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April 3, 2018

Ms. Dana Cannon
West of 4th Project Coordinator
Aspect Consulting
401 2nd Ave S, Suite 201
Seattle, WA 98104

Re: **West of 4th Site - Agreed Order #DE 10402**
Site Unit 2: Capital Industries Plant 4 Interim Action Field Investigation Work Plan

Dear Ms. Cannon:

On March 8, 2018, the Washington State Department of Ecology (Ecology) received an emailed copy of the draft Site Unit 2 *Capital Industries Plant 4 Interim Action Field Investigation Work Plan* (FIWP). The draft FIWP was submitted by the West of 4th PLPs in accordance with Agreed Order (AO) 10402, amended on November 21, 2017. Thank you for submitting the document by its due date.

Ecology's comments on the draft FIWP are enclosed (Enclosure A). The document should be revised to satisfactorily address our comments, and submitted within 30 (thirty) days of receipt of today's letter. If you have any questions, or would like to schedule a meeting or conference call to discuss the comments, please contact me at (425) 649-4449 or ejon461@ecy.wa.gov.

Sincerely,

Ed Jones
Environmental Engineer
Hazardous Waste and Toxics Reduction Program

By certified mail: 9171 9690 0935 0169 7334 57

cc: Jeff Kaspar/Peter Jewett, Farallon
William Carroll, PCE
Janet Knox, PGG
Ronald Taylor, CI
Donald Verfurth, G&R
Marlys Palumbo, VNF



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William Joyce/Ian Sutton, SJZ
William Beck, Stericycle/PSC
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PLPs' W4 repository

ecc: Tong Li, GWS
Peter Hapke, ALG
Nels Johnson, AAG
Patty Foley/Sherell Ehlers, GTCC

ENCLOSURE A

Draft Site Unit 2 Interim Action Field Investigation Work Plan (FIWP) Ecology Comments

GENERAL COMMENTS

The design and implementation of the full-scale interim action should be informed by Stage 1 observations and measurements. Accordingly, there are two approaches we can take:

- (1) prepare a detailed Stage 2 Design and implementation plan now, reach agreement on the document, and then modify it as needed once Stage 1 has been completed; or,
- (2) agree now to general concepts for the Stage 2 Design, and how the action will be implemented and monitored. Then, later, reach agreement on a detailed Stage 2 Design and implementation plan once Stage 1 has been completed.

The first approach requires that the draft FIWP be revised to include Stage 2 proposals that are much more detailed. This would include specific proposals related to how the oxidant will be managed at the work site and how it will be injected (with specified injection pressures, injection techniques, injectant flowrates and volumes per point, etc.). It would also include specific proposals related to both Stage 2 process and performance monitoring.

The second approach would, on the other hand, require that a Stage 2 work plan including this degree of specificity be prepared and approved later -- following Stage 1. Specific proposals in the revised version of the current FIWP could then be limited to the design and implementation of the first stage of the project ("injectability testing").

In deciding which approach should be selected, we should consider:

- the likelihood that detailed Stage 2 plans developed prior to Stage 1 will need to be significantly modified following Stage 1. That is, is it likely that between the two stages a significantly modified Stage 2 work plan will need to be developed, reviewed, and approved? And,
- the potential downsides to a relatively long interval between Stages 1 and 2. Are there, e.g., cost or convenience implications to waiting several months after Stage 1 has been conducted prior to implementing Stage 2?

At this time Ecology's preference is that we proceed per the second approach discussed above. That is, limit the current scope of the FIWP to Stage 1 and its primary objectives – obtaining information needed to determine how best to design and implement the full-scale action. Once the Stage 1 FIWP is revised to address Ecology's Stage 1-related comments, and approved, then the PLPs could construct new monitoring wells, perform baseline sampling, and implement Stage 1 injections and monitoring. The Stage 2 FIWP would be prepared and submitted following Stage 1, and not only propose the full-scale Design and implementation steps, but includes a section that reports on Stage 1 results.

