AGC/WSDOT Structures Team
January 24th, 2020 Meeting Minutes

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Patrick Glassford prepared meeting minutes.

1. **Welcome/Review of Agenda/Past Meeting Minutes**
   Dewayne Matlock opened the meeting and reviewed the agenda. The agenda topics are primarily tasks we plan to tackle this year that were outlined at the AGC/WSDOT Annual Meeting.

   There were some new faces in the room, so introductions were made.

2. **Approval of Previous Meeting Minutes**
   Dewayne asked for additional comments on the December meeting minutes. No further edits or corrections were provided.

   Action Item: Dewayne will post the December meeting minutes to the web.

3. **Girder Stress Checks for Construction Loads – Next Steps**
   Patrick Glassford described the history behind this agenda item. During the March, 2019 AGC/WSDOT Structures Team meeting, Anthony Mizumori from the WSDOT Bridge and Structures Office (BSO) gave a presentation showing who is responsible for girder stress checks during construction and in service. In general, the contractor is responsible for construction engineering while the engineer of record is responsible for design for service; however, the engineer of record does provide built-in allowances to ensure precast girders can be constructed with available means and methods.

   The primary issue to be addressed is that contractor responsibility is repeated in several sections of 6-02.3. The language is being reorganized so the spec is less repetitive.

   Action Item: Patrick will bring spec changes to a future meeting for input.

4. **Load Limits on Existing Bridges Under Construction 6-01.6– Next Steps**
   The topic of construction stresses on girders ties into Section 6-01.6, Load Limits on Existing Bridges Under Construction. The current draft revision limits material storage on girders at 10-psf max, but the group previously indicated the small allowance is not practical. This is an area that WSDOT will revise and bring back to the group for input.

   There is also internal discussion of limiting loads on large deck overhangs during construction to limit torsion on prestressed girders and bending on tub girder webs. The BSO is looking at potentially checking several scenarios with different girders and deck overhang lengths to determine limiting overhang loads and putting the loading assumptions into contracts. If we move forward with this approach, the group prefers we provide them with a max moment per lineal foot of girder for an overhang limit.

   There was discussion about what we check for shipping during design. When we perform girder stress checks for shipping with PGSuper software, we check against

limiting parameters such as transport vehicle axle stiffness, transverse wheel spacing, and roadway cross-slope and put those assumptions in our contracts. If those assumptions will be exceeded, it is the contractor's responsibility to submit a Type 2E Working Drawing. There were concerns that the spec isn't clear on this topic. Another concern is that contractors on design-bid-build jobs aren't equipped with an engineer to do any additional shipping checks. This will be brought up at a future meeting when we bring spec revisions.

There was discussion about what girder transport companies and precasters check. Eric Bowles from Concrete Tech stated that Concrete Tech is not insured to perform shipping stress checks. In practice, girder transport companies check routes against limiting parameters stated in our contracts.

There was discussion about Section 1-07.7(2) and the removal of the 35% allowance for live load over bridges within project limits; Michael Rosa had previously revised this section and removed the 35% allowance, effective in the 2020 Standard Specs. After some discussion, it was agreed that the blanket 35% allowance didn't make sense with our aging bridge inventory. There was discussion about possibly looking at bridges within project limits during design and allowing overloads in the contract depending on current bridge load ratings.

Action Item: Patrick will bring the revised spec to a future meeting and look into the max limit for construction live loads on bridges under construction and bridges within the work zone. We will continue looking at coordination with 1-07.7(2) and 6-01. Dewayne will check with Marco Foster on 1-07.7(2).

5. **Fish Passage Rapid Construction – ABC – Next Steps, Who is Leading This Effort?**

Dewayne asked the group about the history of this topic. There was discussion about several steps WSDOT is taking to streamline the design and installation of fish passage structures:

- Current trial project using fiberglass tube ribs filled with concrete on Loutsis Creek.
- Bundling several fish passage structures into projects with different delivery methods such as design-build, design-bid-build, and progressive design-build.
- Bridge Design Manual (BDM) revisions to clarify buried structure design requirements and allow more material types.
- Creation of Standard Plan culverts to facilitate faster delivery. Coordination with precasters to ensure standards meet form capabilities.
- Allowing metal plate structures for any length of structure.

There was discussion about how successful Europe has been with their standardization of culverts. One of their techniques is to oversize culverts. Then when it's time to be replaced, they will slide another culvert under the existing one and fill

the annular space basically doubling the service life. It will be helpful for WSDOT to get better at standardization to streamline the process.

Action Item: Culvert Standard Plans will be brought to the group for input once they are developed.

6. Contractor Designed Culverts

Geoff Swett discussed how historically, for culverts less than 20 feet, we would give dimensions on design-build (DB) jobs and allow contractors to design the culverts based on those geometric constraints. Currently, the spec allows WSDOT designed culverts greater than 20 feet to be modified through the submittal process for design-bid-build projects. We have seen this lately due to our designs not meeting fabricator formwork capabilities.

There was concern from industry that the spec doesn't address WSDOT approved design software for culverts; currently, hand calculations are required to validate software calculations. The hope is that WSDOT can approve software to help streamline the design process. Geoff Swett informed the group that the BSO hasn't made headway on software approvals yet, but that would also benefit BSO to help streamline their designs. Scott Ayers asked if there's a method to get software approval through the QPL process. That is likely outside the box, but Bob Hilmes suggested the vendor should initiate the process and believes that's the appropriate route. The QPL folks would then reach out to BSO for their input. Typically, there's a specification that corresponds to the product being approved.

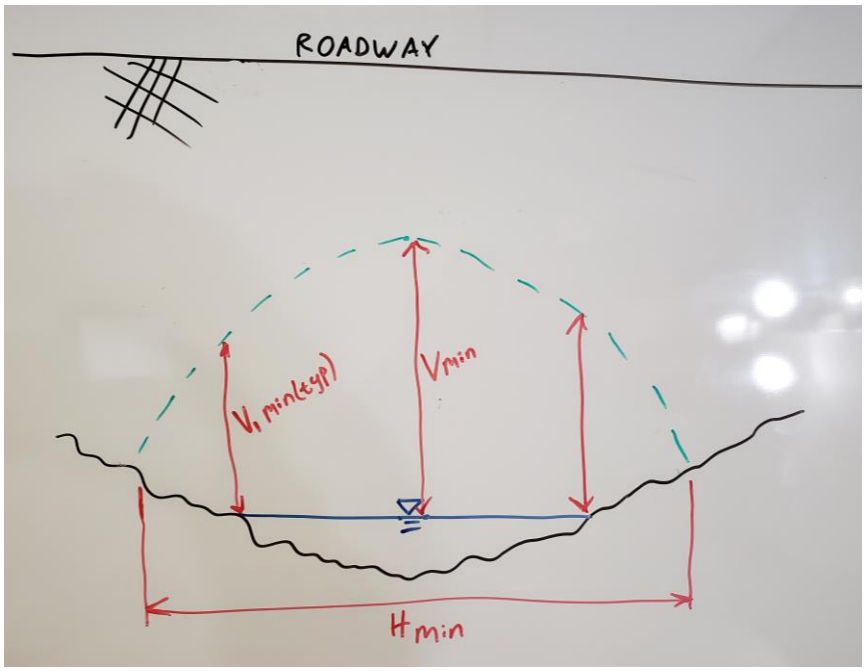
Patrick took over at this point and gave a presentation about the BSO plan to allow contractor designed culverts for all opening sizes. BSO is seeking industry feedback. Below is an outline of the presentation followed with questions and answers from the group.

The Issue

- Historically, WSDOT has provided 100% plans/specifications for buried structures
- While this has worked well, it also has limitations
    - Generally locks in the structure type (usually not enough contract time for a VECP)
    - Precludes the use of other structure types (concrete arches, corrugated metal plate, steel/aluminum boxes, composite arches, etc.)
    - Restricts/prohibits any Contractor innovation
- Almost all of WSDOT 100% PS&E is a concrete box structure
    - With 430 +/- fish barrier corrections by 2030, there is likely insufficient precast capacity to meet the demand
    - WSDOT needs to be open to alternative types of buried structures
- Looking for feedback on making the buried structure a mini design-build element within a design-bid-build package

The Solution?

