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NAS CECIL FIELD
5090.3a

PHASE VII WELL ABANDONMENT WORK PLAN NAS CECIL FIELD FL
1/11/2012
TETRA TECH

**Phase VII Well Abandonment Work Plan
Former Naval Air Station Cecil Field
Jacksonville, Florida
January 11, 2012**

During Phase VII Well Abandonment activities, a total of 43 wells, all monitoring wells, that are no longer required as part of environmental activities at NAS Cecil Field will be abandoned. Attachment A presents the locations of wells to be abandoned, and Table 1 lists well identification numbers, total depths, and coordinates for these wells. Photographs will be taken to document the locations of these wells, including any evidence (broken casing, etc.) that wells were present in these areas. Wells associated with the BP Wells Underground Storage Tank (UST) site have already been abandoned during an effort on October 26, 2011, in order to allow for demolition activities at the site. These wells are included in this plan for completeness.

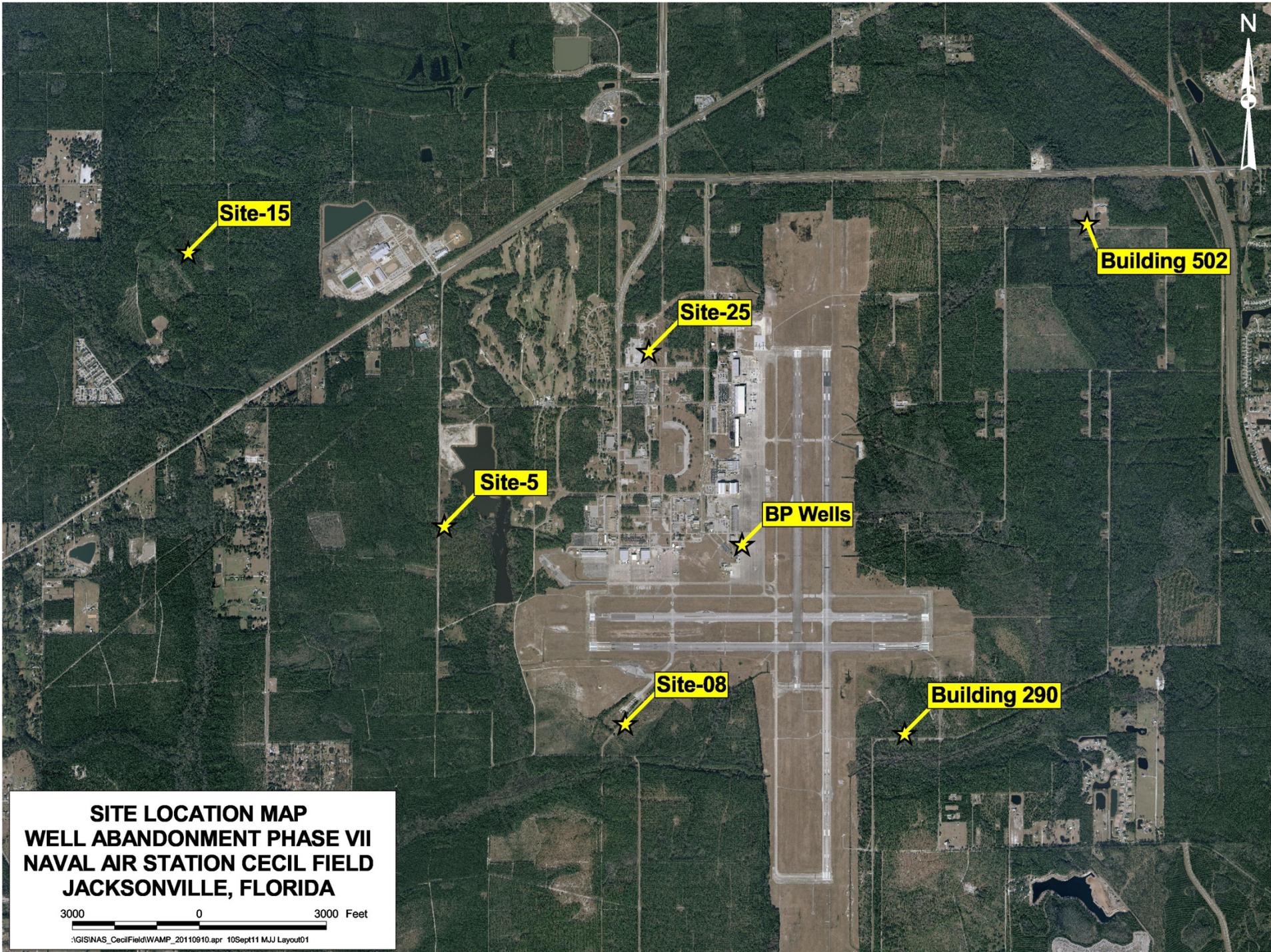
Tasks involved in the proposed well abandonment activities include:

