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NAS CECIL FIELD, FL
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WORK PLAN ADDENDUM 25 REVISION 2 MUNITIONS RESPONSE AND EXCAVATION OF
CONTAMINATED SOIL AT OPERABLE UNIT 5 (OU 5) SITE 15 BLUE 10 ORDNANCE
DISPOSAL AREA NAS CECIL FIELD FL

4/8/2008
CH2MHILL



WORK PLAN REVISION

REVISION NO: 02

PROJECT NAME:	Former Naval Air Station (NAS) Cecil Field, Jacksonville, Florida	CTO NO:	0063
SITE/TASK:	Soil Stabilization Field Study at Site 15, Blue 10 Ordnance Disposal Area	WORK PLAN DATE:	February 2008
WORK PLAN NAME:	Munitions Response and Excavation of Contaminated Soil at Site 15, Blue 10 Ordnance Disposal Area, Former Naval Air Station Cecil Field, Jacksonville, Florida	DATE OF REVISION	April 08, 2008
REVISION PREPARED BY:	Jeffery Marks		

Modifications/Revisions:

Item No.	Description of Modifications/Revisions
001	<p>CTO No. 0063 Work Plan Addendum No. 25, Revision 00 is being revised to include the procedures necessary to conduct a soil solidification/stabilization (S/S) field study using lead-contaminated soil while implementing Munitions and Explosives of Concern (MEC) avoidance support procedures at Site 15, Blue 10 Ordnance Disposal Area (Site 15). Site 15 is located in the southwest section of Yellow Water Weapons Area at Former NAS Cecil Field, Jacksonville, Florida. From the early 1940s through the mid 1950s, Site 15 was used as a skeet range. The former skeet range was approximately 1,000 feet by 2,400 feet in size. From the mid 1960's through 1977, Site 15 was used for ordnance disposal. This operation consisted of burning ordnance materials in a large metal chamber and static firing of rockets. The ordnance disposal structures were located west of the skeet range. The majority of ordnance disposed of at the site was burned and included small arms munitions up to 20 millimeters in size, parachute and distress flares, Mark IV signal cartridges, rocket igniters, cartridge activated devices, 2.75-inch rockets, and 5-inch rockets. Rocket propellant was reportedly placed on the ground and ignited in the area of the burn chamber. An estimated 350 tons of ordnance was disposed of at the site while in operation.</p> <p>In March 2007, CH2M HILL conducted in-situ soil disposal characterization sampling utilizing MEC avoidance. One composite sample was collected per approximate 300 tons and submitted for laboratory analyses. 8,093 cubic yards (cy) (12,140 tons) of soil is proposed as non-hazardous and 3,760 cy (5,640 tons) of soil is proposed as hazardous.</p> <p>From November 2007 through April 2008, CH2M HILL conducted screening-level, batch ("jar") tests in the laboratory to evaluate the effectiveness of S/S for treatment of lead-contaminated soil from Site 15. Effectiveness was judged as reduction of lead in Toxicity Characteristic Leaching Procedure (TCLP) leachate to a concentration less than the regulatory level. Different S/S reagents and doses (reagent/soil mix ratios) were tested with the objective of identifying cost-effective S/S treatment parameters.</p> <p>Soil samples were collected from four site locations expected to exhibit elevated lead concentrations and TCLP results exceeding the regulatory level. The locations sampled were Areas L, B, Q, and N. It is believed that physical soil characteristics are largely comparable across the site. The samples were placed in plastic buckets and shipped to CH2M HILL's Applied Sciences Laboratory in Corvallis, Oregon for testing. Final test results are shown in Table 1.</p> <p>Because of the numerous possible reagents and combinations, and in an attempt to control cost, the study was conducted in phases starting with screening of simple S/S options, and then proceeding with confirmation testing of the most-promising options. The simplest S/S treatment options employ a single reagent. Portland cement (PC) is probably the most widely used reagent for S/S of metals-bearing wastes, and has the advantages of being widely available and having a relatively consistent composition. Other byproduct generic reagents, such as fly ash, cement kiln dust (CKD), and lime kiln dust (LKD), may have a lower unit price than PC if they are readily available near the site, but often require higher mix ratios; consequently, their actual cost may not be lower than PC. Proprietary S/S compounds are usually more expensive than generic S/S reagents. Commercial phosphate compounds have been shown to be effective for stabilizing lead-contaminated wastes, are readily available, and may be relatively inexpensive. For these reasons, PC and a commercially-available phosphate compound were selected for preliminary screening.</p>

