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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

May 23, 1995

4WD-FFB

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Ms. Katherine Landman
Department of the Navy - Atlantic Division
Naval Facilities Engineering Command
Code 1823
Norfolk, Virginia 23511-6287

SUBJ: MCB Camp Lejeune
Draft Treatability Work Plan
Operable Unit No. 14 - Site 69

Dear Ms. Landman:

The Environmental Protection Agency (EPA) has completed its review of the above subject documents. Comments are enclosed.

If you have any questions or comments, please call me at (404) 347-3016 or voice mail, (404) 347-3555, x-6459.

Sincerely,

Gena D. Townsend

Gena D. Townsend
Senior Project Manager

Enclosure

cc: Patrick Waters, NCDEHNR
Neal Paul, MCB Camp Lejeune

1.0 GENERAL COMMENTS

1. Standard Operating Procedures listed in Appendix D are not referenced from the US-EPA, Region 4, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual, February, 1991, (ECBSOPQAM). The document should the appropriate references for field sampling and cleaning/decontamination procedures.

2. The patented UVB and KGB technologies, for which the treatability study is designed to test, are innovative in-well aeration treatment systems. To demonstrate the overall treatment effectiveness of the proposed technologies, monitoring wells must be spaced properly. Calculations which determine the monitoring well configuration are based on estimates of hydraulic and aquifer parameters (e.g., vertical and horizontal hydraulic conductivities). Therefore, the use of valid and accurate methods and procedures to derive these important parameters is essential. However, the Treatability Study Work Plan fails to provide any detailed explanation on the derivation of these key design elements, which potentially undermines the credibility of the treatability study system design.

3. Section 4 does not provide a groundwater sampling or the location of a control sample or background well as specified by the Region IV SOPQAM. The text should provide this information.

4. Sections 4.2.3.4 through 4.2.9 refer to a Standard Operating Procedure (SOP) for monitoring well construction, development and decontamination. However, this SOP does not comply with Region IV SOPQAM in the following areas:

   a. The hydration time for the bentonite pellets to hydrate before grouting is not specified.

   b. The mathematical calculations to determine the volume of water to be removed from the well does not account for the sand pack volume.

   c. The decontamination procedures used do not comply with Region IV SOPQAM located in Appendix B.

   d. The text indicates that well development will be performed "for a minimum of one-half hour or until the discharge becomes visually clear". Other parameters for well development including pH, temperature, and specific conductivity must be stabilized according to the EPA SOPQAM. The report does not always define an acronym or abbreviation when used initially.

5. The assumptions and estimates in Section 4 are not supported by references.

6. Section 2.1.2 states that there are currently 25 UVB systems in operation at 18 sites in the United States; however, a list of references is not included in an appendix or a table. This list should indicate the following data: geographic location, cost (if available), and contact telephone numbers.

7. Figure 4.9 in Section 4.2.5 indicates that an "8-inch" auger will be used to install a 12-inch KGB well. However, at least a 14-inch auger is necessary to install a 12-inch well. The discrepancy in which figures do not match text is a common error in this document, and the text should be revised accordingly.

8. Section 4.2.9 indicates that "All downhole drilling equipment will be decontaminated between drilling locations." According to the EPA SOPQAM, all equipment including drilling rigs, drilling and sampling equipment, backhoes, and all other associated equipment for drilling and sampling shall be clean and decontaminated before entering the designated drill site. Furthermore, the text should verify that additional instructions concerning cleaning and decontamination (C&D) between drilling locations and other C&D procedures in the EPA SOPQAM are "strictly adhered to on all drilling activities".

9. All comments made for the UVB system in Sections 4.3.2, 4.3.3 and 4.3.4 should also apply to the KGB system.

2.0 SPECIFIC COMMENTS

The specific comments for this TRC Report are listed on the following pages in the order of their occurrence in the Treatability Study Work Plan. The comments are organized by section number, page number, table number and/or appendix number, as appropriate.

1. Page ii, Table of Contents.
The report should include a list of acronyms or abbreviation after the contents section.

2. Section 1.0, Figure 1-3.
The legend shows a symbol for groundwater evaluation contour (inferred), however, this symbol (the broken line) is not shown on the map. All symbols on the legend should be found on the map.

