND STAGING AREA AT BOAT RAMP AND PARKING LOT
- FAIRLY FLAT COBBLE BANK LIKELY TO BE WALKED WITH EXCAVATOR AND EQUIPMENT

SCHEMATIC



DESIGNED:	TAK
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DATE:	JULY 2015

MIDDLE MCIVER RAPID
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX.2
JOB NO.	WLCR-01

4.3 - Mclver Park – Lower Rapid

Description (1,130 CFS, 6-29-2014):

The “Lower Rapid” is the first rapid below the Mclver boat ramp. Please see Figure 10, page 13 in the Report and Exhibit 3 of this narrative. This rapid is typically referred to as “Mclver Rapid”. The rapid is a very technical class II to III rapid depending on the water level and varying boaters’ opinions. The first half of the rapid has the most significant drop, and the second half is more flat. This rapid is to the level of difficulty that the typical drift boat operator will not run this section of river; however on the day of the site reconnaissance, there were two drift boat trailers in the parking lot.



Panoramic Photo of Lower Mclver Rapid at 1,130 CFS

WSE Drop

There is 5.24’ of WSE drop in the lower rapid. This first section has the most drop and is slightly over 4’. The remaining 1.24’ of drop in the lower half has less significant “moves” to avoid rocks and large waves. There is enough WSE drop in this rapid for the design of two to three whitewater features.

Construction Access

Construction access for this site is likely to be the most-straight forward of the Mclver sites. A staging area can be established in the existing parking lot directly south of the site, or even set off into the lawn area of the parking lot in order to protect existing parking numbers for the summer crowds. This is the most “typical” and convenient of staging areas seen during excavation projects.

The existing park main access roads can be used to access the site for equipment and material delivery and haul-off. This will likely create conflicts with park users and will require attention to safety. However, there is likely to be minimal to zero haul-off associated with the project and limited deliveries of materials relative to other excavation type projects. A temporary haul route can be cut from the parking lot down to the site through the fairly flat bank and associated willows. Based on aerial mapping, the vertical change on this route is under 20’ and only 200 LF. Removal and restoration of this haul road would require little effort and may be constructed in a fashion to promote permanent future access to the site for both spectators and emergency vehicles. This haul road could also be left in kind and finished as a “pedestrian only” access to the river that raft / kayak / innertube users could use versus the vehicular ramp just upstream. By adding landscape along the alignment and bollards at the entrance, this could become a great pedestrian access amenity for the park and save on final construction costs. This would remove pedestrian uses and loading from the vehicular boat ramp.

See next page for Exhibit 3



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 5.25' DROP OVER APP. 450 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS AND STAGING AREA AT BOAT RAMP AND PARKING LOT
- FAIRLY FLAT COBBLE BANK CAN BE WALKED WITH EXCAVATOR AND EQUIPMENT
- STAGING, EQUIPMENT AND MATERIALS AREA AVAILABLE NORTH OF EXISTING PARKING LOT DIRECTLY SOUTH OF THE SITE

LOWER MCIVER RAPID EXHIBIT 3

© 2014 Google



SCALE: 1" = 50'



SCHEMATIC



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DATE:	JULY 2015

LOWER MCIVER RAPID
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 3
JOB NO.	WLCR-01

4.4 – High Rocks

Description (1,170 CFS, 6-28-2014):

High Rocks Rapid is the first rapid above High Rocks Park (or Cross Park on the Gladstone side), at the pedestrian bridge in Gladstone and directly below the 205 bridge. This site braids out into two jets of current with a gravel bar in between. Due to the nature of this natural configuration, the option of increasing the drop at these channels could create both a kayak feature channel and a non-whitewater channel for other river users. This has been sketched out in the Report on “Attachment 2.” Please see Figure 11, page 14 in the Report and Exhibit 4 of this narrative.



Primary vertical drop at the High Rocks site showing the shallow braided channels



Nature in the City at the High Rocks Site – primary vertical drop in the background

WSE Drop

High Rocks has 2.6 feet of drop from the deep water pool at High Rocks to the upstream side of the trestle bridge. Therefore, at summer flows, backwater would be required from the designed drop to the trestle bridge in order to create necessary drop for one or possibly two features.

Construction Access

Construction access for this site will be a challenge but not impossible. There is an existing emergency access lane from the Gladstone side of the river. However, this ends at an approximately 30' vertical drop to the river. This could be handled by a crane situation with material movement at the site area. This would likely require boat or "barge" access, which is questionable due to the low summer flows. Regardless, the north side of the river has questionable construction access if it were relied on entirely. It would also raise construction costs significantly if typical construction methods could not be used.

Another access is possible along Clackamas River Drive. This would require minimal improvements under the 205 bridge in order for construction access and material haul off/in. This access route will fall under the jurisdiction of both the local railroad and ODOT. Should this site be selected, immediate coordination should be started with both stakeholders. Should this temporary construction access be approved, this site is feasible for relatively simple construction access using typical methods.



Assumed construction alignment route under the 205 bridge (looking south)



Existing access road to the 205 bridge area (looking south along Clackamas River Dr.)

See next page for Exhibit 4



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 2.6' DROP OVER ROUGHLY 500 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS APPEARS FEASIBLE FROM THE RAILROAD ACCESS ON THE SE SIDE OF THE SITE.

SCHEMATIC

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DATE:	JULY 2015

HIGH ROCKS SITE
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 4
JOB NO.	WLCR-01

4.5 – Water Intake

Description (1,130 CFS, 6-29-2014):

The Water Intake site is the first rapid above the 205 bridge. It is an interesting site with an island, diagonal rapids, and a pool – drop in the bottom section. Please see Figure 11, page 14 in the Report and Exhibit 5 of this narrative.



Panoramic View of the Water Intake Rapid at 1,130 CFS – Primary Drop to the Left of the Island

WSE Drop

There is 3.37 feet of WSE drop along this rapid. This is enough drop for one or two designed features.

Construction Access

Construction access is possible along Clackamas River Drive on the South side of the river. Access also appears feasible from the north side of the river from an undeveloped Clackamas County property. A staging area would also be possible using Oregon City's fenced property approximately 50 feet away from the site trail. This would require coordination with the City of Oregon City and fairly extensive streambank restoration upon project completion.

While construction access is possible from both sides of the river, the north side may be the most advantageous due to the County's property ownership along the bank. There is limited existing river access in the area and the creation of new park space and river access at this location would not only allow streamlined construction, but would create a permanent amenity for all river users.

See next page for Exhibit 5.



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 3.37' DROP OVER APP. 450 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS AND STAGING AREA ALONG CLACKAMAS RIVER DRIVE.
- CONSTRUCTION ACCESS ASSUMED ALONG NORTH SIDE OF RIVER PENDING PROPERTY OWNER APPROVAL



Turning RESTORATION into RECREATION

DESIGNED:	TAK
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DATE:	JULY 2014

WATER INTAKE RAPID
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 5
JOB NO.	WLCR-01

Part 5 – Potential Study Sites

During team meetings and conversations regarding this project, additional sites have been discussed that were not a part of the original Report. In the interest of due diligence, these sites have also been analyzed in this supplemental narrative in order to facilitate future discussions with stakeholders. Should these locations be considered for further study, important information such as WSE change will now be readily available if needed.