001 (cont.)	<p>Upon receipt at the lab, each soil sample was thoroughly mixed (independently) to create, to the degree practical, a homogeneous sample. All of the soil samples were generally sandy, and no screening, sorting, or removal of oversized rocks or debris was performed. Aliquots of the homogenized samples were analyzed for the following characterization parameters: total lead (Pb), moisture content, pH, and TCLP lead (Pb) and arsenic (As).</p> <p>All soil S/S jar tests were performed using the same basic procedure. Before beginning tests using dry reagents such as PC, a brief pre-test experiment was conducted to determine how much water was required, if any, to hydrate the reagent without producing any free (“bleed”) water. The basic S/S jar test procedure was as follows:</p> <ol style="list-style-type: none"> 1. For each test, transfer a 500-gram (as-received moisture content) aliquot of soil to a 1-Liter plastic beaker. 2. Add the desired reagent dose to each beaker and the amount of water, if any, determined from the pre-test. 3. Thoroughly mix the beaker contents using a clean stainless steel spoon or spatula. 4. Allow to stand, uncovered, at room temperature for 3 days to set/cure. Note: the cure time was extended to 7 days for Phase 3 testing, to ensure adequate time for complete curing. 5. Re-mix and collect aliquots from each test beaker for analysis of TCLP-Pb and -As. In selected tests, also collected aliquots for evaluation of free water by the paint filter test. (Note: TCLP-As and paint filter test analyses were omitted in later tests, after it was shown that these tests were not needed). <p>S/S jar testing was conducted in three phases. In Phase 1, simple S/S options were screened based on testing of one representative soil sample exhibiting an intermediate TCLP-Pb concentration. In Phases 2 and 3, the better-performing S/S options were tested on other soil samples with the intent of confirming an effective reagent dose.</p> <p>S/S Laboratory Testing Results</p> <p><u>Phase 1 Screening.</u> In Phase 1 testing, conducted on Area Q soil, 5% and 10% PC reduced TCLP-Pb to concentrations less than the TCLP regulatory level of 5.0 milligrams per liter (mg/L), and 10% PC was more effective than 5% PC. Triple super phosphate (TSP) achieved the same TCLP-Pb reduction as 5% PC. Surprisingly, 15% PC was ineffective in reducing the TCLP-Pb concentration. TCLP-As concentrations were less than the analytical reporting limit and regulatory level for all treatments, similar to the untreated results. No free water was produced in the paint filter test in any of the treatments.</p> <p>The apparent discrepancy in effectiveness between the different PC doses can probably be explained by an intricacy of the TCLP test method. The TCLP method specifies the use of one of two extraction fluids. Extraction fluid #1 consists of acetic acid, water, and sodium hydroxide, and has a pH of 4.93. Extraction fluid #2 consists of acetic acid and water only, and has a pH of 2.88. The appropriate extraction fluid for use in the extraction procedure is determined by adding reagent water and a specified amount of hydrochloric acid (HCl) to the sample (with mixing and heating). If the resulting pH is <5.0, extraction fluid #1 is used, whereas if the pH is >5.0, extraction fluid #2 is used. Since PC is an alkaline material comprised principally by calcium oxide, it is reasonable to expect that using a higher dose of PC will cause the sample to be more resistant to pH depression by HCl, and therefore be more likely to require use of extraction fluid #2 in the TCLP test. In fact, that is exactly what happened in Phase 1 testing: the 5% and 10% PC treatments allowed the use of extraction fluid #1 in the TCLP extraction, while the 15% PC test required the use of the more aggressive extraction fluid #2 in the TCLP extraction, yielding poorer apparent treatment effectiveness. The conundrum of this intricacy of the TCLP method is that it, in effect, imposes a “penalty” for using a more rigorous reagent dose for S/S treatment.</p> <p><u>Phase 2 Confirmation Testing.</u> Based on the Phase 1 results, 10% PC was selected as the most-promising S/S reagent and dose for use in Phase 2 testing. In Phase 2, 10% PC was applied to all three of the soils that exhibited untreated TCLP-Pb concentrations greater than the regulatory level (Areas B, Q, and N). 15% PC was also tested for the two soils with higher untreated TCLP-Pb concentrations (Areas Q and N).</p>
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In this round of testing, 10% PC was not effective at reducing TCLP-Pb to concentrations below the regulatory level for any of the three soils tested. Unlike Phase 1, all of the treated Phase 2 samples required the use of extraction fluid #2 in the TCLP extraction. Thus, comparison of the Phase 1 and 2 results for the 10% PC dose support the explanation suggested above, that the lower-pH extraction fluid #2 is more aggressive at leaching higher amounts of Pb from the soil than extraction fluid #1. In Phase 2, 15% PC effectively reduced TCLP-Pb to concentrations below the analytical reporting limit and regulatory level in both soils for which this dose was tested. It is unclear why 15% PC was effective for Area Q soil in Phase 2 but not in Phase 1.

As in Phase 1, TCLP-As concentrations were again below the analytical reporting limit and regulatory level for all soils tested, and no free water was produced in the paint filter test for any of the tests.

Phase 3 Repeat Confirmation Testing. Because of the contradictory results obtained in Phases 1 and 2, Phase 3 testing was added to see if the good results obtained using 15% PC in Phase 2 could be replicated. In Phase 3 testing, 15% PC was applied to all three soils exhibiting untreated TCLP-Pb concentrations greater than the regulatory level (Areas B, Q, and N).