- Confirmation of total depth of well prior to grouting
 - Maximum well depth is 92 feet bgs (CEF-008-20D)
- Backfilling of wells from the bottom up to the ground surface with cement/bentonite grout using a tremie pipe (positive displacement)
- Removal and disposal of concrete pads, well vault, protective casings, and barrier posts
- Restoration of the well location to its original condition with similar material including grass, gravel, asphalt, or concrete
- Completion of a Tetra Tech Well Abandonment Form for each well abandoned

Well abandonment activities will be conducted in accordance with Tetra Tech's SOP GH-2.9, Well Abandonment (attached), and the U.S. EPA Design and Installation of Monitoring Wells Guidance (February 2008). A Well Abandonment Form must be completed for each well to serve as an internal record of the abandonment and for measurement and payment of the driller. Field personnel must confirm quantities (footages abandoned, demolition, and restoration) with the driller after each well and at the end of each day. Copies of the completed Well Abandonment Forms must be sent to the Pittsburgh office daily during abandonment activities.

If a well to be abandoned crosses a confining unit, extra care is required to ensure that the well cannot act as a conduit for contamination migration from the ground surface to the water table or between aquifers. For these wells, the well casings will be removed and the annulus will be pressure grouted with positive displacement. If the casing cannot be removed, the borehole will be pressure grouted in place.

Personal protective equipment and other waste trash will not be considered hazardous and will be disposed of in a municipal landfill. Such trash will be collected in a plastic bag and disposed of in a suitable trash receptacle.



**SITE LOCATION MAP
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

3000 0 3000 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout01

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



CEF-005-07S



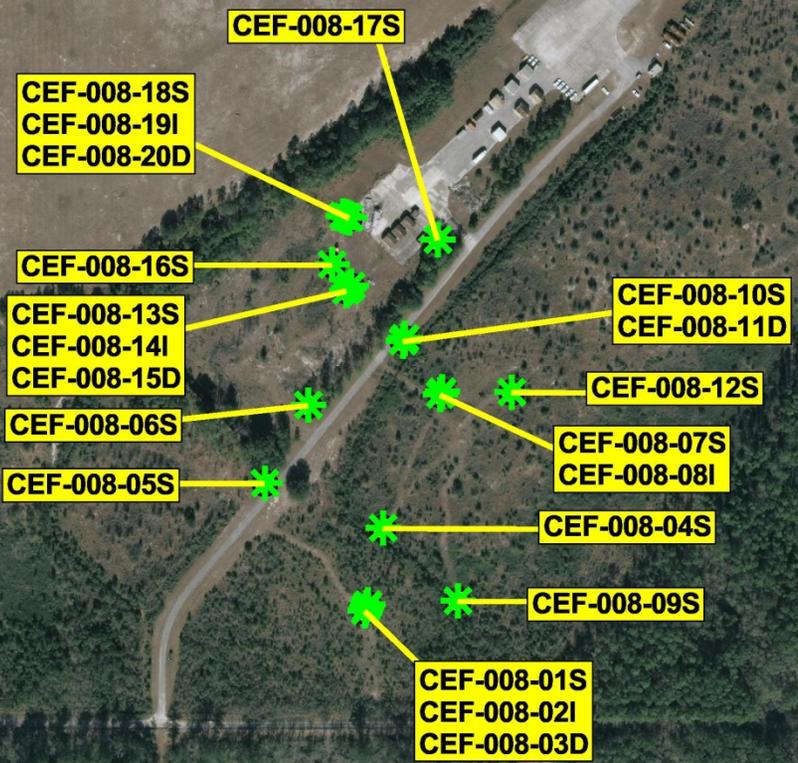
**SITE 5
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