5.1 – Paradise Point Ledge

Description:

This site is an “accident waiting to happen”. There is a dangerous hydraulic and bedrock structure that has been formed during several recent floods that not only creates a hydraulic that flips floating inner-tubers and rafts during the busy summer float times, but also creates a dangerous pinning or entrapment feature. During a hot day last season, myself and a group of kayakers watched over 50% of floaters get flipped in this hydraulic including several temporary pins which could have become life threatening. The positive aspect of this site is that a substantial drop is created in an area of focused narrow flow and velocity. This is the perfect recipe for a whitewater feature created through minimal adjustments. For this reason it also serves as an example of baseline site requirements.



Paradise Rapid Showing Two Relatively Large Features

WSE Drop

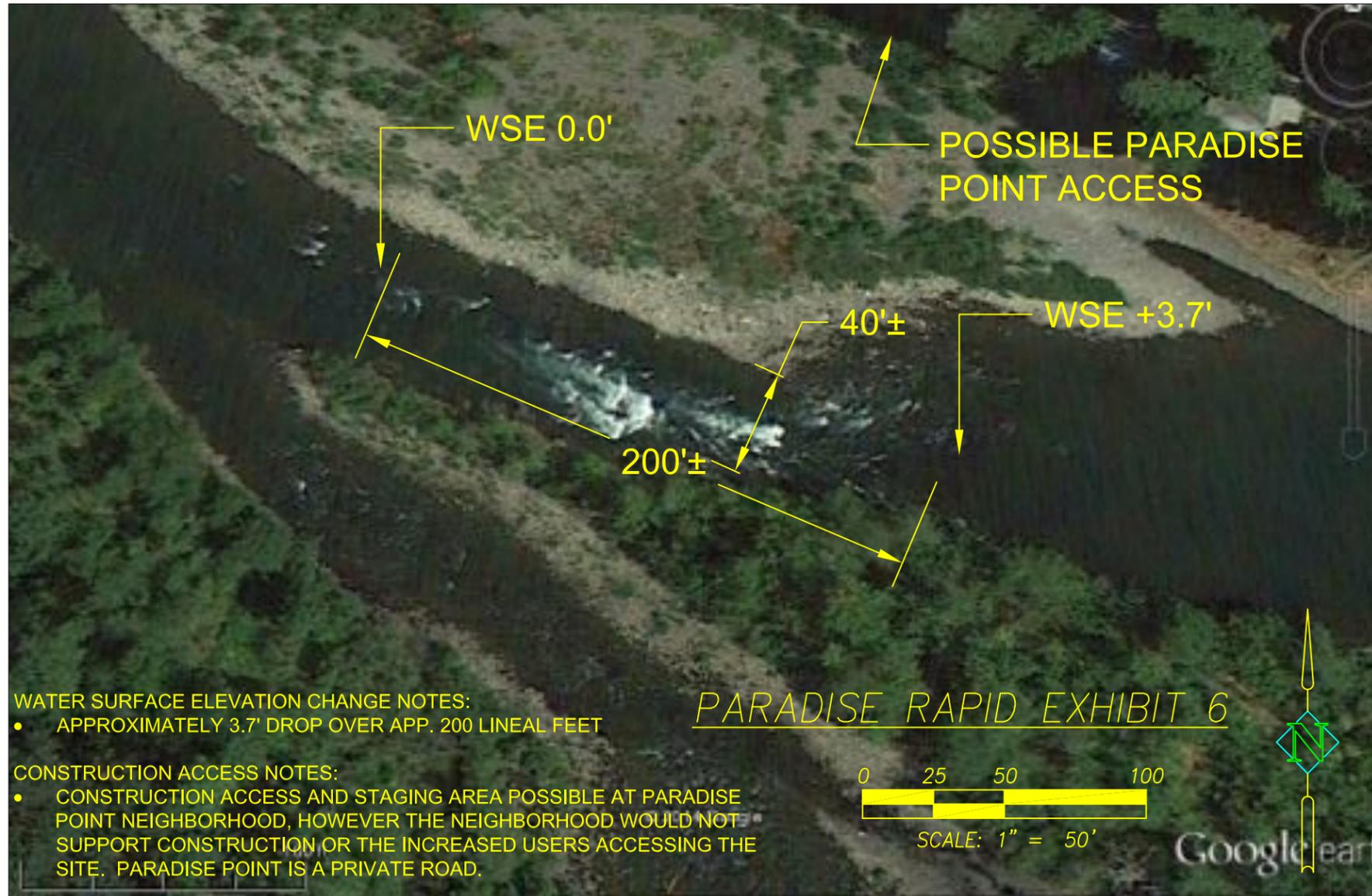
There is 3.7' of drop in the Paradise rapid. This is currently creating 2 fairly large features. The magnitude of the two features in this rapid is due to the fact that the velocity is considerably increased by the necked down nature of the drop. This maximizes the magnitude of the two features despite the minimal drop.

Construction Access

Access at this site is feasible from the neighborhood on river right. A simple access route could be arranged and access through an undeveloped lot in Paradise neighborhood. However, it is very unlikely that the neighborhood would support this project or the increased amount of users in their relatively quiet neighborhood. The roads in the neighborhood are private and the neighborhood consists of a tight knit community. It should be assumed that this site is not feasible simply due to lack of neighborhood support including construction or boater access.

Scoring for this site was completed with the above assumptions in mind. However, there is a possibility for a trail and bridge access from the McIver Park side over to the island at Paradise rapid. This would allow both boater access and spectator access. Construction of this access would create construction access. Due to the difficult permitting and cost associated with this additional work, it was assumed non-feasible. The fact that the Clackamas River bed in this area is not extremely stable would put the long term condition of these improvements at risk.

See next page for Exhibit 6



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 3.7' DROP OVER APP. 200 LINEAL FEET

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS AND STAGING AREA POSSIBLE AT PARADISE POINT NEIGHBORHOOD, HOWEVER THE NEIGHBORHOOD WOULD NOT SUPPORT CONSTRUCTION OR THE INCREASED USERS ACCESSING THE SITE. PARADISE POINT IS A PRIVATE ROAD.