SPECIFIC COMMENTS

FIWP TEXT

1. Page 1-1 (in the FIWP and SAP). At the end of the first paragraph the PLPs state that the interim action “is being conducted solely on behalf of CI.” While it is true that the action focuses on contaminated soil and shallow groundwater in an area beneath Capital Industries’ Plant 4, and Farallon, Capital Industries’ consultant, has prepared the FIWP, the action is being conducted as a requirement of the West of 4th site’s AO. This is correctly noted in the next paragraph. Ecology understands that the West of 4th PLPs internally decide how the work at the site, and related costs, will be apportioned among the four companies. But in documents submitted to Ecology for our approval under the AO it must be clear that the four West of 4th PLPs as a group stand behind the content in those documents. Statements such as the FIWP and SAP sentences referred to above introduce ambiguity and should not be included in AO deliverables.
2. Page 5-2, Section 5.2. Preceding amendment of the West of 4th AO last year, Ecology made a SEPA threshold determination of non-significance (DNS). That determination was, in part, based on our review of the draft SU2 interim action work plan and its related SEPA checklist. The PLPs need not submit another SEPA checklist for the interim action project unless: a) it has become apparent over the past six months that certain entries in the previously-submitted checklist are now out of date or otherwise need revision, or b) the PLPs believe that Ecology should make a new SEPA threshold determination.
3. Pages 5-2 and 5-3, Section 5.3. As the FIWP states, plans in the document to safeguard health and safety during the interim action project are focused on the protection of workers conducting and monitoring the action. However, the project will be carried out on a portion of Capital Industries’ property and the company’s own workers will be present at locations nearby. There are also properties immediately to the east and northeast of Plant 4 where workers or visitors may be present during the project’s injection phases. The revised FIWP should discuss and describe the notifications and other measures the PLPs will undertake to ensure that individuals likely to be present in the vicinity of the interim action will be informed and adequately protected.
4. Page 5-3, Section 5.3. It need not necessarily be discussed in Section 5.3, but the FIWP should include those measures the PLPs propose to safeguard surface features and uncontaminated surface soils from an oxidant release. This could be a release (spill or accidental discharge) that occurs during injection at or upstream of the injection point. Or, it could be “surfacing” of oxidant at a distal location. The revised FIWP should describe the measures that will be put in place before injections begin that will contain surface releases (via, e.g., secondary containment; covering sumps, catch basins, or other “openings” in nearby surface cover; etc.).
5. Page 5-4, Section 5.4. This section discusses utilities that may be present at and near the work site. Ecology agrees that the PLPs should use best efforts to determine the (3-dimensional) locations and purposes of these and other subsurface features. However, beyond the surfacing concern expressed here, there are two additional concerns that

should be acknowledged. First, utility lines or other subsurface features in the area may be harmed by contact with the oxidant. Second, portions of utility lines in the vicinity of the injections could potentially intercept oxidant solution, allowing the permanganate to migrate belowground well beyond the desired injection radius. The FIWP should therefore describe how the PLPs will design the action in a manner that adequately addresses these potential concerns. Please also see SAP Comment #19 below.

6. Page 5-5, Section 5.5. The last paragraph of this section discusses additional field parameters to be measured during groundwater sampling. The FIWP should add that turbidity will also be measured, using a turbidity meter or probe in a flow-through cell. Dissolved metal samples should not need to be filtered if the turbidity reading is 5 NTU or less.
7. Page 5-6, Section 5.6.1. In the last paragraph on this page the PLPs describe what is “typically” done during an injection event, and note that injection “over-pressurizing” can lead to surfacing of the oxidant solution. The FIWP, however, must be much more detailed in its proposals for Stage 1 injections and the process monitoring that coincides with this work. There should be:
 - a) engineering justification for all key design and operation parameters, including:
 - a) the Design “basis,” criteria, assumptions, and calculations for all components of the action;¹ b) expected treatment efficiencies; and, c) citations from guidance or the scientific literature that support the proposed design and operation parameters;
 - b) proposals for optimum, minimum, and maximum injection flowrates and injection pressures, per Stage 1 location, based on the oxidant volumes calculated in Section 5.6.2.² If there are anticipated ranges for Stage 1 injection-parameter values (e.g., a range of injection pressures, injection flowrates, and/or volume/mass of oxidant to be delivered to soils and groundwater per location), these should be clearly presented;
 - c) recognition that lower injection pressures are desirable – not only from the standpoint of minimizing oxidant daylighting, but in order to distribute the treatment solution uniformly in all radial directions from the introduction point. To accomplish the desired distribution the Stage 1 Design should begin by hypothesizing the combination of lowest pressures and highest injection flowrates likely to achieve this purpose;
 - d) proposals for how flowrates and pressures will be monitored during each Stage 1 injection event, and under what circumstances – and how – those measurements will be used to adjust flowrates/pressures. These proposals must be more detailed/specific than the general descriptions provided in Section 5.7 and 5.7.1, and include those activities the PLPs will perform to ensure adequate quality control prior to and during action implementation;

