

**DEPARTMENT OF TOXIC SUBSTANCES CONTROL**Region 4,  
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1995 JUN 06 PM 1:49

June 21, 1995

Ms. Content Garriga  
Department of the Navy  
Southwest Division  
Naval Facilities Engineering Command  
1220 Pacific Highway  
San Diego, California 92132-5181

Dear Ms. Garriga:

**COMMENTS TO DRAFT WORKPLAN SITE ASSESSMENT, NAVAL TRAINING CENTER (NTC), SAN DIEGO, CALIFORNIA - FOR THIRTEEN POINTS OF INTEREST (POI) NUMBERED VARIOUSLY FROM 7 TO 62**

The Department of Toxic Substances Control (DTSC) has completed its review of the subject document and the following comments have been noted. These comments were previously communicated to you via phone conversation on June 15, 1995. Comments from the Regional Water Quality Control Board will be via transmitted via phone call to you this week.

Enclosed with this letter are comments *from* our technical unit regarding the Standard Operating Procedures (SOPs) which are referenced in this document and in other NTC documents. These SOP comments are being transmitted to Southwest Division under separate cover and are for your information.

Please address the following comments accordingly into the draft document:

1. **Page 1-6, last sentence:** "The BCP mentions two inactive ASTs that were located on - site; however, these were not observed during a site visit on 18 January 1995." What is the status of these ASTs? Was there follow-up on them? Please clarify.
2. **Page 1-13, section 1.3.3, first paragraph, last sentence:** "Data for the years 1990 through 1993 was not provided." Was there regular disposal practices during this period? If so, records should be available. Please clarify.
3. **Page 1-18, second paragraph, last sentence:** See comment number one.
4. **Page 1-33, section 1.4.2:** At what level was total petroleum hydrocarbons quantitated?



5. **Page 1-34, section 1.4.4:** As a point of clarification, total threshold limit concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) are for determining if contaminated waste must be managed and disposal of as hazardous waste. If a waste falls below TTLC or STLC this does not indicate that it is non-hazardous. It still may pose a threat to public health and the environment and may or may not need to be remediated depending on risk factors involved for the particular site.
6. **Section 3, Sample Location and Frequency:** More information is needed to determine the adequacy of POI sampling. Please state the rationale for sampling depths, frequency, and locations for the POIs.
7. **Page A4-1, second paragraph:** This paragraph should be in table form for easy reference.

Please address the above comments accordingly. If you would like to discuss, please call me at (310) 590-5563.

Sincerely,



Alice Gimeno  
Remedial Project Manager  
Base Closure Unit  
Office of Military Facilities  
Southern California Operations

Enclosure

cc: Mr. Corey Walsh  
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*Ms. Content Garriga*

*June 21, 1995*

*Page 3*

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GENERAL SOP COMMENTS

1. In general, the Standard Operating Procedures are well written, and provide a compilation of basic information related to various field techniques. Additional detail will be needed in most cases, however, for site specific work plans.
2. There are, however, errors and omissions that should be addressed either by revising the SOP's, or in the near term by specifically addressing issues in work plans.
3. All distributed control copies should be of high quality printing, often it is difficult to read figures that are presented in small print.
4. Prior to amending the SOP's, the Navy and Bechtel should review the August 1994, State of California Environmental Protection Agency, Guidance Manuals For Ground Water Investigations.
5. Some SOP's refer to other Bechtel documents called *Technical Specifications*. The relationship of these specifications to the SOPs should be described.
6. If Bechtel subcontracts field work will the CLEAN II SOP's and Bechtel technical specifications be followed for all field work?

SPECIFIC COMMENTSDRILLING METHOD EVALUATION, SOP 2

1. The document is very brief. There is not enough information provided for an individual who is not personally familiar with each drilling method. The table provided is useful for an initial screening of drilling methods, but cannot provide for, "thorough evaluation of borehole requirements" as suggested in the document.

For this reason, the references section should be expanded. One suggested references to include is:

Aller, et al., Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, National Water Well Association, 397 p.

2. Compiling available information on site geology, hydrostratigraphy and depth to water before selecting a drilling method should be stressed.