SCHEMATIC



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DATE:	JULY 2015

PARADISE RAPID
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 6
JOB NO.	WLCR-01

5.2 – Tualatin River Diversion Dam

Description

The Tualatin River Diversion Dam creates backwater reportedly to create flow into Lake Oswego. While satisfying this end result, the Dam also creates a hazardous obstacle and portage effort for the many paddlers that explore the Tualatin River. This paddle trail is seeing more users annually, and the portage (or avoidance) of this structure creates problems for the flatwater paddlers. *Extensive research into the Tualatin River Diversion Dam was not completed for this narrative; however photos are readily available online.*



Photo from Web of Diversion Dam

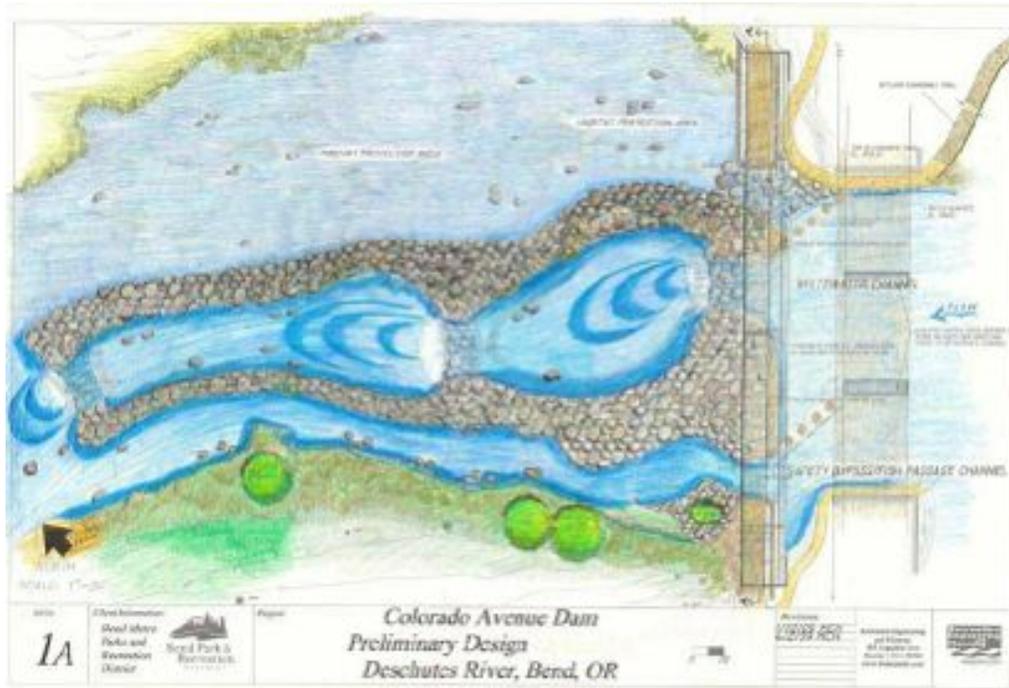


Photo from Web of Diversion Dam

WSE Drop

Due to private property ownership and the lack of clearly marked trail access, this site was not verified or surveyed during the site reconnaissance field work. However, based on existing photos and information available on the web, it is assumed that the WSE drop for this site is between 2 and 3 feet. This is enough for one or two whitewater features.

Options for this site are very similar to what is being constructed in Bend, Oregon. A dangerous dam is being removed and the drop is being stepped down in three unique channels. One channel is for non-whitewater experienced users (such as canoeists), another will have three whitewater features, and a final channel will be primarily for wildlife and habitat. Similar to Tualatin location, the Bend project must maintain the existing upstream WSE for multiple reasons. Therefore the Bend project is a key example for the Tualatin diversion dam potential.



Colorado Dam Project Showing Separate Channel Concept – Bend, Oregon (REP Engineering)

Construction Access

Property ownership has not been researched; however access appears feasible from both sides of the river. Should this site be discussed further, conversations should be initiated to determine ownership and construction access options.

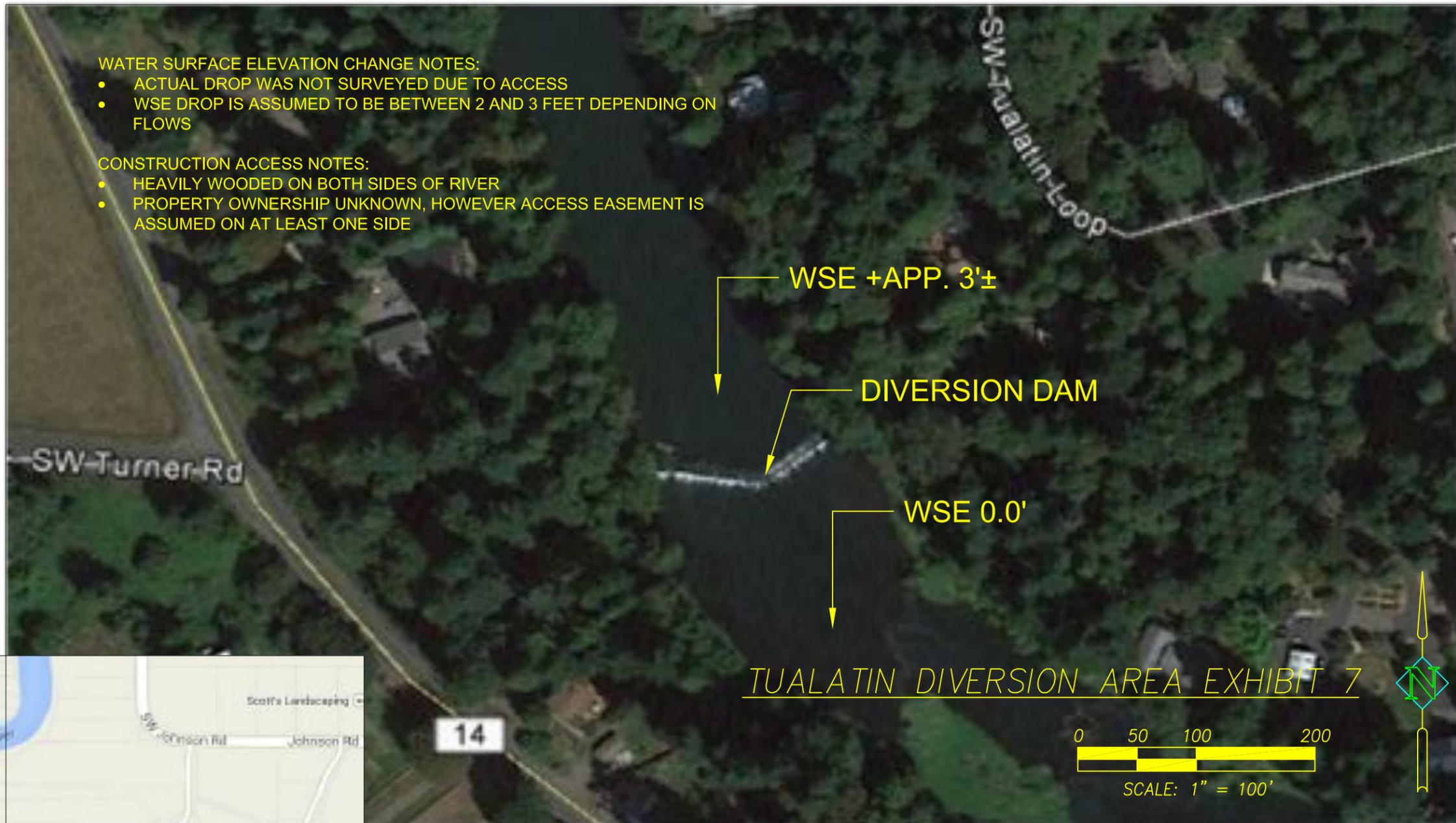
See next page for Exhibit 7

WATER SURFACE ELEVATION CHANGE NOTES:

