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NAS PENSACOLA
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April 23, 1993

Attn: Ms. Linda Martin, code 1851
SOUTHNAVFACENGCOM
2155 Eagle Drive
North Charleston, South Carolina 29418

RE: Draft Comprehensive Sampling and Analysis Plan, Naval Air Station Pensacola, Florida
Contract # N62467-89-D-0318/036

Dear Ms. Martin:

Enclosed please find two copies of a revised Table of Contents, Section 1, and Section 5 of the Draft Comprehensive Sampling and Analysis Plan for the Naval Air Station Pensacola in Pensacola, Florida. Please replace the Table of Contents, Section 1 and Section 5 of the Draft Comprehensive Sampling and Analysis Plan previously submitted to you with these revised sections.

If you should have any questions or need any additional information regarding the plan, please do not hesitate to call me.

Sincerely,
EnSafe\Allen & Hoshall

Henry H. Beiro
Task Order Manager

Enclosure
Revised Table of Contents, Section 1 and Section 5 of the
Draft Comprehensive Sampling and Analysis Plan

cc:
Ron Joyner, NASP - 6 copies
Tom Moody, FDER - 1 copy
Waynon Johnson, NOAA - 2 copies
Lynn Griffin, FDNR - 2 copies
John Mitchell, FDNR - 1 copy
File - 1 copy

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1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, a Remedial Investigation/Feasibility Study (RI/FS) will be completed by EnSafe/Allen & Hoshall (E/A&H) at sites throughout the Naval Air Station (NAS) Pensacola in Pensacola, Florida. Several Remedial Investigation/Feasibility Study Work Plans for NAS Pensacola were completed by Ecology & Environment, Inc. and submitted to the Southern Division Naval Facilities Engineering Command (SOUTHDIV). [The sampling and analysis plan (SAP) completed for each site will be the primary document for the RI/FS investigation. The SAP will document any deviations from the previously submitted work plans and document specific sampling procedures and analytical methods to be used during the investigation. The investigative work will be performed] in accordance with the procedures in the EPA document *Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991 (SOP/QAM). A copy of the EPA SOP/QAM will be kept onsite during all field operations.

The investigations will consist of various activities depending upon the nature of the subject site and the work previously completed by Ecology & Environment, Inc. Tasks may include physical surveys, field sampling, and laboratory analysis. The physical surveys are screening tools and may consist of a preliminary air survey, radiation survey, habitat/biota survey, soil gas survey, aerial photograph reconnaissance, and a contaminant source survey. Physical surveys will be conducted at EPA Level 11 protocol where applicable. The field sampling is used to delineate the extent, nature, and/or magnitude of contamination in the selected media. Surface water, sediment, soil, groundwater and biota will be sampled and analyzed. The analytical tasks will be performed by a USEPA Contract Laboratory Program (CLP) approved laboratory. Field sampling, analytical methods, and reports will be completed at EPA Level IV protocol where applicable,

A report will be submitted to SOUTHDIV upon completion of the investigative work and will include laboratory analyses, a summary of the field activities, and the results and conclusions

of the investigations. The results will provide a basis for a human health risk assessment and/or an ecological risk assessment to be completed at the subject site.

This Comprehensive Sampling and Analysis Plan (CSAP) will provide overall guidance on sampling and analytical techniques to be used at the sites. In addition, this plan will outline proper documentation procedures for all phases of the investigations. A site-specific sampling and analysis plan (SAP) will be provided for each site to address specific techniques and concerns applicable to that site.

5.0 INSTALLING MONITORING WELLS

[The following section provides procedures for installation of temporary monitoring wells, installation of permanent monitoring wells in unconfined and confined aquifers and development of monitoring wells. Although the procedures are provided for temporary monitoring well installation, it is not anticipated that they will be used during the currently planned RI/FS investigations at NAS Pensacola. To collect representative samples for total metals analyses (e.g., unfiltered samples), proper well construction and development are essential in reducing the amount of entrained sediment in the groundwater sample. Temporary monitoring wells do not meet both of these criteria, thus causing a high bias in the detected concentrations of metals. In addition, Phase I screening has previously been conducted at most of the sites identified at NAS Pensacola by Ecology & Environment. At those sites where a Phase I screening has not been conducted, soil gas surveys with both soil gas analysis and heated headspace analysis of groundwater will be conducted before advancement of soil borings and installation of permanent monitoring wells. This approach provides for delineation of contaminant plumes and provides a more cost effective and timely investigation.]