In Phase 3 testing, 15% PC was effective for Area Q soil (TCLP-Pb less than reporting limit and regulatory level), moderately effective for Area N soil (TCLP-Pb = 4.2 mg/L, slightly less than the regulatory level), and not effective for Area B soil (TCLP-Pb = 6.3 mg/L, slightly greater than the regulatory level).

TABLE 1
S/S Test Results

Test ID	Soil Location	Amendment and Dose	TCLP-Pb [mg/L]		TCLP-As [mg/L]		Paint Filter Test [mL free liquid]
Untreated	Area B	None	7.7	*	1.0	U*	
Untreated	Area Q	None	18.1	*	1.0	U*	
Untreated	Area N	None	33.5	*	1.0	U*	
Phase 1							
CF-SS-1.1	Area Q	PC, 5%	2.6	*	1.0	U*	0
CF-SS-1.2	Area Q	PC, 10%	1.0	U*	1.0	U*	0
CF-SS-1.3	Area Q	PC, 15%	13		1.0	U	0
CF-SS-1.4	Area Q	TSP, 4 mole P/mole Pb	2.6		1.0	U	0
Phase 2							
CF-SS-2.1	Area B	PC, 10%	11.9		1.0	U	0
CF-SS-2.2	Area Q	PC, 10%	24.3		1.0	U	0
CF-SS-2.3	Area Q	PC, 15%	1.0	U	1.0	U	0
CF-SS-2.4	Area N	PC, 10%	10.8		1.0	U	0
CF-SS-2.5	Area N	PC, 15%	1.0	U	1.0	U	0
Phase 3							
CF-SS-3.1	Area B	PC, 15%	6.3				
CF-SS-3.2	Area Q	PC, 15%	1.0	U			
CF-SS-3.3	Area N	PC, 15%	4.2				

Note: U = Undetected*

The laboratory S/S testing produced results that were variable in terms of effectiveness. In some cases, the variation is explainable (e.g., the use of different TCLP extraction fluids), while in others the cause of the variation is unclear, but might be related to sample heterogeneity and/or the presence of lead-metal (Pb⁰) particles. That said, treatment with a 15% PC dose produced favorable results in most of the jar tests performed. If this remedial technology is to be pursued further, a PC dose of 15% or higher is proposed, and field testing is strongly recommended before attempting to implement the process at full-scale. Higher PC doses would be expected to eventually counteract the leaching effects of the low-pH extraction fluid #2, although the use of higher doses would reduce cost-effectiveness.

Following are the recommended S/S field testing procedures:

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S/S Field Testing Procedures

1. MEC Avoidance Procedures

MEC avoidance support procedures will be conducted concurrently while collecting any necessary samples required for the S/S field study. Procedures to implement MEC avoidance support will include:

- Prior to field testing, the Unexploded Ordnance (UXO) Technician III will conduct a reconnaissance of the sample area.
- The access route to and the field test locations will be visually checked for Material Potentially Presenting an Explosive Hazard (MPPEH).
- The access route to the field test locations will be checked for anomalies utilizing a magnetometer or equivalent, and the route will be clearly marked with pin flags and/or marking tape. All anomalies will be treated as MPPEH.
- The identification of MPPEH (including anomalies) will require that the route to, and/or field test locations be changed.
- MPPEH (including anomalies) locations will be recorded, flagged and reported to the Project Manager.
- The access route at a minimum will be twice the width of the widest vehicle; and the field study boundaries will be clearly marked to prevent personnel from straying into non-cleared areas. If surface MEC is encountered, the UXO III Technician will mark the location and divert the approach path around the MPPEH (including anomalies).
- All team members will conduct '3R' training (recognize, retreat, report) prior to site activities.
- UXO Technician III will accompany the field testing team for all field test activities.
- Contact with MPPEH is PROHIBITED.

2. Field Testing Procedures

Six locations are proposed for field testing based on the waste characterization results collected in March 2007 and the screening-level, batch ("jar") tests in the laboratory to represent the different lead concentrations found in the soil at Site 15. The locations are proposed for field tests with a 15% Type I-II PC mix to reconfirm the favorable results obtained during the laboratory study and 20% Type I-II PC mix in the event that the 15% mixture field tests exhibit some of the variable results obtained in the laboratory study and to confirm that a higher PC dose would counteract the leaching effects of the low-pH extraction fluid #2. The locations and mix ratios are shown in Table 2 and on Figure 1 through 6.