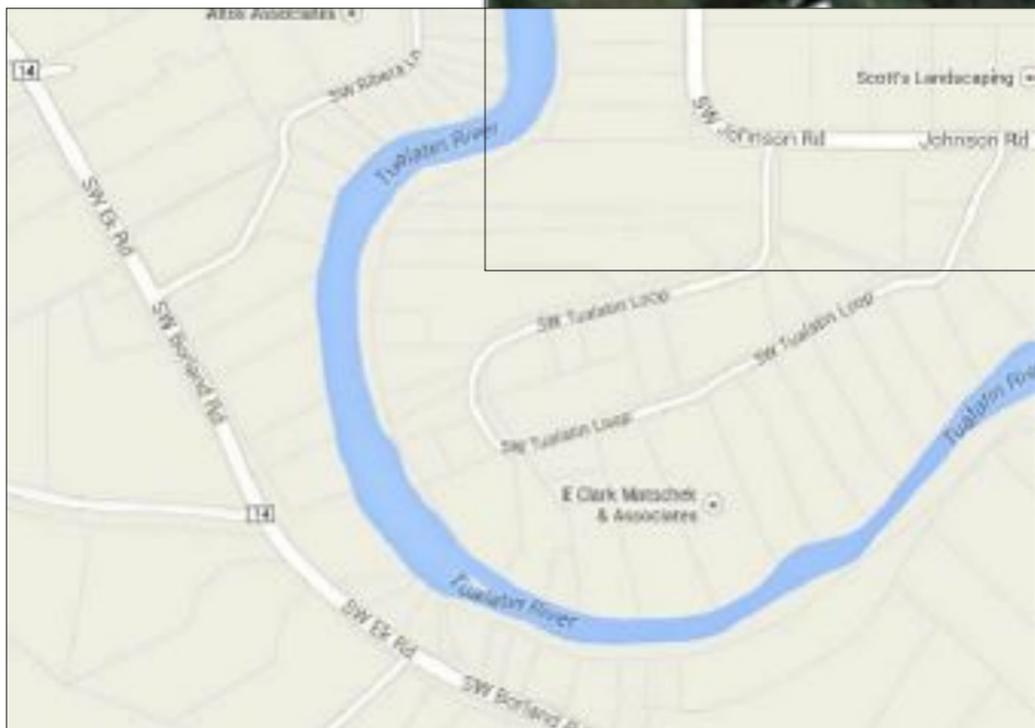
- ACTUAL DROP WAS NOT SURVEYED DUE TO ACCESS
- WSE DROP IS ASSUMED TO BE BETWEEN 2 AND 3 FEET DEPENDING ON FLOWS

CONSTRUCTION ACCESS NOTES:

- HEAVILY WOODED ON BOTH SIDES OF RIVER
- PROPERTY OWNERSHIP UNKNOWN, HOWEVER ACCESS EASEMENT IS ASSUMED ON AT LEAST ONE SIDE



TUALATIN DIVERSION AREA EXHIBIT 7



		Turning RESTORATION into RECREATION		SCHEMATIC	
DESIGNED:	TAK	TUALATIN DIVERSION CLACKAMAS WHITEWATER SITE RECON. CLACKAMAS COUNTY, OR		SHEET NO. EX. 7	
DRAWN:	TAK			JOB NO. WLCR-01	
CHECKED:	WLCR				
DATE:	JULY 2015				

5.3 – Willamette Falls Area

Description

Willamette Falls is an existing historical site in Oregon City and West Linn on the Willamette River. The site is currently in the process of redevelopment on the river right (Oregon City) side and, for this reason, is mentioned in this narrative. This development on the Oregon City side is called the “Legacy Project” and is currently being analyzed at a preliminary level. The Falls is created by a river-wide basalt ledge. This ledge has been modified since the 1800’s in order to facilitate power generation, boat traffic, a locks system, and many industrial buildings. It has been noted that multiple existing channels through the river right (or Legacy Project) had been de-watered and / or plugged during construction of the site. During future development of the site, the option becomes possible to modify the river right in order to put flow back into these channels. They could be modified at this time to be conducive for safe whitewater boating.

5.3A - The Locks

Description

The locks are on the river left side of the river (West Linn). They were built in approximately 1873 but are currently closed and non-operational. While this site is on the National Register of Historic Places, it is unknown if the locks or the museum will ever again be opened.

WSE Drop

Based on Google Earth mapping, the drop in the Locks area (depending on the season and tidal influence) is approximately 40’-50’. This amounts to over 100’ per mile assuming the entire locks alignment was used as a new whitewater channel. To put this into perspective, a world class whitewater slalom course typically has 60’ to 100’ of drop per mile, with the most famous slalom courses having around 100’ per mile. The lower Clackamas River near the site studies has approximately 14’ of drop per mile. Clearly, the caliber of the 100’ per mile Falls site is of international magnitude. A world class whitewater slalom channel needs less than 600 cubic feet of flow per second. This is a drop in the bucket at the Falls site.

Construction Access

Conventional construction access is possible from both sides of the river; however construction would likely be by barge as well. The primary hurdle for this site is the combination of owners, existing easements, and complicated permitting. Army Corps of Engineers owns the locks, PGE owns property and easements, Clackamas County, West Linn, and Oregon City are also property owners. Should this site be selected for further discussion, the focus of those early discussions should be on property ownership and access issues.

5.3B - The Grinder Channel *(Added 9-8-2014)*

Description

The "Grinder Channel" is on the river right side of the river (Oregon City) and is in the direct vicinity of the Legacy Project. It is the first and largest existing side channel below "Black Rock" or the boating deadline (see "Willamette Falls" exhibit 8). The channel appears to have started out primarily natural, and was likely excavated further with dynamite in the 1800's in order to support industry and portaged barge traffic above the falls. This was also the channel that allowed for the outfall of the "grinders" which were an industry fixture during pulp production. It is worth noting that there appears to be an existing adjustable spillway at the "dam" end of this channel.

In its current form, this channel is an unused section of river and one of the only accessible locations that is not a vertical cliff. Several generations of heavy industrial dumping has taken place and the existing channel is filled with a pile of dumped concrete, rusted historical equipment, belt gears, etc. (see attached photos). Due to several pools in the channel with pipe runs connecting them, and tidal fluctuation in the river, salmon and steelhead are frequently trapped in these upper pools with no method to retreat back to the main river. These trapped fish, which are often hand removed, are trapped in the non-oxygenated and warm water or attempt to spawn in the ankle deep water. This does not appear to be due to the channel itself, but the fact that the pools "sieve out" through the historic rubble or otherwise drain through small and silted in pipes. At the time of the site visit, water was conveyed between the pools by a very small diameter pipe segment. The fish cannot simply swim downstream to escape.

WSE Drop

Based on Google Earth mapping, the drop in this channel is approximately 6' in approximately 325 lineal feet (this assumes a "dry" channel at very low Willamette River levels). This amounts to roughly 100' per mile based purely off the channel bottom slope. However, due to the "dam" at the beginning of this channel, any actual foot per mile drop could be incorporated into final design including a more beginner friendly design. With between 40 and 50 foot of potential vertical drop available during summer months, this channel's final vertical layout options are fairly limitless up to and including 100' per mile (see notes on this magnitude of drop in Locks WSE section above). Final design incorporating flow adjustments and upstream channel elevation could easily be accomplished due to the fact that an adjustable spillway and dam already exists on this channel (or could be retrofitted).