5.1 Labelling Monitoring Wells

Temporary and permanent monitoring wells will be labelled according to site, media to be sampled, if the well is temporary and the unique well number. For example if a permanent monitoring well #4 is installed at Site 11, the monitoring well identification would be "11G04". Another example if a temporary monitoring well #79 were installed at Site 36, the monitoring well identification would be "36GR79". If the well is a previously existing well, the well number may remain the same or it may be changed to correlate with this identification system.

5.2 Drilling Methods

For a permanent monitoring well, boreholes will be advanced using hollow-stem augers with a PVC plug as outlined in Appendix E.2.1 of the EPA SOP/QAM manual. The PVC plug is

necessary to keep the augers clear while drilling in saturated soils. Mud rotary wash drilling techniques may also be used.

For a temporary monitoring well, soil borings will be advanced using manual (hand) auger drilling methods or hollow-stem auger.

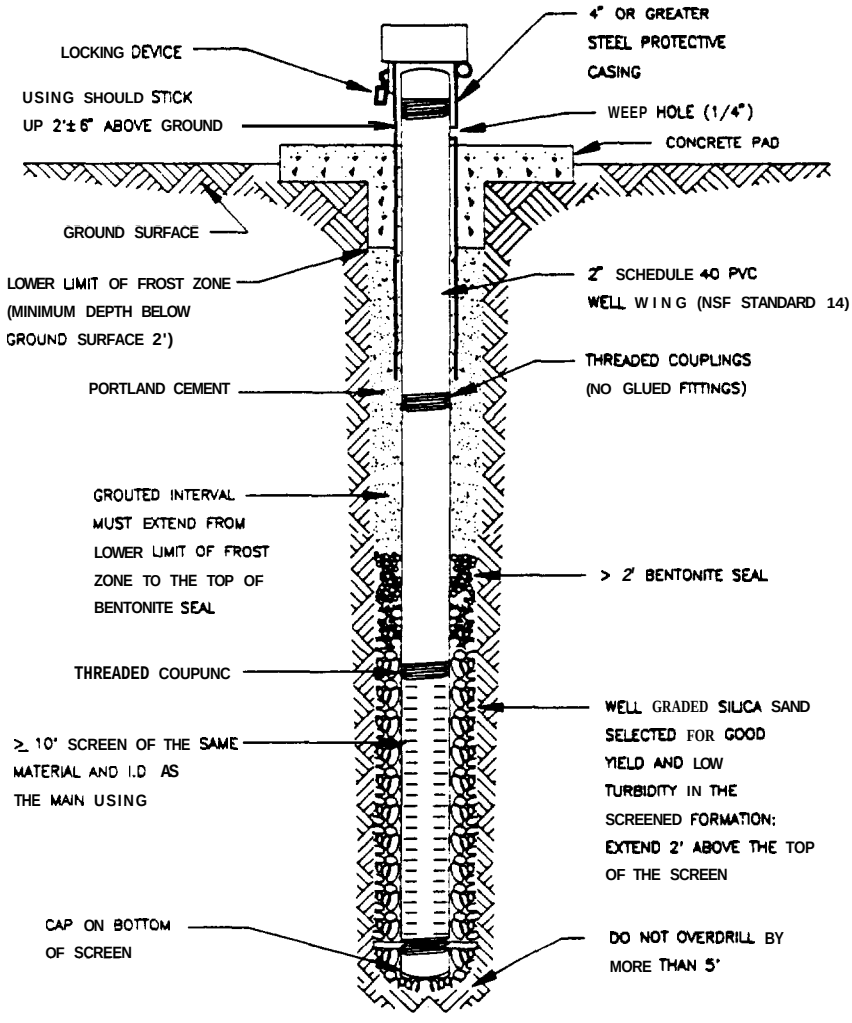
5.3 Monitoring Well Construction

All of the monitoring wells will be constructed in accordance with the Northwest Florida Water Management District regulations (Chapter 40A-3, Florida Administrative Code) and as outlined in Appendix E.4.1 and E.4.2 of the EPA SOP/QAM guidance manual with the following modifications.