TABLE 2
Test Locations/Mix Ratios

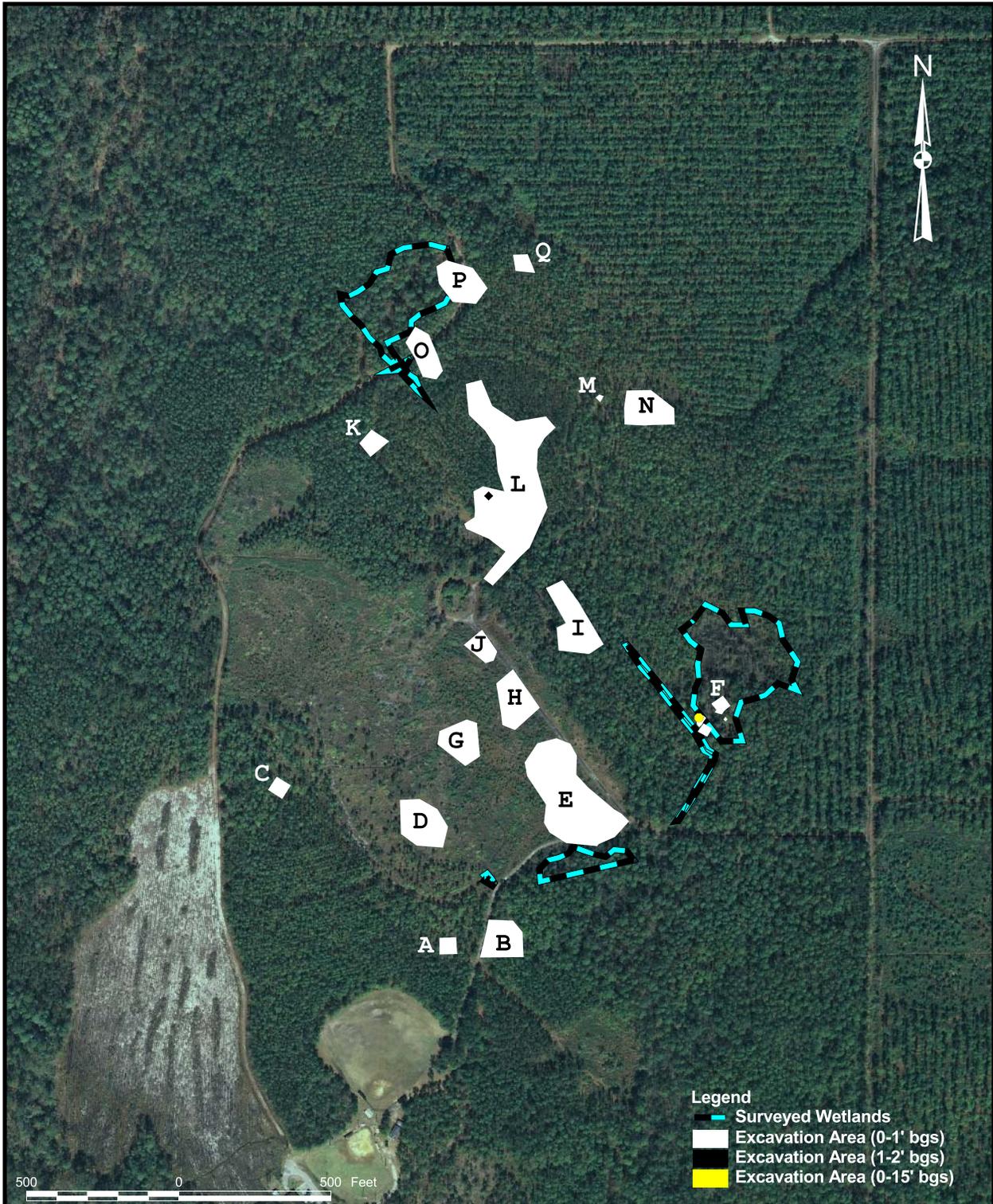
Test Location	March 2007 TCLP-Pb (mg/L)	Mix Ratio
B-01	8.62	15%, 20%
C-01	9.26	15%, 20%
L-03	15.8	15%, 20%
L-11	33.1	15%, 20%
N-01	22.1	15%, 20%
Q-01	6.97	15%, 20%

Note: Test location is "Excavation Area"- "Zone" and, locations are shown on Figures 1-6.

001 (cont.)	<p>One cy will be excavated from each of the proposed test locations using a John Deere 310 Backhoe (or equivalent) and stockpiled in plastic containers. The selected PC mix will be added to the excavated soil. Using a bulk density of 1.269 tons per cy for PC and an assumed bulk density of 1.5 tons per cy for soil, 450 pounds of PC will be added to the soil for the 15% mixtures and 600 pounds of PC will be added to the soil for the 20% mixtures. Using the added water per PC ratio of 0.3 that was used during the laboratory study, 16.3 gallons of water will be added to the 15% mixtures and 21.6 gallons of water will be added to the 20% mixtures to allow for proper hydration. The mixture will be combined until a visual inspection shows that the soil, reagent, and water have formed a homogeneous mixture. The mix will then be covered to prevent additional water from being added to the mix in case of a rain event. A curing time of 6 days will be allowed for proper reaction of the reagent and the soil prior to confirmation sampling.</p> <p>3. Confirmation Sampling</p> <p>One representative sample from each stockpile will be collected prior to testing and following testing and submitted to an approved laboratory for the analyses of TCLP Lead by U.S. Environmental Protection Agency (EPA) Method 1311/6010A. TCLP results will be compared to the regulatory level to evaluate S/S field testing effectiveness.</p> <p>4. Reporting</p> <p>After completion of the work described above, a technical memorandum report will be prepared summarizing the test materials, methods, results, conclusions, and recommendations.</p>
Reasons for the Modifications/Revisions:	
Item No.	Reasons for the Modifications/Revisions
001	This revision is prepared to summarize the results of the laboratory S/S screening-level, batch ("jar") tests, and outline the procedures for S/S field tests to confirm and verify the laboratory results prior to full-scale implementation.