500 0 500 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout06

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



**SITE 8
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**



IGISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout03

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



CEF-015-17S



**SITE 15
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

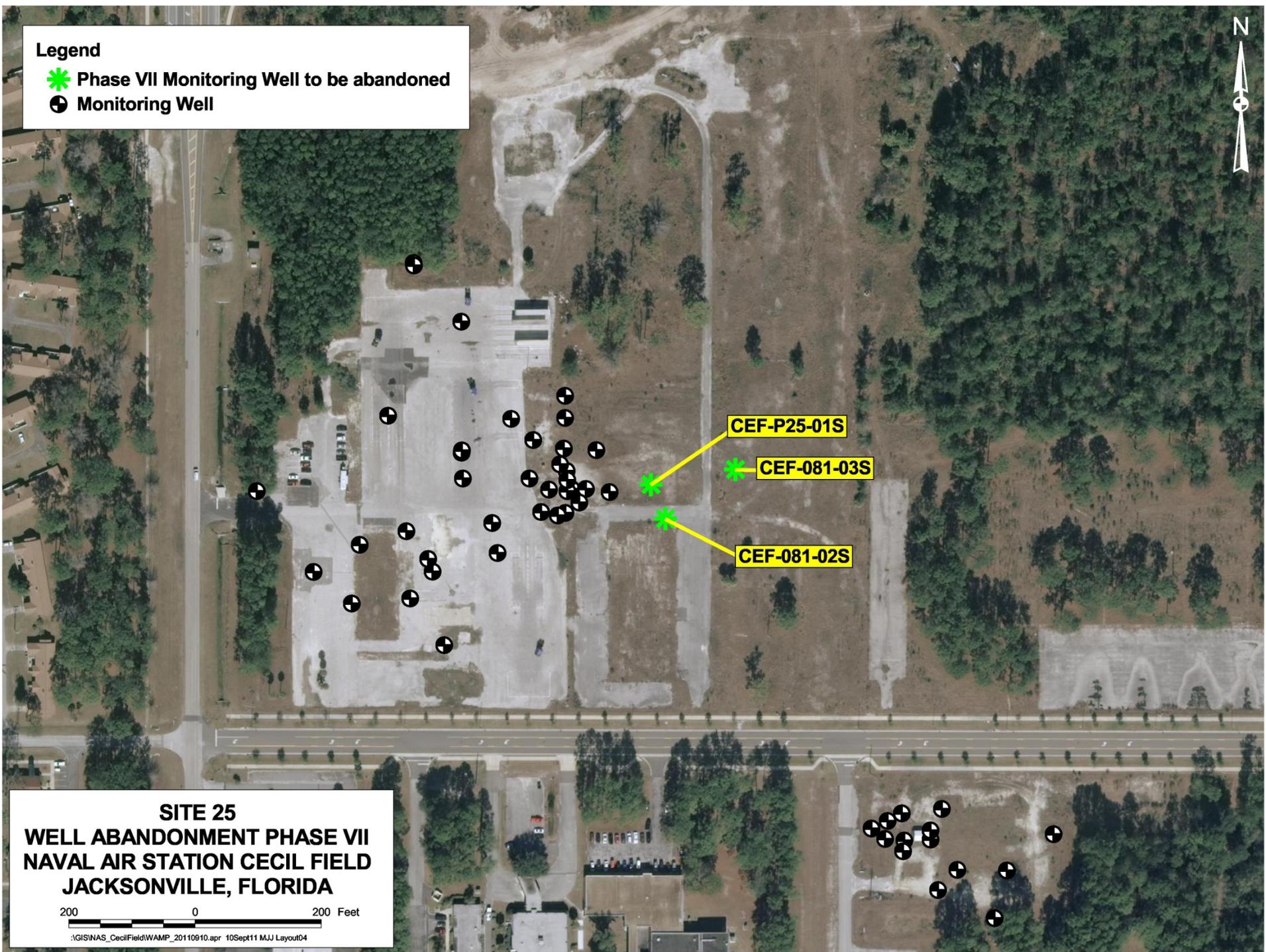
500 0 500 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout02



Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



CEF-P25-01S

CEF-081-03S

CEF-081-02S

**SITE 25
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

200 0 200 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout04

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



CEF-290A-03S



**BUILDING 290
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

200 0 200 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout05

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



CEP-502-6S
CEP-502-7D
CEP-502-4S
CEP-502-3S
CEP-502-9S
CEP-502-8S

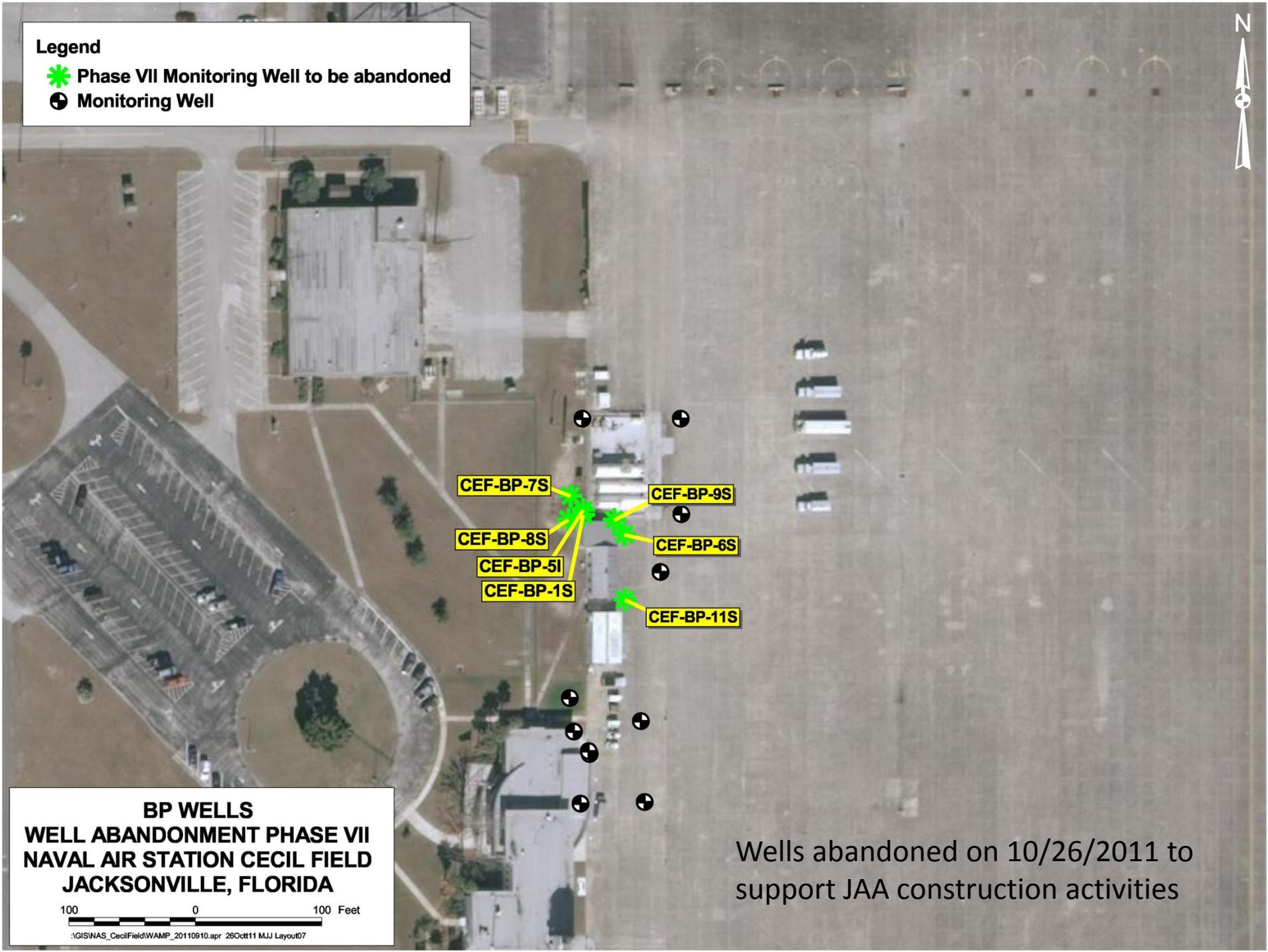
**BUILDING 502
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