- All of the monitoring wells will be constructed of 2-inch inside diameter PVC materials.
- The PVC well construction materials will meet NSF Standard 14, in addition to ASTM Schedule 40. Refer to Figures 5-1 and 5-2 for typical monitoring well construction diagrams in an unconfined aquifer and in a confined aquifer. Detailed monitoring well construction procedures are below.

1. If the well casing, tremie tubing, etc, arrive onsite with printing and/or writing on them, remove the printing with Emery cloth or sand paper before being cleaned. No solvents or hot water may be used to clean the PVC materials.
2. After installing the monitoring well, mark a point on the top of the inner casing. This point will be the reference mark for elevation measurement.
3. To reduce the risk of cross-contamination, the outer protective casings of the monitoring wells will not be painted onsite. Monitoring well construction in an unconfined aquifer and a confined aquifer will be documented on monitoring well construction logs provided in Figures 5-3 and 5-4, respectively. Detailed monitoring well construction procedures are provided below.

TYPICAL ILLUSTRATION **OF** MINIMUM SPECIFICATIONS
FOR MONITORING WELL CONSTRUCTION

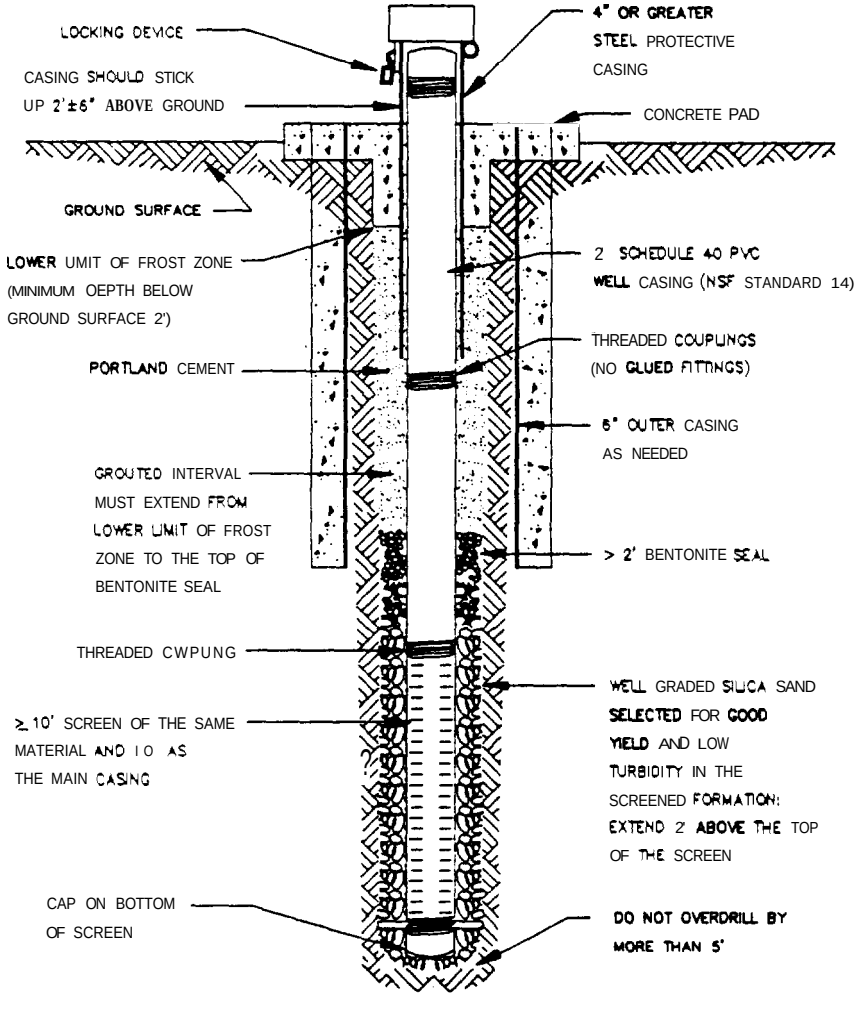


COMPREHENSIVE SAMPLING AND ANALYSIS PLAN
NAS-PENSACOLA
PENSACOLA, FLORIDA

FIGURE 5-1
UNCONFINED AQUIFER
MONITORING WELL DESIGN

DATE: 01/28/93 | DWG NAME: 048TYPE2

TYPICAL ILLUSTRATION OF MINIMUM SPECIFICATIONS
FOR MONITORING WELL CONSTRUCTION



COMPREHENSIVE SAMPLING AND ANALYSIS PLAN
NAS-PENSACOLA
PENSACOLA, FLORIDA

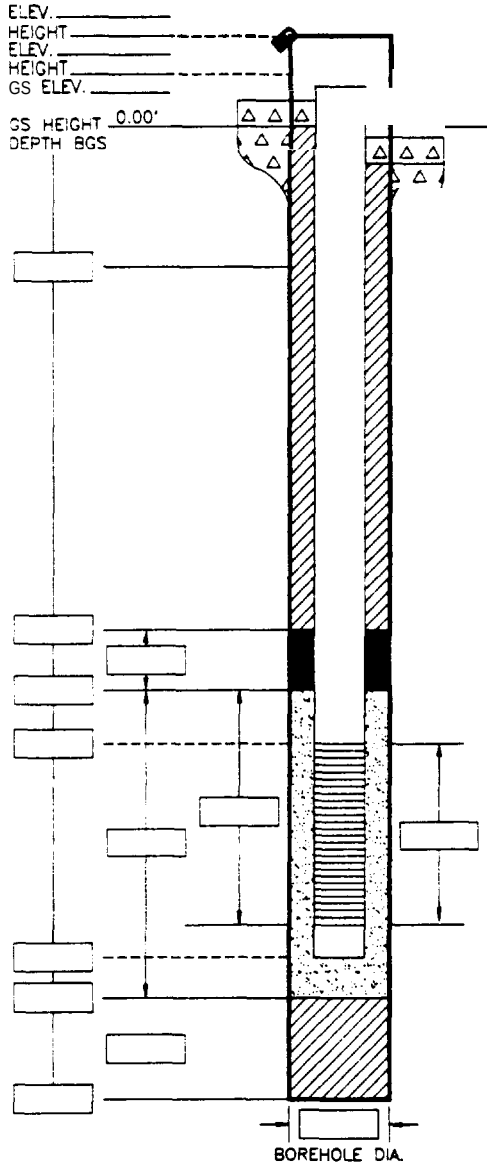
FIGURE 5-2
CONFINED AQUIFER
MONITORING WELL DESIGN

DATE: 03/30/93 | DWG NAME: 01.3MGWE

FIGURE 5-3

MONITORING WELL CONSTRUCTION LOG - UNCONFINED AQUIFER

WELL NO.:	INSTALLATION:	SITE:
PROJECT NO.:	CLIENT/PROJECT:	
DRILLER:		
GEOLOGIST:		



PROTECTIVE CSG
MATERIAL/TYPE
DIAMETER
DEPTH BGS WEEP HOLE(Y/N)

GUARD POSTS (Y/TYPE
NO.

SURFACE PAD
COMPOSITION & SIZE

RISER PIPE
TYPE
DIAMETER
TOTAL LENGTH(TOC to TOS)
VENTILATED CAP (Y/N)

GROUT
AMOUNT

TREMIED (Y/N)
INTERVAL BGS

SEAL
TYPE
MFR.
SETUP/HYDRATION TIME
VOL FLUID ADDED
TREMIED (Y/N)

FILTER PACK
TYPE
AMT. USED
TREMIED (Y/N)
MFR.
CR. SIZE DIST.