Notes

The "Grinder Channel" was added early September after this "Site Reconnaissance Supplemental Narrative" was issued. However, this site surpasses ratings for any other site in the original narrative. Due to the existing site features, historical importance, need for clean-up, fisheries issues, opening up a natural channel, and involvement in Legacy Project, this site is the clear choice. There would be ample parking, spectator access, construction access, and proximity to shopping, dining, and lodging to support Clackamas County. This site should not be written off due to the obvious political and permitting difficulties as the potential here is spectacular.

See photos next pages.



View Easterly at "Grinder Channel" showing Dam, Spillway and Pool that Traps Salmon/Steelhead



View Westerly Showing Pools, Small Diameter Pipe, and Junction at Willamette

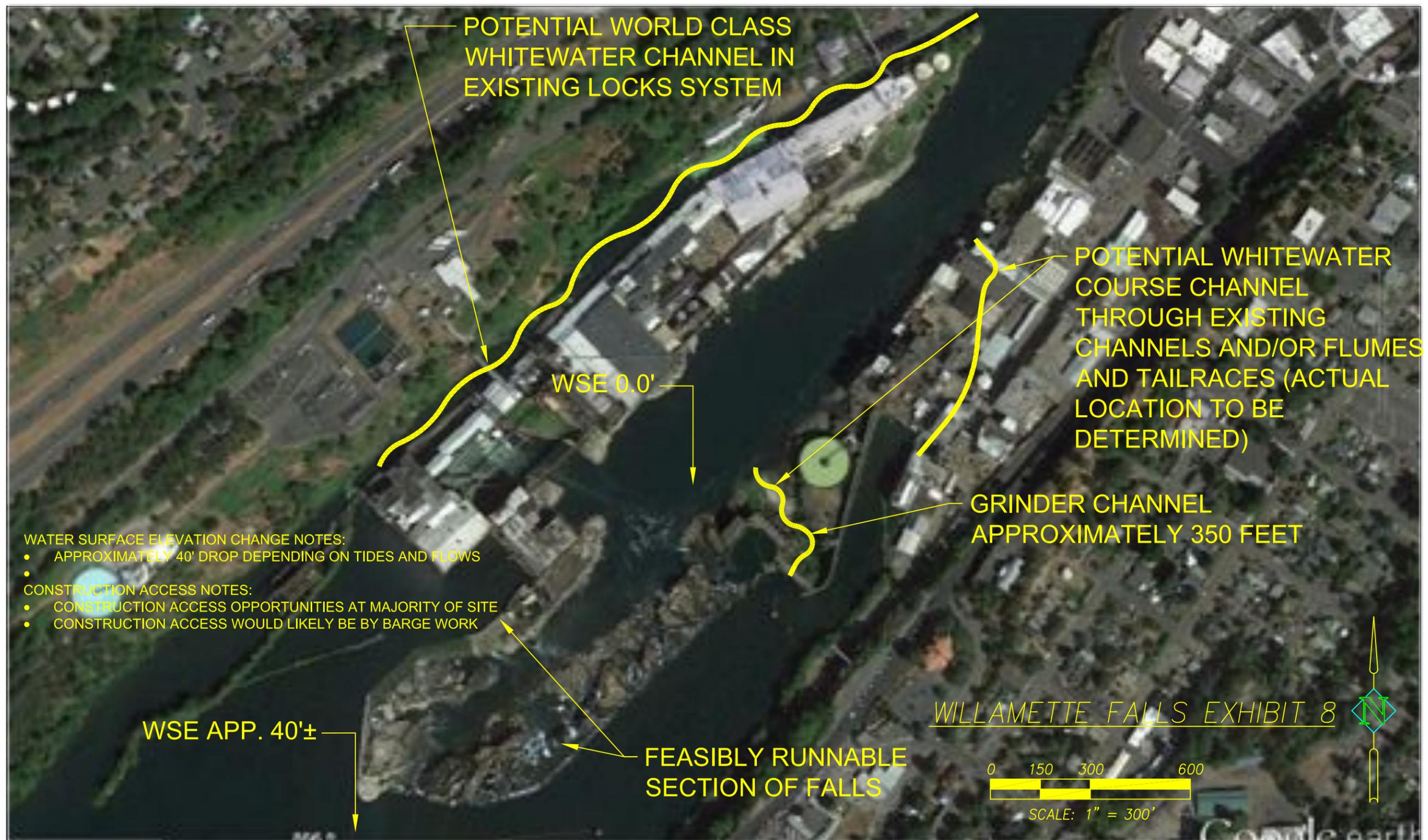


View Westerly Showing Pools and Grinders



View Westerly Showing Pools and Steep Rock Bank

See next page for Exhibit 8



WATER SURFACE ELEVATION CHANGE NOTES:

- APPROXIMATELY 40' DROP DEPENDING ON TIDES AND FLOWS

CONSTRUCTION ACCESS NOTES:

- CONSTRUCTION ACCESS OPPORTUNITIES AT MAJORITY OF SITE
- CONSTRUCTION ACCESS WOULD LIKELY BE BY BARGE WORK

WILLAMETTE FALLS EXHIBIT 8

SCHEMATIC



DESIGNED:	TAK
DRAWN:	TAK
CHECKED:	WLCR
DATE:	JULY 2015

WILLAMETTE FALLS
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 8
JOB NO.	WLCR-01

5.4 – Kellogg Creek Dam at 99E

Description

The existing dam and fish ladder in Milwaukie, Oregon at Kellogg Creek is currently under extensive review for removal. The existing dam is a fish passage barrier, and the fish ladder does not meet fish passage requirements. As such, Kellogg Creek has lost virtually all anadromous fish passage. This dam has been identified by ODOT as the number one priority for fish passage improvements due to the blockage of nearly 10 miles of spawning and rearing habitat. By removing this barrier, virtually the entire Kellogg Creek and Mt. Scott Creek basin is opened up to fish passage, since no other fish passage barriers exist upstream in the basin. As in-stream structure removal projects are the most feasible for concurrent whitewater feature construction, this site has been included in this narrative for on-going consideration. It is recommended that WLCR begin coordinating with the City of Milwaukie and the larger ODOT / ODFW design team in order to analyze whitewater features incorporated into the larger design.

WSE Drop

Based on visual inspection and existing drawings for improvements to the ladder in 2003, the WSE drop at the dam is approximately 9 feet dependent on tides in the Willamette. During dam removal, this degree of drop will need to be accounted for in the design, and the “head-cut” upriver will need to be quantified and protected. An opportunity at this site is to control the 9’ drop by deliberately placed whitewater features.

Looking at WSE drop alone, 3 to 5 world class features could be created by this drop, but the required flows would likely not exist most of the year. Kellogg Creek has very low base flows in the summer months. This drop is likely to be a winter and spring opportunity and would likely have a “bypass” type channel similar to the Bend project. With minimal flows, this site could be part of the stream restoration project while providing a consistently powerful whitewater feature. Of all the sites analyzed, this site is the only viable location for a world class “green wave” prized for surfing potential. Due to the energy created by the large WSE differential, a consistent green wave could be designed assuming minimal flows.