BOREHOLE LOGGING, SOP 3

1. Table of Contents
  - a. The Table of Contents and text should be reorganized in a logical manner. For example, Section 4.2 - ROCK, should be a subsection under Section 4.0 - BOREHOLE LOGGING PROCEDURE.
  - b. Section 4.1.3 text should read, "Examples of Borehole Log Entries For Soils." The SOP should be modified throughout the text to reflect this change.
2. Section 4.0, Borehole Logging Procedure, Page 3, last sentence of second full paragraph - Correct the reference. SOP '12 is designated as "not used" in the Bechtel Standard Operating Procedure, Navy CLEAN II Table of Contents.
3. Section 4.1.2, Description, Page 4 - Add "additional description" to the second sentence of the first paragraph so the list of basic descriptors corresponds with the sequence of presented topics that follows. The SOP should be modified throughout to reflect this change.
4. Section 4.1.2.5, Additional Description, Page 10 - Degree of sorting and gross petrology should be added to the "Additional Description" list for coarse or fine-grained materials.
5. Section 4.1.3, Examples of Borehole Log Entries for Overburden Material, Page 11 - Under the CLAYEY SAND entry, gravel should be changed to lower case.
6. Section 4.2.1, Lithologic Classification and Description, Page 12 - The text that follows the bullet listing should include an entry for each listed subject.
7. Section 4.2.4, Observations During Drilling, Page 19 - The last sentence in the first paragraph should read "This information should include, but is not limited to, the following observations:"

Add "Addition of imported water, including amount, source, and depth the water was added."
8. Section 4.4 - Borehole Log Checking and Entry to the Data Management System, Page 20 - Change the reference T 2.5 to T 2.4.

9. A hand drawn map showing the location of the boring should be drawn and attached to the original borehole log (Attachment A).

SOIL SAMPLING, SOP 4

1. Section 4.3 - Specific directions for the collection of volatile organic compound (VOC) soil samples should be stated. The use of a brass sleeve liner in a split barrel sampler, sealing exposed ends with Teflon sheeting, followed by plastic caps sealed with tape should be added to the text.

MONITORING WELL INSTALLATION AND DEVELOPMENT, SOP 5

1. The SOP should be amended to clarify that guidelines for monitoring well design as well as installation and development are included. For example:

Title: MONITORING WELL DESIGN INSTALLATION AND DEVELOPMENT

Purpose: "The purpose of this procedure is to provide a standardized method and format for the design, installation and development of...."

2. Page 2 - The following amendment is recommended:

"Tremie - to use a pipe or rigid tube to transport filter pack and annular seal materials to the bottom of appropriate interval within the annulus."

3. Page 5 - The SOP references *Drilling Technical Specification No. 22214-TS-001* for installation of conductor casing. *Drilling Technical Specification No. 22214-TS-001* should be provided as part of a Standard Operating Procedure for Drilling Methods.

4. Page 5 - The following amendment is recommended:

"Wells used for pumping during constant discharge aquifer tests should be constructed with well screens and filter packs that extend the entire thickness of the water bearing zone. Observation wells need not be fully penetrating and can most often double as monitoring wells."

5. Page 5 - The following amendment is recommended:

"Well casing of suitable material that extends vertically downward from the ground surface to a ~~depth below~~ the base of the particular water-bearing zone to be monitored."

6. Page 5 - The SOP states "The filter pack generally begins at the bottom of the well bore and extends upward...."

The SOP should be amended to specify that if the borehole was advanced more than a few feet below the design depth of the well, the excess portion of the borehole will be sealed with relatively low permeability grout mixture before constructing the monitoring well to eliminate the potential for preferential flow in the excess borehole.

7. Page 7 - The SOP states "The top of the well screen should never extend beyond the top of the groundwater table, unless designed specifically to monitor floating product (LNAPL)."

The SOP should be amended to delete this requirement. Monitoring wells that are designed to monitor the top of an unconfined water bearing zone are typically constructed with screens extending across the water table to anticipate water level fluctuations and provide for identification of the water table.

Placement of well screens across the water table provides for identification of LNAPL whether its occurrence is expected or not. It is always in the best interest of the Navy to identify LNAPL whenever it occurs to allow evaluation of free product recovery.

Strict compliance with the SOP would require decommissioning and replacing with new wells any wells that due to water level fluctuations end up with their screens spanning the water table.