3. Section 1.1, Page 1-1, Paragraph 4, Sentence 4.
The UVB and KGB systems are indicated as "sole source" technologies. However, SBP is not the only company based in the United States that has developed in-well aeration treatment systems for contaminated groundwater. The Westinghouse Savannah River Company WSRC Savannah River Technology Center (SRTC) in conjunction with Stanford

University designed similar "in situ air stripping" systems. The text should be revised accordingly.

4. Section 1.2, Page 1- 2, Paragraph 3, Sentence 3.
The text indicates that well development will be performed "for a minimum of one-half hour or until the discharge becomes visually clear". Other parameters for well development including pH, temperature, and specific conductivity must be stabilized according to the EPA SOPQAM.

5. Section 1.2, Page 1-2, Paragraph 5, Sentence 3.
The text states that beneath the silty sand is a fairly continuous sandy clay at approximately 27 feet. Because this unit could potentially act as a retarding layer, a vertical permeability investigation should be conducted to provide further characterization of the various geologic intervals present at the site.

6. Section 1.2, Page 1-3, Paragraph 0, Sentence 2.
The label for shallow monitoring well is "69-GW2", but it is indicated in the next paragraph as "69GW2". Only one method of labeling wells should be used throughout this Work Plan.

(This comment also applies to Figure 1-5.)

7. Section 2.1.1, Page 2-1, Paragraph 6.
The text describes two different UVB units but does not indicate which one is selected for the remedy-selection testing treatability study. The text should clearly define which unit will be used during the treatability study.

8. Section 2.1.2, Page 2-2, Paragraph 2.
The text indicates that a UVB system alternative which has been installed over a year will save about $2.5 million over the life of the clean-up period. However, the text does not indicate the present percent reduction of contaminates, present radius of influence (ROI) established vs. ROI calculated, and present effectiveness of chemical containment. Therefore, the text should include a current cost estimate for this installation.

(This comment also applies to Section 2.2.2.)

9. Section 3.0, Page 3-1, Paragraph 4, Sentence 2.
The text states that "The degree of effectiveness will be determined from analysis of the stripped off-gases, analysis of the granular activated carbon (GAC) used to treat the off-gases, as well as periodic analysis of groundwater in monitoring wells". However, the text does not state specific intermediate performance goals. A minimal ROI or specific performance goals which will trigger continuance or full-scale implementation of the UVB/KGB systems should be included in the text.

10. Section 4.1.2, Page 4-1, Paragraph 4, Sentences 1 and 2.
The test states that a local company will provide water during the treatability study. However, the text does not state if this water will be tested. The text should indicate what test will be performed on the water before being used in the treatability study.

11. Section 4.1.3, Page 4-1, Paragraph 6, Sentence 3.
The sentence states that "Mobilization of a dumpster will be not be necessary." This sentence is unclear and appears to contain a typographical error. The text should be checked and revised accordingly.

12. Page 4-2 Section 4.2.1:
PVC (2-inch) Monitoring Wells - Appendix E.5 from the ECBSOPQAM recommends that stainless steel (304 or 316) be used in any well construction. When selecting the materials for well construction, the prime concern should be to select materials that will not contribute foreign constituents, either by leaching or sorption, into the monitoring zone and compromising the integrity of the well and future analytical data. The monitoring program is designed to analyze for organic compounds, such as 1,2-dichloroethene (DCE), trichloroethene (TCE), and vinyl chloride, stainless steel materials should be used.

13. Section 4.2.1, Page 4-2, Paragraph 2, Sentence 1.
The text states that Figures 4-1 and 4-2 show a layout of the proposed UVB and the 2-inch PVC UVB groundwater monitoring well; however, the legend for Figure 4-1 does not match the text. The figures should include a symbol for the PVC UVB monitoring wells.

14. Section 4.2.3, Pages 4-2 and 4-3.
The text lists six subsections under procedures, but they are not in accordance with the EPA SOPQAM. For example, the text in 4.2.3.4 indicates the bentonite seal will be between 1 and 2 feet in thickness. However, according to the EPA SOPQAM, this seal must be no less than 2 feet in thickness.