Worthy of special mention for this site is the opportunity for a winter / spring slalom training site. With a 6 to 9 foot drop, a whitewater channel could be constructed of various lengths that would end up with a world class drop of between 50 and 100 feet per mile. This is consistent with world class slalom racing channels. The Portland Metro area does not have access to a consistent whitewater slalom course with the exception of Bull Run in Sandy, OR. The Bull Run site does not have consistent flow, is dangerous or impossible for spectators to attend, is almost an hour from Portland, and has very difficult gates to adjust for training. As such, there are less than five people in the Portland area that utilize these gates. A close-in site with user friendly gates near other local businesses would be a benefit to the Milwaukie / Clackamas County area. A longer whitewater channel or slalom course (versus one or two large hydraulic features) would likely be a much bigger benefit to both the paddling community and local businesses.

There is an additional option for this site that makes it more exciting than other sites. It is possible to have ideal flows year-round at this site with the use of pumping systems not unlike other slalom and whitewater courses currently being utilized. Water could be pumped at low head from the near-by Willamette River and pumped up to the top of the course during low water. This would make the Milwaukie whitewater site at Kellogg Creek a year round, world class destination boating location not unlike the US National Whitewater Center in Charlotte, NC. The economic benefit to Milwaukie and Clackamas County would be of the highest magnitude. For an example of the type of community building events that a site like this can generate, visit - <http://usnwc.org/event-calendar/>.



Pumped Facility and Evening Event at US National Whitewater Center



Rafters and Slalom Gates at US National Whitewater Center (Drop Similar to Kellogg)

Construction Access

Construction access will be accounted for by the overall dam removal and roadway project associated with this area. There are no special access issues with this typical excavation and roadway project. Assuming the whitewater portion was included in the plans, the construction would simply be part of the dam removal.



Kellogg Lake and Dam at 99E (McLoughlin Blvd.)



Kellogg Creek Dam Fish Barrier

Part 6 – Known Sites for Comparison

The study of existing features on this river was determined to be a critical aspect of this site recon. It would help to identify trends or baselines in what is required for a typical playspot given the same river, flow, streambed nature, and drop of the river. This is key to understanding design requirements for any potential sites discussed on the Clackamas River. This proved to be a worthwhile effort as outlined below.

6.1 – Teeny Weeny Wave

Description

Teeny Weeny is a known playspot that might not offer up dynamic kayak moves but provides a fun surf when no other features are still in during design flows (of app. 1,000 CFS). During weekly summer kayak session with the Portland kayaker crowd, there may be 10 boaters in the eddy waiting for a turn at Teeny Weeny.

The wave is formed by a combination of a steady drop in the cobble streambed and a necked down section of bedrock then backed up by a deep eddy and slow water. The wave is good for flat spins and low angle cartwheel type moves depending on the level and experience of the kayaker.



Willie Illingworth spinning in Teeny Weeny at typical summer flow

WSE Drop

Teeny Weeny Wave has 1.8' of fall from the start of the riffle into the drop to the flatwater below the drop. This is consistent with minimal drop needed for a worthwhile play spot mentioned at other rivers independent of the nature of the river. 1.8' of drop at this site is backed up by the deep eddy downstream and the bedrock. This is a classic example of a low-water feature that could be built more deliberately at another site with better results using gravel bars on each side of the jet of current.

See next page for Exhibit 9



SCHEMATIC



DESIGNED:	TAK
DRAWN:	TAK
CHECKED:	WLCR
DATE:	JULY 2015

TEENY WEENIE WAVE
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 9
JOB NO.	WLCR-01

6.2 – Bob’s Hole

Description

Bob’s Hole is worth study as an example of potential in the Clackamas. Bob’s Hole is an icon at a national level and steeped in the history of kayak rodeo. This was one of the first organized rodeo sites in the nation, and despite yearly changes for the better or worse, this feature still comes in when conditions are right. This feature typically comes in at levels between 1,900 and 2,100 CFS; although, due to the “unstable” type of exploding wave, it can be finicky about levels. This is a regional quality destination playspot during winter and spring months but is not “in” during summer flows.

An interesting aspect of Bob’s Hole is actually the whitewater slightly upstream. In recent years, high quality features come in and out just upstream of Bob’s. If these features were slightly manipulated for a given flow, there would be three park and play worthy features in the one rapid at Bob’s Hole. With an engineered configuration, the upper two lesser features would likely be attainable (able to paddle back up to the feature) while the destination feature of Bob’s Hole would be the primary feature when the kayaker washes out downstream.

Bob’s Hole is formed primarily from the actual vertical WSE drop in the rapid and backed by a strong eddy on river left. Based on this author’s observation of the hole for over twenty years, the feature does not appear to be formed solely from the bedrock structure below but also by the hydraulic jump associated with velocity differential. This observation makes Bob’s Hole an interesting case study in what type of drop is required for a world class whitewater feature on the Clackamas.

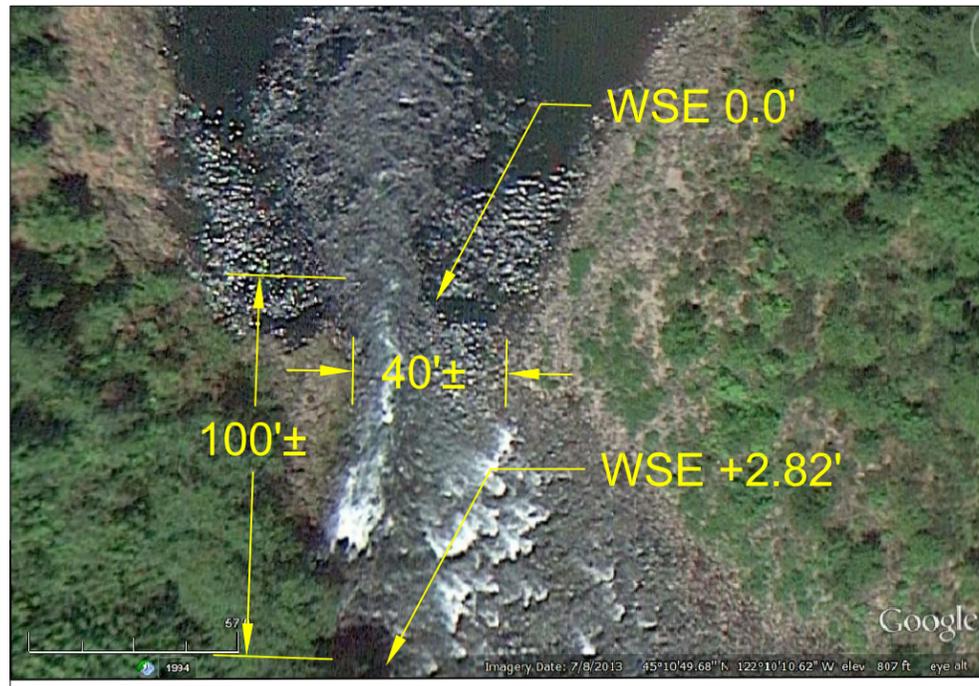


Luke Spencer cartwheeling in Bob’s Hole at App. 2,000 CFS

WSE Drop

The study of Bob's Hole was very telling for this supplemental narrative. Approximately 5' of drop occurs along the rapid creating 3 unique kayak playspot features. These are not always "in" at the same time, but the features are always visible and apparent. Bob's Hole "proper" has 2.5' of drop. This clearly demonstrates that the big feature (Bob's) takes 2.5' of the drop and the other two take another 2.5' (or 1.25' each). This is a classic example of what features would be feasible with this amount of WSE change or drop. The bigger drop yields the better feature, while the smaller drops still yield consistent decent features. Using this as an example, 2.5' of drop is likely to produce a worthwhile feature assuming it is designed correctly.