¹ The FIWP states that porosity is assumed to be 0.25. The document should include the PLPs’ other assumed parameter values, such as soil bulk density; effective pore space/percent of effective pore volume; and, the number of pore volumes the treatment is targeting.

² P_{max} for injections into groundwater should be calculated as recommended by USACoE, 2013 (“In Situ Air Sparging Engineer manual”), incorporating a conservative “safety factor.”

- e) figures/drawings/schematics/specifications depicting and describing all of the Stage 1 injection and process monitoring equipment (such as: all aboveground injection “skids,” pumps, tanks, piping, valves, connectors, auxiliary equipment, containment features, and measuring devices [pressure gauges/indicators, flowmeters, flow totalizers, etc.]). Specifications should ensure chemical compatibility between the project’s materials and the proposed oxidant (and oxidant strength).³ Figures in the FIWP should depict the Stage 1 target treatment zones, both vertically and laterally, with a “blow-up” figure showing Stage 1 injection and (soil) monitoring locations. A Process and Instrumentation Diagram should indicate schematically the aboveground injection and process-monitoring apparatus;
- f) an SOP that describes injection and injection-monitoring field activities, step-by step;⁴ and,
- g) a statement of the specific Stage 1 objectives. From Ecology’s perspective, Stage 1 work is being performed to establish “final” injection and monitoring proposals/specifications for the full-scale interim action Design. To do this it must be clear how the oxidant volumes, flowrates, and injection pressures utilized during Stage 1, and how the particular parameters monitored during injections, will provide sufficient information to achieve this goal. Although soils and groundwater will be sampled and observed/analyzed after the Stage 1 injections have been completed, to best ensure that a second “injectability testing” event is not needed prior to full-scale Design, plans for Stage 1 should clearly link the critical ISCO injection-related data gaps to the specific activities and data-gathering (measurements) proposed during Stage 1 injections.

Plans related to Stage 2 (full-scale) injections and process monitoring must also be much more detailed than what is currently in the draft FIWP. However, as noted in our General Comments, Ecology need not review detailed Stage 2 injection plans until Stage 1 has been completed and the PLPs have utilized the results of that stage to establish firm proposals for the full-scale injection Design.

- 8. Pages 5-7 and 5-8, Section 5.6.2. Editorial comment: This section of the FIWP is titled “Stage 2 – Full-scale Implementation.” However, the third paragraph discusses Stage 1 injection locations and anticipated oxidant volumes for those three points. It appears that this discussion would be better located in Section 5.6.1.
- 9. Page 5-7, Section 5.6.2. The FIWP should describe the basis for assuming – at this point – an ROI of 14’ for both the vadose and saturated zones. It should also include the criteria the PLPs will use to determine whether the oxidant has been delivered and distributed per Design specifications (i.e., the criteria that will *define* the ROI per injection point).

³ Besides the materials chosen and used during the project, the PLPs will need to ensure chemical compatibility between the injectant and any belowground man-made features (such as utility lines) that may possibly come into contact with the oxidant solution.

⁴ Including how the oxidant will be delivered to the work site and received/certified; how it will be mixed (if mixing is needed); and, proposals for how the oxidant will be injected (bottom-up or top-down; how – and how much of – the injectant will be delivered to specific depth intervals, etc.).