8. Page 8, Figure 1, Types of Monitoring Well Construction - The figure should be amended to illustrate the use of centralizers as appropriate.

9. Page 9 - The SOP discusses construction of several wells within a single borehole (nested wells). The SOP clearly supports constructing wells in individual boreholes rather than nested well construction.

We agree with the preference for not constructing nested wells. It is recommended that nested wells only be constructed under extraordinary circumstances.

10. Page 9 - The SOP states "Clustered wells are installed individually following the procedures described in Section 4.2.1." Section 4 is titled References and includes no procedures. The text should be corrected.
11. Page 10, Figure 2, Nested Monitoring Wells - The figure should be amended to illustrate the use of centralizers.
12. Page 11 - The SOP discusses joining stainless steel casing and screen sections by threaded joints, welding or using stainless steel screws or pins.

It is recommended that casing and screen lengths be connected by threaded joints that form a watertight seal.

13. Page 14 - The SOP states "The following is a general summary of monitoring well installation procedures. Specifics will be in accordance with the technical specification (TS-001)".

As discussed above, the relationship between these technical specifications and the SOPs needs to be clarified and the specific procedures proposed for implementation need to be provided for review and concurrence.

13. Pages 14 and 15 - The SOP refers to use of a "wench" for suspending well casing and screen over and in the hole. This appears to be a spelling error. The SOP should be amended to require using a winch for hoisting and lowering casing.
14. Page 15 - The SOP discusses adding lengths as the casing and screen are lowered into the hole.

The SOP should be amended to specify tightening joints in accordance with the manufacturer's instructions.

15. Page 15 - The SOP identifies using centralizers every fifty feet to insure the casing is centered in the hole.
  - a. The SOP should be amended to specify installation of centralizers at the top and bottom of well screens and every forty to fifty feet thereafter.
  - b. The SOP should be amended to specify that centralizers are not needed for wells constructed within hollow-stem augers.
16. Page 15 - The SOP discusses placement of filter pack.
  - a. The SOP should be amended to specify measuring the depth to the top of the filter pack as placement proceeds. Such measurements are needed to allow identification of

filter pack bridging and to determine the appropriate increments to withdraw temporary casing or auger.

- b. The SOP should be amended to specify identification and breaking of any bridges that occur in the filter pack.
  - c. The SOP should be amended to specify incremental removal of temporary casing or augers as filter pack and annular seals are placed.
17. Page 15 - The SOP recommends that the well be surged after placement of the filter pack.

The SOP should be amended to require that the well be surged and filter pack be added as needed to meet design specifications before adding transition seal materials.

18. Page 16 - The SOP provides a typical cement/bentonite mixture as 94 pounds of Type I Portland cement, 6 or 7 gallons of water and approximately 5 to 10 pounds of powdered bentonite.
- a. The SOP should be amended to recommend less bentonite. The recommended mixture would be very difficult to pump. Also, the percentage of bentonite should not exceed six percent or excessive shrinkage is likely to occur (Driscoll, 1986). DTSC recommends two to four percent bentonite prehydrated in seven to nine gallons of water for 94 pounds of Type I Portland cement.
  - b. The SOP should be amended to specify measuring, weighing, and recording quantities of materials used for grouting.

19. Page 16 - The SOP should be amended to specify that while grouting, the end of the tremie should initially be placed about five feet above the transition seal and should remain submerged at least twenty feet while grouting.

20. Page 16 - The SOP states "If grout is lost to the formation, bentonite in the form of "well plug" can be added to stop the loss."

The SOP should be amended to specify how hole plug will be mixed and delivered to the interval of the bore hole that is losing grout to the formation.

21. Page 18 - The SOP states "...development time is frequently limited to 4 to 8 hours or specified as removal of up to 5 or 10 casing or well volumes."

Specifying a time limit or volume of water to remove does not insure a consistent or adequate well. The SOP should specify

development methods and criteria for stopping development as well. According to ASTM Method D5092, development by surging and pumping is both effective and relatively fast compared to bailing.

The SOP should be amended to specify that development should be continued until representative water, free of drilling fluids, cuttings, or other materials introduced during well construction is obtained. Low turbidity and stable pH, temperature, specific conductance, and dissolved oxygen are indicators of representative water.