- WSDOT provides
  - Minimum vert. and horiz. Geometry
    Potential advantages – contractor could provide larger openings if it benefits their design (e.g. less load on structure, select predesigned precast for expedience)
  - Design and construction specifications
  - Site-specific limits on structure type (e.g. prohibit steel plate in a marine environment)
  - Some geotech work (more discussion later)
- Contractor takes care of everything else

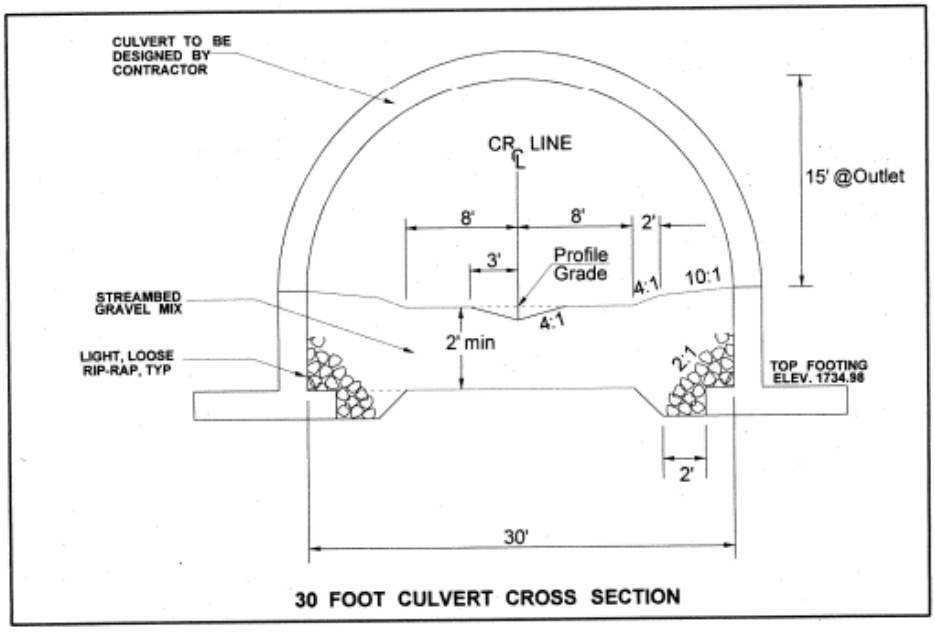


Benefits (For WSDOT)

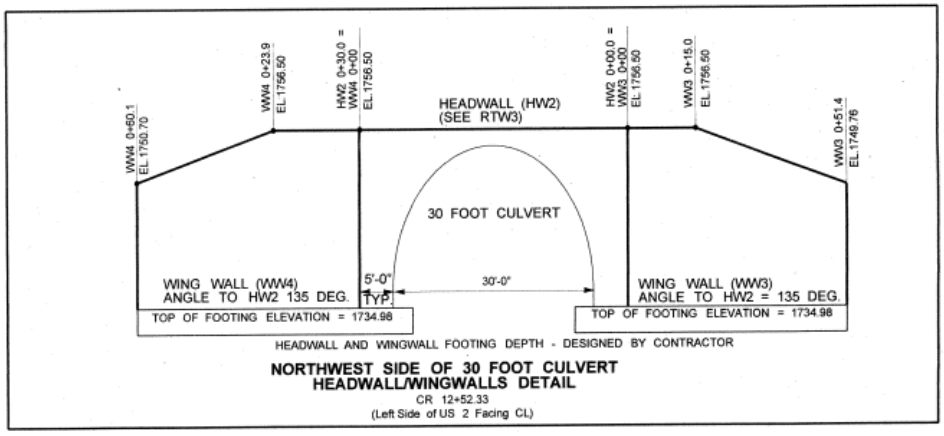
- Shifts design effort (and risk) to the Contractor
- Promotes innovation
- Contractor can select the lowest-cost/lowest-risk structural solution
- Allows Contractor to consider market conditions (e.g. availability of precast)

Past Example

US 2 Deadman Creek (part of the North Spokane Corridor project)



30 FOOT CULVERT CROSS SECTION



NORTHWEST SIDE OF 30 FOOT CULVERT
HEADWALL/WINGWALLS DETAIL
CR 12+52.33
(Left Side of US 2 Facing CL)

Question: What concerns do you have with this approach?

Responses: Building in enough design time. The US 2 project was one part of a larger project and was a multi-year job. There were lots of hoops to jump through such as getting HPA approval and getting BSO buyoff on the design. The recommendation is to make sure the culvert is part of a larger project; otherwise, with the fast pace of culvert replacement projects, there's not enough time to get all the required approvals. Bundling several culverts into one project is one way to overcome the approvals issue. It also allows the contractor to get past the learning curve with the first few in the bundle and get more efficient with the process.

There was concern raised about contractors putting in design effort before bidding. That could add a lot of cost to the estimate. One proposed solution was to offer a stipend. Geoff pointed out that suppliers can usually provide a solution to the contractor before bid relatively quickly.

Question: From a cost/risk perspective, do you see this as a better than, neutral or not as good as our current approach (WSDOT provides the design)?

Responses: It would be better than our current approach if the contract is structured right. If it's implemented on too complex of a project the cost/risk goes up. If we give them sufficient contract time, that would minimize the cost/risk. The less design getting pushed onto the contractor the better. If we have dozens of culverts in one

project, then they could get good economy of scale; however, we don't want to make the projects so large that it pushes away several potential bidders. This gives the contractors more time for design and innovation. But this gets into more of a design build job.

Question: How much time is needed from contract award to start of construction to get the design completed?

Responses: Typically 3-6 months. This would include design time, fabrication time, etc. It was recommended to put projects on ad during the fall before the summer fish window when it would be installed. Bob Hilmes said he would check how long the US 2 project took from initial submittal to final approval. Scott Ayers stated it depends on how much permitting the contractor would have to do. On the US 2 project, all the permits and approvals were completed prior to advertisement, as it was a design-bid-build project. Obtaining the permits ahead of time locks in opening size but not structure type. It was mentioned that using a predesigned structure, such as a precast culvert from Contech, would be more effective at bid time than a special design culvert. It was also pointed out that there's engineering that needs to be done to the foundations prior to bidding, so we would need to provide geotechnical information in the contract; the culvert precasters don't design the footings. The less design of foundations, headwalls, etc. that the contractor has to perform, the more confidence in bidding and the more bidders; although, Geoff Swett pointed out the footing design would depend on the culvert chosen, so that would likely need to be part of the contractor's design using this delivery method. Something to keep in mind is the light requirement for fish when obtaining permits; the longer the culvert, the wider and taller it needs to be so there's enough light to encourage fish to use the passage.

Question: What level of geotechnical work should WSDOT complete before advertisement?

- Just the borings?
- Full geotech report based on anticipated foundation types?
- Something else?

Responses: A full geotechnical report is preferred. It was advised that contractors wouldn't bid anything that didn't have a geotechnical report, as that would be too large of a risk. If we gave just borings, we would still need to put a geotech baseline in the contract. If soil amendments were required, that method likely wouldn't work unless we defined the type of soil amendments required. The consensus was the more geotechnical information we could provide, the better.

Patrick asked the group if they thought the geotechnical report would lock in the structure opening. The group responded that the geotech report would provide minimum parameters, so there would still be room for innovation. Plus, the bore logs could be used to show the soil capabilities that they could apply to their design.

Question: What does WSDOT need to do to make this approach successful?

Response: There was nothing to add to this topic, as it was addressed in depth in the answers to the previous questions.

Question: Overall, do you support WSDOT increasing the use of this approach on future projects?

Response: Everyone in the room supports this approach if structured appropriately, as discussed previously.

Question: Anything else you want to share?

Responses: Dewayne added that Bob Dyer is working on minimum specifications for structures with minimum or no fill.

Action Item: Bob Hilmes will look back and see how much time the US 2 project took from initial design submittal to final approval.

7. Construction Tolerances for Geosynthetic Walls and Surrounding Elements – Next Steps, Who is Leading This Effort?

Nobody in the room recalled discussing this topic in the past. It was suggested to get the question from the roadway group and bring it to this group at a future date. Bob mentioned if the batter is off, there will be a gap at the top of wall.

Action Item: Dewayne will check with Marco Foster to clarify what the issue is and if our group needs to discuss further.

8. On-Site Precast

Patrick explained that Michael Rosa will discuss this spec again at the next PCI NW Annual Meeting, then BSO will review the spec for potential adjustments. It has been a while since our group has reviewed this spec, so we will bring back for another review. We will plan to get the new spec into the 2021 book.

In the recent past, there have been projects where the contractor proposed to precast minor structural elements on site. This has been accomplished through a change order. It is preferred to get the revision into the specs and allow contractors the option to precast on site without having to process a change order.

Bob Hilmes suggested routing the new spec around to the construction engineers as a final review before publishing.

It was pointed out that construction schedule is one of the drivers for this spec because precasters can't always meet the schedule. Also, having to process a change order to allow precasting on site takes time and affects schedule. This could also benefit rapid construction: having the ability to cast on-site leveling pads,

crossbeams, etc. so they don't have to be transported to the site. There was also discussion about casting culverts on site. The group agreed they would do this if the precasters couldn't meet their schedule. The precasters are often busy around the same time of year with everyone needing their culverts installed during the fish window.

Additionally, this could benefit the contractor's workforce. They may have lulls where their workers don't have anything to do. Including the option to precast on site could fill that void.

Action Item: Patrick will bring the spec back to discuss at the next meeting. BSO should review again, and we'll aim to get the spec into the 2021 spec book.

9. **Shotcrete Bond Properties with Substrate**

Patrick reached out to Conco, and they agreed to provide us with test panels. This item will be removed from the agenda.

10. **Changes to Section 6-02.3(11) Curing Concrete**

Patrick gave an update on the changes to this spec based on comments from the last meeting. There was previously concern about the requirement to cure cast-in-place barriers in the formwork for the first 3 days. There was also concern about the language requiring the second curing period to be 7 days; we require a total cure of 10 days, but the way it's written, that period could be more or less if the first curing period is more or less than 3 days. References to the 7 day cure have been removed, the total 10 day curing requirement is now clearly stated at the beginning of this section, and the word "minimum" was added to clarify that a 3 day minimum cure in the forms is required; we don't want early stripping to be allowed. The concrete specialist in the BSO feels strongly about getting a 3-day cure in the forms to prevent early age shrinkage cracking, as many of our barriers are severely cracked.

Concern was raised that the 3-day requirement isn't consistent with our slip form spec; however, it was also pointed out that our water/cement ratio is a lot lower for our slip form barriers which tends to reduce shrinkage cracking. Also, there's more heat of hydration with the higher water/cement ratio in cast-in-place concrete. If the forms are stripped too early, the exterior concrete will cool more quickly than the core leading to more cracking.