In addition,

- a minor comment but the formula to calculate solution volume should be stated as “ROA *area* (in square feet) X depth interval...”; and,
- at the bottom of the page it is stated that the oxidant volume for location F5 is based on a 5-foot injection interval. Since Section 5.6.1 states that the F5 injection interval is 1’ to 8’ bgs, it is not clear why the PLPs chose to calculate volumes for only a five-foot distance (instead of seven).⁵

10. Page 5-8, Section 5.7. The third sentence of this section discusses “common” process-monitoring objectives. What may be a *common* objective for this monitoring is relevant to early, conceptual Design plans, such as the PLPs’ January 2018 interim action Work Plan. For the FIWP, however, our interest is not in what may commonly be an objective, but what *is* an objective for this particular project. Please see Comment #7.g above.
11. Pages 5-8 through 5-10, Section 5.7.1. Certain statements in the second paragraph of this section (which continues onto p.5-9) should be clarified in the revised FIWP. These include:
- a) The proposal at the top of page 5-9 to extend performance borings to “the total depth of the ISCO injection point...”. It seems reasonable to extend the depths of these performance borings some distance below (e.g., 2’) the total depth of the injection points.
 - b) References to the lithologic logging of soil borings. Soil stratification in the vicinity of each injection point may be one of the key factors that impacts oxidant migration, distribution, and achieved ROIs. The FIWP should explicitly state that detailed lithology will be logged at each boring by an experienced geologist/hydrogeologist.
 - c) The statement that “[t]he color distribution will be logged..., and photographed to...estimate the concentration...”. The statement is repeated on p.5-10 during the discussion of the second series of borings. Do these sentences mean that KMnO4 concentrations will be estimated from the color distribution, and that the distribution will then be logged and photographed?
 - d) The proposal for collecting and analyzing a “minimum of one soil sample per 5-foot depth interval...”. The proposal is repeated on p.5-10 during the discussion of the second series of borings. Does this mean that, at a minimum, the PLPs will collect and analyze:
 - one sample from each of the three B3 borings, if the soil in that boring exhibits a pinkish color?
 - one sample, or two samples, from each of the three F5 borings (when/where the soil in those borings exhibits a pink color)?

⁵ There also appears to be a typographical error in the later equation (p.5-8) used for calculating location E5’s oxidant mass. “228” should presumably be 288.

- four samples from each of the three E5 borings (when/where the soil in those borings exhibits a pink color)?
- e) The proposal for collecting and analyzing “additional soil samples” based on observations made during drilling. While Ecology can foresee situations where it would be wise to perform these additional analyses, the FIWP should at least provide examples of the types of observations that would trigger additional sample analyses.
- f) The statement referring to the absence of color in a boring. Ecology assumes there will be nine Stage 1 performance borings. Are the PLPs stating here that if any of these nine borings do not appear to be contacted with the oxidant, a soil sample from that boring will be collected “from each soil type” in that boring and analyzed for NOD?⁶ Or will soil samples per soil type only be collected for NOD analyses if no oxidant is observed at any of the nine borings?

12. Page 5-10, Section 5.7.1. In the last three paragraphs the following statements should be clarified in the revised FIWP:

- a) the proposal to collect soil samples “at depths where previous sampling indicated COCs were detected...” and analyze the samples for CVOCs.

Ecology assumes there will be nine “second series” Stage 1 performance borings. Are the PLPs stating here that soil samples will be collected and analyzed from each of these nine borings, corresponding to those depths where CVOCs were detected nearby during previous RI/FS soil sampling? Will these samples be collected and analyzed regardless of whether there are indications of KMnO₄ in the soils? And,

- b) the statement in the last paragraph regarding the evaluation of “rebound.”
The PLPs apparently propose to compare Stage 1 CVOC measurements with older, co-located CVOC measurements (“historical analytical results”). If the FIWP is referring only to groundwater measurements here, this should be clarified and the document should explain why the most recent groundwater CVOC measurements should not be compared to the project’s baseline CVOC measurements. If, on the other hand, the PLPs are (or are also) referring to soil CVOC results, the FIWP will need to describe what “rebounding” means in this context.