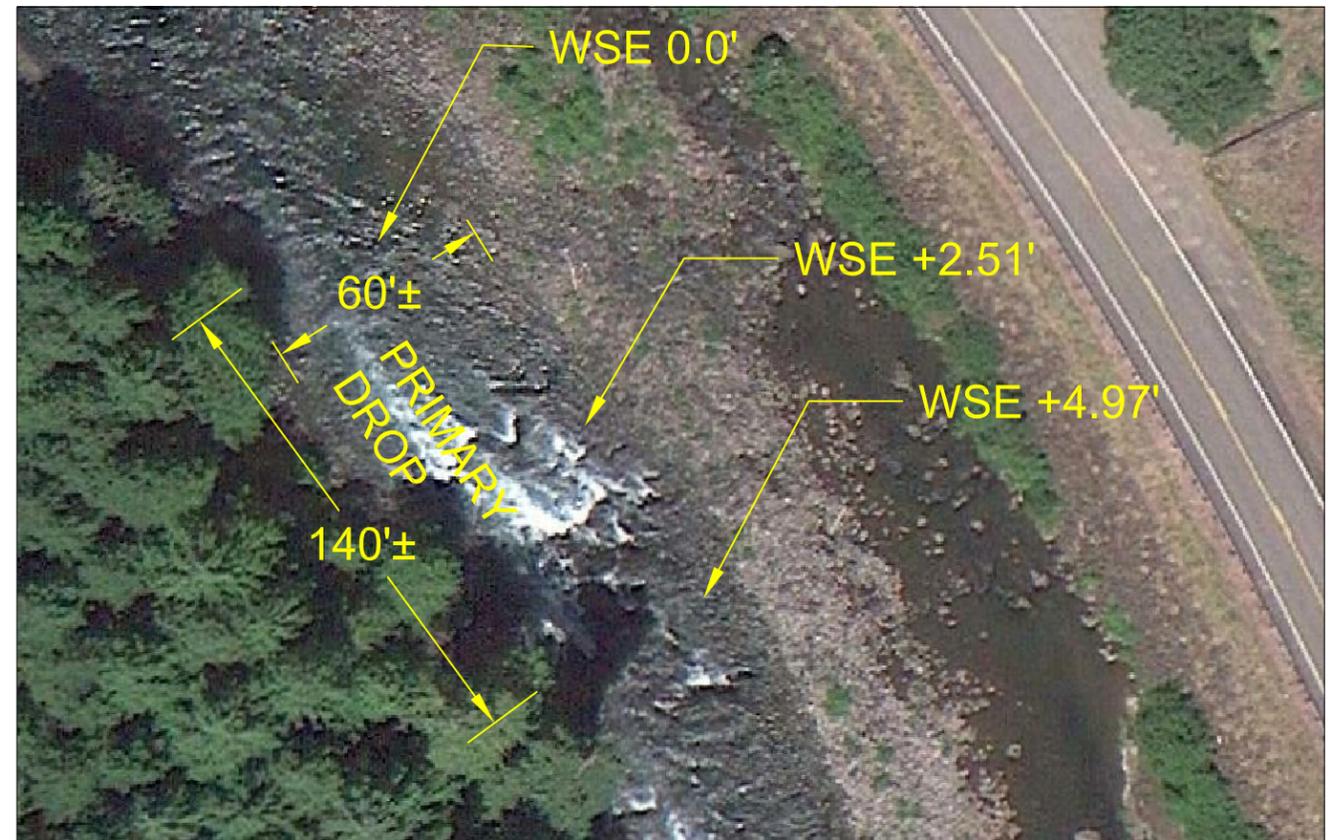
See next page for Exhibit 10



BIG EDDY RAPID

REFERENCE FEATURE NOTES:

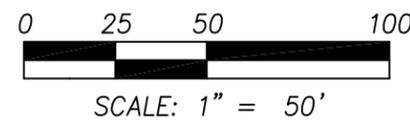
- APPROXIMATELY 2.82' DROP OVER 100 LINEAL FEET



BOB'S HOLE RAPID

REFERENCE FEATURE NOTES:

- APPROXIMATELY 5' DROP OVER 140 LINEAL FEET



BIG EDDY AND BOB'S HOLE RAPID EXHIBIT 10

SCHEMATIC



DESIGNED:	TAK
DRAWN:	TAK
CHECKED:	WLCR
DATE:	JULY 2015

BIG EDDY / BOB'S HOLE
 CLACKAMAS WHITEWATER SITE RECON.
 CLACKAMAS COUNTY, OR

SHEET NO.	EX. 10
JOB NO.	WLCR-01

6.3 – Big Eddy Waves

Description

Big Eddy Wave is a finicky pair of features that come in and out during the summer flows. There are actually two waves at this site with preference dependent on flow. The waves here are more of the surf wave variety than a shorter more intense hole or reversal. The fact that these are “green waves” is why they are more finicky than a more predictable hole or stable hydraulic reversal. These waves are a good case study because they are primarily formed due to fast water hitting deep and slow water thereby creating a classic wave train necessary for an enjoyable kayak feature.



Ken Hooker getting bounce on Big Eddy Wave at 1,170 CFS

WSE Drop

There is 2.82' of WSE drop in this rapid to create two decent surf waves. The preferred wave is dependent on flow. Based on observation the two lower waves appear to take 2' of this available energy while the other 0.82' is simply creating velocity upstream of the features. While a feature would likely be there with only the 2' of drop, the dynamic character and bounce of this wave is created by the velocity added from the upstream 0.82'. This drop continues the theme of around 2.5' of drop needed for a worthwhile play feature.

See previous Exhibit 10

6.4 – Conclusions

As mentioned at the introduction of this section, the purpose of studying existing Clackamas River features was to create a baseline of typical requirements needed with this specific streambed composition, flow, and drop per foot of Clackamas River alignment. Based on case studies of built features across the country, the three sites mentioned above and accepted open channel flow hydraulics engineering, approximately 2' of drop appears to be minimal for a worthwhile playspot feature. As the amount of this drop increases, not only does the power and potential of the feature increase, but options for adding additional features and eddylines becomes available. Worthy of consideration, but largely neglected in the whitewater community, is the potential to create basic strong eddylines which are useful for both beginner kayak instruction and specific elite slalom kayak training.

While the purpose of this narrative was not to create hydraulics recommendations, it is apparent from existing Clackamas River rapids and features that a 2' minimum drop should be recommended for any ongoing feasibility analysis for potential play features. Despite the fact that a feature could be built with minimal drop, anything less than 2' drop is likely not worth the effort as the whitewater feature would not be worth a "park and play" focus. In addition, anything under 2' of drop would likely need to be designed as more of a "hole" or reversal versus a wave or crashing wave in order to be consistently "in".