The group feels there's still a specification conflict between the 3-day requirement and the early stripping spec under section 6-02.3(17)N. There's also concern that it will take a lot longer to open a bridge with the 3-day minimum requirement because it prevents daily or every-other-day pours. Architectural form liners are expensive; it is less expensive and more time efficient to strip and reuse the form liners as quickly as possible. The group feels that mandating 3-day curing in the forms will lead contractors to choose the slip forming option and we'll end up with worse looking barriers.

Bob Hilmes asked if we've had barrier failures due to cracking. Nobody in the group knew of a specific instance. He suggested that we should prioritize productivity and remove the 3-day requirement.

Another issue raised with cast-in-place barrier is that the sacking is required to take place after the 10-day cure, which is followed by another 48 hours of curing. With slip formed barrier, the curing is done in 10 days, and the bridge can be opened to traffic. The time savings makes slip forming the preferred option. It was suggested that we allow the finishing work to be done within the 10-day curing period, preferably at the time stripping is performed. The group would like sacking to be allowed at least within the second (7-day) curing period.

Bob Hilmes mentioned that he gave Patrick feedback on the curing specification. He asked the group if the correct terminology is "cure" or "curing." Bob asked the group if there were concerns about the 1,500 psi pressure washing not finding all the air pockets. From past experience, he doesn't think that's enough pressure and would like it increased.

Action Item: Patrick will discuss allowing earlier cleaning and sacking to keep the curing within 10 days total. He will also look into the early stripping request and the possibility of increasing the pressure for pressure washing barrier.

11. Conclusion

Dewayne asked if there were any other items to be discussed. No more items were mentioned.

The meeting adjourned at 11:12.

Future meeting dates are March 6, April 17, and May 29. Kevin offered to bring coffee to the March 6 meeting.

AGC/WSDOT Structures Team
March 6, 2020 Meeting Minutes

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Patrick Glassford prepared meeting minutes.

1. **Welcome/Review of Agenda/Past Meeting Minutes**
   Dewayne Matlock opened the meeting and reviewed the agenda. Several members and guests called and Skyped into the meeting, so introductions were made.

2. **Approval of Previous Meeting Minutes**
   Dewayne asked for additional comments on the January meeting minutes. No further edits or corrections were provided.

   Action Item: Dewayne will post the January meeting minutes to the web.

3. **Fish Passage RFQ/RFP Updates**
   Bob Dyer introduced himself and opened up his presentation about the template document updates for fish passage, design-build projects. He explained these will be the templates for fish passage, design-build contracts that only have fish passages in them; however, they will be optional for other design-build projects that include fish passages. The template discussed is included in the Padden Creek project. It is only available through Bob, as it is constantly changing as lessons are learned from other projects.

   The reasons for the changes are:
   - Poor reaction from tribes and WDFW on several projects. They feel design-builders are trying to use WDFW guidelines as a tool to meet minimum standards. The guidelines were never intended to be a contract document.
   - Problems with too much risk being put on the design-builder, such as potential for future flooding outside the right of way.
   - Do a better job conveying the requirements we've committed to the tribes and WDFW.

   The following goals are part of the basis used to evaluate proposals and select the design-builder:
   - Build a project that meets requirements of the injunction.
   - Instill more trust by the tribes than we have in the past. This will help increase efficiency and reduce project costs by minimizing back and forth about every little detail. There are 413 more fish passages to construct with a price tag of about 2 billion dollars. Incentives are included that aim to accomplish meeting the intent of the WDFW guidelines.

   The evaluation criteria is based on the Padden Creek project. 3 million technical credits are included, which is a large percentage compared to what we've traditionally

included. The criteria is used for evaluating submittals related to the fish passage design and the plan for the design-builder to collaborate with the WFDW.

In Chapter 1, state law language protects us from lawsuits related to putting streams back to their natural state, but that protection likely isn't bullet proof for WSDOT:

- WSDOT could be sued if we affect other property due to regrade, and a jury would likely be sympathetic to the property owners.
- Liability could be placed on design-builder and designer. We don't want that risk to be included in the proposal price.
- We want streams to go back to their natural state, which could include the streambed grade dropping or meandering.
- Indemnification (included in Chapter 1) only applies to design-build, fish passage jobs that have a regrade requirement. If there's a lawsuit, WSDOT will defend, protect, and indemnify the design-builder.
- On all design-build projects, an indemnification for flooding will be included. New structures will have larger hydraulic capacities, which could increase downstream flooding.
- Damage inside the right of way, such as scour around structure, is not indemnified.

There's also an incentive program included in Chapter 1 for collaborating with the tribes and WDFW. This will be a one-time incentive at the end of the project. The evaluation team will be the project engineer, one representative from each tribe, one from WDFW, and one from WSDOT hydraulics. The criteria is based on a 0-100% scale.

The four statements that scores are based on are as follows:

- Does design-builder, as a team, know what they're doing?
- Do the tribes and WDFW think design-build is a good delivery method for the future?
- Did the design builder listen and respond appropriately?
- Will the fish passage last for a long time?

These statements are intended to be subjective. There is a protest process that would like go the Deputy State Construction Engineer, but this can't go to the disputes review board or court.

Fish passage chapter changes:

- Make it crystal clear that the material part of the contract is obtaining the permit, not just submitting the permit.
- Definitions have been created to communicate the structure free zone of the fish passage. No part of the structure is allowed to be inside the structure free zone.
- We've increased requirements on qualifications of the stream design engineer, and a lot of weight will be put on who to short list based on their qualifications and experience. We'll put less weight on who the overall design manager is. We need a good team of disciplines.

- Peer review is an optional requirement. The Mount Baker area wanted have this as a requirement for the Padden Creek project. Essentially, a duplicate effort is performed; another independent stream team validates that the original stream team's work.

There was a comment from industry that there are not many individuals in the state that are qualified to do this work; with multiple fish passage, design-build projects going on simultaneously, it will be challenging to get another team to duplicate the work. Bob agreed and will recommend not making this mandatory in the future.

Industry question: is the peer review team also part of the grading criteria for the job? Bob answered no. This is only in one contract right now in the RFP for Padden Creek. He advised industry to get in touch with Project Engineer Mikkel Lamay if they're on the short list to discuss with him.

Preliminary hydraulic design report (PDH): this is part of the effort of WSDOT to do a better job conveying the requirements we've agreed to with the tribes and WDFW into contract language. PHD's are not a contract requirement unless explicitly referenced in contract. A dimensions table will convey the contract requirements. WSDOT warrants that what's in the table will be approved by the tribes and WDFW. What's not in the table is the responsibility of the design-builder. Maximum hydraulic length will be included in contracts for the fish advantage. We have also defined the 100-year design freeboard. This might be more than the usual 3-feet for fish passages. To avoid conflicts, we are including a minimum amount of large, woody material and guaranteeing that it will be approved. If the tribe doesn't approve, we will process a change order.

There was a question from industry about if it matters if a culvert is 3 or 4-sided. Bob responded that for Padden Creek, it just needs to meet any of our buried structures. The question was brought up because the tribes prefer 3-sided structures. This chapter says we could approve 4-sided. Is that part of the indemnification right of way warranty? Bob responded that if chapter 2.13 allows 4-sided culverts, then we are guaranteeing that the tribes will accept that. Bob pointed out that the bottom of 4-sided culverts will be deeper than they were in the past; nothing can be higher than 2 feet below the 500-year scour. Michael Rosa pointed out it will be stated specifically in 2.13 if it has to be a 3-sided structure; that chapter will specifically state the required structure type. Bob specified if the tribe wants a 3-sided structure, we will put that into the table.

Bob repeated the goals that the table attempts to accomplish:

- Higher level of satisfaction to tribe and WDFW. We are attempting to achieve that by providing an incentive.
- Reduce design-builder's risk on what tribe will accept. We are guaranteeing the tribe will be accept what is in the table.

- Do better job of conveying to the design-builder the commitments we've made to the tribe and WDFW. This will reduce the design-builder's risk and the risk of change orders.

Bob will also talk to the design build/AGC/ACEC group. Bob wants to get the word out to designers and design-builders of what the changes are. These changes are to address lessons learned from past design-build fish passages. This will be an ongoing effort. Send Bob an email if anyone wants these specs.

4. I-90 Easton Project Review

Jeff Minnick opened the topic and explained the project. This is a South Central Region project on I-90 and is one phase of a larger project. I-90 is being widened southward to add a fourth lane in each direction. To accomplish this, there will be composite retaining walls constructed on steep slopes with rock within the National Forest. This will be done in stages by first shifting traffic to the north. The composite walls will be soldier pile, tieback walls with MSE walls on top. There will be 3 locations with this wall type. The main question from the design team is regarding access to get to bottom to install the soldier piles. The current scheme uses 36 inch diameter drilled shafts to set the piles. The soldier pile walls will be up to 40 feet tall with MSE walls on top that are up to 30 feet tall. What is the width required for access?

There was a typical section shown to the group. Jeff explained there's an impact line that limits how much Forest Service land can be impacted. The MSE wall offset on top is currently shown at 5 feet from the face of soldier pile wall. The soldier piles will be spaced at 6 to 8 feet. The soldier piles will likely be embedded in bedrock. They will need to be installed through colluvium and rock fill from past I-90 construction. In order to stay back from the detour roadway, shoring and/or sloping fill will need to be used.