200 0 200 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 10Sept11 MJJ Layout06

Legend

-  Phase VII Monitoring Well to be abandoned
-  Monitoring Well



**BP WELLS
WELL ABANDONMENT PHASE VII
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

100 0 100 Feet

:GISINAS_CecilFieldWAMP_20110910.apr 26Oct11 MJJ Layout07

Wells abandoned on 10/26/2011 to support JAA construction activities

TABLE 1
PHASE VII - WELL ABANDONMENT WORK PLAN
JACKSONVILLE, FLORIDA
PAGE 1 OF 1

Site	Well_ID (CEF-)	Type	Depth	Florida State Plane NAD 83 (feet)		UTM NAD 83 Zone 17 (meters)		UTM NAD 27 Zone 17 (meters)	
				X	Y	X	Y	X	Y
Site 5	CEF-005-07S	MW	14.0	371013.40	2142463.74				
Site 8	CEF-008-01S	MW	14.0	375251.63	2137125.33				
	CEF-008-02I	MW	50.0	375248.65	2137119.04				
	CEF-008-03D	MW	89.0	375245.46	2137112.73				
	CEF-008-04S	MW	13.0	375283.59	2137286.56				
	CEF-008-05S	MW	14.0	375035.96	2137380.82				
	CEF-008-06S	MW	14.0	375126.92	2137544.26				
	CEF-008-07S	MW	14.0	375408.25	2137572.16				
	CEF-008-08I	MW	65.0	375404.22	2137566.31				
	CEF-008-09S	MW	20.0	375440.80	2137133.43				
	CEF-008-10S	MW	13.0	375329.66	2137684.49				
	CEF-008-11D	MW	82.0	375325.95	2137678.59				
	CEF-008-12S	MW	25.0	375553.77	2137571.39				
	CEF-008-13S	MW	14.0	375216.45	2137794.37				
	CEF-008-14I	MW	50.0	375211.72	2137789.64				
	CEF-008-15D	MW	85.0	375207.01	2137784.27				
	CEF-008-16S	MW	13.0	375176.34	2137839.49				
	CEF-008-17S	MW	20.0	375399.13	2137891.86				
CEF-008-18S	MW	13.0	375199.98	2137941.85					
CEF-008-19I	MW	50.0	375206.64	2137939.78					
CEF-008-20D	MW	92.0	375212.76	2137937.61					
Site 15	CEF-015-17S	MW	13.0	365413.56	2148155.09				
Site 25	CEF-081-02S	MW	15.0	375965.15	2146360.93				
	CEF-081-03S	MW	15.0	376075.89	2146438.73				
	CEF-P25-01S	MW	12.0	375942.20	2146414.54				
Bldg 290	CEF-290A-03S	MW	15.0	381960.33	2137396.93				
Bldg 502	CEF-502-3S	MW	14.0	386253.92	2149395.71				
	CEF-502-4S	MW	14.0	386209.80	2149439.67				
	CEF-502-6S	MW	14.0	386252.03	2149464.74				
	CEF-502-7D	MW	30.0	386250.54	2149448.80				
	CEF-502-8S	MW	13.0	386296.10	2149411.41				
CEF-502-9S	MW	13.0	386279.35	2149455.21					
BP Wells	CEF-BP-1S	MW	15.0	378077.59	2141835.85				
	CEF-BP-5I	MW	35.0	378077.79	2141839.72				
	CEF-BP-6S	MW	15.0	378110.15	2141820.31				
	CEF-BP-7S	MW	15.0	378067.70	2141850.70				
	CEF-BP-8S	MW	15.0	378065.97	2141832.07				
	CEF-BP-9S	MW	15.0	378102.14	2141831.75				
	CEF-BP-11S	MW	15.0	378110.67	2141768.88				
	CEF-BP-2S	MW	15.0	378076.80	2141911.99				
	CEF-BP-3S	MW	15.0	378154.67	2141912.08				
	CEF-BP-4S	MW	15.0	378155.04	2141836.51				
CEF-BP-10S	MW	15.0	378138.58	2141790.85					



TETRA TECH

STANDARD OPERATING PROCEDURES

Number GH-2.9	Page 1 of 5
Effective Date 01/2012	Revision 3
Applicability Tetra Tech, Inc.	
Prepared Earth Sciences Department	
Approved J. Zimmerly	

Subject
WELL ABANDONMENT

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1.0 PURPOSE

Well abandonment is that procedure by which any monitoring well is permanently closed. Abandonment procedures are designed to prevent fluids from entering or migrating within the monitoring well. Therefore, an abandoned monitoring well must be sealed in such a manner that it can not act as a conduit for migration of contaminants from the ground surface to the water table or between aquifers.