As the WSE drop increases, the more options and the more realistic both world class whitewater features and world class events become feasible. For example, the potential at Willamette Falls is of the caliber of televised Olympic events at an international level (and would likely book every hotel room in Clackamas County during those events), while a couple feet drop at another site is capable of a decent summer's night surf wave at a Portland - Metro level. Similarly, the large WSE drop at Kellogg Creek Dam would ensure a more worthwhile and powerful hydraulic independent of available flows. All of these scenarios will provide benefits to the local paddling community, but WSE drop and feature potential should be highly analyzed prior to further design effort as the larger site could potentially pull tourists and destination boaters from several continents.

Part 7 – Review Matrix and Scoring

The purpose of this portion of the Narrative is to describe the methods used to analyze and rank the potential sites from Parts 4 and 5. The original Report only scored two sites, Mclver and High Rocks. As additional sites were researched for this Narrative, a new scoring was necessary. On July 21st, 2014 Sam Drevo, Holly Heiberg, Kate Daniel and I discussed the attributes key to all stakeholders, assigned weightings to those attributes and then re-ranked the sites.

7.1 – Scoring Attributes

Attributes were determined by reviewing past scorings, lengthy discussion / brainstorming, and considering how the attributes related back to key stakeholders. The attributes used for scoring were the following:

- Potential quality of the feature – This attribute is primarily associated with the WSE drop findings, or potential for the actual whitewater feature at the site. A site with significant WSE drop would score highly on this attribute.
- Proximity to Portland / Metro area - This attribute is associated with travel time / effort to the site from the bulk of the Portland / Metro residents. There will be more interest in the site if it is located closer to Oregon's largest population center.
- Construction access – Construction access is critical to the project as a site with limited construction access will escalate construction costs and lower the overall feasibility of the project. A site scoring high for this attribute could use typical construction methods with minimal additional site work to facilitate construction.
- Proximity to local businesses – Tourism is critical to the success of this project, so proximity to local businesses needs to be an attribute as economic development must be involved in all decisions. A site scoring high for this attribute would have local businesses and shopping within short distance.
- Boater access / parking – Sites scoring high with this attribute will have boater vehicle parking within a relatively short distance, and a short walk or paddle to the feature.
- Spectator access / parking – Sites scoring high with this attribute will have parking and pedestrian access for spectators. It would also typically facilitate events on-site with a large group of spectators.
- User conflict – This attribute considers conflicts between the various river user groups. These may include fishermen, drift-boaters, powerboat operators, kayakers, rafters, swimmers, innertubers, sunbathers and more. A site scoring high for this attribute is anticipated to have minimal conflicts between river users.
- Overnight stays – This attribute is a measure of the likelihood of site users to stay overnight at nearby lodging. A site scoring high with this attribute would typically have a very high quality feature, or be located in very close proximity to available overnight lodging.
- Existing amenities – This attribute is a measure of existing bathrooms, picnic facilities, trails, signage, etc. A site scoring high for this attribute is likely to already be purposed as a park facility.

7.2 – Scoring and Weightings

Once the attributes were determined, the group discussed the fact that some attributes hold more weight than others. A “paired comparison” ranking was used which scores each attribute against the others. This is an objective way to truly determine which attributes are critical to the success of the project.

Looking at the attributes listed above in 7.1, the order of weight was highest for “Potential quality of the feature”, and lowest with “Existing Amenities”. The listing in 7.1 reflects decreasing weightings determined by the group.

7.3 – Scoring Summary

The scoring completed by the group for this Narrative included 9 sites versus only 2 for the original Report. The results and a brief description are as follows:

1. Willamette Falls East – Grinder Channel – This site is assumed to be incorporated into the “Blue Heron” site and associated future Legacy Project improvements. Due to proximity to downtown Oregon City, Portland / Metro area, easy construction access, opening up a natural / historic channel and the exciting potential scale of this site, it is the clear candidate for further analysis.
2. Milwaukie – Kellogg Creek at 99E – This site scored the highest for several reasons. It is the most likely to actually receive construction dollars, and the WSE drop must be accounted for in any future designs. While the required flows are not likely to be present during the summer months, all the other attributes scored perfectly with the attribute of overnight stays. The overnight stays attribute scored low due to the fact there is no lodging in close proximity.
3. High Rocks – While the potential of the feature did not score well at the High Rocks site, the remaining attributes were typically high. It is centrally located in Clackamas County with existing parks and infrastructure and is in very close proximity to businesses and lodging. User conflict is highest at this site. For these overall reasons, High Rocks scored third in the rankings.
4. Willamette Falls West – This site is assumed to be in the existing locks system. While the site is an obvious choice for multiple world class whitewater courses (versus single features), access issues drove down the score. Should this site be discussed in the future, access should be considered.
5. Tualatin Diversion Dam – Tualatin diversion dam site scored high due to the feasibility of this improvement and improvements for the river users. Assumptions were made regarding construction access and future parking access. Should amenities and parking be constructed in tandem with the whitewater feature, this site would be very promising. This site is potentially close to the neighborhood of Willamette assuming parking and trails are built in the future.
6. Water Intake Rapid – Water intake rapid scored well but has challenges. Similar to the Tualatin Diversion dam site, this site will need a new backbone of park type facilities for both construction access and final user access. User conflicts are high in this area. There is limited parking available at the site and it is over-crowded during the summer months. Assuming the County could build park amenities near the feature, this site would become more feasible.
7. Lower McIver – Lower McIver has great potential based on WSE, hydraulics and existing amenities, but it is located the farthest from the population center. There are limited businesses and lodging in the area. Proximity to businesses and population drove the scoring down on this site.
8. Middle McIver – Middle McIver has the same scoring as lower – with the exception of much more difficult construction.

See next page for Scoring Summary

Supplemental Rankings
Completed 7-21-2014 (Revised 9-8-14)

1 Poor, 3 Average, 5 Best

	Weight	Middle Mclver Score	Lower Mclver Score	Paradise Point Score	Water Intake Score	High Rocks Score	Tualatin Diversion Score	Willamette Falls West Score	Milwaukie - Kellogg Creek Score	Willamette Falls East Grinder Channel Score
Potential Quality of Feature	10	3	5	4	4	3	4	5	5	5
Proximity to Portland / Metro Area	9	1	1	1	4	4	4	5	5	5
Construction Access	9	4	5	1	3	4	3	5	5	5
Proximity to Local Businesses	8	2	2	2	4	5	4.5	5	5	5
Boater Access / Parking	8	4	4	1	4	5	4	2	5	5
Spectator Access / Parking	7	3	5	1	4	5	4	2	5	5
User Conflict	7	4	3	3	3	2	5	4	5	5
Overnight Stays	7	3	3	3	4	5	4	5	4	5
Existing Amenities	6	5	5	1	1	5	1	3	5	5
		Total	Total	Total	Total	Total	Total	Total	Total	Total
		193	209	97	210	266	228	241	298	305

- Rankings:
- 1 Willamette Falls - Grinder Channel
 - 2 Milwaukie - Kellogg Creek
 - 3 High Rocks
 - 4 Willamette Falls - West
 - 5 Tualatin Diversion Dam
 - 6 Water Intake Rapid
 - 7 Lower Mclver
 - 8 Middle Mclver
 - 9 Paradise Point