This project was presented to the ADSC/WSDOT Joint Team back in November, 2019. They provided good information such as installation bench width, but the prime contractors will control installation access; that is the outstanding issue. Currently, the planned access roads are varied based on existing geometry configurations: cut walls, fill walls, and combination cut/fill walls. One question for the primes is do they want access from the back, front, or a straddled configuration? The goal is to limit the amount of required shoring. Regarding drilling PGA from the top or bottom of the wall, some contractors have drills on excavators that can reach down over 20 feet. Workers are still needed on other side to feed the tie back, but the consensus is that access from the front of wall is the preferred strategy.

There was an idea to place fill behind the soldier pile wall without tiebacks, then install tiebacks before placing the MSE wall.

One member asked if it's possible to cut steeper than 1.5:1. The response from the design team is that 1.5:1 was assumed, but the material could support 1:1 slopes in

some locations. One member had the idea to build a temporary geosynthetic wall to build the bench and tear it out afterwards. That would lessen the potential impacts to the roadway above and the impact line below. One solution is a 24 foot bench with a 30 foot wall based on strap length.

Jeff showed an example of a wall cross section at Wall 2 that will be more of a cut wall situation. A question was asked as to what type of rock the bedrock is. Todd Mooney explained that the bedrock type varies, but at Wall 2, it is relatively weak basalt that is weathered at the top. In general, the shafts would be drilled through fill, colluvium, advance outwash (in some locations), then 5-10 foot weathered rock (weak fractured). 500-10000 psi rock will then be drilled into to socket the piles.

A big issue is whether the bench will be in the front or back of wall. The two scenarios produce drastic differences in wall height. There could be up to 10 feet of difference in wall height. There are many variables to consider when determining bottom of wall profile. So the amount of bench they need in front vs. behind the wall is very important from a design and cost perspective. Is 20-25 feet barely feasible or is that overkill?

There was discussion regarding the type of backfill at the top of wall affecting pile embedment depth. The looser the soil is, the deeper the pile will be to minimize wall deformation. The worst case condition at top of wall is being considered in design.

The design team suggested they're also trying to avoid using a moment slab. The idea of building a bridge or half bridge instead of walls was proposed but is likely cost prohibitive.

There was a suggestion to have the soldier pile wall installed right underneath the barrier and have the barrier be part of wall. This would eliminate using an MSE wall or moment slab barrier on top. There would also be less disturbance to the Forest Service and less trees cut down.

The design team pointed out they have been using the composite wall idea to keep it more cost effective; however, moving the wall up might not increase the height the of soldier pile wall by much. The design team will consider looking into this scenario.

Regarding bench location, the consensus is that it's best to have the bench below (outside) the wall and building a temporary wall to support the bench where necessary. It was also pointed out that soldier pile work could proceed through the winter.

There was talk about bridge cost vs. wall. They've been estimating at $200 per square foot for the walls, and BSO has been using $300 per square foot for a bridge estimate. Per lineal foot or roadway, the bridge option is much more expensive. It was pointed out that soldier pile is riskier than a bridge, but getting equipment to drill a shaft is expensive, which could jack up the price of a bridge.

There was talk about girder availability and the fact that the ad date for this project is in March. In about 1.5 years, Concrete Technology will be finished building girders for Sound Transit for now. Using the total lineal feet of wall (about 3,400 feet), Michael Rosa pointed out that a bridge would include about 170-200 girders using a 200' max span for prestressed girders. That would take up a lot of Concrete Tech's production.

In summary, the final consensus is that a 20 foot bench in front of the wall is a good assumption for design. This will likely be a 4-5 year job due to weather. The project is currently paused due to the I-976 bill, but we hope to go on ad this year with the traffic shift/detour part of it part of the project.

5. Cast-On-Site Precast

Michael introduced the topic by discussing the specification changes he was working on last year. After the summer PCI meeting, the spec change was put on hold and not included in the 2020 Standard Specifications update.

Michael then gave a recap of the revision history. Bob Hilmes had started with the revision. The method was to change anything where precast was mentioned to include requirements for cast-on-site precast. It was spread out throughout the Standard Specifications. Michael then took another approach and started version b, a new section for cast-on-site precast concrete units. This was modeled after precast concrete panels with quality control and contract requirements. That way there were less spec section modifications.

Once Michael got back into the spec modifications, he realized there was a lot of duplication of information. Now version c is a combination both earlier versions. It combines Concrete for Precast Units, Section 6-02.3(27) and Precast Concrete Panels, Section 6-02.3(28) into one section, Precast Concrete Units. This includes whether it's made at a fabrication facility or cast on site. For the most part, we want to make sure the quality standards are the same between the two. The only difference is precast plants require certification. We can't have same certifications for on-site fabrication. But more extensive shop drawings and working drawing submittals are required for cast-on-site, such as precast schedule and quality control plan. The plan is to move the revisions to a vacant section in the Standard Specs. Anywhere precast is mentioned will reference back to that main section.

Michael then opened the draft specification section to show the group the modifications. He is primarily keeping the current requirements but adding the cast-on-site precast option. The certifications required for precast plants will be maintained. One question that has come up is what if the contractor has a staging yard that's not within the project limits? Can they use their yard to precast? There might be refinements to the spec to allow that. We need to determine how far away from the project site we'll allow cast-on-site precast. We want to avoid them opening a precast

plant near the site where they haven't gotten certification. Our preference is to stick to within project limits under the contractor's control.

The overall structure is still mostly the same. Self-consolidating concrete (SCC) for precast units will be included in the current SCC section. Acceptance testing will move into the acceptance section for concrete to minimize repetition. Other testing requirements will remain as they are. Michael asked the group to provide comments if any, and he will follow up at next meeting. The intent is to get the new and modified sections into 2021 spec update due at beginning of June. We will need to go over comments in the April meeting and get the spec sections finalized.

Other sections, such as structural earth walls, that include precast will now reference back to the precast section. In the meantime, Michael will modify other sections that mention precast to reference back to the new section.

Action Item: Michael will continue with modifications, and the group will review and comment on the revisions as needed.

6. Load Restrictions on Bridges Under Construction – Section 6-01.6 Revisions

Patrick discussed the changes to this specification since the last meeting. There was previously a 10 psf limit for material loads on bridges, but the group stated that this was unrealistically low.

Patrick has since met with the BSO and discussed more practical options that would be constructible and meet design needs. The conclusion was that any material that will become part of a span will be allowed to be stored on that span as long as it is not stored within the middle third.

There were no comments from the group during the meeting regarding these revisions, but Patrick asked the members to send him any comments they may have.

At the last meeting, there was concern regarding bridges within project limits in Section 1-07. With the removal of the 35% live load overload allowance in the 2020 Standard Specs update, contractors expressed concern that it will be difficult to move equipment around within the project limits. With our aging bridge inventory, it doesn't make sense to keep a blanket overload allowance in place, hence the removal in the 2020 Spec update. There was a suggestion during the last meeting to look at existing bridge load ratings during design and allowing overloads on a case-by-case basis.

Last year, while specifications were being reviewed for the 2020 spec book, the AGC/WSDOT Structures team agreed that contracts will include bridge inspection reports at advertisement that contain allowed tonnage. That way bidders will know what bridges may require working drawings if they want to drive heavier equipment across them.

7. Girder Stress Checks for Construction Loads – Section 6-02.3(25) Revisions

Patrick explained this revision is mostly a reorganization of content in order to reduce repetition and clarify contractor responsibility. He then touched on the main changes that the group may be interested in.

There is a new bracing requirement that states temporary bracing shall be installed by the contractor at a minimum of 60 feet. This is to preclude lateral torsional buckling of prestressed girders. It is still the responsibility of the contractor to design and submit bracing. That bracing submittal shall be in accordance with the girder erection plan, which is a new requirement.

A clarification was made regarding contractor responsibility for lifting, shipping, and erecting prestressed concrete girders. This responsibility is now clearly stated only once. Also included is a statement that shipping and handling details included in WSDOT contracts are suggested only. The shipping and handling assumptions made during design are typically stated in the contract, but WSDOT cannot foresee every construction scenario, hence the details are suggested only.

There were no questions or concerns from the group on this topic.

8. Changes to Section 6-02.3(11) Curing Concrete

Patrick went over the most recent concrete curing revisions based on feedback from the last meeting. There was previously concern that our cast-in-place concrete barrier curing specifications required a 3-day wet cure in the forms. The contractors prefer to use the early stripping specification, which helps keep production moving and allows reuse of special forms. The recent change explicitly allows early stripping in accordance with Section 6-02.3(17)N as long as curing blankets are placed immediately after stripping.

There was also previous concern that 1,500 psi pressure washing wasn't enough to remove air pockets just below the surface that form near the top of barrier. There have been situations where a thumbnail could punch through the concrete after the pressure washing was complete, and the contractor wouldn't fix the problem because they had already followed the spec. Patrick added spec language that specifies removal of blisters and air voids just below the surface shall be removed to the satisfaction of the Engineer.

Another concern from the last meeting was that sacking of barriers wasn't allowed until after 10 days of wet curing, then another 2 days of wet curing was required. There was concern that this would lead contractors to choose the slip forming method since they could finish in 10 days and save time. Patrick added language that allows sacking after 7 days of wet curing as long as curing blankets are not removed for more than 8 hours and they are only removed in the immediate work area.

There were no further questions or concerns about those additions.