Jeffery D. Marks CTO Project Manager	 Signature	04/08/2008 Date
Michael D. Halil Deputy Program Manager	 Signature	04/08/2008 Date
U.S. Navy Responsible Authority	Signature	Date

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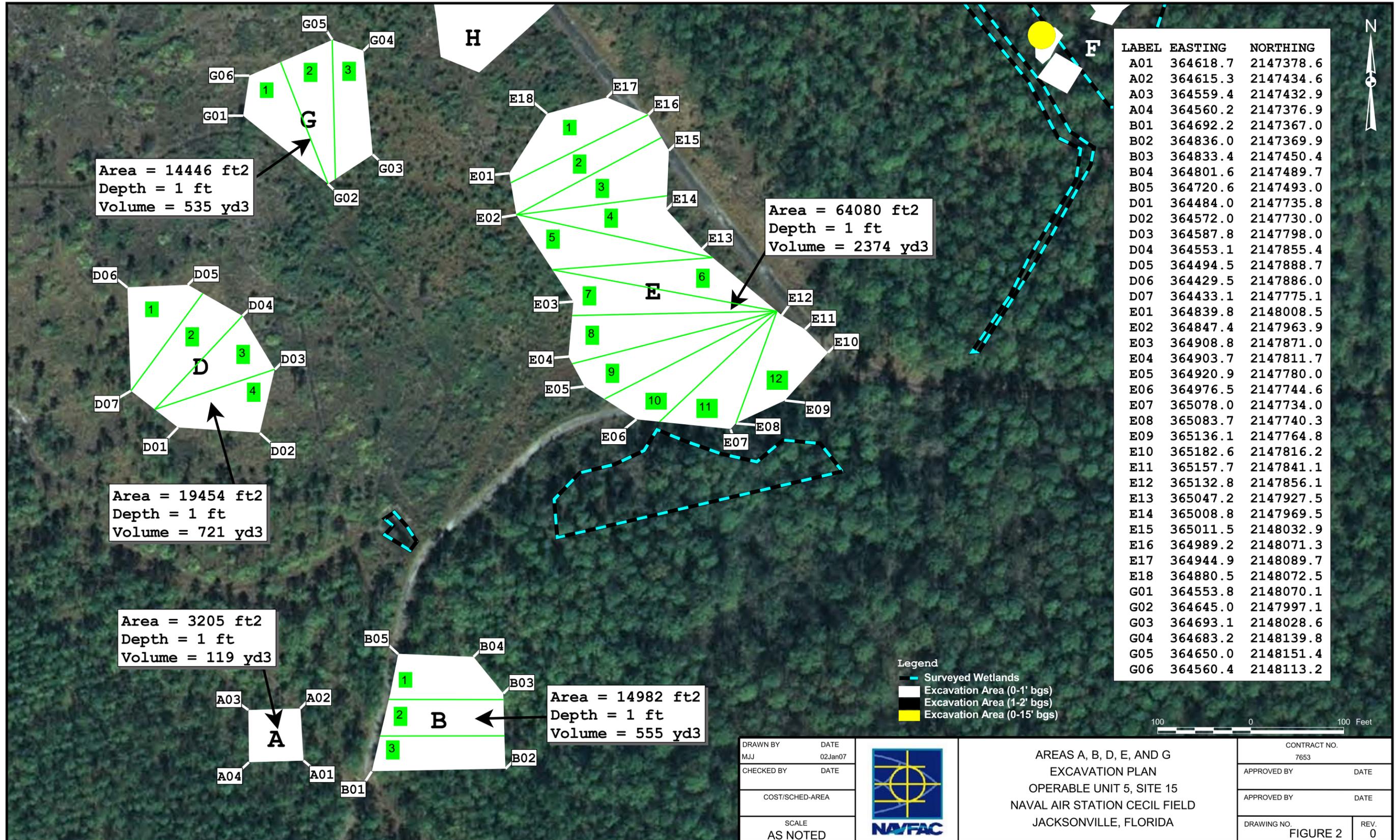