13. Pages 5-11 through 5-13, Section 5.7.2. As noted in Comment #7, Ecology expects the interim action Design document to contain detailed proposals for injections, process monitoring, and performance monitoring. This includes figures/drawings/schematics/specifications and per-activity SOPs. However, we also realize that the PLPs may not be ready to prepare this information for the full-scale action (Stage 2). Rather than revise the draft FIWP to include this level of Stage 2 detail, it may be advisable to prepare separate FIWPs for Stages 1 and 2. Please see our General Comments above.

⁶ Based on the discussion in Section 4.1, it appears that the PLPs are anticipating three primary soil types: silty sand, silt with sand, and fine sand.

In addition to the general inadequacy of the draft FIWP to serve as an engineering Design (EDR) for Stage 2, please note the following comments below:

- in the third bullet of the section's first paragraph the FIWP proposes to conduct confirmation soil sampling once "...soil and groundwater sampling indicate...interim action objectives..." have been achieved. Why should the onset of confirmation soil sampling depend on *groundwater* sampling results?
- the FIWP proposes initial Stage 2 post-injection performance monitoring at six grid locations in the southeast corner of the project site. This is reasonable, but the FIWP should acknowledge that two of these grid locations (F5 and E5) will be dosed as part of Stage 1. If injected oxidant is also delivered to these areas during Stage 2 (which the FIWP appears to propose), the observed treatment effectiveness may not be directly relatable to areas where only a single injection was administered;
- it is unclear why the FIWP proposes "up to" six initial performance borings, advanced "up to" 10' bgs. Under what circumstances would fewer than six initial performance borings be advanced? Under what circumstances would the borings extend to less than 10' bgs? and,
- it is unclear why the FIWP states that fewer than 85 soil samples may be collected and analyzed from 17 grid locations. What circumstances would justify collection of less than five samples from one or more of the 17 locations?

14. Page 7-1, Section 7.0. The PLPs propose an Addendum to the FIWP, "if needed," following "evaluation of Stage 1 injection data." As we have noted in comments above, a detailed Stage 2 Design document will certainly be needed. Immediately following completion of Stage 1's data evaluation may be the best time to begin preparing it. The revised (Stage 1) FIWP should propose a due date for submitting the Stage 2 Design for Ecology's review and approval.

15. Page 7-1, Section 7.0. An interim action Completion Report should be prepared and submitted following the evaluation of Stage 2 monitoring data, as the FIWP states. Ecology suggests that the FIWP include a due date X days following receipt of one of the later post-injection groundwater sampling events, but no later than the summer of 2019. If merited, a different due date (than "X") for the Completion Report can later be selected by the PLPs and Ecology, but we should try – as much as reasonably possible – to coordinate the timing of the later deliverables for SU2 with those of SU1.

16. Pages 7-2 and 7-3, Section 7.0. The FIWP schedule should explicitly include a "pre-final inspection," to be conducted just prior to Stage 1 and Stage 2 injection events.

FIWP SAP (APPENDIX B)

17. Page 1-1. Please see Comment #1 above.

18. Page 1-2. In the last paragraph of Section 1.0 the SAP refers to SOPs in its Appendix A. As noted in Comment #7, SOPs need to include proposed Procedures for performing

Stage 1 and 2 oxidant injections and the process monitoring that accompanies the injections. They may be included in the SAP or some other part of the revised FIWP.

19. Page 3-1. In the second-to-last sentence of the second paragraph of Section 3.0 the PLPs discuss subsurface features – such as utility lines or other buried cables/structures – that may be present at and near the work site. In addition to determining the depths and locations of these features, the FIWP should state that the PLPs will evaluate their vulnerability should they contact the interim action's proposed oxidant. This will require information regarding the purpose of, and materials used to construct, these features. Please also see Comment #5 above.
20. Page 3-1, Section 3.1. In Section 5.5 (page 5-4) of the FIWP the five new 1-inch observation wells are proposed to be installed using direct-push (DP) drilling methods. However, the SAP states that the new wells will be advanced using hollow-stem auger drilling methods. The revised FIWP should address this apparent inconsistency.
21. Pages 3-1 and 3-2, Section 3.1. To supplement the observation well description in this part of the SAP the PLPs should include a figure/drawing of the proposed 1" wells. If some of the wells will have different screened intervals (i.e., other than 10' lengths) and/or will be completed at different depths bgs (other than 18'bgs), this should also be shown.
22. Page 3-3, Section 3.2. The SAP states here that soil borings for performance and confirmation soil sampling will be advanced to a total depth of 10 feet bgs. This may be true for many soil borings, but some injection points (E5 in Stage 1 and any other injection points extending into the Water Table Interval) will be injected between depths of 1 to 20 feet bgs. The revised SAP should more accurately describe the soil boring depths, and – as noted in Comment #11a – propose advancement a few feet below each point's total injection depth.
23. Page 4-2, Section 4.1.2. The FIWP/SAP should describe the type of pump the PLPs will use to draw groundwater from the five observation wells to the surface during purging and sampling/monitoring.

