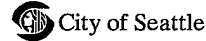
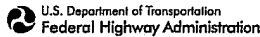


Alaskan Way Viaduct & Seawall Replacement Program



Memorandum

To: Alec Williamson, WSDOT
From: Gordon Clark, Parsons Brinckerhoff
Date: February 16, 2009
Subject: AWW Single Bored Tunnel
Shannon & Wilson's Proposed Exploration Plan
Don Richards' Review Comments

A few comments offered below, organized according to documents reviewed.

- On-Call Services; Agreement Y-10393; Task AC; Scope of Services; Exhibit A
 - 1 ○ Scope of Services, Page 2, Paragraph 1: It is noted that there are to be ten (10) "*tunnel explorations*", but Table 1 Boring Summary only designates nine (9), specifically as tunnel explorations – it does include 2 other borings designated as "both".
 - 2 ○ Scope of Services, Page 2, Paragraph 1: It is noted that one to three (1-3), average of two (2) VWP will be installed in 15 of the borings, but Table 1 Boring Summary, indicates no more than two (2) VWP in a single boring (all are designated to have two per boring).
 - 3 ○ Scope of Services, Page 2, Paragraph 1: As long as the Monitoring Wells are already there, consider (budget allowing) monitoring for more than the planned one year. As noted in Approach – Task AC-2, Page 5, Paragraph 1, if field work does not start until early March at the earliest, and takes the planned 6-8 weeks to complete, then VWP installation could be as late as early May, allowing only an 8 month monitoring period.
 - 4 ○ Approach – Task AC-2, Page 3, Paragraph 1: It is noted that the borings are intended to extend approximately one diameter below tunnel invert. Agree with this concept, but since no profile is included with this document, and no tunnel depths are reported in the Table 1 Summary, this is not evident other than described here.
 - 5 ○ Approach – Task AC-2, Page 4, Paragraph 3 (following the bulleted items): It is noted that one to three (1-3), average of two (2) VWP will be installed in 15 of the borings, but Table 1 Boring Summary, indicates no more than two (2) VWP in a single boring (all are designated to have two per boring).
 - 6 ○ Approach – Task AC-2, Page 5, Paragraph 1: It is noted that VWP will be monitored until December 2009. If field work does not start until early March at the earliest, and takes the planned 6-8 weeks to complete, then VWP installation could be as late as the end of April or early May, allowing only an ~8 month monitoring period. But Scope of Services, Page 2, Paragraph 1 notes a 1 year monitoring period – i.e. 12 months, not 8 months, as the proposed schedule provides for.

- 7 ○ Approach – Task AC-3, Pages 5 & 6: A number of engineering characteristic laboratory tests are discussed, but these are not presented as separate line items in the Phase 1 Central Tunnel Borings table. Should they be? Do they have separate unit costs?
- 8 ○ Approach – Task AC-3, Page 6, 4th bullet: Proposed Miller Abrasion tests might be better related to geology, if a mineralogy determination were also performed on the same sample – e.g. % “hard” or abrasive minerals or quartz content.
- 9 ○ Approach – Task AC-3, Page 6, 4th bullet: Existing abrasion data from Seattle area subsoils indicates that sands tend to have a higher abrasion than clays, silts and gravels, thus application of the Miller test, should be concentrated on those soil types most likely to be the potentially problematic.
- 10 ○ Approach – Task AC-3, Page 6, 4th bullet: Existing abrasion data from Seattle area subsoils indicates that particle shape has a significant influence upon measured abrasion values, suggesting that characterization of grain shape of Miller Abrasion test samples would be worthwhile, in order to put the test results into better perspective.
- 11 ○ Approach – Task AC-3, Page 6, last bullet: As long as cobble & boulder rock samples are intended to be retrieved and tested, consider simultaneous mineralogical determinations, for estimation of hardness and abrasion characteristics, on the same specimens on which Point Load compressive strength will be determined.
- 12 ○ Approach – Task AC-4, Page 9, Paragraph 3: In the “Generalized Subsurface Profile”, it is not clear if an attempt will be made to establish lithologic layers (e.g. Qpnf, Qpnl, Qppl, etc.), as is normally done on most S&W subsurface profiles. If not, it should be, with appropriate qualifying statements regarding reliability of interpretations and extrapolation of lithologies between borings.
- 13 ○ Anticipated Schedule – Page 11: With drilling starting in March, and a 6-8 week completion period, some VWP would not be installed until late April, therefore the planned groundwater monitoring until the end of December, will allow only ~8 months of monitoring, not the 1 year as noted in Scope of Services, Page 2, Paragraph 1.
- 14 ○ Cost Management, Item F: Not a technical issue, but is **servicing** a real word, or is it a mistaken spelling of some sort? Should this maybe say ...7th **work day** or 7th **week day** instead?
- Proposed Exploration Plan; Figure 1; Sheets 1-6
 - 15 ○ Boring spacing appears to widen north of Main Street. Is this increase in spacing planned due to anticipated geology, planned tunnel depth, surface access restrictions, or budget restrictions? South of Main Street, spacing is about 500-600 feet, but north of Main Street, this spacing increases to about 800 - 1000 feet.
 - 16 ○ Consider supplementing the Plan view, with a **Profile** view, demonstrating the depth relationships between the borings and the planned tunnel, as had been noted in Approach – Task AC-2, Page 3, Paragraph 1.

- Exhibit D, Excel Summary – Phase 1 Central Tunnel Borings
 - 17 ○ By definition in the Scope of Services, this subsurface exploration program is for “Environmental Engineering”, but it seems a shame to plan for ~3750 linear feet of boring, and have the Miller Abrasion test as the only apparent test for determination of engineering characteristics of the subsoils encountered. It would be a better return on investment, and improve the overall usefulness of the borings, if a more comprehensive plan for laboratory testing for engineering properties were to be incorporated into the existing plan. With borehole sampling already planned at 5 ft intervals for depths >25 feet, an increased scope-of-work for more engineering property determinations would require no additional sampling beyond that already planned (764 “geotechnical samples”). This type of testing is discussed in Approach – Task AC-3, Pages 5 & 6, all of which I agree with, but these **are not presented** as separate line items in this table. Should they be? Do they have separate unit costs, or is the geotechnical testing and characterization somehow included in another line item, or another budget?
 - 18 As a further effort to improve the overall usefulness of the borings, as long as they are being done anyway, it should be considered to be conducted in-situ borehole permeability tests if granular materials are present at the planned bored tunnel elevation. Slug tests are noted under Task AC-2, to be performed in each of the monitoring wells, but that activity **does not appear to be shown** as a separate activity in the tabular summary. Should they be? Do they have separate unit costs, or is the slug testing somehow included in another line item, or another budget?
- Table 1; Summary of Proposed Field Explorations; Phase 1
 - 19 ○ It would be useful in the table, to also include the planned depth to invert of the proposed tunnel at the location of the proposed boring, so that it will be demonstrated that the proposed boring is sufficiently deep to account for any future vertical profile modifications during the design phase, without ending up being too shallow to reach the “final” invert level if the detailed design phase makes vertical profile “adjustments”. This depth relationship was noted in Approach – Task AC-2, Page 3, Paragraph 1, but is not evident in this Table, nor is it presented in any profile views.