15. Page 4-3, Section 4.2.3.4:
The method to be used in placing the filter packs and bentonite seals in the deep monitoring wells should be specified in the text. For boreholes greater than 50 feet deep, the ECB SOPQAM states that filter pack materials and bentonite pellets shall be placed by the tremie or positive displacement method to prevent materials from bridging in the borehole. Any such bridging or other discontinuities in these annular seal materials could create pathways for water and contaminants, causing the wells to be unusable. Furthermore, the ECB SOPQAM states that the bentonite seals should be 2 feet in thickness. The proposed monitoring well installation should follow the guidelines provided in the ECB SOPQAM.

16. Section 4.2.4, Page 4-4, Paragraph 2, Sentence 1.
The text indicates that a "steel casing" will be used to construct the UVB-200. EPA SOPQAM specifies that the steel casing must be 304 or 316 stainless steel. In addition, Figure 4-7 indicates that the casing material is PVC. This Figure 4-7 needs to be revised to show the 8-inch diameter casing as being constructed of 304 or 316 stainless steel.

17. Section 4.2.4, Page 4-4, Paragraph 3, Sentence 2.
The text indicates that "The UVB-200 well will be installed through a permanent 14-inch surface casing, grouted in place to 12 ft bgs." However, Figures 4-7 and 4-8 show an 18-inch diameter PVC surface casting, and Figure 4-8 also indicates that this casing is 11 ft bgs not the 12 bgs reported in the text. These discrepancies need to be corrected.

18. Section 4.2.5, Page 4-4, Paragraph 6, Sentence 1.
The text indicates that "Figure 4-9 shows a construction diagram, as well as details of the air distributor and the double screen for the KGB well." However, Figure 4-9 does not identify or detail an air distributor nor a double screen well. These discrepancies need to be corrected and noted in the text.

19. Section 4.2.5, Page 4-4, Paragraph 6, Sentence 2.
The text indicates that "The KGB well will be 6-inch in diameter and will be installed to 12 ft bgs"; however, Figure 4-9 shows a 12-inch diameter borehole and PVC casing for a KGB well 11-feet deep. These discrepancies should be corrected and revised in the text.

20. Section 4.2.7, Page 4-4, Paragraph 2, Sentence 2.
The text indicates that The UVB casing will be fitted with two 6-feet screen sections. However, Figure 4-7 indicates that the upper screen is 8 feet long and the lower screen is 4 feet long. The design/selection of the UVB upper and lower screens must be incorporated into this treatability study Work Plan. The screen size contradictions should be corrected in the text.

21. Page 4-5, Section 4.2.7:
The text states that monitoring wells will be developed for a minimum of one-half hour or until the discharge becomes visually clear. In addition to the aforementioned criteria, however, well development should be conducted until the pH, temperature and specific conductivity in the groundwater have stabilized.

22. Section 4.3.3, Page 4-7, Paragraph 2.
The text refers to upstream and downstream stagnation points, however, they are not identified on Figures 4-10 and 4-11. The stagnation points should be depicted on the figures.

23. Section 4.3.3, Page 4-7, Paragraph 2, Sentence 3.
The text indicates that "These distances have been calculated from an upstream distance from the UVB well of 5H, where H is the height of the saturated zone affected by the UVB." However, the text does not indicate the reason the height of the saturated zone is multiplied by 5. Therefore, the text should explain how this distance was calculated.

24. Section 4.3.3, Page 4-7.
The text indicates that the proposed UVB-200 system estimated downstream and upstream stagnation points of 43.13 m (141 ft) from the center of the system. A method for determining this value (43.13 m) needs to be explained. This value seems to be the same as S/H shown on Table 4-1 under "Herrling's Diagrams". Also, Figure 4-12, which has the same title as Figures 4-13 through 4-17, seems to be a graph from which the value of S/H was taken. If this is true, the graphical solution for S/H on Figure 4-12 does not include S/H =4.2m. In addition, the significance of A/H=0.1 needs to be explained in the text or on Table 4-1 under Well data. Furthermore, all design values used on Table 4-1 are selected from outside the range of the graphical solutions shown on Figures 4-12 through 4-17.

25. Section 4.3.3, Page 4-7, Paragraph 4, Sentence 1.
The method of calculating Q/H^2*V and a/H should be explained in the text or on Table 4-1. Simply stating that aquifer data are entered into a "computer spreadsheet" and that variables are calculated is not sufficient. The text should be revised accordingly.