It is important that the appropriate state or local agency be notified of monitoring well abandonment. The application of and adherence to this SOP must be tailored to applicable state, local, and Federal regulatory requirements.

2.0 SCOPE

The methods described in this procedure shall be used for all projects requiring well abandonment where specific state, local, or Federal regulations are unavailable. An abandoned well shall be filled and sealed so that it will not act as a pathway for the interchange of water between the surface and subsurface or present a hazard to the environment.

3.0 GLOSSARY

Well - Any constructed access point to an aquifer, confined or unconfined, including, but not limited to, test borings, hydropunch holes, monitoring points, and production wells.

Abandon - To permanently discontinue the use of a well. Any well shall require abandonment when it is no longer serving as a monitoring point or is in such a state of disrepair that continued use for the purpose of obtaining groundwater is impracticable, or when it has been permanently disconnected from any water supply system or irrigation system.

4.0 RESPONSIBILITIES

Project Manager - It shall be the responsibility of the Project Manager and/or Project Hydrogeologist to determine the applicability of well abandonment, based on the established scope and objective of the project and program-specific requirements. It shall be the responsibility of the Project Manager (or designee) to ensure that the procedures established for well abandonment are thoroughly specified and/or referenced in the relevant project planning documents. It shall be the responsibility of the Project Manager to ensure that the Field Operations Leader is familiar with the proper procedures for well abandonment and confirm the supervising project geologist or the subcontractor performing the well abandonment are qualified to perform such activities.

Field Operations Leader (FOL) - It shall be the responsibility of the Field Operations Leader to ensure that all field technicians and/or drilling personnel are thoroughly familiar with this Standard Operating Procedure. It shall be the responsibility of the FOL to ensure that the procedures identified in this SOP are used during well abandonment.

5.0 PROCEDURES

5.1 General

Well abandonment is warranted when the project team has reason to believe, on the basis of local conditions, that the well is causing or is a potential source of pollution to an aquifer; is a production well that is producing water that is polluted; or does not have a certificate of potability, if required. Wells may

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also be abandoned once their designed purposes have been fulfilled and are determined to no longer be of use.

Well abandonment is conducted to eliminate physical hazards, prevent groundwater contamination, prevent intermixing of aquifer waters, and conserve aquifer yield and hydrostatic head.

Please note Federal, state, and local regulations concerning this activity may vary. Therefore, applicable regulatory requirements should be reviewed to determine the need for Licensed/Certified Well Drillers to complete/oversight this activity.

5.2 Material for Sealing

Acceptable sealing materials include concrete, portland cement grout, sodium-base bentonite clay, or combinations of these materials. These materials are defined as follows:

- Concrete may be used for filling the upper part of a well or water bearing formation, or plugging short sections of casing and filling large diameter wells.
- Portland cement grout is superior for sealing small openings, penetrating any annular space outside the casing, and for filling voids in the surrounding formation. Portland cement grout shall be composed of one bag of Type I cement per 6 to 8 gallons of water. Two parts sand to one part cement may be added.
- Bentonite clay, when applied as a heavy mud-laden fluid under pressure, has most of the advantages of cement grout, but under some conditions may be carried away into the surrounding formation. A bentonite clay mixture shall be composed of not less than 2 pounds of clay per gallon of water. Bentonite clay may not be used where it will come in contact with water of a pH below 5.0 or total dissolved solids (TDS) content greater than 1,000 mg/L or both. Bentonite may also be added to cement grout to add flexibility.