9. FYI – Changes to Section 2-09.3(1)E

Patrick discussed the reasons for changes to this specification. For abutments greater than 15 feet in height, there were questions as to why we have the requirement to cure for 14 days and achieve 90 percent design compressive strength prior to backfill. The reasoning behind the timing is to limit deflection due to creep on green concrete. Language was added that allows backfill up to 15 feet prior to 14 days as long as 90 percent design strength is attained. Also, there's an allowance for backfill to be placed at a minimum of 70 percent design strength if Type 2E Working Drawings are submitted demonstrating structural adequacy.

There were concerns about the 14-day requirement even when concrete attains full strength at 4 days. Some industry members were questioning how much deflection we could get at that point. This has apparently been an ongoing disagreement between AGC industry contractors and WSDOT.

The explanation is that the concrete is still young and green at that point and can still creep. Creep is largely time dependent.

10. Wellesley Bridge Question

Patrick and Michael Rosa presented a question from the BSO regarding a deck pour on a single span steel plate girder bridge. The volume of concrete will be about 800 CY. Can 800 CY be poured in a single deck pour? How many CY can be done in one pour? Staged sequencing gets tricky with cross bracing and stress distribution.

Industry answered that it depends on the batch plant, but a deck with that much volume could be done in one day with the right equipment. Michael asked what the limit is on how much concrete can be poured in one pour. The answer is it's dependent on labor force, what the batch plant can produce, and how much the finishing machine can finish per hour. They've done 2000 to 3000 yard foundations in one pour.

Another question: would one finishing machine be used for the entire 120 foot width? The answer was yes. They have done one with 130 feet on Nalley Valley. They stated that it's not feasible to finish with two finishing machines.

11. Conclusion

Dewayne asked if there were any other items to be discussed. No more items were mentioned.

The meeting adjourned at 11:08.

Future meeting dates are April 17 and May 29. Bill Binnig offered to bring coffee to the April 17 meeting.

AGC/WSDOT Structures Team
April 17, 2020 Meeting Minutes

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Guests

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Patrick Glassford prepared meeting minutes.

1. **Welcome/Review of Agenda/Past Meeting Minutes**
   Dewayne Matlock opened the meeting and asked for additional comments on the March meeting minutes. No further edits or corrections were provided.

   Action Item: Dewayne will post the March meeting minutes to the web.

2. **Changes to Sections 6-02.3(11) Curing Conc and 6-02.3(10)D3 Conc Placement**
   Patrick Glassford introduced changes to the concrete curing and concrete placement sections, specifically for bridge decks. Feedback from WSDOT field engineers suggest too much concrete is being placed in front of concrete finishing machines in some cases. This is in violation of section 6-02.3(10)D3, item 6 which states the contractor shall "maintain a slight excess of concrete in front of the screed across the entire width of the placement operation." The proposed spec revision requires bridge deck concrete to be placed, consolidated and struck off within 30 minutes.

   The revision to section 6-02.3(11) is regarding placement of burlap. This group has had discussion in the past about timing with getting wet burlap down on the deck concrete. The spec currently states immediately after deck finishing, the contractor shall fog the bridge deck until burlap can be placed. There has been concern that if placed too soon, the burlap could get stuck in the concrete or walking on the freshly finished concrete could damage the finish. There has also been much concern internally that burlap is not placed timely and fogging often ceases. The proposed spec revision requires burlap to be laid down within one hour of finishing and requires work bridges for placement. WSDOT field engineer feedback suggests carefully laying burlap with work bridges does a good job minimizing surface damage.

   Industry did not see a problem with the timing in general but expressed concern that there are some cases where the timing does not make sense, such as when the concrete has not set up yet for some reason. Depending on how the concrete is behaving (for example, in the case where hydration stabilizers are used), the one hour limit would be too soon, and we could end up getting a poor quality product. There was a suggestion to add "unless otherwise approved by the engineer," but there was concern that the field inspector may not have the experience to make that call. Another idea was to include construction manual language for inspectors.

There was also concern that the 30 minute limit for concrete to be placed, consolidated, and struck off could be too soon in certain cases such as bridges with extreme skew. There was a suggestion to discuss the topic in the pre-deck pour meeting and decide on the limit depending on circumstances such as time of year. There was an example discussed where there was a bridge deck pour in December and they barely met the temperature requirements. In that case, they could not get the burlap down until over 12 hours after pouring.

Action Item: Patrick will consider industry feedback and send another version out to the group for comments.

3. Purdy Creek (SPUR) Project Review

Brian Aldrich gave an overview the project:

- Fish passage project on SR 302 in Purdy, WA
- Purdy Creek crosses under SR 16 and into the Puget Sound
- Proposed new structure is simple span voided slab, 77 foot span
- Proposed abutments are spread footings, tidally influenced (water up to elev. 13)
- Bottom of footing to be placed around elevation 0.0
- Staged construction/temp two lane roadway to the east, structural shoring required
- Preference to use spread footings, which would require a cofferdam be installed in stages. Can cofferdams be installed at this site while accommodating staged construction?

Brian shared with the group the subsurface profile. Top to bottom: ESU 1: loose silty sand, ESU 2: dense silty sand, ESU 3: hard silt. ESU 2 gets dense midway. The bottom of spread footings would be in ESU 3. Brian mentioned a second substructure alternative: secant pile wall.

A question was asked regarding where the secant pile wall tops would be placed in relation to the superstructure. Brian clarified that the top of shaft cap would be placed just below the voided slabs, and the cap would possibly lie partially below high tide. The secant pile wall option is estimated to be substantially more expensive than the spread footing option.

Industry thinks construction with spread footings is feasible, but construction in a small area in stages will be complicated. There will be a lot of water pumping, and the cofferdam will need a seal and be expensive. There was concern about getting a good seal between the two stages.

There was a question of the feasibility of installing sheet piles into the dense soil. Embedment alone will not be sufficient, so bracing would need to be installed at the top and bottom.

One member questioned the total price of the secant pile wall solution. Brian did not have the exact number, but it was estimated to be over 1 million dollars in savings. There was a question about if sacrificial cofferdam components were considered in the cost estimate comparison. The group was surprised with the cost difference considering how slow and complex cofferdams are to construct, especially with rings of whalers at the top and bottom.

There was a question about what it would take to increase the bridge length to eliminate scour. Brian brought up the fact that the hydraulic report states the stream can migrate, so spanning out of the scour risk does not seem feasible. Also, since the current configuration was negotiated with other stakeholders, changing it is not an option.

A couple more questions were asked.

Question: What about using a shaft foundation on either side and perch the cap high? Then you would not need cofferdams or a secant pile wall.

Answer: This was not explored since WSDOT policy is to place the bottom of shaft cap below scour. This could be a possibility, though, if we allow the approach fills to wash out.

Question: What is the cost per square foot of a coffer cell with double rings of whalers?

Answer: Likely over $200 per square foot plus the cost of the seal. However, with the unusual situation, there is not certainty that this is accurate. In addition, sealing between the two stages will be difficult when traffic staging is shifted.

It was mentioned that the first phase cofferdam would be constructed with sheets installed all the way around like a typical cofferdam, but in the second phase, one end would be pulled out, and the cofferdam would be extended to encompass both phases of construction. There was concern that placing seal concrete against the existing seal could result in leakage. Also, there's concern about retaining backfill from under the stage 1 roadway.

Brian summarized the suggestions:

- Revisit cost for spread footing with seal and cofferdam option; the current estimate may be a little low. The estimate needs to include the difficulty in constructing the seal between the two stages.
- Plan details should include how the cofferdam should be integrated with the structure construction.

The possibility of constructing spill-through abutments was revisited. The idea was floated to have riprap armor the abutments. It was noted that environmental agencies and the tribes generally discourage armoring.

4. <u>Buried Structure Standard Specification Review</u>

Brian Aldrich discussed the buried structure Standard Specification revisions that are a companion to updated WSDOT policies.

Policy changes: The WSDOT Bridge and Structures office recently released design memoranda regarding corrosion and abrasion of steel aluminum buried structures. WSDOT is now allowing structural plate in buried structures; only concrete was allowed previously for spans 20 feet or more. Also, previously buried structures 20 feet or greater had to be designed with plans placed in the contract before bid. For structures less than 20 feet, contractor supplied designs were allowed. The span range for contractor supplied designs is now 30 feet or less. This will encompass most of the buried structures for the fish passage program.

Spec revisions: WSDOT is introducing a new Standard Specification section: 6-20 Buried Structures. The new specification section begins with definitions including headwall and wingwall, then a materials section. The design section includes design criteria for buried structures. This section was modeled after the section on the alternative structures section currently in Section 7-02. Buried structures are currently covered in sections 7-02 and 7-03 for concrete and metal plate. Those sections will be moved into the new section, 6-20. Under the design criteria subsection, manuals covering design and construction are listed. Some other important elements are as follows.