SCREEN
TYPE
DIAMETER
SLOT SIZE & TYPE

SUMP (Y/N)
INTERVAL BGS LENGTH
BOTTOM CAP (Y/N)

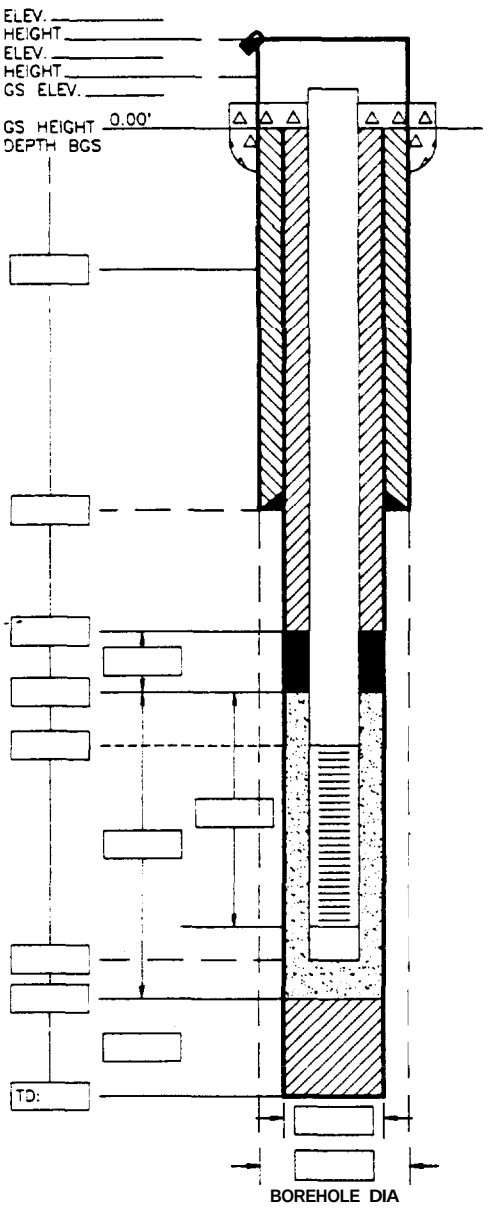
BACKFILL PLUG
MATERIAL
SETUP/HYDRATION TIME
TREMIED (Y/N)

048MWCLG

FIGURE **5-4**

MONITORING WELL CONSTRUCTION LOG - **CONFINED AQUIFER**

WELL NO.:	INSTALLATION:	SITE:
PROJECT NO.:	CLIENT/PROJECT:	
DRILLER:		
GEOLOGIST:		



PROTECTIVE CSG
MATERIAL/TYPE
DIAMETER
DEPTH BGS WEEP HOLE(Y/N)

GUARD POSTS (Y/N)
NO. TYPE

SURFACE PAD
COMPOSITION & SIZE

SURFACE CSG
TYPE
DIAMETER TOTAL LENGTH

RISER PIPE
TYPE
DIAMETER
TOTAL LENGTH(TOC to TOS)
VENTILATED CAP (Y/N)

GROUT SETUP/HYDRATION TIME
AMOUNT

TREMIED (Y/N)
INTERVAL BGS

CENTRALIZERS (Y/N)
DEPTH(s)

SEAL
TYPE
MFR.
SETUP/HYDRATION TIME
VOL. FLUID ADDED
TREMIED (Y/N)

FILTER PACK
TYPE
AMT. USED
TREMIED (Y/N)
MFR.
GR. SIZE DIST.

SCREEN
TYPE
DIAMETER
SLOT SIZE & TYPE

SUMP (Y/N)
INTERVAL BGS LENGTH
BOTTOM CAP (Y/N)

BACKFILL PLUG
MATERIAL
SETUP/HYDRATION TIME
TREMIED (Y/N)

48MWCLG1

5.3.1 Monitoring Well Installation (Unconfined Aquifers)

Before Installation:

1. Make sure area is clear of all underground and overhead utilities. Clear vegetation and debris from monitoring well site.
2. Place plastic sheeting on ground near the area to put decontaminated equipment on.

During Installation:

Drill the Hole

3. Advance the borehole to the required depth using a bit or auger flight with PVC plug of a diameter sufficient to allow for insertion of the tremie pipe when the casing is centered. The borehole should be at least 4 inches larger than the casing in diameter. Drill the hole slightly deeper than required for the combined length of casing and screen. Sound the final completion depth with a decontaminated, weighted tape before continuing well placement.
4. Condition the borehole by circulating drilling fluids (mud, water, or air), or by rotating augers without drilling until the hole is cleaned of cuttings. Remove the cuttings from the area around the auger.