It should also note that turbidity will be measured in the field (see Comment #6 above).
24. Page 4-2, Section 4.1.2. A minor comment, but it is unclear why the third and fourth SOP bullets (concerning well construction and development) have been included in the discussion of activities that will occur during each "groundwater monitoring and sampling" event.
25. Pages 5-1 and 5-2. The table in this section should be consistent with the SAP's Table 1. Please see Comment #29 below.

In addition, though a minor comment, it is unclear why the 1st and 2nd bullets under Stage 1 and 2 Groundwater Samples are the same (CVOC analysis per 8260C).

26. Page 6-3, Section 6.4.2 (and QAPP Sections 3.2 through 3.4). Section 6.4 of the SAP states that trip blanks will be utilized during the project, and duplicate groundwater

samples will be collected and analyzed during Stage 2. Ecology agrees that duplicate groundwater samples need not be collected during Stage 1. However,

- a) it is not clear whether a single duplicate groundwater sample will be collected from a single well or multiple monitoring wells during each Stage 2 sampling event. Nor does the SAP identify the well(s) that will be used for this collection;
- b) typically QC samples during groundwater monitoring include matrix spikes (MS), MS duplicates, equipment blanks (per set of any equipment cleaned), and cooler temperature blanks (unless trip blanks will serve this function);
- c) while, as the SAP notes, the collection of duplicate (i.e., co-located) soil samples for the purpose of calculating precision may not be worthwhile, collecting such samples can be valuable for estimating representativeness. For Stage 2 soil sampling and analysis performed to indicate attainment of cleanup levels, the revised FIWP should propose a limited number of “co-located” (within the same grid space) samples to better estimate the potential degree of spatial variability in CVOC concentrations and the provide an indication of how well the sampling results represent the range of concentrations present in each “decision-making” grid space; and,
- d) if they contain detectable levels of permanganate, post-injection soil and groundwater samples routinely need to be “quenched” before being transported to the lab for CVOC analyses. See EPA’s August 2012 *Groundwater Issue* (EPA/600/R-12/049). This will remove unreacted oxidant from the samples prior to transport to the lab and better ensure that the CVOC results are representative of concentrations present at the time of sampling. The revised FIWP must include the PLPs’ proposed quenching SOP(s), and:
 - identify those Stage 1 and 2 samples in the SAP and QAPP which will be subjected to the procedure; and,
 - those that will not. For these latter soil and groundwater samples the FIWP must explain why the presence of residual levels of unreacted oxidant during analysis is desirable (in terms of meeting the project’s data objectives).

27. Pages 7-1 and 7-2, Section 7.0. The FIWP/SAP should additionally note that hazardous liquids stored on-site, whether they are products or wastes, will be stored within sufficiently-sized secondary containment.