- Minimum service life of 75 years
- Corrosion and abrasion shall be considered per BDM
- Class 1 and 2 buried structures are introduced
- Class 1 < 20 feet
- Class 2 is 20 feet and greater
- Contracting agency supplied designs – build to the provided plans and specs
- Contractor supplied designs – self explanatory

Brian gave a brief overview of the sections in 6-20:

- Design criteria
- Fall protection requirements
- Concrete structure vs. structural plate requirements
- Submittals – shop drawings, working drawings, load rating for Class 2 structures, dewatering system, installation plan for Class 2 structural plate structures
- Tolerances
- Preconstruction conference for Class 2 structures

- Manufacturer's representative required for Class 2 structures: at precon, on site for initial installation, and available at other times
- Excavation requirements
- Bedding and foundation
- Fabrication
- Placement and assembly
- Backfill – critical for metal plate structures
- Wingwalls and headwalls
- Measurement and payment (one lump sum item for buried structure: includes structure, wingwalls, headwall, fall protection)

Bob Hilmes suggested adding language to the specs so the contractor takes ownership of all design elements based on issues with a past project. Brian clarified that we would provide all the geometric requirements in the plans with a WSDOT engineer stamp. A member asked for clarification: would that take care of global stability of the structure? Brian answered that it would probably need to be considered. Michael Rosa pointed out that WSDOT may decide to design a structure, even if the span would be less than 30 feet, depending on complications at the job site. Michael asked if the calculation requirement section talks about global stability. Brian responded that we currently do not have that specific requirement. There are requirements in the design criteria section that geotechnical and hydraulic considerations be considered. WSDOT will provide a geotechnical report, but since we cannot anticipate every situation, there is a caveat that additional geotechnical investigations should be done as necessary for the design.

Bob had another comment regarding dewatering and compatibility with the structural excavation spec when water is encountered. Also, he suggested making sure pipe bedding is compatible with other specification sections.

Bob also had a comment regarding fit up requirements. Some WSDOT precast culvert designs have come out with a slope, which is not compatible with constructability. The culvert profiles should be designed to be flat and allow the streambed material inside to create the slope.

There were two comments in the Skype chat window:

Dave Ziegler: This new approach should be coordinated with the Environmental permitting process. Most of the permits we get these days identify a particular structure type such as a precast split box. If the structure type changes to say a CMP, the permit and hydraulics report would need to be updated. Not sure the timelines necessary to do this would fit in a regular contract. Permitting may need to include multiple structure types in order to not delay construction.

Jeff Firth: Dave, good point, would the use of the project special provisions to modify a permit concern / type of structure required be an option?

Brian asked the group to review the new specification and provide him with comments within one week.

5. Cast-On-Site Precast Spec

Michael went over the topic of on-site precast and the spec revisions since the last meeting. He asked the group to send him any comments on the revisions within a week or two so he could get it incorporated into the 2021 Standard Specifications update. Mike gave a summary of the changes. Below are some of the main points covered:

- Content that was in sections 6-02.3(27) Concrete for Precast Units and 6-02.3(28) Precast Concrete Panels have been moved to section 6-02.3(9)
- Vibrating concrete that was in section 6-02.3(9) has been moved to a vacant section
- The new, combined section is general for precast concrete units
- Intent with reorganization was to allow for cast-on-site precast
- Precast facility requirements remain essentially the same
- New statement for precast units cast within the project limits – contractor shall submit a type 2E Working Drawing – onsite precasting and quality control plan. Michael went over a list of requirements
- If the contractor requests to strip forms prior to 70% of design strength, calculations shall be included
- Shop Drawings will also be required whether cast on site or cast in a precasting facility
- SCC requirements have been moved back to materials section
- Mix design requirements were moved to mix design submittal section
- Acceptance of concrete was moved to section 6-02.3(5)
- Handling and storage: a statement was added that requires lifting calculations to be submitted at the request of the engineer. Applies to precasting facilities and on-site precasting
- Michael went over many of the requirements that will be the same for both precasting facilities and on-site precasting
- Units cast on site shall not be transported to their permanent location until approved by the Engineer
- The remaining changes are primarily concerning updating references to call out the new section 6-02.3(9) throughout the specifications

Precast units cast at a fabrication facility require an approved for shipping stamp. Michael asked for ideas on how inspection should look for cast-on-site units. Eric Bowles clarified that for design build (DB) and design bid build (DBB), there is not a difference in how approval for shipping works. Michael clarified that the intent is to not have WSDOT fabrication inspectors inspect cast-on-site units but rather leave this up to project offices for final acceptance. There was a lot of discussion on this topic and how it relates to DB and DBB contracts. Michael asked the group to think further on this topic and provide him with any comments.

6. Conclusion

Dewayne asked if there were any other items to be discussed. No more items were mentioned. Dewayne asked the group to send him or Patrick any agenda items prior to the next meeting. We will hold the meeting if there are enough agenda items.

The meeting adjourned at 10:45.

The future meeting date is May 29.

AGC/WSDOT Structures Team
September 18, 2020 Meeting Minutes

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Roger Manson			

Patrick Glassford prepared meeting minutes.

1. **Welcome/Review of Agenda/Approval of Previous Meeting Minutes**
   Dewayne Matlock opened the meeting, asked for additional comments on the March meeting minutes, and gave a brief overview of the meeting agenda. No further edits or corrections were suggested for the March meeting minutes.

   Action Item: Patrick will post the March meeting minutes to the web.

2. **SR 305/Sam Snyder Creek: Remove Fish Barrier - Constructability Review**
   Michele Britton, WSDOT Port Orchard Office PE, introduced the project and team members and gave an overview of the project:

   - Project site is on Hwy 305 between Bainbridge Island and Poulsbo in the Suquamish Reservation
   - Existing culvert with high fill (70-80 feet from roadway to streambed)
   - Proposed 3-span replacement bridge
   - Tribal easement right-of-way
   - Nearby features are fireworks stands, private dead-end road north of the bridge with two private high schools
   - Densely vegetated, wooded area
   - Must keep two lanes of traffic open at all times (11 foot lane, 5 foot shoulder) due to lack of detour routes
   - In-water work to be completed within fish window
   - Geotech information (logs in fill on nearby project, no liquefaction issues foreseen at this site, glacially consolidated)

   Primary discussion topics:

   - Construction access
   - Earthwork removal (36,000 CY)
   - Staging for drilled shafts and retaining wall construction
   - Wall types
   - Access road to be constructed – steep with a 30% grade

Joe Merth took over the presentation and gave a brief rundown about construction staging. Stage 1 traffic will be shifted to the west and is tightly constrained by an existing retaining wall. Structural shoring will need to be placed to construct the first stage of the structure. During soldier pile wall shoring construction, traffic will be narrowed down to one lane, and the work will be performed at night.

Joe discussed minimum excavation limits to get abutment shaft caps and interior pier shafts installed. Shoring will need to retain approximately 12 to 15 feet at the abutments. Top of interior pier shafts will be approximately 40 feet down and will require casing shoring, at least 12 feet in diameter, to construct 4-foot columns. Rotary or oscillator methods are assumed to be required to excavate shafts. Shafts could be about 80 feet in length and 7 feet in diameter.

With casing shoring in place and columns constructed, options are:

- leave casing shoring in place, construct crossbeams and superstructure then excavate and cut out casing shoring later, or;
- backfill and pull out casing shoring prior to constructing crossbeams.

Once the stage 1 portion of the bridge is complete, retaining walls (probably SE walls) about 200 feet in length will be constructed beyond the abutments to retain the west side of the roadway. Traffic will then be shifted to the stage 1 portion of the structure.

For stage 2 construction, the temporary shoring will be removed and the excavation for shaft construction won't be as limited as it was in stage 1. The primary limiting factor for stage 2 excavation will be the slope of the access road; it may be challenging to get drilling equipment in place if the access road is too steep. Otherwise, construction will be similar to that of stage 1, and completion of the structure will be straightforward. Retaining walls on the east side of the roadway will be much shorter than on the west side and will likely also be SE walls.

Stage 3 will involve construction of a cast-in-place curb to separate the shared-use path from the roadway, completion of excavation, and streambed restoration during the fish window.

To summarize the conceptual staging sequence and challenges:

- Tight construction constraints
- Challenging shaft construction

Primary questions from the design team are:

- Is this construction scheme feasible and cost effective?
- Are there any other suggested options?

The following is a breakdown of the Q/A and general discussion that followed the presentation:

Question: Is there room to build a bag wall to get traffic out of the way and avoid staging?

Answer: There's an existing retaining wall that would need to get removed first, then a new wall would need to be built. That would all be throwaway work. It would be a deep excavation, and the sides are very steep. Also, there are trees that would need to be cut down, and the team is trying to avoid that. Another problem with a bag wall is all the excavation and temporary shoring required. Then there wouldn't be room for the two lanes required. Another issue with this approach is there's a fireworks stand to south of bridge in June and July, and during the school year, access to the two high schools needs to be maintained.

Question: Are there any major concerns about this type of construction with deep casing shoring?

Discussion: One member asked if they have to transition the shaft to a column, or if they could run a shaft up full length? Geoff Swett from the WSDOT Bridge and Structures Office (BSO) suggested something in between; extend the shaft up to where it is 15 or 20 feet below the shaft cap. Then casing shoring would not be as large, and we would still have the column required for inelastic behavior. Bijan Khaleghi from the BSO suggested an option of running the shaft all the way up to the crossbeam and providing a different boundary condition at superstructure, thus eliminating the column plastic hinge requirement. He also suggested balancing the spans by shifting the interior piers over toward the abutments and having a longer intermediate span.

Another idea is to make the bridge one long span, such as a steel plate girder bridge. The girders could be brought to the site in a few pieces and spliced together. Excavation would only need to extend to the bottom of the bottom flange. This option would increase the depth of the walls at the ends.

Another idea is to construct a segmental concrete girder structure.

A question came up as to the feasibility to ship long girders to the project site. The route is fairly straight, but there is one overpass where vertical clearance could be an issue.

A question was raised about the possibility of using a single-lane detour bridge to allow more room for construction.