26. Section 4.3.3, Page 4-7, Paragraph 4, Sentence 3.
The text indicates that values from Dr. Herrling's graphical solutions are "inserted in a spreadsheet to calculate the dimensions of the theoretical circulation cell capture zone and release zone." All values inserted into the spreadsheet as shown on Tables 4-1 and 4-2 are outside the ranges shown on all Figures 4-12 through 4-17. In order for the calculated values of the "dimensions of the theoretical circulation cell capture zone and release zone" to be based on Dr. Herrling's graphical solutions for a/H=0.1, all graphical solutions (Figures 4-12 through 4-17) must be revised to include the value of Q/H^2*V required (i.e. $Q/H^2*V=162$).

27. Section 4.3.3, Page 4-7, Paragraph 4, Sentences 4 and 5.
The text indicates that true, or actual, circulation zone (ROI) is typically estimated as 80% to 98% of the upstream and downstream stagnation points (s). However, the average of the estimated percentages (91%) was used for this study. A reference or calculation needs to be incorporated into this text which indicates how the radius of influence (ROI) is calculated. Reference needs to support the suggested

typical range of 80% to 98% of the downstream and upstream stagnation points as a good indication of the ROI. Tables 4-1 and 4-2 indicate that calculated values for ROI are possible; however, they are not shown (i.e. R(m) =0). The graphical solution for R/H needs to be included with this report so that the calculated value of ROI can be compared with the estimated value of ROI (128 ft).

28. Pages 4-6 and 4-7, Section 4.3.3:
This section presents a number of aquifer and hydraulic parameters used in the treatability study system design (e.g., Darcian velocity, horizontal and vertical hydraulic conductivity and vertical flow rate). However, it is totally unclear how these parameters were derived (e.g., whether a site-specific aquifer test was conducted). Since these parameters were used to calculate the radius of influence and the capture zone, their accuracy and validity have significant impact on monitoring well spacing and are essential to the overall success of the treatability study system design. The failure to provide any specific information on the methods and procedures used in deriving these parameters is the most significant deficiency of the Treatability Study Work Plan and should be addressed.

29. Section 4.3.4, Page 4-8, Paragraph 1, Sentence 1.
The text states that maintenance intervals are recommended to start immediately and continue every two months until completion of study. However, an estimate of the length of the treatability study is not indicated. This information should be included in this study.

30. Section 4.3.4, Page 4-8, Paragraph 1, Sentences 8 Through 13.
Any materials of construction such as cables, packer, and air hoses inside well must meet EPA SOPQAM specifications (i.e. the packer must not contaminate samples by leaching chlorinated compounds into the well's groundwater).

31. Section 4.3.4, Page 4-8, Paragraph 1, Sentence 14.
The text states that the desired range for the vacuum is 65 to 45 millibar; however, no explanation is provided. The text should include a reference for this range.

32. Section 4.3.4, Page 4-8, Paragraph 1, Sentence 19.
The text indicates that a "bird cage should be secured to top of fresh air intake pipe." However, this bird cage will not prevent particulates from entering and contaminating the well. Moreover, this may encourage birds to "perch and excrete waste down the fresh air " intake pipe. Therefore, the fresh air intake pipe as shown on Figure 2-1 needs to be redesigned in a manner which will prevent an object from being dropped straight down into the well. In addition, the end exposed to the atmosphere needs to prevent rain and particulate matter from entering this well, and be secured

to prevent intentional and non-intentional contamination of the well.

33. Section 4.3.4, Page 4-8, Paragraph 1, Bullet 12.
The text indicates that "if neither air flow, vibration or bubbling is hard, re-check items B through J." However, the items are listed in this section with "Bullets" and not letters. This discrepancy should be corrected in the text.

34. Section 4.3.4, Page 4-8, Paragraph 1, Sentence 24.
The text states that if problems persist, IEG should be contacted. However, a telephone number for IEG's Charlotte, North Carolina office and Germany home office is not provided. The text should indicate this information.

35. Section 4.3.4, Page 4-9, Bullet 1, Sentence 1.
The text contains a misspelled word. The word "pimp" should be "pump". The text should be corrected.

36. Section 4.3.4, Page 4-9, Bullet 1, Sentence 2.
The report states that "...should be +/- 15% of the start-up flow", which is unclear. The text should be verified and revised accordingly.