28. SAP Table 1. It is imperative that the SAP clearly identify the individual soil and groundwater samples that will be collected, or field observations made, per point. In addition to the information included in the draft SAP’s Table – i.e., analytical method, sample size and container, and hold time – the document should:

- link the individual soil and groundwater samples with respective analytical methods, sample collection methodologies, sample sizes and containers, and hold times;
- link the individual soil and groundwater samples, and/or field observations, with respective field analytical methods;

- link the analytical methods with the specific contaminant concentrations or other parameters that are data gaps for baseline sampling, Stage 1 sampling/monitoring, and Stage 2 sampling/monitoring; and
- provide the anticipated reporting/detection limits/levels for individual sample and/or field observation contaminant concentration (or other parameter) measurements. I.e., it should be clear which analytical methods will be used for each soil and groundwater sample/observation, and the anticipated reporting/detection limits/levels for each contaminant/ parameter of interest.⁷

29. SAP Table 1. The SAP contains Table 1, but also provides a table within its text (pp.5-1 and 5-2) that identifies “sample description” and “analyses.” The two tables can provide different pieces of information, but they should not be inconsistent. For example,

- a) an analytical method identified for soil samples in Table 1 is Method 7196A, a method commonly used for quantifying Cr+6 concentrations. But the table in the SAP’s text does not appear to envisage any soil sampling for Cr+6 (and no related method is included);
- b) EPA 6000 series Methods for quantifying metals concentrations are mentioned in Table 1’s soil analysis columns. No metals analyses are identified for groundwater samples other than those for arsenic and Cr+6. The table in the SAP’s text, however, proposes groundwater sample analyses for six additional metals (per EPA 6000/7000 series Methods), and does not identify any soil sample analyses for metals; and,
- c) Table 1 does not include mention of the ASTM 7262 method for determining NOD. Nor does it identify the SM-2540 method for quantifying TDS levels in groundwater. But both methods are proposed in the text’s table.

In addition, neither table presents the SM-4500 method for determining KMnO₄ concentrations in Stage 1 soils (proposed on p. 5-9 of the FIWP).

The revised FIWP should resolve these apparent inconsistencies and omissions.

FIWP QAPP (APPENDIX C)

30. Page 3-2. Section 3.2.1 proposes that duplicate samples be collected and analyzed at some groundwater monitoring well locations, but that no duplicate soil samples be collected from performance borings. Please see SAP Comment #26.
31. Pages 3-2 and 3-3, Section 3.5. Ecology agrees that “the more critical the use, the greater the completeness objective.” Yet the QAPP appears to set a completeness objective of 95% for all data associated with the interim action. This section of the QAPP could be improved by discussing the “data” that will be collected during: a) baseline groundwater sampling, b) Stage 1 testing (process and performance monitoring), and c) Stage 2 sampling/monitoring, and then identifying those data points that are most critical for meeting project goals. Essentially, these would be those measurements (or other types of

⁷ Table 2 in the QAPP provides MDLs and PQLs for nine analytes in soil and “water” samples. It also includes the associated analytical methods for each analyte. This is a good table, but please see Comments #29 and 34 below.

data) that if not obtained, or not obtained with a sufficient degree of quality, are expected to constitute an unfilled data gap.

32. Pages 7-4 and 7-5, Section 7.3.1.2. Ecology agrees that there are several data-generating activities associated with the interim action for which Farallon may provide data validation. Following full-scale ISCO injections (during Stage 2), however, the PLPs intend to collect soil samples for the purpose of demonstrating attainment of site CVOC PCULs. For this data set the validation must be performed by an independent (third) party.
33. Page 11-1, Section 11.0. Ecology concurs with the topics identified here, proposed for the Completion Report's "QA section" content. But the QAPP should have also proposed: a) an assessment of PARCC parameters other than (just) accuracy and completeness; b) a report of data validation results; and, c) an evaluation of data usability. Ecology expects these data-related assessment components to be included in the Report.
34. Table 2 of the QAPP. This table provides MDLs and PQLs for nine analytes in soil and "water" samples, as well as the associated analytical methods per analyte. In the revised FIWP it should additionally:
 - include analytical methods and anticipated reporting limits/levels for Pb, Fe, total Cr, Mn, Cd, and mercury in groundwater samples;
 - include the analytical method and anticipated reporting limit/level for TDS in groundwater samples;
 - include the analytical method and anticipated reporting limit/level for KMnO4 in soil samples;
 - provide a note, explaining why analytical methods and MDLs and PQLs are listed for metals in soil samples (please see SAP Comment #12 above); and,
 - (if the PLPs actually intend to sample soils for arsenic) provide a note for the soil-sample arsenic MDLs and PQLs, stating that these concentrations are higher than site PCULs.