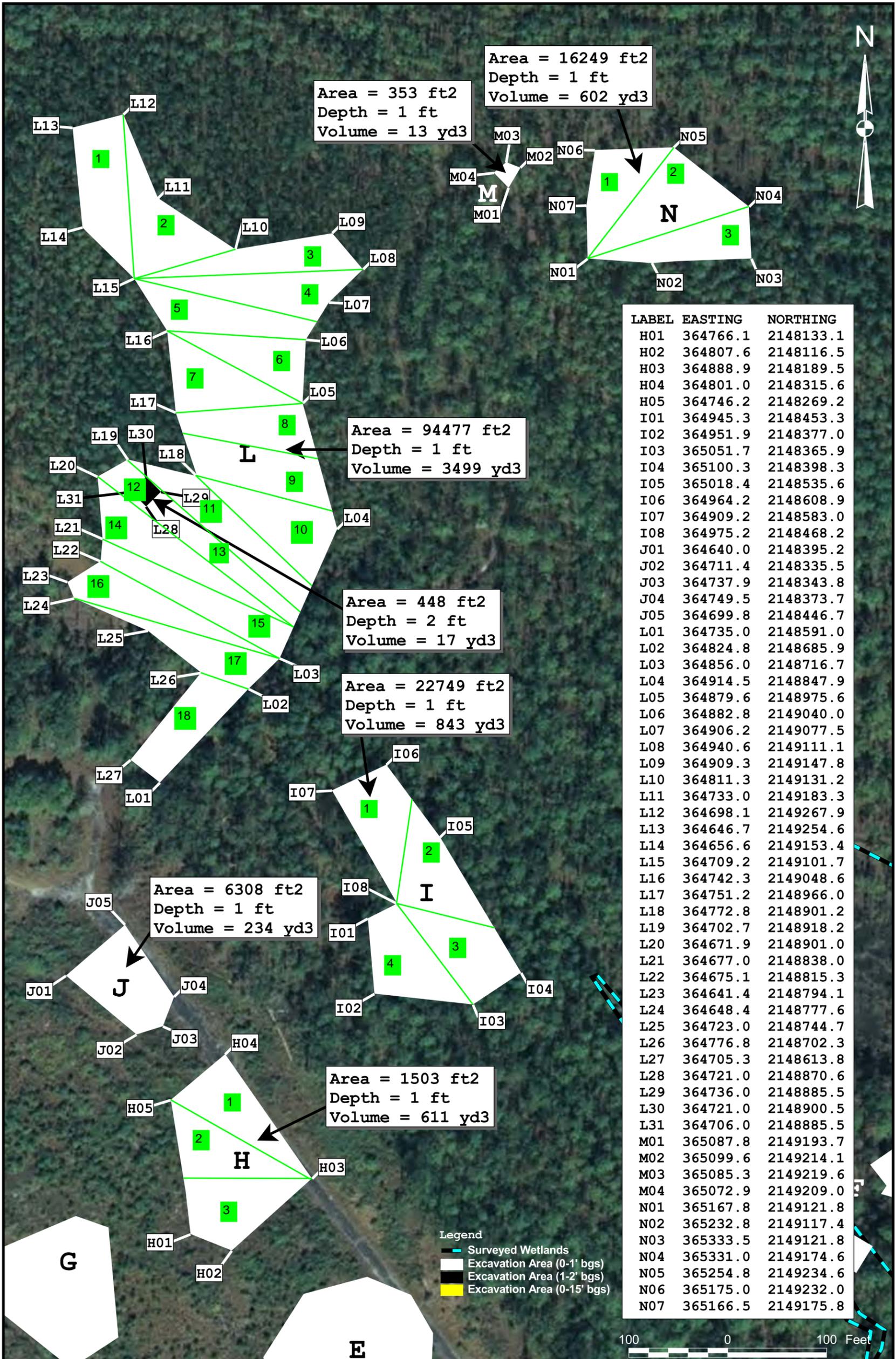
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SCALE AS NOTED	



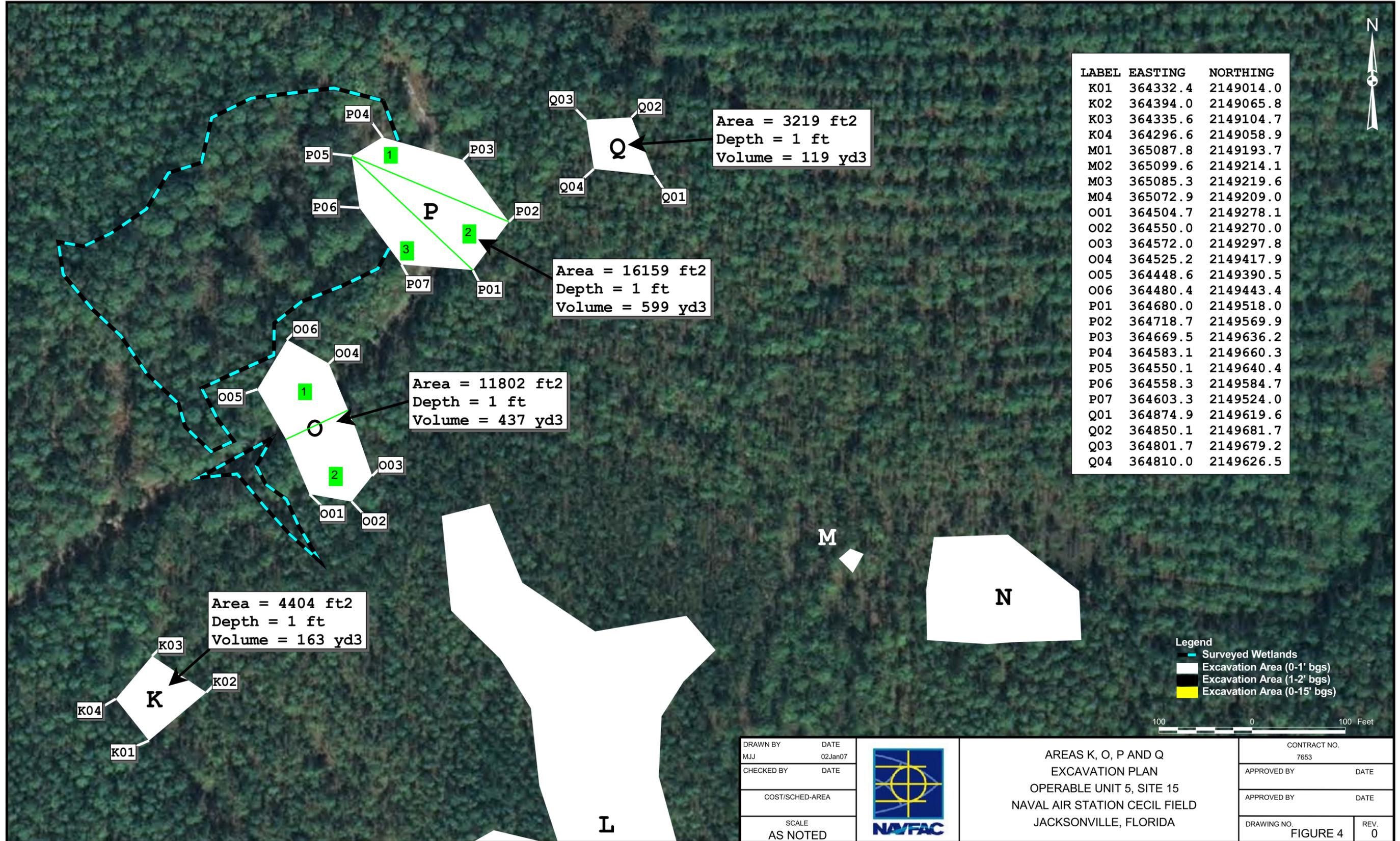
EXCAVATION PLAN
 OPERABLE UNIT 5, SITE 15
 NAVAL AIR STATION CECIL FIELD
 JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7653	
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DRAWING NO. FIGURE 1	REV 0





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COST/SCHEDULE-AREA				APPROVED BY	DATE
SCALE AS NOTED				DRAWING NO. FIGURE 3	REV 0



LABEL	EASTING	NORTHING
K01	364332.4	2149014.0
K02	364394.0	2149065.8
K03	364335.6	2149104.7
K04	364296.6	2149058.9
M01	365087.8	2149193.7
M02	365099.6	2149214.1
M03	365085.3	2149219.6
M04	365072.9	2149209.0
O01	364504.7	2149278.1
O02	364550.0	2149270.0
O03	364572.0	2149297.8
O04	364525.2	2149417.9
O05	364448.6	2149390.5
O06	364480.4	2149443.4
P01	364680.0	2149518.0
P02	364718.7	2149569.9
P03	364669.5	2149636.2
P04	364583.1	2149660.3
P05	364550.1	2149640.4
P06	364558.3	2149584.7
P07	364603.3	2149524.0
Q01	364874.9	2149619.6
Q02	364850.1	2149681.7
Q03	364801.7	2149679.2
Q04	364810.0	2149626.5

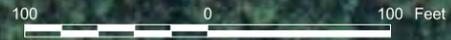
Area = 4404 ft²
 Depth = 1 ft
 Volume = 163 yd³

Area = 11802 ft²
 Depth = 1 ft
 Volume = 437 yd³

Area = 16159 ft²
 Depth = 1 ft
 Volume = 599 yd³

Area = 3219 ft²
 Depth = 1 ft
 Volume = 119 yd³

Legend
 Surveied Wetlands
 Excavation Area (0-1' bgs)
 Excavation Area (1-2' bgs)
 Excavation Area (0-15' bgs)



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SCALE AS NOTED	



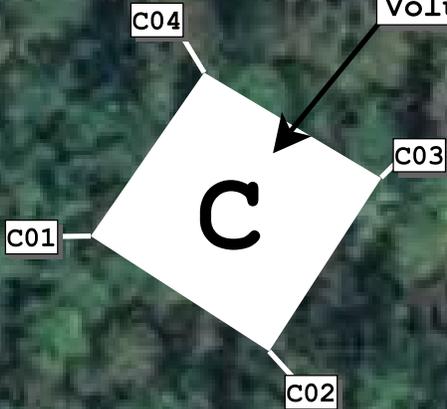
AREAS K, O, P AND Q
 EXCAVATION PLAN
 OPERABLE UNIT 5, SITE 15
 NAVAL AIR STATION CECIL FIELD
 JACKSONVILLE, FLORIDA