Prepare the Casing

5. Prepare the casing and screen for installation. Decontaminate the casing and screen in accordance with Section 11. Do not clean the PVC casing and screen with hot water or solvent rinse.
6. Withdraw the drill rods and bit or the auger flights. (If installing casing through hollow-stem augers, skip this step. Withdraw auger flights after installing the casing.) Check the depth of the hole with a weighted surveyor's tape.
7. Hang the casing string, screen down, over or in the top of the borehole. Lower the casing string down to the bottom of the well.

Set the Casing

8. If a filter pack is required, prepare the dry sand.
9. When the casing string is set to the desired depth, hang the centered casing in place and insert the tremie pipe. There should be 2 to 3 feet of stickup once the well has been lowered to its final position, unless the wellhead is flush mounted because of its location.

Install the Filter Pack

10. Install the filter pack through the tremie pipe. Six inches or more of filter pack material must be spotted at the bottom of the hole, under the screen. Withdraw the tremie slowly so that the filter pack is placed evenly around the screen without bridging. The filter pack will be installed to at least 2 feet above the top of the screen.
11. Check the depth to the top of the filter pack with a weighted tape.
12. Do not remove the tremie pipe unless a larger diameter pipe is needed for installing the bentonite seal and grout.

Install Bentonite Seal

13. Tremie bentonite pellets (not powder) onto the top of the filter pack. Use pellets if the seal is to be seated below the water table. Granular, flake, or slurried bentonite may be used above the water table. Slowly withdraw the tremie pipe as the bentonite is added to ensure even placement of the bentonite seal around the annulus. Check the depth with a weighted tape. At least 2 feet of bentonite is required above the screen.
14. If the seal is installed above the water table, hydrate according to manufacturer's specifications.

Grout the Annular Space

15. Mix Portland cement and water to make a pumpable slurry.
16. Tremie the grout into the annulus using a side exiting tremie. Slowly withdraw the tremie pipe as the annulus fills. Grout the well to within 2 to 4 feet of the surface but

not higher than the average frost line. Note the amount of grout used in the field logbook.

17. After installing grout, dismantle and decontaminate tremie equipment. Allow adequate cure time (–24 hours) for the grout before proceeding with well development.

Construct Wellhead Pad

18. Mix and pour concrete for the wellhead pad. Concrete must extend below the frost line and to the top of grout. It may be convenient to first fill the annulus to the bottom of the pad form and then set the locking well cover or locking protective casing. After the protective casing has been installed, the remaining concrete should be poured into the pad form.
19. Finish the concrete pad so that it slopes away from the wellhead in all directions with a minimum thickness of 6 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.
20. If the well design specifies traffic barriers, dig the holes and set the barrier posts in concrete separate from the concrete pad. Posts and concrete must extend to a depth of 2 feet beneath the ground surface.

After Installation:

21. Record the appropriate construction/completion information in the field logbook and on the appropriate field log forms.
22. Return to the well site after the concrete has cured for at least 24 hours and remove the form. Drill two weep holes on opposite sides of the protective casing, just above the concrete pad.
23. Mark the well identification on the protective casing.
24. Paint the bumper guard posts.

    Note: Posts are to be painted with high visibility yellow epoxy paint AASHTO M220.

5.3.2 Monitoring Well Installation (Confined Aquifers)

Before Installation:

1. Make sure area is clear of all underground and overhead utilities and clear vegetation and debris from monitoring well site.
2. Place plastic sheeting on ground near the area to put decontaminated equipment on.

During Surface Casing Installation:

Drill the Hole

3. Using hydraulic rotary or auger techniques, advance an oversized borehole through unconsolidated surface deposits to a depth of 2 to 3 feet into the top of the confining bed. The borehole should be 4 inches larger than the casing in diameter.
4. Condition the borehole by circulating drilling fluid (mud, water, or air) or by rotating augers without drilling until the hole is cleaned of cuttings. While conditioning the borehole, prepare necessary length(s) of surface casing.