If the design team gets feedback from the group that the steep access road makes the current scheme not constructible, then they will revisit the detour bridge option. The

group agreed that the only equipment that needs to use the access road will be excavation equipment, but the road will need to be around 30-40 feet wide.

An idea was raised to place the access road parallel to the roadway then turn and go transverse to the roadway to reduce the steepness. It was pointed out that access to do the earthwork will not be an issue. Getting the drill rig in place, having enough area to avoid swinging over the road, and installing a large enough bench for the equipment is a bigger concern.

Neil Hunt pointed out that a single-span steel bridge will likely be more cost effective than a three-span bridge given the constraints of this project site. A single-span steel bridge is quicker to construct than concrete. It is not always the cheapest option, but given this location, it probably would be. This option may also be better environmentally. It was pointed out that using the single-span option would shorten the structure length since the girders will be deeper.

Ioanna Kladou stated with the rest of the concerns they had, a single span would likely solve those problems, and they will look more closely at that solution.

Bob Hilmes asked how much water would be flowing in the creek during construction. Two 36” pipes are being replaced, which don’t move much water. Bob suggested installing a shoofly and putting in a 3-sided box culvert structure might be a better option. The problem is we would need very large shoring walls in order to maintain traffic. Bob suggested the tradeoff with installing a temporary bridge and cutting down several trees vs. the cost and duration of staged construction should be considered.

The idea of doing a weekend closure and installing an aluminum-plate arch structure was mentioned, but there would need to be a way to get 30,000-40,000 yards of dirt out and back in.

Ioanna agreed they could discuss that option with the tribes and WDFW. Ioanna asked if there were any other comments before wrapping up the presentation. Hearing nothing, Michelle closed the presentation and stated they will look at temporary bridge, culvert, and single span options. If nothing else, they will move the interior piers toward the abutments.

Dewayne asked how the BSO would view using a steel arch in this location. Geoff stated that they would not have an objection to a steel arch with current policy; although, steel is not allowed within 1000 feet of a marine shoreline. Aluminum likely would not be strong enough. Bijan mentioned that we allow for alternative structure types and just successfully finished our first AIT composite arch project. Joe mentioned that they proposed a steel arch on another project. Fish and Wildlife had a lot of concern regarding galvanizing, even if above the high water mark.

3. <u>SR 411 – Cowlitz River Bridge - Constructability Review</u>

Geoff Swett began his presentation and gave a rundown of the project. This will be a deck replacement project on the 409/11 bridge over the Cowlitz River. The existing deck consists of lightweight concrete and is deteriorating. It will be removed and replaced with a conventional concrete deck.

Following are features of the structure:

- Steel plate girder bridge with four girder lines
- 480 foot, 5-span bridge
- Two end spans are 65 and 110 feet long and don't have shear studs connecting the deck
- Drop in span has shear studs

The planned construction sequence is as follows:

- One lane of traffic is required to stay open during construction
- Construction will be performed in two stages, demolishing half at a time
- The plan is to construct half, shift traffic over, then demolish and construct the other half
- A closure will then be poured to connect the stages

Primary issue:

- Castle Rock Emergency Services (fire, rescue, and police) require access; full bridge closures would be problematic. The detour route is too long for reasonable response times. They would need to put staff on the other side of the bridge, just in case, if there would be full bridge closures. This would place a burden on emergency services.

Questions:

- At night, traffic control will be required to deliver materials for intermittent pauses in traffic. About 10:00 PM to 5:00 AM would be the construction timeframe. For demo work and casting the deck, is that feasible without a full bridge closure? Could the work begin mid-span and progress back to allow for that?
- Could the deck be cast with a long tremie tube starting mid-span and working back?
- How would demolition over the girders with shear studs be accomplished?
- Can this work be accomplished without full bridge closures?

There was a suggestion to close the bridge to the public but move construction equipment out of the way to allow emergency services to get through, as needed. Geoff had asked Emergency Services about that, and they stated that need immediate access.

A question was asked about loading requirements for demolishing and replacing the deck. The idea is to demo the middle of the deck then pour back concrete from a truck that's on the deck, one third of a span at a time. Geoff stated that there are no legal load restrictions on the structure, so as long as loading is in accordance with the Standard Specifications, that will be acceptable.

It was mentioned that the Columbia River Crossing project had a specification requiring equipment to be moved to allow emergency services access across the structure within 10 or 15 minutes of a code call. That specification could be used as a reference for this project. Geoff mentioned that he could revisit that option with Emergency Services.

It was noted that the deck could be poured from the ends of the structure beyond the abutments with a line pump. Demolition would be more challenging. With the length of the structure, it would be difficult to have cranes pick up panels of deck concrete while sitting off the bridge; however, an excavator could potentially pick the pieces up and track them off the structure.

Cross bracing and bottom laterals will need to be removed prior to removing the deck to bring the camber up and allow the girders to deflect with the new deck concrete. Another means will need to be installed temporarily to provide stability, such as pinned struts.

It was asked if there are utilities under the structure, and if there would need to be a pour sequence in pouring the deck back. There are utilities (sewer and water). The water line is getting replace and the sewer line is being rehabilitated. The spans are short, so the camber is relatively small; there will not be a significant amount of deflection.

As far as the pour sequence goes, the middle of the spans will need to be poured first. It was suggested that if there were two crews, they could start in the middle and pour back toward each abutment.

Joanna Lowrey stated that Emergency Services has many volunteer workers. Part of the concern with closures is that the volunteer workers would not be able to access an emergency vehicle to respond to a call.

Geoff stated Emergency Services were not totally opposed to staging staff on either side of the bridge. He thinks they would be more open to this option with the least amount of closures possible. Joanna will talk to Emergency Services again about reimbursing costs to stage emergency crews during full bridge closures.

4. <u>eManifest Specification Updates</u>

Patrick explained to the group that in an effort to go paperless, WSDOT is changing the way waste manifests are submitted. Whenever a waste manifest is necessary, the

Standard Specifications will require the use of the EPA's eManifest system. We are trying to get the word out to as many industry personnel as possible.

The group did not have any feedback.

5. Conclusion

Dewayne asked if there were any other items to be discussed and if the future meeting dates worked for the group. No more items were mentioned, and the group agreed to the dates.

The meeting adjourned at 10:45.

Future meeting date are October 30, December 11, and January 22.

AGC/WSDOT Structures Team
October 30, 2020 Meeting Minutes

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Patrick Glassford prepared meeting minutes.

1. **Welcome/Review of Agenda/Approval of Previous Meeting Minutes**

   Dewayne Matlock opened the meeting and went over the agenda. Since the September meeting minutes were sent out late, we will wait a couple weeks before posting to the web to allow time for comments.

   Action Item: Patrick will post the September meeting minutes to the web once any comments are addressed.

2. **DBE Program Waiver**

   John Huff began his discussion to the group regarding the DBE white women waiver that ended and the changes that occurred on October 1.

   For the last couple of years, WSDOT contracts have been operating under a waiver that excluded white women owned DBE firms from counting for race conscious participation. As of Oct. 1, the waiver was lifted, and white women owned firms may count as race conscious participation.

   If a project had a goal set prior to October 1, 2020, it will operate under UDBE requirements. As of October 1, WSDOT started setting DBE goals, not UDBE.

   John asked the contractors in the group to spread the word to other prime- and sub-contractors and pay close attention to the special provisions. A change to the GSP's should be ready by mid-November. In the meantime, for projects functioning under UDBE requirements, continue to use UDBE's.

While the white women waiver was in effect, only 8.7% of 19% goal was race conscious. With the lifting of the waiver, the 19% overall goal is still in place; however, components of the goal have changed. We now have a 16.8% race conscious portion and a 2.2% race neutral portion.

3. <u>SR 116 Chimacum Creek – Fish Passage Constructability Review</u>

Lisa Popoff, Project Engineer, introduced the project team and project. Chris Shell is the design team leader, and Eric Backstrum is the designer. The project team is in Wenatchee in the North Central Region and is working on fish passage projects for the Olympic Region. The project is located on SR 116 near Port Townsend, north of the Hood Canal Bridge.

The purpose of the project is to correct a fish passage barrier. The current culvert is undersized at 9 feet in diameter and will be replaced with a 70-foot long voided-slab bridge to span over the creek. The foundation will likely be drilled shafts about 50 feet deep.

On the south end of the roadway, the project team is expecting that temporary construction easements (TCEs) will not be obtained in time due to the vast quantity of property owners. A big question for the team is whether the project is constructible while staying within the existing right-of-way (ROW). An added complication is there will be utilities bored under the creek.

Groundwater at the site will be approximately 7-12 feet over existing roadway during the fish window due to artesian pressure, based on piezometer readings. Lisa asked the team what type of construction methods could be utilized to overcome this obstacle.

A couple of initial questions sparked the following data:

The fish window is July 15 – September 15.
There will be a full road closure during construction.

Chris Shell took over the presentation and showed the team a profile and elevation of the proposed bridge.

Some additional challenges are as follows:

- There will be a low clearance beneath the structure with the 100-year flow.
- The project is in a floodway, and the creek frequently overtops the channel.
- The site is surrounded by wetlands; therefore, the construction footprint will need to be minimized.
- There is a 20-foot layer of liquefiable soil underneath the roadway fill.

The primary question is regarding ROW. The team is trying to get TCEs for two properties at the south, upstream end of the project. Both are jointly owned with a

total of 77 owners. Real Estate Services said they need all 77 owner's signatures to get TCEs. There is a big risk of not obtaining those by project advertisement or construction. There is about 18.5 feet from outside barrier to edge of right-of-way (20 feet from edge of pavement).

Ideally, the team is aiming to install a check dam and send water east under the roadway if they can obtain the TCEs in question. Without the TCEs, the team is unsure how they will divert water and construct the bridge while staying within the ROW.

Chris discussed existing utilities on the project. There are overhead power lines that can be dropped and a water line to the east under the road that can be capped off for construction. There are also fiber optic lines that will be bored under the creek preconstruction.

The design team is assuming artesian pressures will need to be addressed anywhere excavation occurs. There is a possibility that artesian pressures will only have to be addressed during shaft construction depending on how deep the shaft caps will extend.

Below are some of the options that were discussed:

- Raising the roadway to help get the shaft caps out of the water. The reason shaft caps are placed below the thalweg is for scour protection.
- Installing secant pile wall abutments with shaft caps.
- Installing 3-sided sheet pile walls to raise the shaft caps out of the water to help with dewatering and/or use as permanent. There was reluctance with the group due to our lack of experience with this method and the potential for lateral spread. Geoff Swett will look into using sheet piles as permanent abutments.
- Bring the shaft caps out of the water and allow the possibility for the roadway embankment to scour away but ensure the bridge is still standing. Another option with this method is to use riprap for scour protection but design the bridge assuming the embankment will scour away.

There was discussion about the challenges with shaft construction in artesian conditions. Casing will have to be utilized to the bottom of the shafts, and a large static head will have to be maintained to counteract artesian pressure; however, construction could be challenging with the height of casing required above the roadway. Another option is to depressurize in the vicinity of work before shaft construction. Bottom heave in the shafts will also be a concern.

The option of driving piling instead of drilling shafts was brought up. Todd Mooney mentioned they used that option on the I-5 Fisher Creek project. Driving closed-ended piles on that project was possible due to the loose soils.

Due to surface water, dewatering for abutment construction was brought up. Either the wetlands will need to be drained or robust cofferdams will need to be utilized.

Jim Cuthbertson mentioned that he likes the option of constructing secant pile wall abutments with shaft caps and placing the voided slab superstructure on top. With sheet piles, there is potential for lateral spread failure with liquefaction. It will likely prove difficult to get enough stiffness to resist lateral spread using sheet piles. One idea to counter that is to use the superstructure as a strut to change the boundary conditions and reduce flexural demand. Jim also mentioned that drilled shaft casing would need to be 20-25 feet up in the air, so that will be a fatal flaw unless the artesian conditions can be depressurized.

Jim stated that we have had difficulties in the past with permitting agencies accepting permanent sheet piles that may contact stream water. Also, debris can get hung up on sheet piles due to their inherent geometry.

Piper Pettit asked how competent the soil is below the liquefiable layer. The soil layers have fairly good blow counts, so shafts won't have to be drilled excessively deep.

Chris asked the group if the shaft caps could be placed higher if 3-sided, temporary sheet piling is used. The WSDOT Bridge Design Manual requires the bottom of shaft caps to be 2 feet below the 500-year scour elevation, so that would require an exception. The risk is losing the roadway fill behind the abutment during a scour event.

Dewayne asked the team for clarification on what will be in-water work. If the creek stays within the existing culvert and construction water is contained, that will not count as in-water work. He also asked if the 2-month in-water work window seems feasible. With the water level being really high within the fish window, that will be challenging.

The abutments, as currently planned, are about ten feet in height. In order to do that work, a cofferdam and large seal will need to be installed. That work can be done while the stream is still in the culvert. For the in-water work portion, it will be difficult to pump and stay within the ROW since a dam will be required upstream of the culvert.

Geoff asked what the required, final channel width of the stream is and if the bridge could be lengthened to get the abutments out of the water. The problem is clearance is already tight at the site, and increasing the span length would increase girder depth.

Chris asked the group if there were any ideas for taking out the culvert while staying within the ROW? The group stated that they would use vactor trucks and storage tanks to temporarily store material. The operation would be expensive. If a temporary

dam could be installed in front of the culvert, then the culvert could simply be dug out. Two-ton sandbags could be used for a dam.

Chris asked the group how far sheet pile machines can reach out beyond the pavement. Scott replied that it depends on crane size, but they should be able to install sheets right on the property line, easily.

Chris asked the group if there was a way to deal with the mud that will result when taking out the culvert due to the high water table. He suggested digging a low point and pumping the water out. Scott cautioned that is a lot of water to be pumping out, and sheet piling will need to be used on both the upstream and downstream ends. Liquefiable soil could also be a problem with sheet pile stability.

There was talk about getting a possible in-water work extension. Dewayne explained to the group that the permitting agency typically won't allow in-water work extensions up front. They will look into an extension usually a couple weeks before the fish window deadline and monitor fish migration at that point. Therefore, an extension is risky to rely on up front.

Geoff Swett suggested that the design team talk to Brian Aldrich in the BSO about the possibility of getting a deviation from the BDM to raise the shaft cap.

Action Item: Geoff Swett will look into the possibility of using sheet pile walls as permanent abutments.

4. **I-90 Easton Hill to W Easton I/C – Phase 3 – Wall 3 Constructability Review**

Todd Moony introduced the project office team and began his presentation. Todd explained that the fill walls in question are due to widening the new eastbound lanes. The project is scheduled to go on advertisement in April. The goal is to shift traffic to the south and work on north side of the roadway, then shift traffic over to the north so the fill walls could be constructed. There will be about 2000 feet of this wall type. The walls will be combinations of soldier pile and structural earth (SE) walls. This project has been presented to the ADSC/WSDOT Task Force. Todd presented wall layouts to the group to demonstrate how steep the terrain is. The steep slope is controlling design and construction. The primary focus for the questions will be constructing the shotcrete fascia on the SE walls. Portions of the walls will have 15 – 25 foot high anchored soldier pile wall with SE wall on top up to 50 feet high. Todd shared a cross section at wall 1 that consists of a soldier pile wall with SE wall on top. The SE wall will be a special design geosynthetic wall due to the height. Primary questions for the group are:

What size bench is required below the walls to do shotcreting when the wall is SE only?

What size bench is required in cases where SE walls are perched atop soldier pile walls? How will the soldier pile wall affect the shotcreting operation?

Can the shotcreting operation be done from the top of the wall if need be?

The design team is considering installing horizontal construction joints in the fascia to account for wall flexibility due to settlement. If they install premolded joint filler, how would that impact fascia construction?

How might the 48V:1H wall batter impact fascia construction with shotcrete?

Soil profile in front of the walls gets steep at the ends of the walls with a maximum grade of about 20%. Is that bench profile acceptable for wall and fascia construction? If not, what is the maximum, acceptable slope?

Scott Ayers stated some work could be performed from above. They would work with a crane and lower a work platform. This will be more costly than working from a manlift.

There was some discussion about the potential horizontal construction joints in the shotcrete face. The top surface of the joint would need to be smoothed out to accept the joint material. Todd asked the group if there is a need for the joints and if they are practical. Based on intern conversations, nobody is a big fan of them. The group suggested talking about this to the shotcrete contractors.

Regarding the bench width at the base, the group thinks 25 feet is reasonable.

One team member asked if a Hilficker wall has been considered. Todd stated they had looked at that, and that would be a viable wall option, but geosynthetic walls are easier to design and inexpensive.

Piper Petit asked the design team how they determined the 6.5 foot offset from the face of soldier pile wall to the face of SE wall. Todd answered that one of the main concerns was making sure the SE wall is offset enough from the top soldier pile wall anchor. The walls are still under design, so that setback is preliminary.

There was talk about installation of the PGA's. They will be approximately 70 to 100 feet in length and anchored in rock. There was a question about whether the 25-foot bench would be enough for drilling the anchors. The shaft drillers prefer to have at least a 25-foot bench for soldier pile installation.
Bijan Khaleghi asked how long the walls will be and if half bridges have been considered instead of walls. The design team state that this was considered and access for shaft drilling was the biggest roadblock.

Another idea proposed is shifting the wall toward the roadway to make the lower wall a soil nail wall and placing the SE wall on top where the fill would begin. Todd explained one reason for using the soldier pile wall is to raise the SE wall up to reduce the amount of rock excavation required.

The determination is that a 25-foot bench is probably sufficient to do PGA, install shafts, and do the shotcrete.

The discussion turned to the minimum bench width outside the soldier pile wall limits where there is just an SE wall. The group agreed that 13-15 feet is about the minimum for using a manlift if the edge of the bench is competent.

The impact of batter on fascia construction was brought up. Scott doesn't think that will be a problem. They would shoot about 20 feet horizontally, then go up 20 feet the next day. The shotcreters know how far up they can go and have the shotcrete hold. They typically shoot in two layers.

The question about what the maximum profile at the end of the walls can be came up again. The design team would like to know if about 15% will be acceptable for construction equipment such as manlifts. The group stated they will need to have a level bench where work is being performed. The problem with this approach is it may get too steep to walk from bench to bench. Realistically, shotcreting work will have to be done from the top; a manlift may not be able to climb a slope that steep.

Jeff let the group know that the information presented will be added to the Ad and Award site within a couple weeks.

Dewayne asked the design team if they got their questions answered and when the project goes to ad. The project will go on advertisement toward the end of April, and the team had no further questions.

5. <u>Conclusion</u>

Dewayne asked if there were any other items to be discussed and if the future meeting dates worked for the group. No more items were mentioned, and the group agreed to the dates.

The meeting adjourned at 11:19.

Future meeting date are December 11, January 22, and March 5.