37. Section 4.3.4, Page 4-9, Bullet 3, Sentences 1 and 2.
The text states that iron and scaling build-up on upper screen and UVB component parts should be removed in order to prevent a significant reduction in performance. However, the method for removing the iron and scaling build-up is not outlined. The text should clearly state the procedures involved.

38. Section 4.3.5, Page 4-9, Paragraph 3, Sentence 7.
The text of this sentence refers to gas-liquid distribution coefficients and a "double-case screen" for stripping gases. However, the text does not reference a table of gas-liquid distribution coefficients and a figure to show the location of the double-case screen. This information should be provided in the text.

39. Page 4-4 Section 4.4 Dye Tracer Test:
Overall, the dye tracer test is generally vague. ECB recommends providing more detail with regard to charcoal packet placement. The OUL QAPP addresses this in only general terms. Please provide an explanation for what is meant by divergent and convergent dyes. Please provide an explanation for what property exists that would make the dyes, while in aqueous solution, behave differently when present in and subjected to laminar flow conditions. ECB recommends testing the dyes on chlorinated solvents to see what effect it will have on them, if any at all. The QAPP for the dye study is acceptable.

40. Section 4.4.2, Page 4-11, Paragraph 2, Sentence 1.

The text indicates that the "Dye/Tracer tests will be simultaneously performed in both systems (UVB and KGB)." However, Figures 4-2 and 4-5 show that the UVB and KGB systems will be installed side-by-side. These two "different" types of in well aeration must be located/installed outside of each others "estimated radius of influence" in order to determine how effective each type of system is in relation to the other. If the two systems remain as proposed, different dye tracers may be found for each system; however, one system's influence on the local groundwater flow and microbial community will influence the others groundwater flow and microbial community.

41. Section 4.4.3, Page 4-12, Paragraph 2.
This paragraph proposes the amounts of dyes to be used per dye type: however, no bases for the selected quantities per station is given. A reference for dye selection and quantity used needs to be incorporated into the text.

42. Section 4. 5, Pages 4-12 and 4-13.
All equipment decontamination procedures must be in compliance with the EPA Environmental Compliance Branch SOPQAM, February 1, 1991.

43. Page 4-12, Section 4.5:
This section describes the equipment decontamination procedures and states that hexane or 2-isopropanol will be used as a rinsing solvent. Hexane is not miscible with water and, therefore, is not an effective rinsing agent, especially given the nature of the sampling activity (i.e., groundwater sampling) at the site. According to the ECB SOPQAM, the standard cleaning solvent should be pesticide-grade isopropanol. Therefore, the use of any solvent other than pesticide-grade isopropanol for equipment cleaning purposes must be justified.

44. Section 5, Page 5-1, Paragraph 1, Sentence 2.
The text indicates that the "Specification for the major pieces of equipment are provided in Appendix F". The equipment performance curves supplied in Appendix F need to have all operating points clearly shown (i.e. high and low water table conditions).

45. Section 5.1, Page 5-1, Paragraph 2 and 3.
These paragraphs describe blowers and compressors to be used on UVB and KGB units; however, no reason for equipment selection is given. Design calculations must be included with this study.

46. Section 6.1.2.3: - Sampling Plan for Inorganics: turbidity measurements should be included to the list of sampling parameters which characterize the inorganic groundwater quality.

47. Page 6-12, Section 6.2.1.1:
The decontamination procedure for the water level measurement equipment should be provided in the text.

48. Table 6-1:
For soil boring 69UWSW-22, the column titled "Frequency" incorrectly lists "2' Plastic Cores" as the frequency of collection. Based on the context, the frequency at which soil samples are to be collected should be expressed as "every # of feet." Please correct.

49. Section 6.0, Page 6-1, Paragraph 2, Sentence 3.
The text states that the Sampling & Analysis Plan follows the guidelines presented in EPA document EPA/60018-91/005, however, the title of the document is not given. The text should give the title and the number of EPA documents.

50. Section 6.1.2.3, Page 6-5, Paragraph 1, Sentence 1.
The text states that four sets of samples will be collected for inorganic water quality analysis, however, the text does not indicate the number of samples in each set. The text should give exact numbers of samples which will be collected for analysis.