22. Page 20, Well Construction Diagrams, Attachment A and Attachment B.

The SOP and attachments should be amended to include the drilling method used, the placement of centralizers, the volumes (calculated and actual) of filter pack, transition seal (bentonite and/or sand) and cement/bentonite grout seal.

#### INSTRUMENT CALIBRATION AND USE, SOP 6

1. The SOP is thorough for the six measurements/instruments discussed: pH, Specific Electrical Conductance (EC), Temperature, Redox Potential (Eh), Dissolved Oxygen (DO), and Turbidity. The field screening instruments, Flame Ionization Detector, Photo Ionization Detector, Oxygen Lower Explosive Limit Meter, and Draeger Tubes will be covered in the next SOP revision. The Navy should provide a copy of this revision when prepared so that DTSC may keep its files current.
2. Section 1.0 - The text states, "these procedures are complete when supplemented with the manufacturer's calibration and maintenance instructions for the specific instrument." I recommend that this statement be strengthened or highlighted to underscore its importance.
3. Section 5.1.6 - It would be helpful to define the word "nephelometer" so field crews of all technical abilities would not be confused by this term.
3. Section 5.1.6.2 - The first bullet cites ASTM Standard D1889-88 used to prepare calibration curves for turbidity determination when a precalibrated scale does not exist. This Standard should be included in this SOP since a field crew probably would not have quick access to this if needed.

GROUNDWATER SAMPLING, SOP 8

1. Pages 6 and 7 - The SOP identifies pre-sampling activities.
  - a. The SOP should be amended to include identification of locations for collection of QA/QC samples where appropriate (e.g., field blanks, duplicates and splits).
  - b. The SOP should be amended to include identification of the order of sampling and a schedule for the sampling event.

2. Page 7 - The SOP refers to Attachment A, Well Sampling Record Form, for identification of the information required to be collected and recorded during the sampling event. The referenced attachment is not provided.

The attachment should be included and should provide for recording the following information: project identification, date, well identification, well condition, well depth, depth to water, elevation of water, presence and thickness of immiscible layers and detection method, well purging procedure and equipment, date and time well purged, purge rate and volume, drawdown during purging, well recovery rate, collection method for immiscible layers, sample collection method and equipment, sample collection date and time, sample bottle types, sample identification numbers, field preservation methods, parameters requested for analysis, names of samplers, comments, weather conditions, internal temperature of sample transport containers (ice chests).

3. Page 7, Procurement of Analytical Laboratory Services - Quantitation limits needed for sample analyses should be discussed with the laboratory and included in the order for laboratory analytical services.
4. Pages 7 and 8 - The SOP identifies turbidity and dissolved oxygen meters as optional equipment. Refer to recommendation 9, below.

The SOP should be amended to specify that dissolved oxygen will be monitored as an indication of representative ground water during purging.

5. Page 8 - The SOP discusses selection of purging and sampling devices.

It is recommended that consistent purging and sampling equipment and practices be maintained from one sampling event to the next.

6. Page 10, Water Level Measurements - The SOP should be amended to specify decontamination of the water-level meter before and after use.
7. Page 12 - The SOP states "...and the field parameter measurements have stabilized."

It is recommended that this section of the SOP be amended to refer to Section 5.1.7.3 where "stabilization" of field parameters is discussed.

8. Pages 12 and 13, Pumping Purge Water - The SOP should be amended to specify that 1) water levels will be monitored during purging and 2) for moderate to high yield wells, pumping rates will be controlled to minimize drawdown.
9. Page 13, Measurement of Field Parameters During Well Purging - Studies have shown dissolved oxygen and specific conductance to be the most useful field indicator parameters for stabilization of water quality during purging (Barcelona, et al. 1994).
  - a. The SOP should be amended to specify that dissolved oxygen will be monitored along with other field parameters. Stabilization of dissolved oxygen has been suggested to be indicated by consecutive readings of  $\pm 10$  percent (Puls and Pauls, 1995).
  - b. The use of a flow through cell is recommended for monitoring temperature, specific conductance, dissolved oxygen, and pH.