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LABEL	EASTING	NORTHING
C01	363995.5	2147919.8
C02	364042.2	2147889.6
C03	364071.6	2147935.0
C04	364025.3	2147962.6



Area = 2904 ft²
 Depth = 1 ft
 Volume = 108 yd³



- Legend**
- Surveyed Wetlands
 - Excavation Area (0-1' bgs)
 - Excavation Area (1-2' bgs)
 - Excavation Area (0-15' bgs)

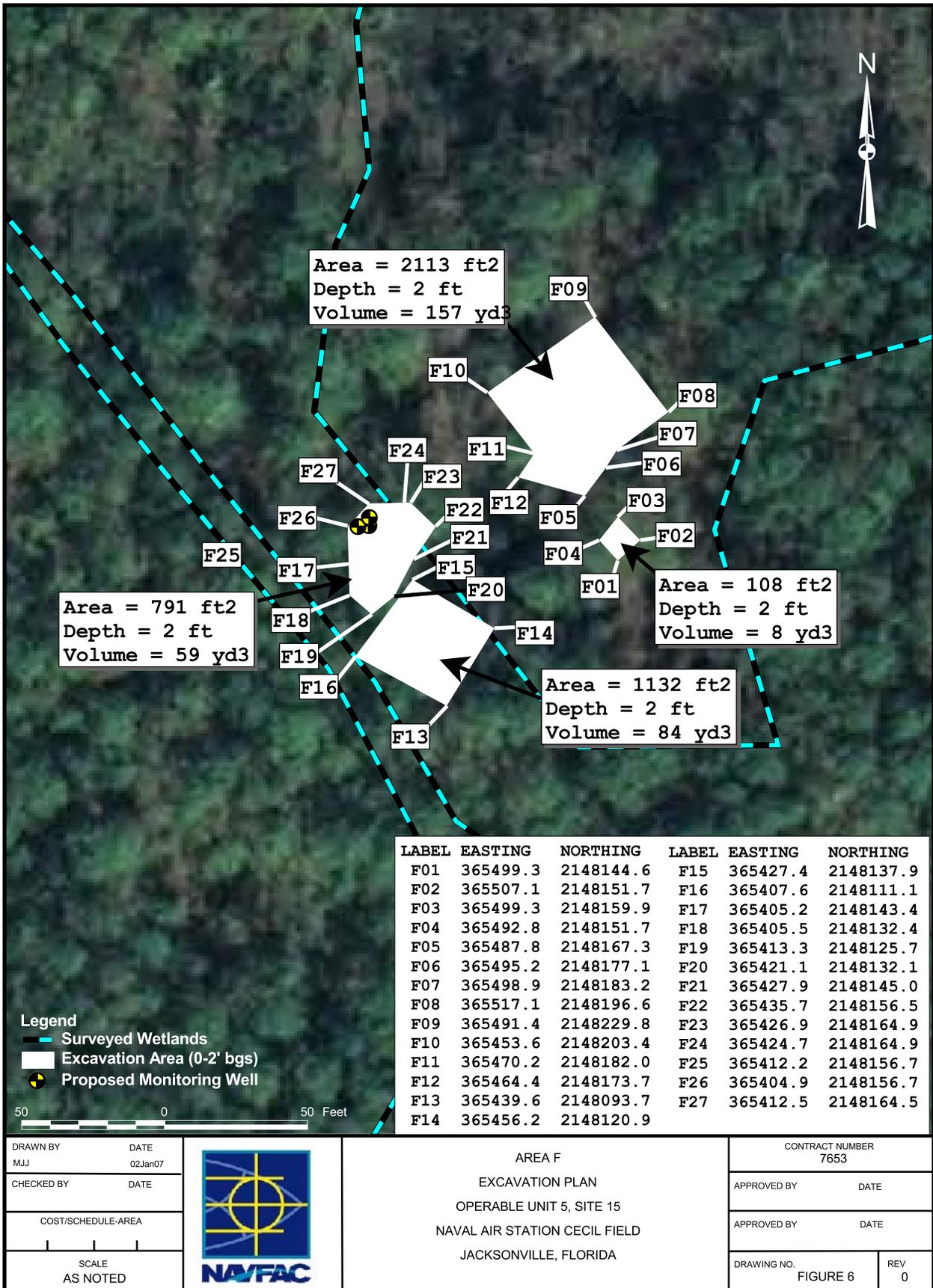


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AREA C
 EXCAVATION PLAN
 OPERABLE UNIT 5, SITE 15
 NAVAL AIR STATION CECIL FIELD
 JACKSONVILLE, FLORIDA

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SCALE AS NOTED	



AREA F
EXCAVATION PLAN
OPERABLE UNIT 5, SITE 15
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7653	
APPROVED BY	DATE
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DRAWING NO. FIGURE 6	REV 0