51. Section 6.1.6.1, Page 6-9, Paragraph 2.
The text lists information included in a Chain-of-Custody, but some of the required information is not listed. According to EPA Guidance (EPA, 1991), the Chain-of-Custody should also include the project name, project number and sampling location.

52. Section 6.1.6.1, Page 6-9, Paragraph 3, Sentence 1.
The text states that a typical chain-of-custody form is shown in the SOP (Appendix C, Figure SOP-6.2). However, the Chain-of-Custody form in Appendix C is different from a typical EPA Chain-of-Custody record and is difficult to read due to a poor photocopying; its suitability can not be determined. The report should present a legible Chain-of-Custody record used for the treatability study.

53. Section 6.1.6.3, Page 6-1-0, Paragraph 4.
According to EPA SOP (EPA, 1991), the elapsed time between sample collection and initiation of laboratory analyses must be within a prescribed time frame for each individual analysis to be performed. The text does not indicate the sample holding times for all samples. The Work Plan should include the sample holding times.

54. Section 7.0, Page 7-1.
This report contains a general QAPP and three laboratory-specific QAPPs. The EPA has a guidance for the QAPP (EPA, 1992)but this guidance is only followed by one of the Laboratory-specific QAPPs. (See Appendix C.) Neither does the general QAPP follow the EPA guidance to include all

suggested issues, but instead refers to the Laboratory-specific QAPPs in Appendices A through C. The report should indicate which of the QAPPs during the treatability study will be followed.

55. Section 7.3, Page 7-3.
The Section on QA/QC Samples text states that matrix duplicate, instrument blank, trip blank and field blank samples will be collected and analyzed periodically to assure quality data. According to EPA's SOP (EPA, 1991) for quality control additional samples should include control samples and background samples. The text does not indicate that the control samples and/or background samples will be collected for the analysts. The text should list the control samples and/or background samples to be a part of the QA/QC samples.

56. Section 7.4, Page 7-4, Paragraph 7, Sentence 1.
The text states that, where applicable, the laboratory shall report the data for volatiles using the procedures and forms, or equivalents, as described for the level III Data Quality. According to EPA SOP (EPA, 1991), the Data Quality Objectives (DQO) of Level III has some requirements for equipment blank samples. For example, DQO Level III mandates that a blank of rinse water must be collected and analyzed prior to beginning the study and at the end of each week sampling equipment is field cleaned. The text addresses equipment blanks in Section 7.3.2 (see Page 7-3) but does not mention the above requirements by DQO Level III.

57. Page 8-1, Section 8.1:
The text states that soil cuttings and drilling mud generated during soil boring, trench excavations and monitoring well installation will be managed according to one of three options: to be backfilled (for soil boring and trenching), to be spread on the ground surface near the borehole (for intermediate well installation) and to be containerized, analyzed and disposed accordingly (for deep well installation). However, the text does not provide any rationale for these distinctively different disposal options or any justification for selecting the first two options (i.e., backfilling or spreading without determining whether the soil cuttings are hazardous). Unless proper justification is provided, all soil cuttings generated during the treatability study activities should be analyzed, containerized and disposed in a manner based on a determination of their contaminant characteristics.

58. Page 8-1, Section 8.2:
The text states that groundwater obtained during purging of existing wells will be discharged to the ground surface near the monitoring well. This is unjustified since the groundwater is known to be contaminated and requires

remediation. The purge groundwater should be containerized and analyzed prior to selection of a treatment and disposal option.

59. Appendix D Standard Operating Procedures (SOP)
Please reference the ECBSOPQAM.
Sampling procedures listed in this Appendix are not referenced from the ECBSOPQAM. Please reference Section 4.0 Sampling Procedures from the ECBSOPQAM. In most cases sampling procedures listed in this Plan meet the same performance standards as ones in the ECBSOPQAM. However, the EPA will not be responsible for deviations from the ECBSOPQAM or problems with data that may occur due to those deviations.

Decontamination procedures listed in this Appendix are not acceptable (i.e. the use of methylene chloride versus the use of isopropyl alcohol as a solvent rinse). Methylene chloride, a chlorinated solvent (which is the chemical group that is being analyzed for) may interfere with sample analysis through cross contamination. Please reference Appendix B Cleaning and Decontamination Procedures from the ECBSOPQAM.