10. Page 14 - The SOP discusses sampling clean wells first and those wells suspected to be the most contaminated last.

The SOP should be amended to move the discussion into Section 5.1, Preparation for Groundwater Sampling From Wells, regarding pre-sampling activities.

11. Page 15 - The SOP proposes that any VOA vials containing air bubbles will be discarded and another filled. Obtaining samples with absolutely no bubbles from some wells can be very difficult or impossible.

The SOP should be amended to provide for using VOA vials that contain minimal air bubbles if several attempts to collect samples from deep wells fail to produce bubble-free vials.

12. Page 15 - The SOP discusses preparing field blanks.

The SOP should be amended to specify that the sample bottles will be prepared by the analytical laboratory.

References

M.J. Barcelona, H.A. Wehrman, and M.D. Varljen "Reproducible well-purging procedures and VOC stabilization criteria for ground-water sampling", Ground Water 32, No. 1, January-February 1994, pp. 12-22

R.W.Puls and C.J. Paul, "Low-flow purging and sampling of ground water monitoring wells with dedicated systems", Ground Water Monitoring Review, Winter 1995, pp. 116-123

SAMPLING CONTAINERS, PRESERVATION, AND HANDLING, SOP 9

1. In Section 4.1, Attachment A, "Sample Containers, Preservation, and Holding Times for Common Analytes" is referenced. This attachment lists priority pollutant metals (PPM) as one group, except for Mercury which has a different holding time. The holding time for hexavalent chromium should also be listed separately (24 hours) because it is different from most PPMs and is considered a common analyte for which analysis is requested in California.

SAMPLE CUSTODY, TRANSFER AND SHIPMENT, SOP 10

1. Section 4.2.3, Laboratory Sample Receipt and Custody Procedures - This section states that the designated sample custodian, who takes custody of the samples at the analytical laboratory, shall inspect all samples for signs of damage or tampering. This section and the Chain of Custody Record form (in Attachment B) could be improved by adding that the temperature of the samples upon receipt at the laboratory shall be noted.

DECONTAMINATION OF EQUIPMENT, SOP 11

1. In Section 5.2.3, it should be stated that detailed procedures for protecting equipment from recontamination, to be followed by field teams, will be included in site specific Field Sampling Plans.

ABANDONMENT OF BOREHOLES AND WELLS, SOP 12

1. Section 4.0, References - The fifth reference listed is McJunckin (sic). This should be corrected to "McJunkin."
2. Section 5.1.1, Review of Existing Information - This section lists recommended well construction information that should be established before attempting to perform the actual decommissioning process. However, in some cases, the information that the SOP recommends is not available or is poorly documented so that uncertainty exists for well construction specifications. Therefore, almost without exception for production wells or older monitoring wells, wells should be video logged prior to decommissioning.
3. Section 5.1.3.2, Borehole/Well Volume Calculation - The guidance notes that a "borehole or well installed in a rock formation characterized by fractures or voids" may require a greater volume of sealant than estimates (calculations) indicate should be present. It needs to be noted that MOST unconsolidated sedimentary formations will accept more sealant than is calculated to be needed.
4. Section 5.1.3.3, Requirements for Sealing Materials, Water, and Additives - The guidance lists "concrete" as being acceptable for decommissioning. This must be an oversight or error. Concrete could never be installed through a tremie pipe which is required for most applications. In addition, concrete is much too permeable to use as a sealant because the amount of cement in the mix is so minimal (e.g., 5 sack mix).
5. Section 5.1.3.3, first paragraph - The text lists a permeability of  $1 \times 10^{-10}$ . Is this a typographical error?
6. Section 5.1.3.3, second paragraph - The text states that a sand-cement mix of 2:1 sand to cement by weight may be used with seven gallons of water per sack of cement. We recommend that the maximum amount of sand used in a mix for hazardous waste site investigations be no more than a 1:1 ratio by weight with the maximum amount of water used in this formulation the same as if sand were not used which is 6.0 gallons of water per sack of cement. Well and borehole seals at hazardous waste sites require low permeability seals and a 2:1 ratio of sand to cement may be too permeable.
7. Section 5.1.3.3 - If bentonite is used in a cement formulation, it needs to be clearly stated that the bentonite must be non-beneficiated (i.e., contains no polymers or extenders). In addition, the SOP should clearly state that if bentonite is used to make a cement formulation it must be weighed to achieve the prescribed percentage in the mix.