Prepare and Set the Surface Casing

(Follow these procedures for each separate aquifer that must be cased off.)

5. Pressure grout cement grout to fill the portion of the borehole in the confining bed.
6. Insert the surface casing into the borehole and push firmly into the confining bed.
7. Mix Portland cement and water to make a pumpable slurry.
8. Insert the side-exiting tremie pipe into the borehole and begin pumping or tremieing grout. Slowly withdraw the tremie pipe as the annulus fills to ensure even placement with no bridging.
9. Allow grout to cure for at least 24 hours before proceeding with well installation.

Drilling and Installation of Monitoring Well

10. After the grout has cured, continue drilling with a smaller diameter bit or auger string. Advance the borehole to the desired depth. Drill the hole a few feet deeper than

necessary to allow for cavings during casing placement. If more than one aquifer will be encountered during drilling, the well must be cased in separate stages to prevent cross-contamination.

11. Condition the borehole by circulating drilling fluid (mud, water or air) until the hole is cleaned of cuttings. Pull the drill string out of the borehole when no additional cuttings reach the surface. Check the depth of the hole with a weighted surveyor's type.

Prepare and Set the Casing String

12. Prepare the casing string in manageable sections while conditioning the borehole. Decontaminate the casing and screen in accordance with Section 11, but do not wash PVC materials with hot water or rinse them with solvents. Tighten casing joints.
13. Insert the first segment of the casing string and lower to a convenient height for adding the second casing segment.
14. Chock the casing, add the second segment, then release the chock and lower the casing. Repeat this process until the full casing string is hanging in the well.
15. Allow the casing string to hang in the well rather than sit on the bottom. Never allow casing strings with Schedule 40 PVC to sit on the bottom because the weight of the casing will significantly reduce the slot size and may cause the screen to collapse.

Install Filter Pack

16. If the well is to be completed without a filter pack, insert a decontaminated pump tube or submersible pump so that unconsolidated sediments will collapse against the screen.
17. Lower a weighted surveyor's tape to make sure that formation sands or gravels have collapsed to a distance of 2 feet or more above the top of the screen. Continue pumping until sufficient collapse has occurred. If pumping does not cause collapse, then a filter pack should be spotted at the screen as described in the next step.
18. If a filter pack is required, as is most common, prepare the dry sand or sand slurry, then proceed from the previous step listed above.

19. Insert a tremie pipe near the bottom of the screen and begin running the filter material through it. Slowly withdraw the tremie pipe so that the filter pack is placed evenly around the screen without bridging. Six inches or more of filter pack material should be spotted at the bottom of the hole, under the screen. The filter pack will be installed to at least 2 feet above the top of the screens. If the top of the screen is below the bottom of the confining layer, extend the fdter pack to the confining layer, if appropriate.
20. If the filter pack was installed dry, do not remove the tremie unless a larger diameter pipe is needed for installing the bentonite seal and grout.

Install Bentonite Seal

21. Tremie the bentonite pellets onto the top of the filter pack. Bentonite pellets will be used where the seal is installed below the water table. The bentonite seal must extend 2 feet into the confining layer, if possible. Slowly withdraw the tremie pipe as bentonite is added to ensure even placement around the casing without bridging.
22. If the bentonite seal is installed above the water table, hydrate the bentonite according to the manufacturer's specifications.

Grout the Annular Space

23. Mix Portland cement and water to make a pumpable slurry.
24. Tremie the grout into the annulus. Slowly withdraw the tremie pipe as the annulus fills to ensure even placement. Grout the well to within 2 to 4 feet of the surface but not above the average frost line.
25. After installing grout, dismantle and decontaminate the tremie equipment. Allow adequate cure time (–24 hours) before proceeding with well development.

Construct Wellhead Pad

26. Mix and pour concrete for the wellhead pad. Concrete must extend below the frost line and to the top of grout. It may be convenient to first fill the annulus to the bottom of the pad form and then set the locking well cover or locking protective casing. After the protective casing has been installed, the remaining concrete should be poured into the pad form.
27. Finish the concrete pad so that it slopes away from the wellhead in all directions, with a minimum thickness of 6 inches. If weather conditions warrant, cover the concrete until cured. Lock the well cover.
28. If the well design specifies traffic barriers, dig the holes and set the barrier posts in concrete separate from concrete pad. Posts and concrete must extend to a depth of 2 feet.

