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| Correction Analysis Form | | | | | |
| Site Information (measurements in feet) | | | | | |
| Project Name: Mill Creek Fish Passage Project | | PRISM Project #: | | Date: 6/27/18 | |
| Bankfull Width (outside influence of culvert): 10.5 ft | | Utilities Crossing: Yes  No  Unknown | | | |
| Road Fill at Culvert Invert: 5.3 ft | | Road Width: 20 ft | | | |
| Road Description/Condition (mainline, spur road, driveway/access): Local access road, narrow compared to current design standards, very little shoulder present, no guardrail currently, pavement is in fair condition (some patches present) | | | | | |
| Evaluator Information | | | | | |
| Evaluator Name: **Nic Truscott, PE** | | Affiliation: **Natural Systems Design** | | | |
| Mailing Address: **305 Flora St.** | | City: **Bellingham** | State: **WA** | | Zip: 98225 |
| Telephone: 360-656-5207 | FAX: | Cell: 360-296-0019 | E-mail: nic@naturaldes.com | | |
| Upstream Habitat/Channel Description | | | | | |
| Channel Slope (outside of culvert influence): 5.8% | | Re-grade Potential (streambed US – streambed DS in feet): 6.5 ft | | | |
| Dominant Substrate:  Sand (<1/5”)  Gravel (1/5”–3”)  Cobble (3”-12”)  Boulder (>12”)  Bedrock | | | | | |
| Additional Upstream Information, Habitat Description, Other Site Conditions or Concerns, Including Potential Re-Grade Impacts Relative to Channel Stability And Habitat:      Streambed is dominated by gravel substrate; pools and diversity in local bed topography are almost always associated with the presence of boulders and/or wood. Riparian vegetation is largely healthy. Channel is entrenched with banks that are only inundated at infrequent events (25-year or greater). Bed slope is fairly steep, but proposed channel slope aligns well with natural slope of channel in vicinity of crossing and therefore potential channel re-grade following construction in minimized. Construction of bed and in particular incorporation of stable particles to simulate natural banks and channel bed roughness will be critical in terms of providing a stable stream simulation channel. | | | | | |
| Downstream Habitat/Channel Description | | | | | |
| Channel Slope: 6.8% (outside of culvert influence) | | | | | |
| Additional Downstream Information, Habitat Description, Other Site Conditions or Concerns:      Similar to upstream conditions, downstream habitat is largely riffle with local pools and holding areas associated with boulders and/or logs. Riparian vegetation is healthy, channel is slightly less entrenched downstream of the culvert with a high floodplain bench on the left bank downstream of the culvert. Substrate is mostly gravel with occasional large boulders and some cobble present. | | | | | |
| Correction Options and Preferred Alternative | | | | | |
| Options to Consider – Provide up to Three Site-Appropriate Correction Alternatives. Option 1: Precast bridge (36’ span, shallow abutments)  Option 2: Girder bridge (45’ span, deep abutments and footings)  Option 3: High Radius Arch Structure Plate Culvert (20’-8” span, deep footings) | | | | | |
| Preferred Alternative - Provide a 1- or 2-paragraph Recommendation for this Site. Include any Site-Specific Concerns that Will Need to be Addressed During Design and Construction:The existing culvert at this site is clearly undersized and should be replaced due to the fact that it is both undersized and inappropriately placed (slope is much shallower than natural stream slope). Replacement with a structure which accommodates an appropriate stream simulation design channel is a suitable and affordable option to pursue.Option 1 did not meet the requirements of Chelan County Public Works and so this option had to be abandoned.Option 2 initial cost estimates were clearly way more than we had initially proposed so this option also had to be abandoned.Option 3 was developed with a different engineer who meets the requirements of Public Works and has the ability to accommodate cost issues with standards. Project stakeholders have expressed concerns regarding the potential for debris flow events to occur at this site. Addressing these concerns in a cost-effective manner, while at the same time providing a design which accounts for the uncertainty associated with climate change then becomes the biggest challenge at this site. A traditional bridge would address these concerns, but is not cost-effective. The current design (Option 3) attempts to address these concerns in a cost-effective manner through using a much more cost-effective structure which maximizes opening size, provides adequate footing depth (scour protection), and is resilient to climate change and/or channel evolution following construction. | | | | | |
| Cost Estimates | | | | | |
| Rough Cost Estimate\* - Attach Detailed Cost Breakdown Using the Appropriate Cost Estimate Template, Provided Separately.  Option 1: $ 203,051  Option 2: $1,441,295  Option 3: $ 552,284  \*This is a rough approximation of project costs; actual costs may vary depending on specifications identified during final project design. | | | | | |

# Correction Analysis Form Instructions

## Site Information

**Project Name –** This is the landowner’s last name followed by the creek name. If more than one site per landowner is evaluated on the same creek, designate each site with a letter, e.g. Franklin – Boulder Creek A.

**PRISM Project Number –** This will be provided by PRISM database.

**Bankfull Width –** The stream width measured perpendicular to flow at the stage at which water begins to overflow into the active flood plain. Bankfull width requires a floodplain or a bench not present in many channels. In those cases, use ordinary high water. Ordinary high water is where the regular stream flow makes a line on the bank marking soil or vegetation with a character distinct from that of the abutting upland. Also defined as the lowest point at which perennial vegetation grows on the stream bank. Enter the average of several bankfull width measurements taken up and/or downstream of the culvert, outside the influence of the culvert.

**Utilities Crossing –** Include any water, gas, phone or electrical utilities at the crossing to be affected by project construction.

**Road Fill at Downstream End –** Measure height of material from top of culvert to top of fill at downstream end.

**Road Width –** Measurement should include shoulders.

**Road Description/Condition –** Provide a brief description of the road surface, use, condition, etc.

## Evaluator Information

Provide contact information for the people completing the Correction Analysis Form.

## Upstream Habitat and Channel Description

**Channel Slope –** This is measured outside of the culvert influence.

**Re-grade Potential –** Subtract the downstream streambed elevation from the upstream streambed elevation at the site.

**Dominant Substrate –** Identify the size category most prominent in the substrate.

**Additional Information –** Provide any additional upstream information that may be important to the project.

## Downstream Habitat and Channel Description

**Channel Slope –** This is measured outside of the culvert influence.

**Additional Information –** Provide any additional upstream information that may be important to the project.

## Correction Options and Preferred Alternative

**Options to Consider –** The purpose of this section is to provide the sponsor some guidance on the intended fix. Most small forest landowner projects should be relatively straightforward; however each site is different.

**Preferred Alternative –** Describe the recommended correction and site-specific concerns to be addressed during design and construction.

## Cost Estimates

**Rough cost estimate –** Provide estimated costs for correction options listed above. Costs should be based on cost estimate templates, provided separately, for culverts, bottomless arch culverts, and bridges. Attach the corresponding completed template for each estimate. These represent approximate costs; actual costs may vary depending on specifications identified during final project design.