Using volumetric quantities of bentonite to relate to a weight is unacceptable.

8. Section 5.1.3.3 - The SOP states that formulations of bentonite-cement consisting of as much as 6 percent (essentially the same as six pounds) by weight may be used. This ratio should be four to five percent.
9. Section 5.1.3.3 - "Bentonite" grout is stated in the guidance as being acceptable as a sealant. Prior to this provision being part of the guidance, the author of the draft guidance should verify that test data are available to indicate that "pure bentonite" grouts will have long-term integrity in the presence of high total dissolved solids (TDS) and/or contaminants. DTSC has not been successful in getting NL Baroid or American Colloid Products to provide data that is time tested to assure that bentonite grouts have long-term integrity; rather, both manufacturers have only insisted that their products would perform adequately. The lack of verifiable proof of integrity should preclude the use of a "pure bentonite" grout being used at hazardous waste sites.
10. Section 5.3, Borehole and Well Abandonment - A statement needs to be added to this section that specifies that "extreme" care and some specialized tools and techniques will need to be used to assure that while drilling out a well casing the drill bit does not drift off center and begin cutting a new borehole adjacent to the well being decommissioned. Some issues of concern include: controlling down pressure on the drill bit, using a stinger attachment on the end of the drill bit to guide the bit along the casing being removed, and a contingency plan that should be followed if the drill bit does drift off-center.
11. Section 5.3.1, Removal or Perforation of Casings/Well Screens - A clear statement needs to be added that, if possible, only zones of fine-grained geologic materials should be perforated so that these intervals may be sealed to minimize cross contamination.
12. Section 5.3.2, Sealing the Borehole or Wellbore - A statement is needed that indicates the emphasis of the sealing activity should be to re-establish the integrity of aquitards to that existing before the well/borehole was installed. Sealing fine-grained intervals to prevent cross contamination should be the focus of all decommissioning activities. This guidance does not seem to recognize this point.
13. Section 5.3.2.1, Boreholes Terminating Above Static Water Level - A statement needs to be added that for cement placed in boreholes less than 20 feet deep, if a tremie pipe is not

used the slurry once emplaced needs to be tamped or agitated to ensure adequate placement and to settle the sealant material and remove air.

For boreholes greater than 20 feet in depth, a tremie pipe should always be used to install sealing materials. The guidance does not mention the use of a tremie pipe in this section.

14. Section 5.3.3, Quality Control - The guidance should indicate that the well/borehole being decommissioned should be excavated and removed to a depth of approximately five feet below ground surface; the open excavation should then be backfilled with clean earthen materials. This will provide for future use of the area without having to deal with the decommissioned well bore at the surface.

#### AQUIFER TESTING, SOP 14

1. Overall the SOP is thorough. A lot of the document, however, is dedicated to methods that will be rarely, if ever, used to characterize hydraulic properties of geologic materials at sites. These are included in Constant Head Tests, Section 5.3. It should be stressed that these methods will only be appropriate in a very limited number of applications.
2. Section 5.1, Slug Tests - The SOP should stress the importance of well design and well development to slug testing, and the possibility that borehole damage such as clay smearing or mud infiltration will affect test results.
3. Page 4, Paragraph 3 - Clarify that slug-in tests are inappropriate for unconfined aquifers only when the well screen and filter pack cross the water table.
4. Section 5.1.2 - Well construction records should include evaluation of drilling method and well development procedures.
5. Figure 3 - In the confined aquifer figure, the cone of depression occurs in the potentiometric surface, not the water table as shown.
6. Page 11 - The equations given for determining pumping test discharge rates are not very useful in practice, since the radius of influence is not known prior to testing. A better rule of thumb would be to pump the well at least 10% of maximum yield based on a step-drawdown test.

7. Page 11 - In addition to tidal effects, the effects of barometric pressure changes on water levels in wells should be characterized before the pumping test.
8. Page 11 - Even when pumped water is uncontaminated, it may need to be contained to preclude infiltration that might affect test results.
9. Section 5.2.1.1 - Clarify that the drawdown of 20% of saturated thickness is applicable to unconfined aquifers only. In confined aquifers, water levels should not be lowered below the confining layer.
10. Page 13, Paragraph 1 - Discuss the placement of observation wells in two or more directions from the pumping well to characterize anisotropy in the aquifer.
11. Page 13, Paragraph 2 - The text states that six observation wells will be needed if the water table is not horizontal. The reason for this is unclear, since the water table will almost never be horizontal. The magnitude of the water table slope for which this is applicable should be clarified or the statement deleted.
12. Page 13, Paragraph 2 - In discussion of observation well depth, state that observation well in a confined aquifer should be placed at the midpoint of the screened interval of pumping well to ensure that the observation well lies along a horizontal flowpath.
13. Section 5.2.2 - Add to the equipment list: 1) a valve to regulate discharge, and 2) a barometer or barometric probe for the data logger.
14. Section 5.2.3.1 - In addition to monitoring for tidal influences, monitoring for barometric influences should be conducted prior to the pumping test.
15. Page 17, Paragraph 2 - Discharge should be monitored frequently in the beginning of the test as discharge may drop rapidly as drawdown occurs in the pumping well.

gINT SYSTEM: BOREHOLE AND WELL LOG DATA ENTRY, SOP 16

1. Add a Table of Contents.
2. Figure 2 - Add an entry for "total depth of boring".

RADIOLOGICAL SCREENING OF SOIL SAMPLES, SOP 20

1. The document should be reviewed by the Radiological Affairs Support Office of the Navy. Their prior or concurrent review of the document from the federal government and Navy perspective would alleviate much of the problem with completeness and accuracy of the document.
2. The document is somewhat disjointed organizationally, and appears to be excerpts from a more comprehensive document. There is a need to elaborate basic information that connects the procedures sections with the attachments.
3. Section 5.5.1 - Incorporate a discussion of the discriminator circuitry of the scintillation detector that may be used when radiation fields consisting of activation products and naturally occurring radioactive material could be part of the source term.
4. Section 5.5.2 - Include a description of the density of the detector surface for beta radiation measurements.
5. Section 5.7 - Specify the procedure for testing radiation anomalies in the soil with alpha or beta emitters.
6. Section 5.12 - Clarify the phrase, "check background frequently." The standard frequency for this protocol is a minimum of two documented background checks, one at the beginning and one at the end of an 8-hour shift.
7. Section 6 - Why wasn't a protocol for field soil preparation included? Is the removal of biological material and the uniformity of media size a consideration?
8. Attachment A, Section 1
  - a. The terms and formulations found in this attachment are unrelated to the procedure discussion that preceded it, i.e., there is no foundation laid in the text, and thus no continuity of thought.
  - b. Does the discussion depend on data being normally distributed?
  - c. What is the relationship between alert and action levels vs. the definitions for critical and detection levels respectively? What are the latter terms association with the power of the statistics used and (1-a) and (1-b)?
  - d. Relate the Type I and Type II Error discussions to that for Critical Level found in Section 2.2.

- e. What is the relationship between the Lower Limit of Detection and that for Minimal Detection Quantity found in Section 2.3? Is the formulation for LLD similar to Minimum Detection Level? If not how does it differ?
9. Attachment A, Section 2.1 - What is the meaning of the phrase, "... one tailed normal distribution abscissa....?"
10. Attachment A, Section 2.2 - When formulations are finalized, practical examples should be used to illustrate the effectiveness of the formulas.
11. Attachment A, Section 2.5 - The text states, "For values between the critical level and detection level, the result is statistically indeterminate." Is this statement true if nonparametric statistics are considered? What if 40% of all data points are within 90% of the (1-a) to the (1-b) values?
12. Attachment B - Clarify the manner in which  $S_b$  is calculated.
13. Attachment C - Items 6 and 8 should be documented on the survey form with indication that they were performed at the beginning and end of the work shift.
14. Attachment D, Section 2.1 - The 10% precision value indicated is for individual instruments and single measurements. What is the precision for an array of instruments used to make a single measurement? In either case, for precision within or across instruments, when the value is exceeded, are instruments taken out of service?
15. Attachment D, Section 2.2.3 - The setting, type of instrument and use of data should be described for instruments to be used, "without calibration."