After Installation:

29. Record the appropriate construction/completion information in the field logbook and on the appropriate field logbook forms.
30. Return to the well site after the concrete has cured for at least 24 hours and remove the form. Drill two weep holes on opposite sides of the protective casing and just above the concrete pad.
31. Mark the well identification in the protective casing.
32. Paint the bumper guard posts. Note: ***Posts will be painted with high visibility yellow epoxy paint (AASHTO M220).***

5.3.3 Temporary Monitoring Well Installation (Unconfined Aquifers)

Before Installation:

1. Make sure area is clear of all underground and overhead utilities. Clear vegetation and debris from piezometer site.
2. Place plastic sheeting on ground to place equipment on.

3. If using a drill rig, align the rig to sampling location.

During Installation:

4. Hand-auger or drill with a rig to the desired depth.
5. Prepare the decontaminated screen with attached drive point for installation.
6. Drive the screen into the ground until the top of screen is approximately 1 foot above the ground surface. Keep the screen vertical while it is being driven.
7. Attach the decontaminated riser pipe segments to the screen and continue driving until the screen is at the correct depth.

After Installation:

8. Cap the riser.
9. Decontaminate the equipment in accordance with the procedures in Section 11 of this document.
10. Record construction information in the logbook.

5.4 Developing Monitoring Wells

Monitoring wells are developed after the neat cement grout in the annular space of the well has cured for at least 24 hours. Development is needed to restore the normal hydrologic conditions of the geologic formation near the borehole. Monitoring wells can be developed using various techniques such as bailing, surging and bailing, or surging and pumping. *Before* development and *after* development procedures apply to surging, bailing, and pumping. Monitoring well development will proceed until the water withdrawn is relatively free of turbidity based on the geology of the area and pH, temperature, and specific conductivity have stabilized.

Before Development:

1. Don personal protective clothing and equipment as required in the site-specific HASP.
2. Cover the ground surface around the well with clean plastic sheeting to contain any spilled development water.
3. Open the well cover and check the condition of the wellhead.
4. Measure the depth to static water level with an electronic water level indicator.
5. Prepare the necessary equipment for development to be performed in accordance with the EPA SOP/QAM.

During Development:

Wells may be developed by bailing, surging and bailing, or surging and pumping. These techniques are discussed separately but may be used separately or in combination.

Surging:

1. Attach rope or PVC rod to a surge block.
2. Lower the surge block into the monitoring well with the rope or rods.
3. Raise and lower the surge block so that groundwater will be surged in and out of the monitoring well screen.
4. Continue for approximately 10 to 15 minutes.
5. Remove the surge block from the well for decontamination.

Bailing:

1. Assemble and lower the decontaminated bailer into the monitoring well and begin bailing.
2. Continue until the groundwater withdrawn is below 0.5 milliliters per liter (ml/L) of settleable solids in 15 minutes using an Imhoff Cone or as free of turbidity as possible given the subsurface conditions.

3. The new monitoring well shall be developed until the column of water is as free of visible turbidity as possible given the subsurface conditions, and the pH, temperature, and specific conductivity have stabilized.

Pumping:

1. Prepare the decontaminated pump and tubing, and lower it into the well.
2. Begin pumping the well.
3. If the productivity of the monitoring well is low, it will be alternately pumped then left idle to allow for recovery. The on-site geologist will determine when development is complete based on normal development criteria.
4. Continue well development until the groundwater withdrawn is below 0.5 milliliters per liter (ml/L) of settleable solids in 15 minutes using an Imhoff Cone, or as free of turbidity as possible given the subsurface conditions and the pH, temperature, and specific conductivity have stabilized.

After Development:

1. Groundwater withdrawn from the monitoring wells during development will be placed in 55-gallon drums for future disposal by the Navy.
2. Remove development equipment from the monitoring well and decontaminate (if required) in accordance with Section 11 of this CSAP.
3. Lock the well cover before leaving the site.
4. Record all pertinent information in the field logbook.