Fill materials include clay, silt, sand, gravel, crushed stone, or a mixtures of these materials may be used as a filler in sealing a well when used in conjunction with the sealing materials described above. Organic material may not be used and fill material may be required to be disinfected or certified clean prior to use. Spent drilling muds or drill cuttings are not to be used to seal a well.

5.3 Procedures for Sealing Wells

5.3.1 Preliminary Considerations

Several factors should be considered to determine the appropriate well abandonment method. These factors include:

- Conditions of the well.
- Details of well construction, including casing material, diameter of casing, depth of well, and well plumbness.
- Obstructions within the well that may interfere with filling or sealing.
- Hydrogeologic setting.
- Level of contamination and the zone or zones where it occurs.
- Regulatory requirements.

Degraded wells may not permit casing removal by pulling. Also, the casing material may dictate whether a casing can be removed intact. Stainless steel will have a higher tensile strength than PVC and may

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hold together while pulling the casing; PVC well casing may break under pulling and may need to be overdrilled to remove it. The depth of the well and well plumbness may limit casing removal depending on whether a casing is pulled or overdrilled. In some cases, casings can be left in-place if they are properly filled with appropriate backfill.

The formation lithology influences the selection of casing removal. Unconsolidated materials can be drilled with hollow-stem augering techniques whereas consolidated materials cannot. Unconsolidated materials may also cave-in during well casing removal.

5.3.2 Filling and Sealing Procedures

Drilled wells (all wells not dug) shall be filled with sealing material or a combination of sealing material and fill material.

In some cases, well casing removal is necessary for well abandonment. If the borehole is unstable and may cave-in, sealing material will be emplaced simultaneously during casing removal. If the well is not grouted, casing may be pulled with hydraulic jacks or a drilling rig. It may also be pulled by sandlocking. Sandlocking consists of lowering a pipe wrapped with burlap approximately 2/3 of the well depth and filling the burlap wrap with sand. The pipe is slowly lifted and locks the sand, pulling the casing. Well casings can also be removed by overdrilling. Wells can be overdrilled with larger diameter hollow stem or solid stem augers or direct rotary techniques, using air or mud. Augers used for overdrilling should be at least 2 inches larger in diameter than the diameter of the well casing.

If well casing is in poor condition or is grouted in place, the casing may be ripped or perforated and filled and pressure grouted in place.

Abandoned wells shall be filled with the appropriate filling and sealing material placed from the bottom of the well upward. When Portland cement grout or concrete is used, it shall be placed in continuous operation using a tremie pipe. Sealing material shall be placed in the interval or intervals to be sealed by methods that prevent free fall, dilution, and/or separation of aggregates from cementing material.

A well constructed in unconsolidated material in an unconfined groundwater zone shall be filled and sealed by placing fill material in the well to the level of the water table, and filling the remainder of the well with sealing material. If the water table is at a depth greater than 40 feet, a minimum of 40 feet of sealing material shall be required.

A well which penetrates several aquifers or formations shall be filled and sealed in such a way as to prevent the vertical movement of water from one aquifer or formation to another. If the casing has been removed, sealing material shall be placed opposite the confining formations and from the surface down to the first confining formation. Sand and other suitable fill material may be placed opposite the producing aquifer. Ideally, the entire well can be filled with sealing material. If the casing has not been removed, the entire well shall be fill with sealing material.

A well penetrating creviced or cavernous rock shall be filled using coarse fill material opposite the cavernous or creviced rock portions of the well. Sealing material shall extend from the top of the unfractured rock portion of the well or base of the casing, whichever is deeper, to the surface. The minimum depth of sealing material may not be less than 10 feet.

In the case where wells penetrate specific aquifers where conditions necessitate the sealing of specific aquifers or formations, the annular space in the area of the specific aquifer or formation shall be sealed during the abandonment of the well.

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A dug well exceeding 24 inches in diameter shall be filled and sealed by placing fill material (excluding clay or silt) in the well to a level approximately 5 feet below the land surface, and placing a 3 foot plug of sealing material above the fill. The remainder of the well shall be back filled with soil material.

6.0 REFERENCES

Maryland Department of the Environment (MDE Regulations); Title 26, Subtitle 04; Regulation of Water Supply, Sewage Disposal, and Solid Waste; Chapter 4--Well Construction.

U.S. EPA, February 1990. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells.