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NSWC PANAMA CITY

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Mr. John Winters  
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2600 Blair Stone Road, Office 471F  
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Tallahassee, FL 32301

Reference: CLEAN Contract No. N62467-04-D-0055  
Contract Task Order No. 0038

Subject: Responses to University of Florida Comments on the RFI Addendum for AOC 1 and SWMUs 3, 9, and 10 Revision 02 Naval Support Activity Panama City

Dear Mr. Winters:

On behalf of Mr. Bill Gates, please find the enclosed (1) Responses to Comments concerning the Resource Conservation and Recovery Act Facility Investigation Addendum (RFI Addendum) for Area of Concern 1 and Solid Waste Management Units 3, 9, and 10, Revision 02, Naval Support Activity for Panama City, Florida, (2) attachments to the Responses to Comments, and (3) the RFI Addendum change pages. A courtesy copy of these materials is also being provided to Dr. Steve Roberts at the University of Florida to expedite the review process.

Please contact me at (412) 921-8615 (email: [Tom.Johnston@tetrattech.com](mailto:Tom.Johnston@tetrattech.com)) or Dr. Jennifer Choich at (412) 921-8083 (email: [Jennifer.Choich@tetrattech.com](mailto:Jennifer.Choich@tetrattech.com)) regarding any questions you may have pertaining to the enclosed materials. These materials are being provided in hardcopy format (enclosed with a hardcopy of this letter), were also distributed via electronic mail yesterday, and have been posted to the IR Collaboration Gateway.

Sincerely,

Tom Johnston, Ph.D.  
Task Order Manager

TEJ/jc

cc: Mr. William Gates, NAVFAC SE (1 copy of letter and enclosure) ✓  
Mr. Michael Clayton, NSA PC (1 copy of letter and enclosure)  
Ms. Debra Humbert, Tetra Tech (1 copy of letter)  
Mr. Mark Perry (1 copy of letter and enclosure)  
Mr. Arturo McDonald, NSA PC (1 copy of letter and enclosure)  
Dr. Steve Roberts, University of Florida (1 copy of letter and enclosure)  
Dr. Jennifer Choich, Tetra Tech (1 copy of letter only)  
Dr. Tom Johnston, Tetra Tech (1 copy of letter and enclosure)  
File Copy – CTO 0038 (1 copy of letter and enclosure)

**RESPONSES TO UNIVERSITY OF FLORIDA COMMENTS DATED MARCH 3, 2008 CONCERNING THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION ADDENDUM FOR AREA OF CONCERN (AOC) 1 AND SOLID WASTE MANAGEMENT UNITS (SWMU) 3, 9, AND 10, REVISION 02, NAVAL SUPPORT ACTIVITY (NSA) PANAMA CITY, PANAMA CITY, FLORIDA (APRIL 22, 2008)**

**SWMU 3 General Comment**

The original RFI in 1996 found excess cancer risk to transients (trespassers) from exposure to soil to be greater than  $10^{-6}$ , due primarily to arsenic and PAHs. Future adult and child residents were also calculated to have excess cancer risks above  $10^{-6}$  from exposure to soil and to surface water. The conceptual model was revised in the Addendum and only transients are addressed. There are a number of comments related to this re-evaluation.

**SWMU 3 Specific Comment 1**

The exposure frequency for the transients was decreased from 100 days per year to 26 days per year. The exposure duration was also decreased from 11 or 24 years (for adolescent and adult transients, respectively) to 3 years. No clear rationale for the change in exposure frequency is stated. We agree that 100 days per year may be a little high, but 26 days per year appears too low. Transients could come from the base or from the Marina campground. The Marina is stated to limit campers to 60 days, so that could be proposed as a site-specific exposure frequency [assuming that the 60-day limit is per year and not per stay, which is not clear in the Addendum]. Alternatively, an exposure frequency of 45 days per year could be justified as being consistent with EPA Region 4 guidance. Either would be a better choice than 26 days per year, in our opinion. The reduction in exposure duration to 3 years is explained as reflecting "... the maximum expected tenure of a person at NSA Panama City who could be considered a transient." We are unsure what this means. It seems to suggest that base residents who might visit SWMU3 would be there at most for three years. If so, the basis for this contention needs to be explained. Even if this is true, SWMU3 is also accessible to campers, and we see no reason why their visits to the area would be limited to three years.

**SWMU 3 Specific Response 1**

The exposure frequency and exposure duration for the transient are based on unbiased discussions with base personnel but with an emphasis of erring on the conservative side to ensure that risks are not underestimated as a result of incorrect exposure assumptions. Upon further reflection, NSA PC environmental personnel have concluded that campground visitors

are not the most likely SMWU 3 visitors. The campground is well removed (about 0.5 miles) from SMWU 3 which means that exposure to SMWU 3 would not occur frequently for campsite visitors. The marina at the campground also has a beach which is a much more attractive recreational area to campers. NSA PC base workers could visit SMWU 3 but there are no facilities at SMWU 3 that require or encourage periodic visits. SWMU 3 is not mowed or maintained in other ways so there is no risk of maintenance worker exposure to contaminated soils. The SMWU 3 physical configuration is such that a large portion of it is frequently or continuously covered with water from St. Andrew Bay, depending on the location within the SWMU. This is evident in Figure 1A, attached. NSA Panama City Environmental Department personnel rarely observe visitors at SWMU 3 (NSA PC, 2008). Based on NSA PC (2008), the actual exposure of any human receptor is less than half what was estimated in the RFI Addendum, Revision 2, and could even be one-tenth or less than one-tenth of this estimate. Therefore, the exposure assumptions included in the risk re-evaluation are considered to be conservative and lead to an overestimation of actual risks. Also note that the cited EPA Region IV exposure frequency of 45 days a year is for swimming and not for transients.

Text will be added to the RFI Addendum Revision 2 to more completely explain the basis for the exposure assumptions. The revised text of Section 5.1, page 5-2, paragraph 2 will appear as follows:

**“Revised Conceptual Site Model**

*“...Although 25 years of observation have led to the conclusion that people rarely visit SMWU 3, of all the potential visitors the most likely would be a fisherman. Base residents and marina campground visitors are not likely to visit SMWU 3. The campground and residential area are about 0.5 miles or further from SWMU 3 and are far enough from SMWU 3 that casual visits to this SMWU by campers or residents are very unlikely...”*

The following new paragraph was added before the current last paragraph on page 5-3:

*“The fraction ingested was altered from 1 to 0.5 because SWMU 3 is a relatively small area of which more than half is covered with water, thick vegetation, and rip rap. In addition, it is unlikely that a receptor would be engaged in activities were*

*they would have significant contact with soil or sediment at SWMU 3. Therefore, only a portion of the amount of soil or sediment that they incidentally ingest in a day would come from the site and this was estimated conservatively to be 0.5."*

### **SWMU 3 Specific Comment 2**

In the re-evaluation, the fraction ingested from contaminated source is reduced from 1 to 0.5. A fraction ingested less than 1 could perhaps be justified if the area occupied by SWMU is small compared to the area that a transient would be expected to visit. However the case for using a value other than the default of 1 needs to be made in the report – simply stating that a different assumption was used is inadequate.

### **SWMU 3 Response 2**

A fraction ingestion of 0.5 was used because the transient is assumed to be at the site only part of the day. In addition, the size of SMWU 3 is relatively small and more than half of the SMWU is covered by water, thick vegetation, and rip rap. Also, it unlikely that a receptor would be engaged in activities where they would have significant contact with soil or sediment at SWMU 3. Therefore, only a portion of the amount of soil or sediment that transients incidentally ingest in a day would come from the site and this was estimated conservatively to be 0.5. Attached Figure 1A shows that the SWMU is relatively small (about 0.5 acres in size). Attached Figure 1B, which represents the current site configuration, shows that more than half of the area at SMWU 3 is either a tidal inlet or rip rap (light colored inverted "L" on Figure 1B) with a relatively small amount of beach and grassy areas. Figure 1C shows a closer view of the rip rap from the northeaster edge of SWMU 3, the amphibious assault landing craft area (AALCA) in the distance, and part of the fence separating a portion of SMWU 3 from the AALCA. A portion of the grassy areas is thickly vegetated and difficult to traverse, as shown in Figure 1D, which is a view looking southwest from the northern edge of SWMU 3 tidal inlet. Figure 1E (facing southwestward from within SWMU 3) also shows the thickness of the vegetation. This site configuration is not expected to attract visitors who would subsequently stay at SMWU 3 for any significant time on a daily basis.

See also the response to SWMU 3 Specific Comment 1.

### **SWMU 3 Comment 3**

Surface water was not included in the re-evaluation, with the explanation that beryllium is no longer considered a carcinogen and benzo(b)fluoranthene in surface water is not quantitatively evaluated in risk assessment. The former statement regarding beryllium carcinogenicity is correct [at least for the oral route]. With respect to the latter statement, it's not clear why PAH risks from surface water were quantifiable in the original RFI but not in this addendum.

#### **SWMU 3 Specific Response 3**

As noted on EPA's RAGS Part E website, (<http://www.epa.gov/oswer/riskassessment/rage/index.htm>), errata in the final document were corrected in 2007. One of the corrections states:

*"Page B-12 Exhibit B-3 of Appendix B: To clarify some confusion relating to uses of RAGS Part E with respect to contaminants that are outside the effective predictive domain for the water pathway, some "N" symbols were changed to "NA" for "not applicable" to clarify that those contaminants are outside the effective predictive domain. Section 6.3 of RAGS Part E recommends not attempting to quantify risk on such contaminants (outside the effective predictive domain) in the body of a risk assessment. (a 2007 clarification)"*

As a result of these corrections RAGS Part E now recommends not quantifying risks for dermal exposures to PAHs in water.

No change to the RFI Addendum is recommended in response to this comment.

### **SWMU 3 Specific Comment 4**

Risks for future residents were not re-evaluated and are assumed to be the same as calculated in 1996 (see page 5-4). The report contends that if land use changes to permit residential scenarios in the future, contaminant concentrations will likely have changed and human health risks would need to be re-evaluated. This is reasonable, but the conclusion should not be lost that this SWMU is unsuitable for unrestricted land use.

#### **SWMU 3 Specific Response 4**

Agreed. Because debris has already been removed from SWMU 3, the concentrations used for the risk re-evaluation are overestimates but the degree of overestimation is not known.

Nevertheless, the Statement of Basis for SWMU 3 requires the use of land use controls to prevent intrusive activities and unacceptable levels of exposure and the corrective measures implementation plan imposes land use controls to accomplish this objective. Signs currently posted at SMWU 3 also serve to advise any visitors to avoid contact with soil and water. One of these signs, located north of the SWMU, is visible in Figure 1F, slightly left of center.

No change to the RFI Addendum is recommended in response to this comment.

#### **SWMU 3 Specific Comment 5**

The Addendum states, "Risks for site workers are expected to be comparable to those of the transients." (page 5-4). Presumably, this statement applies to future scenarios, given the context of the paragraph and the clear message elsewhere (see page 5-2) that no workers currently visit this SMWU. We would not expect risks to future workers to be comparable to risks calculated for transients. A future worker scenario will involve more frequent contact with the site over a longer duration than is assumed for a transient, resulting in higher risks.

#### **SWMU 3 Response 5**

This statement is meant to describe NSA Panama City base workers who visit SWMU 3 on an infrequent basis and is not meant to describe an industrial worker who is at the site on a full-time basis. This interpretation of risk exposure is viewed to be logical given the SMWU 3 physical configuration as shown in Figures 1A and 1B. However, the term "site worker" has been replaced with "base worker" to make it clear that the receptor is not a person who would be required to frequent SWMU 3, but is instead a person who works at NSA Panama City and may occasionally visit SMWU 3. The text of page 5-4, fifth full sentence now reads as follows:

*"Risks for base workers are expected to be comparable to those for the transients because these workers are not required to frequent SWMU 3 for work related activities but may occasionally visit SMWU 3."*

#### **SWMU 3 Specific Comment 6**

In the 1996 RFI, risks posed to construction workers by contact with subsurface soil were calculated to be less than  $10^{-6}$ . This scenario was not re-evaluated, in part because no intrusive activities are expected. Unless there is a prohibition against intrusive activities, it would be worthwhile to include a re-evaluation of the construction worker scenario to verify that calculated risks remain below acceptable levels using contemporary exposure assumptions.

### **SWMU 3 Specific Response 6**

The Statement of Basis for SWMU 3 requires the use of land use controls to prevent unacceptable levels of exposure and the corrective measures implementation plan (CMIP) for SWMU 3 imposes land use controls. This CMIP includes the following land use control performance object for SWMU 3: *"Although construction in the landfill is not anticipated, ensure that appropriate protective equipment is used by any workers who must excavate in the SWMU 3"*.

Please also note that signs at SWMU 3 advise visitors to avoid contact with soil and water.

No change to the RFI Addendum is recommended in response to this comment.

### **SWMU 10 General Comment**

The re-evaluation of risks for SWMU 10 consists of comparison of updated groundwater and soil concentrations with criteria from Chapter 62-777, FAC. We have the following comments:

#### **SWMU 10 Specific Comment 1**

There are a number of contaminants in groundwater at concentrations that exceed their groundwater cleanup target levels (GCTLs) or surface water cleanup target levels (SWCTLs). The Addendum concludes correctly that "adverse health effects would be expected if groundwater was used as a domestic drinking water supply." The Addendum also states, "The SWCTL exceedence, however, were generally slight and no adverse impact to surface water is anticipated because of natural attenuation. We agree that natural attenuation will be helpful in minimizing impacts associated with the discharge of contaminated groundwater to surface water. However, the discharge of concentrations that exceed the SWCTL is not allowed under Chapter 62-780, FAC.

#### **SWMU 10 Specific Response 1:**

In 2004, the SWCTL exceedances were limited to:

- naphthalene at 25.4 and 26.7 µg/L in an original and duplicate groundwater sample, respectively, versus the 26 µg/L SWCTL.
- 2-methylnaphthalene at 33.5 and 35.9 µg/L in an original and duplicate groundwater sample, respectively, versus the 30 µg/L SWCTL.

- phenanthrene at 0.81 and 0.82 µg/L in an original and duplicate groundwater sample, respectively, versus the 0.031 µg/L SWCTL. Phenanthrene concentrations did not exceed the 210 µg/L GCTL and this chemical was eliminated from the groundwater monitoring program.

Figures 2A and 2B show the locations of wells at SWMU 10 with the groundwater level contours. Figure 2B is the most recent available aerial photograph. The exceedances identified above occurred at well PCY-363-MW-1R, which is adjacent to the former contaminant source (oil and bilge water released to soil), and therefore represents the worst case or near worst case groundwater conditions. Well PCY-363-MW-1R is located approximately 100 feet upgradient of St. Andrew Bay, the closest surface water body to SWMU 10. This well is far enough from the bay and the measured concentrations are close enough to SWCTLs that natural attenuation processes are expected to reduce the concentrations to levels less than the SWCTLs by the time the groundwater reaches the bay. This is explained further below.

More recent data from well PCY-363-MW-1R are available but could not be include in the RFI report because they were not collected as part of the RFI. Table 1 presents these recent groundwater monitoring data. The data span four calendar quarters beginning in September, 2006. Specifically, at well PCY-363-MW-1R the concentrations of 2-methylnaphthalene and naphthalene were less than their respective SWCTLs in the four quarters beginning in September of 2006. The maximum concentration for 2-methylnaphthalene was 13.8 µg/L in September 2006. This chemical was not detectable (detection limit = 2 µg/L) for the next three quarters. Similarly, the maximum naphthalene concentration of 3.4 µg/L was observed in September 2006 and this chemical was undetectable (detection limit of 2 to 3 µg/L) in the next three quarters. These most recent data confirm the assertion that natural attenuation would reduce 2-methylnaphthalene and naphthalene concentrations to less than their SWCTLs.

Phenanthrene belongs to the same polycyclic aromatic hydrocarbon (PAH) class of chemicals as 2-methylnaphthalene and naphthalene, consequently it has similar chemical and physical properties. Based on this similarity of properties and assuming that a decrease of comparable magnitude would occur for all three compounds, the concentration of phenanthrene is also expected to be less than its SWCTL today.

As the last line of evidence for no significant impact to St. Andrew Bay, please consider data from well PCY-363-MW-4R (also known as PCY-10-4R). This well is located almost directly downgradient of and less than 20 feet from PCY-363-MW-1R. The concentrations of naphthalene and 2-methylnaphthalene in this well in all four monitoring rounds from September 2006 to August 2007 were not detectable at detection limits of 2 to 3 µg/L. So, even in September 2006 which is the year in which the maximum PAH concentrations were observed for the four rounds of monitoring, the PAH concentrations had decreased to nondetectable levels after migrating less than 20 feet. The dissolved oxygen concentration measured in 2003 at well PCY-363-MW-8R was 9.59 mg/L and the oxidation-reduction potential (ORP) was -60 mV as measured against the silver-silver chloride electrode. This value would be approximately +160 mV relative to the standard hydrogen electrode. Well PCY-363-MW-8R is located directly downgradient of the former contaminant source (i.e., the former UST area), as shown on Figure 2-B. The groundwater conditions in this well represent conditions that are conducive to microbiological degradation of petroleum hydrocarbons. The conditions in well PCY-363-MW-4R (ORP = +436 mV and DO = 8.55 mg/L) are also conducive to aerobic microbiological degradation and are consistent with the concentration decreases described above for the groundwater flow path from PCY-363-MW-1R to PCY-363-MW-4R to St. Andrew Bay.

Based on these observations, the assertion that natural attenuation reduces the PAH contaminant concentrations in groundwater to less than SWCTL values and the contamination therefore has no significant impact to St. Andrew Bay has been demonstrated.

See also SWMU 10 Specific Response 2, below.

No change to the RFI Addendum is recommended in response to this comment.

#### **SWMU 10 Specific Comment 2**

With regard to soil, we have no comment other than to point out that the reevaluation confirms the presence of contamination in soil that exceeds both residential and commercial/industrial criteria (per Chapter 62-777, FAC).

## SWMU 10 Specific Response 2

Comment is noted. Also, the title "Surface Soil" in Section 5.2 of the RFI Addendum should be "Soil". This will be corrected and each reference to surface soil will be changed to "soil" in this section of the report.

The CMS report of 2004 noted that a contaminant source reduction had already been accomplished through removal of underground tanks and contaminated soils, and a recommendation was made against any further active remedy for SWMU 10. Figure 2B shows the current site configuration, although the Building 581 shadow obscures most of the detail in the contaminant source area. Soil sample PCYS10Z0906, which was collected in 2003, was the only one of six soil samples in 2003 with an exceedance of the 2,700 mg/kg soil cleanup target level (SCTL) for direct industrial exposure. The TPH concentration in PCYS10Z0906 was 9,500 mg/kg, which is about 3.5 times the SCTL. That sample was collected from a depth of about 4 to 6 feet below land surface (bls) at soil location PCYS10Z9 (shown on Figure 2B). The soil locations shown on Figure 2B are approximate, but the sampled area is relatively small at less than about 500 square feet. The soil in the area around location PCYS10Z9 was redistributed when Building 581 was constructed and underground piping was installed to a depth of at least 4 feet bls. Therefore past concentrations no longer represent current soil conditions.

Five of the six total petroleum hydrocarbon results in 2003 soil samples exceeded the 340 mg/kg leachability to groundwater and marine surface water criteria. This is shown in Table K-7 of the RFI Addendum, Revision 2. Also shown in Table K-7, however, is that the individual aliphatic and aromatic group concentrations did not exceed any of their respective leachability criteria. Table K-7 shows data only for chemicals detected at least once in all the samples analyzed. The double dashes ("—") in Table K-7 indicate that the respected chemicals were not detected. Detection limits for individual aliphatic and aromatic carbon ranges ranged from 37 to 70 mg/kg for these samples.

The Synthetic Precipitation Leaching Procedure (SPLP) results for total petroleum hydrocarbons were non-detect at 100 µg/L for each of the three soil samples analyzed in 2003. The data for this parameter do not appear in Table K-7 but Table K-3 shows that the SPLP test was conducted on three samples (PCYS10Z506, PCYS10Z0906, and PCYS10Z1404). As stated earlier, PCYS10Z0906 had the highest (9,500 mg/kg) total petroleum hydrocarbon

concentration. The 100 ug/L detection limit is 50 times less than the 5,000 ug/L residential GCTL and marine SWCTL. Consequently, the SPLP test showed that leaching of petroleum hydrocarbons from soils to groundwater or surface water at concentrations considered to be detrimental to human health or the environment will not occur.

To address this comment, the affected text of section 5.2 will be changed to read as follows:

**“Soil**

*Table L-9 presents an FDEP Level 1 evaluation of a comparison of maximum detected concentrations in soil to FDEP residential SCTLs. Carcinogenic PAHs (expressed as benzo(a)pyrene equivalents) and TPH were detected at concentrations exceeding the Level 1 SCTLs and were retained as potential COCs for residential exposures to soil at SWMU 10.*

*The results of the Level 1 evaluation identified several chemicals as COCs; therefore, a Level 2 evaluation was conducted. A comparison of the maximum concentrations in soil to the FDEP industrial SCTL is presented in Table L-10. TPH was detected at concentrations exceeding the Level 2 SCTL, and TPH was retained as a potential COC for industrial exposures to soil at SWMU 10.*

*Table L-11 presents comparisons of maximum detected concentrations in soil with Florida criteria based on leachability to groundwater. Concentrations of mercury exceeded the FDEP leachability to marine surface water CTLs. Mercury was not detected in the groundwater samples collected in 2003 and 2004 so there is no evidence that mercury is leaching from soils at unacceptable concentrations. Concentrations of TPH in soil exceeded the both leachability to groundwater and marine surface water CTLs, however, the Synthetic Precipitation Leaching Procedure (SPLP) results for TPH were less than 100 µg/L. This indicates that TPH is not leaching from soils at unacceptable concentrations. This is supported by the chemical analysis results for individual carbon ranges (see Table K-7) that show all results to be less than the leachability criteria.”*

The corrective measures implementation plan (CMIP) for SMWU 10 requires enforcement of land use controls to prevent use of the land that would lead to unacceptable levels of exposure. Additional details are provided in the response to Recommendation 2 below.

### **AOC 1 General Comment**

As with SWMU10, the re-evaluation of risks for AOC1 consists of comparison of updated groundwater and soil criteria from Chapter 62-777, FAC. Our comments are as follows.

### **AOC 1 Specific Comment 1**

We agree with the statement that updated groundwater analysis" ... indicate that adverse human health effects would be expected if groundwater were used as a domestic water supply."

### **AOC 1 Specific Response 1**

Comment has been noted. The corrective measures implementation plan for AOC 1 will require enforcement of land use controls on the AOC 1 property to prevent unacceptable risks to current or future receptors. Signs currently posted at AOC 1 advise visitors against having contact with soil or water.

No change to the RFI Addendum is recommended in response to this comment.

### **AOC 1 Specific Comment 2**

There was a significant change in groundwater concentrations as compared with SWCTLs between 2003 and 2004. In 2003, one VOC, five SVOCs, and one inorganic (iron) in groundwater exceeded their respective SWCTL. In 2004, only the VOC (1,1-dichloroethene) exceeded its SWCTL. This is an encouraging trend, if real. Additional sampling may be needed to clarify this. The Addendum states that groundwater flow patterns indicate that migration to St. Andrews Bay will not occur. This is an important point but evaluation of this contention is outside of our expertise.

### **AOC 1 Specific Response 2**

Similar to the SMWU 10 argument in SWMU 10 Specific Response 1 above, more recent groundwater data collected from September 2006 to August 2007 at AOC 1 confirm the assertions made for AOC 1 in the RFI Addendum Revision 2 concerning decreases in chemical concentrations. Table 2 presents the recent groundwater monitoring data for AOC 1. The Table 2 data show few exceedances of GCTLs. The CMS report indicates that, although degradation rates were not computed, recharge from [aerated] precipitation is expected to support biodegradation of the AOC groundwater contaminants, which are subject to this type of degradation. With regard to groundwater transport and no impact to surface water from

groundwater, this was demonstrated in a contaminant migration study that has been approved by FDEP (ESTCP, 2005).

No change to the RFI Addendum is recommended in response to this comment.

### **AOC 1 Specific Comment 3**

As with SWMU 10, the re-evaluation of soil concentration data for AOC1 also indicates the presence of contamination exceeding residential and commercial/industrial cleanup levels.

### **AOC 1 Specific Response 3**

Comment has been noted. AOC 1 is currently completely paved and covered with Building 399, thus eliminating any direct exposure pathway for human receptors. This can be seen in Figures 3A and 3B. Although the AOC 1 appears to have a color similar to soil in these figures, it is covered with concrete and asphalt pavement and is used as an equipment storage area. The corrective measures implementation plan for AOC 1 will require enforcement of land use controls on the AOC 1 property to prevent unacceptable risks to current or future receptors. Signs currently posted at AOC 1 advise visitors against having contact with soil or water.

No change to the RFI Addendum is recommended in response to this comment.

## **Recommendations**

### **Recommendation 1**

For SWMU 3, the Addendum recommends No Further Action with Institutional controls (Risk Management Option Level II in Chapter 62-780, FAC) to deal with surface soil contamination. The scenario used to evaluate risk at this SWMU is an alternative scenario - a transient. By using an alternative exposure scenario, the approach moves to Risk Management Option Level III, and potential additive effects of Contaminants must be considered. There are two issues here: 1) whether appropriate screening approaches have been used to identify the chemicals present that might contribute significantly to total risk; and 2) whether the right exposure assumptions are being used for the alternative scenario. As indicated in comments above, it is our opinion that some exposure assumptions for the transient used in the Addendum are too restrictive (exposure frequency and duration) or have not been sufficiently justified (fraction from contaminated source). Yet another re-evaluation of soil contamination at SWMU3 is needed, we

think, that complies more closely with requirements of Chapter 62-780, FAC and uses a somewhat different set of exposure assumptions. We would be happy to meet with FDEP and other members of the partnering team, as well as with Tetra Tech NUS, to discuss this in more detail.

#### Recommendation 1 Response

The Addendum evaluated risks from exposure to chemicals identified as chemicals of potential concern (COPCs) in the original HHRA. COPCs were identified in the original human health risk assessment (HHRA) by comparing the maximum detected concentrations of chemicals to risk-based screening levels based on USEPA Region 3 risk-based concentrations (RBCs). The screening levels corresponded to an incremental lifetime cancer risk (ILCR) of  $1 \times 10^{-6}$  or a hazard index (HI) of 0.1. The 95 percent UCLs were then calculated using FL-UCL (version 1) for the COPCs. Next, ILCRs and HIs were calculated for each COPC using current US EPA Risk Assessment Guidance for Superfund then the ILCRs and HIs were summed to produce a cumulative risk for exposure to all the COPCs. Based on this approach and the response to Specific Comments 1 and 2 for SWMU 3, it is believed that the additivity requirements of 62-780 FAC were met and the exposure assumptions were conservative and appropriate.

No change is recommended in response to this recommendation.

#### Recommendation 2

The recommended approach for SMWU 10 and AOC1 is a combination of natural attenuation for groundwater and land use controls for soil. With regard to natural attenuation, it would be helpful for the Addendum to explain succinctly how the current status of groundwater contamination satisfies criteria for monitored natural attenuation in Chapter 62-780, FAC. Also, it is unclear to us what is meant by land use controls in the context of these sites. Both have surface soil contamination that exceeds residential and commercial/industrial criteria. Evaluation of risks associated with other land uses were not presented, and it is therefore not apparent from this document how land use should be controlled to result in acceptable risks.

#### Recommendation 2 Response

In accordance with Chapter 62-780 FAC, specifically **62-780.690 Natural Attenuation with Monitoring**, natural attenuation with monitoring is an allowable strategy for site rehabilitation if

certain criteria are met. Each of the criteria and how SWMU 10 and AOC 1 meet these criteria is described below:

#### **SWMU 10**

**(a) Free product and explosive hazard must be absent:** Free product was removed along with several tons of TPH-contaminated soil so free product is not present at this site. No fire or explosive hazard exists as a result of a release of non-aqueous phase liquids.

**(b) Contaminated soil must not constitute a continuing source of contamination to groundwater...:** Limited soil contamination remains at SWMU 10 as described in the response to SWMU 10 Specific Comment 2. Because the soil has been redistributed, however, the concentrations of TPH that exceeded the SCTLs are expected to be less than measured in 2003. SPLP testing has also shown TPH concentrations in soil not to be adversely affecting groundwater or marine surface water. Furthermore, the geochemical conditions appear to support aerobic degradation of the petroleum hydrocarbons in the soil, as stated in the response to SWMU 10 Specific Comment 2. Although, no groundwater monitoring is conducted directly downgradient of location PCYS10Z09, which had the 9,500 mg/kg TPH concentration in 2003, groundwater monitoring in other areas of SMWU 10 have demonstrated a decrease in groundwater contaminant concentrations. The decreasing concentrations are near, or less than, GCTLs and SWCTLs for nearly all chemicals measured in the monitoring program (see Table 1). This is convincing evidence that natural attenuation of TPH is occurring.

**(c) Contaminants present in the groundwater above background concentrations or applicable CTLs are not migrating beyond the temporary point of compliance or migrating vertically...:** Based on groundwater data downgradient of the contaminant source, there appears to be no migration of contaminants from soil to groundwater that could be released to St. Andrew Bay at unacceptable concentrations. St. Andrew Bay is the surface water body immediately downgradient of SMWU 10.

**(d) The physical, chemical, and biological characteristics of each contaminant and its transformation product(s) are conducive to natural attenuation:** Current data, which include geochemical parameter concentrations and chemical contaminant concentrations, indicate that natural attenuation is occurring. This conclusion is based primarily on observed

decreases in contaminant concentrations but also on measurements of parameters indicating that aerobic conditions exist at SMWU 10 (See SWMU 10 Specific Response 1).

**(e) The available data show an overall decrease in the contamination:** Overall contaminant concentrations are decreasing, as evident from the data collected as part of the long-term groundwater monitoring program at SWMU 10.

**(f) One of the following is met (in this case, a technical evaluation of the geochemical conditions was selected as the criterion):** Groundwater oxidation-reduction potentials are generally oxidative at SMWU 10. These conditions are conducive to aerobic degradation of TPH, which is a primary degradation pathway for this contaminant. This, coupled with direct observations of reduced TPH concentrations in groundwater over time, support the conclusion that natural attenuation is occurring at SWMU 10. As stated in the response to SWMU 10 Specific Comment 1, contaminant concentrations decreased rapidly from well PCY-363-MW-1R to PCY-363-MW-4R during the groundwater monitoring program between September 2006 and August 2007. Because soil sampling location PCYS10Z09 is near the edge of the contaminant source zone, the soils and geochemical conditions are expected to be similar to the conditions near these wells. Therefore, the same type of degradation and degradation rate for TPH should exist at and around location PCYS10Z09 as near the wells.

Land use controls for SWMU 10 will prevent the development of this SMWU for residential or residential like purposes and will prevent current and future access to groundwater within the SMWU 10 land use control boundary until media cleanup standards are met.

#### **AOC 1**

**(a) Free product and explosive hazard:** Free product was reduced to negligible levels through the use of bioslurping so free product is no longer a concern at this site. No fire or explosive hazard exists as a result of a release of non-aqueous phase liquids.

**(b) Contaminated soil:** Limited soil contamination remains at AOC 1, however, recent groundwater monitoring data collected between September 2006 and August 2008 indicate that the 1,1-DCE concentrations have been steadily decreasing and are less than the 7 µg/L GCTL in all wells except on (PCY-13-12I). The 1,1-DCE concentration is less than the 3.2 µg/L

SWCTL in five of the nine wells and appears to continue to decrease. Other chemicals in the AOC 1 groundwater monitoring program have also continuously decreased in concentration and are approaching their GCTLs and SWCTLs. This is an indication that the soil is leaching little organic contamination into the groundwater. This corroborates the assertion that free product was reduced to negligible levels as a result of bioslurping.

**(c) Contaminants present in the groundwater above background concentrations or applicable CTLs are not migrating beyond the temporary point of compliance or migrating vertically...:** Coastal Contamination Migration Monitoring was used as a one-time event to determine that 1,1-DCE is not actually discharging into St. Andrew Bay at levels above the SWCTL. The 1,1-DCE was the only contaminant in excess of the SWCTL in 2002. Coastal monitoring involved screening the site for areas of potential groundwater discharge, and collection of water samples during the screening survey. The samples were analyzed for standard water quality characteristics, and a subsample was subjected to VOC analysis. The flow path of 1,1-DCE is expected to apply to the other groundwater contaminants.

**(d) The physical, chemical, and biological characteristics of each contaminant and its transformation product(s) are conducive to natural attenuation:** In 2004, the CMS concluded that biodegradation of 1,1-DCE to concentrations less than SWCTL should occur within 5 years and this appears to be occurring. The degradation estimate was based on observations at other Navy sites. The continued reduction in 1,1-DCE and other VOC concentrations appears to support this expectation.

**(e) The available data show an overall decrease in the contamination:** Overall contaminant concentrations are decreasing, evident from the data collected as part of the long-term groundwater monitoring program at AOC 1.

**(f) One of the following is met (in this case, a technical evaluation of the geochemical conditions was selected as the criterion):** In 2004, the CMS concluded that biodegradation of 1,1-DCE to concentrations less than SWCTL should occur within 5 years and this appears to be occurring. The degradation estimate was based on observations at other Navy sites and an expectation that recharge into the shallow groundwater would replenish oxygen sufficiently to support biodegradation. The chemicals associated with the AOC 1 history and that are included in the AOC 1 groundwater monitoring program are subject to this type of degradation.

Land use controls (LUCs) for AOC 1 will prevent current and future access to groundwater within the SMWU 10 land use control boundary until media cleanup standards are met and they will ensure that the appropriate protective equipment is used by workers who must excavate within the AOC 1 soil LUC boundary. LUCs will also prevent development and use of property within the soil LUC boundary for residential or residential-like purposes.

No changes are recommended in response to this recommendation.

### **References**

ESTCP, 2005. Technical Report Monitoring of Water and Contaminant Migration at the Groundwater-Surface Water Interface, Demonstration Site I: Naval Support Activity Panama City, Panama City, Florida Final October 2005

NSA PC, 2008. SWMU 3 Visitor Memorandum from Mr. Arturo McDonald (Naval Support Activity Panama City) to Mr. Bill Gates (Naval Facilities Engineering Command Southeast) regarding exposure frequency and duration of human receptors to SWMU 3 Soils, April.

# Interoffice Memo

**Date:** 4/17/2008  
**To:** Bill Gates, NAVFAC SE  
**From:** Mike Clayton/Arturo McDonald  
**RE:** SMWU 3 Visitor Memo

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SMWU 3 is within the boundaries of a military installation (NSA Panama City) and it is off-limit to the general public. Only retired military, active military, base workers and authorized visitors have access to the base, which limits the pool of people who can visit SMWU 3. There is some military housing located more than 0.5 miles north and northwest of SMWU 3. The longest period of time a resident spends at NSA Panama City is 3 years.

Base personnel have no reason related to their work to visit SMWU 3; hence there are no SMWU 3 site workers. Routine grounds maintenance such as grass or weed mowing does not occur at this SWMU, so exposure of maintenance workers does not occur. Currently, signs are posted discouraging visitors from contacting soil and water within SWMU 3.

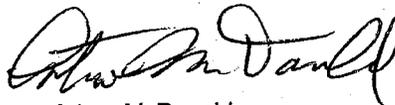
Based on personal observations during the past 25 years, SWMU 3 is rarely visited by anyone other than an occasional fisherman. These individuals have been observed to wade in 2-3 feet of water about 30-40 feet from the SWMU 3 shoreline in St. Andrew Bay. These fishermen are believed to have been site workers or residents but, again, visits to SWMU 3 by anyone are rare. Security signs along the NSA Panama City shoreline warn unauthorized individuals (boaters) to stay at least 100 feet from the shoreline.

Upon further reflection since we last discussed visitors at SWMU 3, the marina campground is far enough (about 0.5 miles) from SWMU 3 that visitors to the campground are not perceived to be likely visitors. A reason for this, in addition to the distance from SWMU 3, is that the marina has its own beach area.

Based on SWMU 3 physical features, knowledge of NSA PC base operations, and the direct observation that transients or other human receptors are rarely observed at SWMU 3, an assumption that any one person would visit SWMU 3 more than once every two weeks is untenable. Visits to SWMU 3 would probably occur less than one or two times per year by the same person.



Mike Clayton



Arturo McDonald

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## 5. Re-Evaluation of Human Health Risks for SWMU 3, SWMU 10, and AOC 1

The original human health risk assessments for SWMUs 3, 9, and 10 and AOC 1 were reviewed and, if appropriate, re-evaluated. The re-evaluations incorporated the results of the recent field investigations conducted up to 2004 and current USEPA and FDEP risk assessment guidance. The results of the re-evaluations are presented in this section.

### 5.1 Solid Waste Management Unit 3 (SWMU 3)

#### Summary of Original Human Health Risks

The original RFI (ABB-ES, 1996) identified four risk scenarios under which an unacceptable level of risk was estimated for SWMU 3 under current or future conditions. These scenarios are:

- Current Unacceptable Risks:
  - The incremental lifetime cancer risks (ILCRs) of  $4 \times 10^{-6}$  for adolescent transients (trespassers),  $4 \times 10^{-6}$  for adult transients, and  $8 \times 10^{-6}$  for lifelong transients exposed to surface soil were within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ , but exceeded the FDEP target risk level of  $1 \times 10^{-6}$ . Benzo(a)pyrene and arsenic were the major contributors to the ILCRs.
- Future Unacceptable Risks:
  - The ILCR of  $6 \times 10^{-5}$  for hypothetical lifelong residents exposed to surface soil was within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  but exceeded the FDEP target risk level of  $1 \times 10^{-6}$ . Benzo(a)pyrene and arsenic were the major contributors to the ILCR.
  - The ILCRs of  $7 \times 10^{-6}$  for hypothetical child residents,  $5 \times 10^{-6}$  for hypothetical adult residents, and  $1 \times 10^{-5}$  for hypothetical lifelong residents for exposures to sediment were within the USEPA target risk range but exceeded the FDEP target risk level. Carcinogenic PAHs were the major contributors to the ILCRs. Risks for potential exposures to sediment by transients were not

calculated but were assumed to be the same as, or less than, those for hypothetical residents.

- o The ILCRs of  $1 \times 10^{-5}$  for the hypothetical child resident,  $2 \times 10^{-5}$  for the hypothetical adult resident, and  $3 \times 10^{-5}$  for the hypothetical lifelong resident exposed to surface water were within the USEPA target risk range but exceeded the FDEP target risk level. Benzo(b)fluoranthene and beryllium were the major contributors to the ILCRs. Risks for potential exposures to surface water by transients were not calculated but were assumed to be the same as those for hypothetical residents.

### **Revised Conceptual Site Model**

The four risk scenarios described above were re-evaluated. For the first part of the re-evaluation the conceptual site model used in the original evaluation was reviewed and updated based on the physical configuration and size of SWMU 3, known base activities, and restrictions on public access to NSA Panama City. The updated conceptual site model is discussed in the following paragraphs.

Although 25 years of observation have led to the conclusion that people rarely visit SMWU 3, of all the potential visitors the most likely would be a fisherman. Base residents and marina campground visitors are not likely to visit SMWU 3. The campground and residential area are about 0.5 miles or further from SWMU 3 and are far enough from SMWU 3 that casual visits to this SMWU by campers or residents are very unlikely.

No workers frequent SWMU 3 as part of their daily work activities. Because the SWMU is largely a protected wetland it is not likely that this will change. Workers present at NSA Panama City during the work week do not have time to visit SMWU 3 as frequently as the base residents or campers. No maintenance (including grounds maintenance) is conducted at SMWU 3 and this is not expected to change as long as the property remains part of NSA Panama City.

Based on the above, the most likely receptor at SWMU 3 would be the transient. In the 1996 RFI, the transient was assumed to frequent the SWMU 45 days per year for 11 years

but risk were computed for the resident who frequents the site 100 days per year. In the re-evaluation, the transient was assumed to frequent the site every other week, or 26 days per year, for a maximum of 3 years. The 3-year maximum exposure duration reflects the maximum expected tenure of a person at NSA Panama City who could be considered a transient. The original evaluation assumed that all of the soil/sediment that was incidentally ingested by the transient came from the site. The re-evaluation assumed that only 50 percent of the soil/sediment that was incidentally ingested by a transient every day came from the site.

Also, USEPA and FDEP human health risk assessment guidance has been revised since the 1996 RFI was prepared. The revised guidance was used in the re-evaluation.

### **Results of the Risk Re-Evaluation**

Table 5.1 summarizes the ILCRs as presented in the 1996 RFI risk assessment and the revised ILCRs calculated using the updated site-specific exposure assumptions. Only the key exposure assumptions that are different between the 1996 and the revised ILCRs are presented in the table.

Table 5.1 indicates the following significant changes in risk between the 1996 and revised ILCR estimates:

- The unacceptable current exposure of adolescent, adult, and lifelong transients to surface soil as estimated in 1996 is now within the USEPA allowable range of  $10^{-4}$  to  $10^{-6}$  and less than the FDEP maximum allowed level of  $10^{-6}$ .
- The unacceptable current exposure of child, adult, and lifelong transients to sediments as estimated in 1996 is now within the USEPA allowable range of  $10^{-4}$  to  $10^{-6}$  and less than the FDEP maximum allowed level of  $10^{-6}$ .
- The unacceptable future exposure of all receptors, including transients and residents, to surface water as estimated in 1996 (upper half of Table 5.1) is now within the USEPA allowable range of  $10^{-4}$  to  $10^{-6}$  and less than the FDEP maximum allowed level of  $10^{-6}$  (Lower half of Table 5.1).
- The fraction ingested was altered from 1 to 0.5 because SWMU 3 is a relatively small area of which more than half is covered with water, thick vegetation, and rip rap. In addition, it is unlikely that a receptor would be engaged in activities were they would

have significant contact with soil or sediment at SWMU 3. Therefore, only a portion of the amount of soil or sediment that they incidentally ingest in a day would come from the site and this was estimated conservatively to be 0.5.

In each case, current risks estimated to be unacceptable in 1996 are within the USEPA allowable range of  $10^{-4}$  to  $10^{-6}$  and less than the FDEP maximum allowed level of  $10^{-6}$  according to the revised assumptions and are therefore no longer considered to be unacceptable. In the revised risk assessment only current risks were quantitatively evaluated, which excludes hypothetical residents. Risks for hypothetical residents exposed to contaminated surface soil were not recalculated because these risks would not be expected to change significantly from those estimated in the 1996 RFI. Additionally, the surface soil contaminant levels may change significantly between now and the time of a conversion from industrial to residential or residential-like land use. These changes could necessitate an additional re-evaluation of risks at that time. Risks for base workers are expected to be comparable to those for the transients because these workers are not required to frequent SWMU 3 for work related activities but may occasionally visit SMWU 3. No intrusive activities are expected to occur at SWMU 3 because of the presence of wetlands, beaches, and the landfill. The original RFI evaluated constructions workers exposed to subsurface soils and the risks were less than  $1 \times 10^{-6}$ .

#### **Comparison of 2003 and 2004 Groundwater Monitoring Results to FDEP CTLs**

The 2003 and 2004 groundwater monitoring results were compared to the FDEP GCTLs and marine SWCTLs (Tables L-1 through L-4) in accordance with Chapters 62-780 and 62-777, F.A.C. In 2003, concentrations of aluminum, arsenic, iron, manganese and sodium exceeded GCTLs and in 2004 concentrations of aluminum, iron, and manganese, and sodium exceeded GCTLs. Arsenic was not detected in 2004 groundwater samples. In 2003 concentrations of copper, iron, and mercury exceeded SWCTLs while in 2004 concentrations of iron and silver exceeded SWCTLs. Copper and mercury were not detected in 2004 groundwater samples. These exceedences are consistent with exceedences observed in the groundwater samples collected in 2002. As shown in Table 4.1, concentrations of aluminum, arsenic, iron, manganese, and sodium exceeded GCTLs in the 2002 groundwater samples. Concentrations of aluminum, arsenic, copper, iron, mercury, and silver exceeded SWCTLs in the groundwater samples collected in 2002. The

SWCTLs for aluminum and arsenic were revised in 2005 and the concentrations of aluminum and arsenic in the 2002 groundwater samples were less than current SWCTLs. This indicates that the major contaminants in groundwater have not changed since 2002.

## **5.2 Solid Waste Management Unit 10 (SWMU 10)**

The 2003 and 2004 groundwater monitoring results were compared to the FDEP GCTLs and marine SWCTLs (Tables L-5 through L-8). Also the 2002 soil sample results were compared to the FDEP SCTLs (Tables L-9 through L-11). The comparisons were conducted in accordance with Chapters 62-780 and 62-777, F.A.C. The results of the comparison are presented in this section.

### **Groundwater**

In 2003 2-methylnaphthalene, 4-methylphenol, bis(2-ethylhexyl)phthalate, naphthalene, arsenic, and manganese were detected at concentrations exceeding FDEP GCTLs, whereas isopropylbenzene, 2-methylnaphthalene, naphthalene, 1,1-biphenyl, 3&4-methylphenol, arsenic, and manganese were detected at concentrations exceeding GCTLs in the 2004 groundwater samples. These results indicate that adverse health effects would be expected if groundwater was used as a domestic drinking water supply.

Concentrations of 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, phenanthrene, and arsenic exceeded SWCTLs in groundwater samples collected in 2003. In 2004, only 2-methylnaphthalene, naphthalene, and phenanthrene were detected at concentrations exceeding SWCTLs. These results indicated that groundwater migrating to surface water could adversely impact surface water. The SWCTL exceedence, however, were generally slight and no adverse impact to surface water is anticipated because of natural attenuation.

### **Soil**

Table L-9 presents an FDEP Level 1 evaluation of a comparison of maximum detected concentrations in soil to FDEP residential SCTLs. Carcinogenic PAHs (expressed as benzo(a)pyrene equivalents) and TPH were detected at concentrations exceeding the Level 1 SCTLs and were retained as potential COCs for residential exposures to soil at SWMU 10.

The results of the Level 1 evaluation identified several chemicals as COCs; therefore, a Level 2 evaluation was conducted. A comparison of the maximum concentrations in soil to the FDEP industrial SCTL is presented in Table L-10. TPH was detected at concentrations exceeding the Level 2 SCTL, and TPH was retained as a potential COC for industrial exposures to soil at SWMU 10.

Table L-11 presents comparisons of maximum detected concentrations in soil with Florida criteria based on leachability to groundwater. Concentrations of mercury exceeded the FDEP leachability to marine surface water CTLs. Mercury was not detected in the groundwater samples collected in 2003 and 2004 so there is no evidence that mercury is leaching from soils at unacceptable concentrations. Concentrations of TPH in soil exceeded the both leachability to groundwater and marine surface water CTLs, however, the Synthetic Precipitation Leaching Procedure (SPLP) results for TPH were less than 100 µg/L. This indicates that TPH is not leaching from soils at unacceptable concentrations. This is supported by the chemical analysis results for individual carbon ranges (see Table K-7) that show all results to be less than the leachability criteria."

### **5.3 Area of Concern (AOC 1)**

The 2003 and 2004 groundwater monitoring results were compared to GCTLs and marine SWCTLs (Tables L-12 through L-15). In addition, 2002 soil sample results were compared to SCTLs (Tables L-16 through L-18). The comparisons were conducted in accordance with Chapters 62-780 and 62-777, F.A.C. The results of the comparison are presented in this section.

#### **Groundwater**

Seven VOCs, four SVOCs, and three metals were detected in groundwater samples collected in 2003 at concentrations exceeding the FDEP GCTLs. In 2004, three VOCs, two SVOCs, and two metals were detected at concentrations exceeding GCTLs. Although the overall risk from potential exposure to groundwater decreased from 2003 to 2004, these results still indicate that adverse human health effects would be expected if groundwater were used as a domestic drinking water supply.

In 2003, concentrations of 1,1-dichloroethene, five SVOCs, and iron exceeded the FDEP SWCTLs, although in 2004, 1,1-dichloroethene was the only chemical detected at a

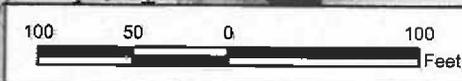
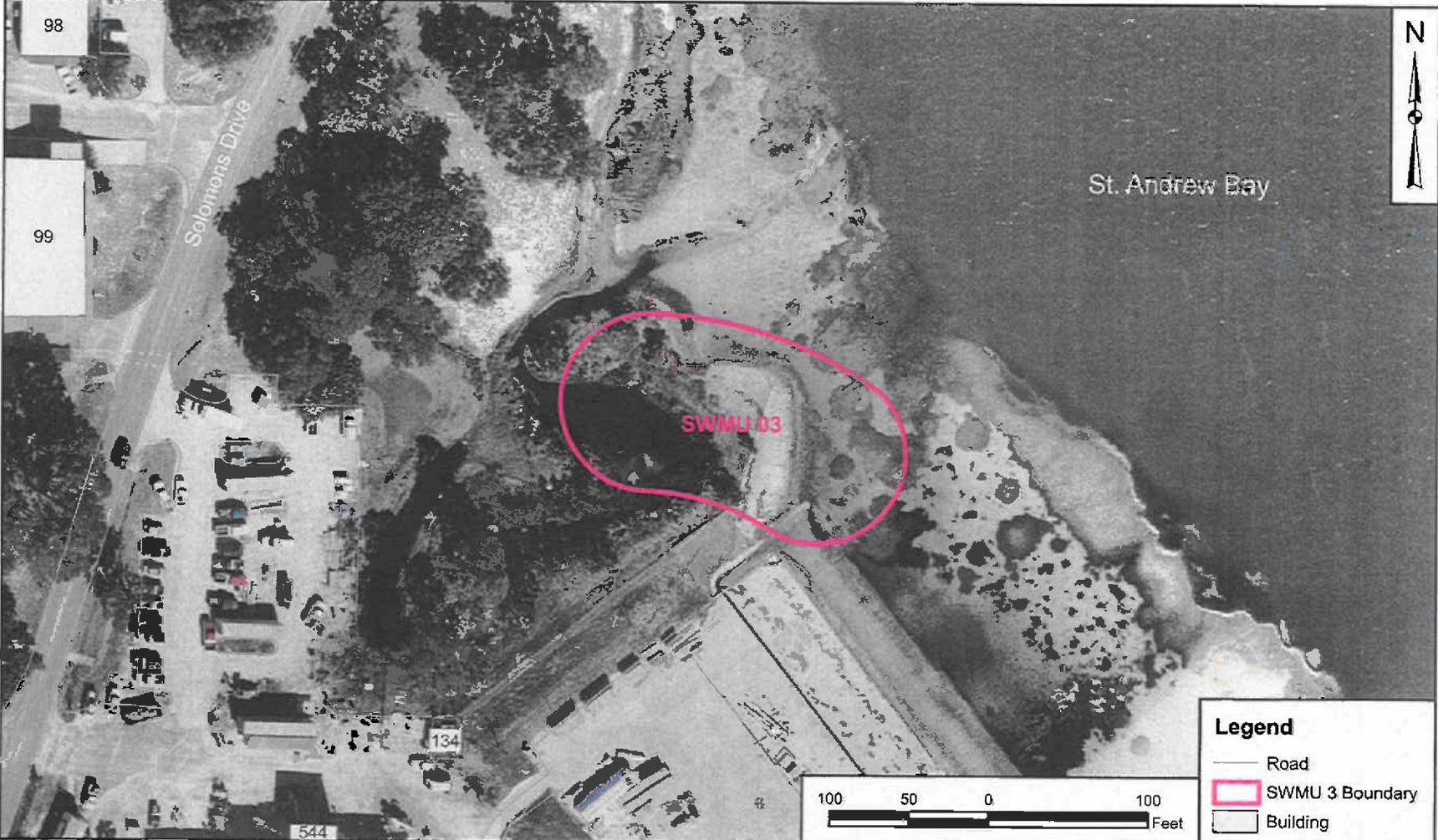
concentration exceeding the SWCTLs. This is evidence of a potential adverse impact to surface water if groundwater migrated to St. Andrew Bay, but groundwater flow patterns indicate that such migration would not occur, thus mitigating the risks.

### **Surface Soil**

Table L-16 presents an FDEP Level 1 evaluation of a comparison of maximum detected concentrations in surface soil to FDEP residential SCTLs. Carcinogenic PAHs (expressed as benzo(a)pyrene equivalents), lead, and total petroleum hydrocarbons were detected at concentrations exceeding Level 1 SCTLs and were retained as potential COCs for residential exposures to surface soil at AOC 1.

The results of the Level 1 evaluation identified several chemicals as COCs; therefore, a Level 2 evaluation was conducted. A comparison of the maximum concentrations in surface soil to FDEP industrial SCTLs is presented in Table L-17. TPH was detected at a concentration exceeding Level 2 SCTLs, and was retained as a potential COC for industrial exposures to surface soil at AOC 1.

Table L-18 presents comparisons of maximum detected concentrations in surface soil with Florida criteria based on leachability to groundwater. Concentrations of several VOCs, SVOCs and total petroleum hydrocarbons exceeded both the leachability to groundwater and the marine surface water CTLs. Concentrations of cadmium and chromium exceeded leachability to marine surface water CTLs. Cadmium and chromium were not detected in 2003 and 2004 groundwater samples collected at AOC 1, therefore evidence of leaching was not found..



| Legend |                 |
|--------|-----------------|
|        | Road            |
|        | SWMU 3 Boundary |
|        | Building        |

|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 10/2/07 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE              |         |
| AS NOTED           |         |



**SWMU 3 SITE LAYOUT**  
**2002 AERIAL PHOTO**  
**NSA PANAMA CITY**  
**PANAMA CITY BEACH, FLORIDA**

|                 |      |
|-----------------|------|
| CONTRACT NUMBER |      |
| 0701            |      |
| OWNER NUMBER    |      |
| 0038            |      |
| APPROVED BY     | DATE |
| DRAWING NO.     | REV  |
| FIGURE 1A       | 0    |



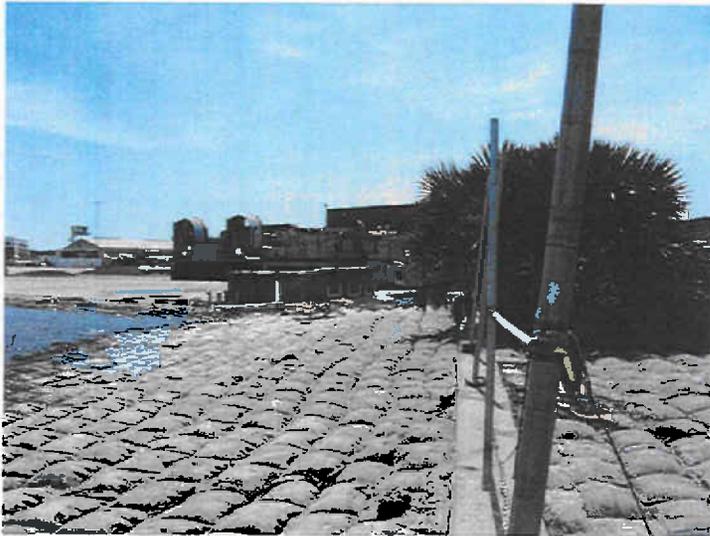
| Legend |                 |
|--------|-----------------|
|        | Road            |
|        | SWMU 3 Boundary |
|        | Building        |

|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 10/2/07 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE AS NOTED     |         |



SWMU 3 SITE LAYOUT  
 2005 AERIAL PHOTO  
 NSA PANAMA CITY  
 PANAMA CITY BEACH, FLORIDA

|                 |      |
|-----------------|------|
| CONTRACT NUMBER |      |
| 0701            |      |
| OWNER NUMBER    |      |
| 0038            |      |
| APPROVED BY     | DATE |
| DRAWING NO.     | REV  |
| FIGURE 1B       | 0    |



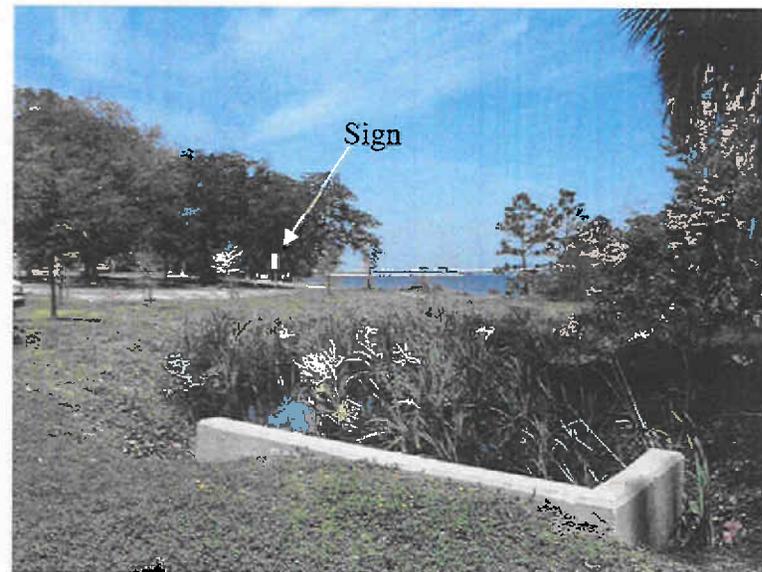
**Figure 1C. Rip Rap from NE edge of SMWU 3.**



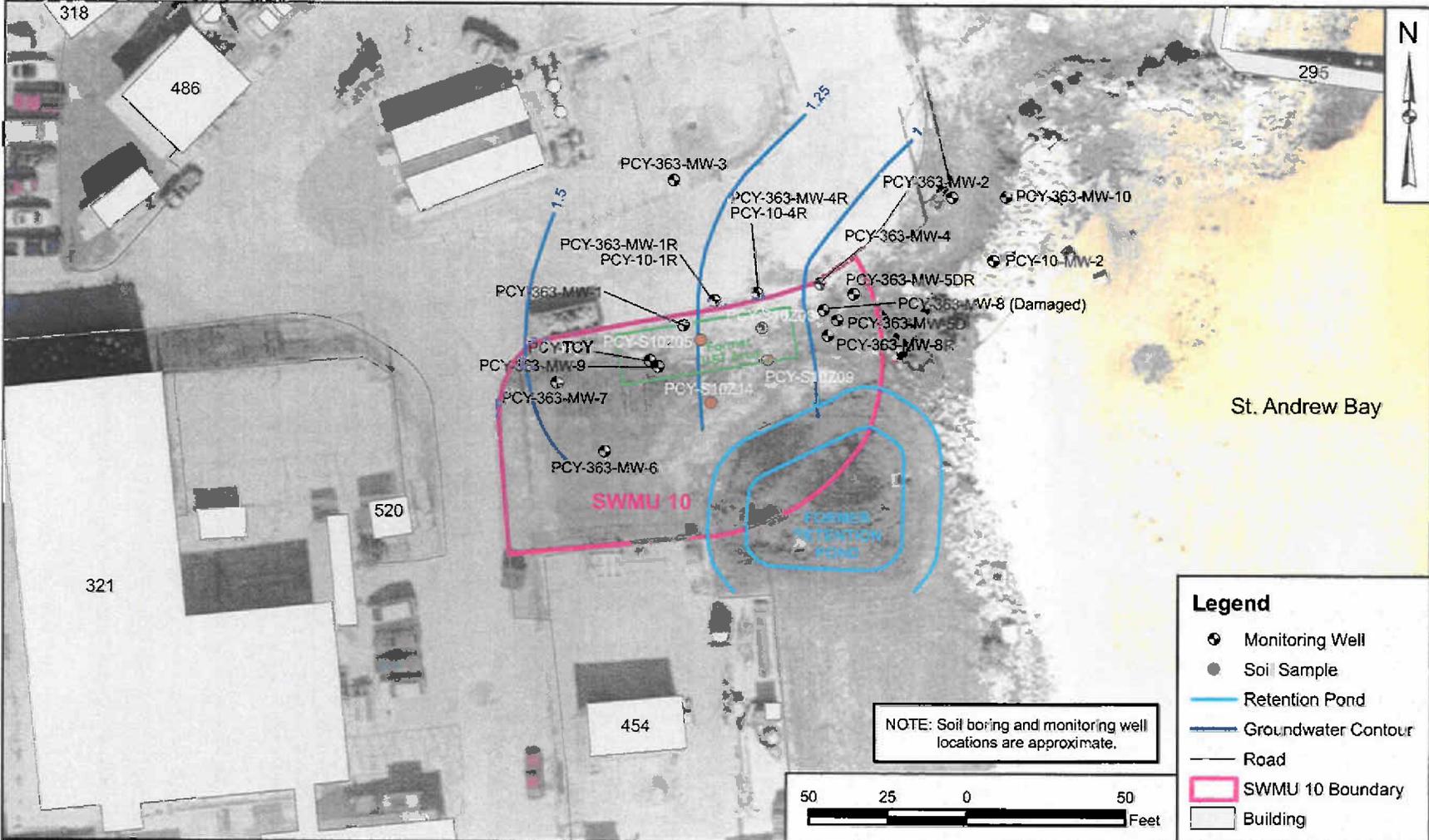
**Figure 1D. SMWU 3 Vegetated Area Facing SW.**



**Figure 1E. Facing SW from Within SWMU 3.**



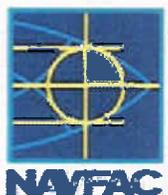
**Figure 1F. Sign (in distance) located North of SWMU 3.**



**Legend**

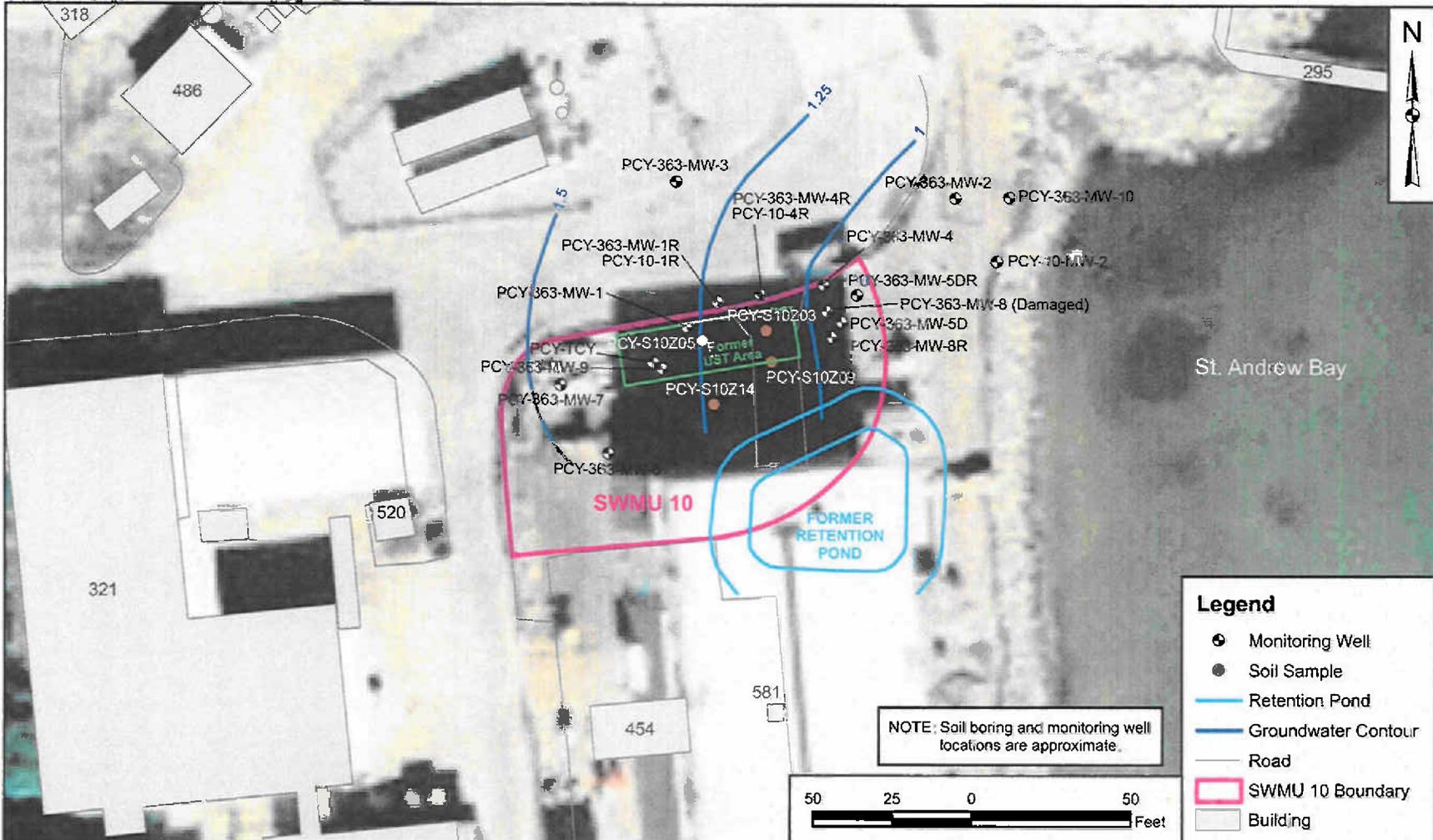
- Monitoring Well
- Soil Sample
- Retention Pond
- Groundwater Contour
- Road
- SWMU 10 Boundary
- Building

|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 3/27/08 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE AS NOTED     |         |

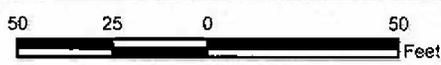


SWMU 10 SITE LAYOUT  
 2002 AERIAL PHOTO  
 NSA PANAMA CITY  
 PANAMA CITY BEACH, FLORIDA

|                 |      |
|-----------------|------|
| CONTRACT NUMBER |      |
| 0701            |      |
| OWNER NUMBER    |      |
| 0038            |      |
| APPROVED BY     | DATE |
| DRAWING NO.     | REV  |
| FIGURE 2A       | 0    |



NOTE: Soil boring and monitoring well locations are approximate.



**Legend**

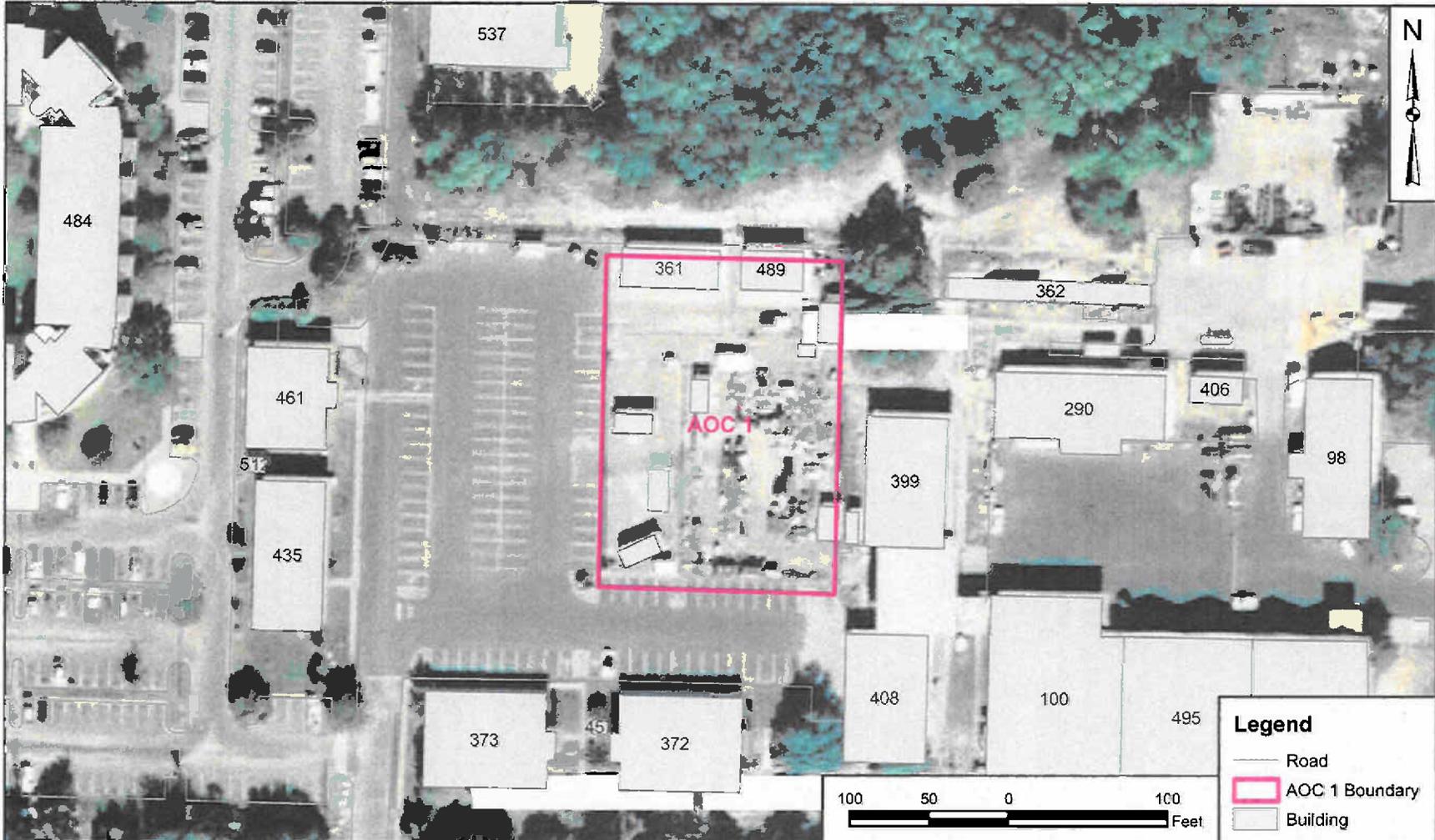
- ⊙ Monitoring Well
- Soil Sample
- Retention Pond
- Groundwater Contour
- Road
- ▭ SWMU 10 Boundary
- ▭ Building

|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 3/27/08 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE AS NOTED     |         |

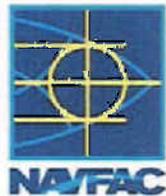


**SWMU 10 SITE LAYOUT**  
**2005 AERIAL PHOTO**  
**NSA PANAMA CITY**  
**PANAMA CITY BEACH, FLORIDA**

|                 |      |
|-----------------|------|
| CONTRACT NUMBER |      |
| 0701            |      |
| OWNER NUMBER    |      |
| 0038            |      |
| APPROVED BY     | DATE |
| DRAWING NO.     | REV  |
| FIGURE 2B       | 0    |

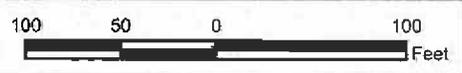
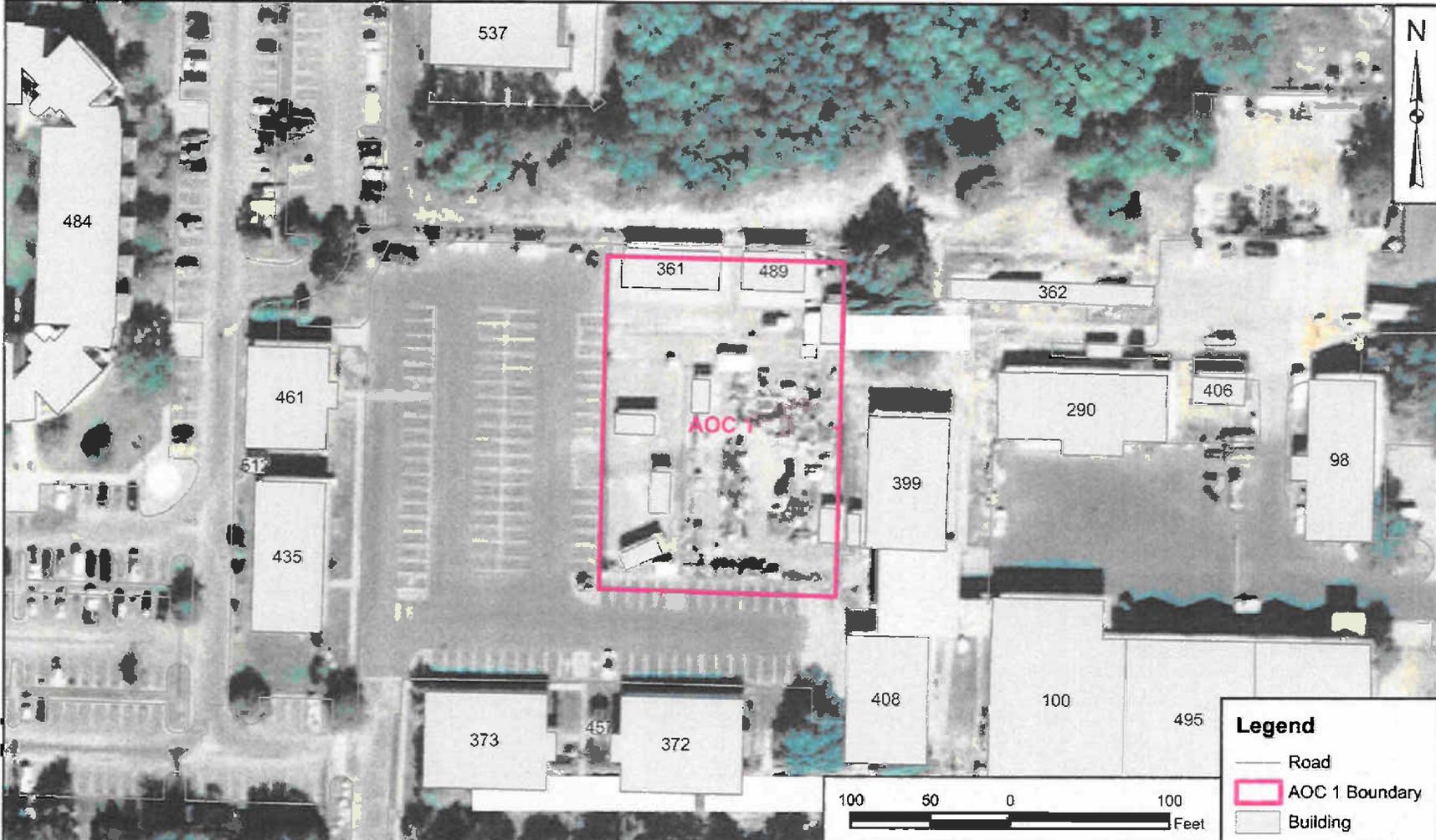


|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 3/27/08 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE AS NOTED     |         |



AOC 1 SITE LAYOUT  
 2002 AERIAL PHOTO  
 NSA PANAMA CITY  
 PANAMA CITY BEACH, FLORIDA

|                          |                |
|--------------------------|----------------|
| <b>Legend</b>            |                |
|                          | Road           |
|                          | AOC 1 Boundary |
|                          | Building       |
| CONTRACT NUMBER<br>0701  |                |
| OWNER NUMBER<br>0038     |                |
| APPROVED BY              | DATE           |
| DRAWING NO.<br>FIGURE 3A | REV<br>0       |



| Legend |                |
|--------|----------------|
|        | Road           |
|        | AOC 1 Boundary |
|        | Building       |

|                    |         |
|--------------------|---------|
| DRAWN BY           | DATE    |
| K. MOORE           | 3/27/08 |
| CHECKED BY         | DATE    |
| T. JOHNSTON        | 3/27/08 |
| COST/SCHEDULE-AREA |         |
| SCALE AS NOTED     |         |



**AOC 1 SITE LAYOUT**  
**2005 AERIAL PHOTO**  
**NSA PANAMA CITY**  
**PANAMA CITY BEACH, FLORIDA**

|                 |      |
|-----------------|------|
| CONTRACT NUMBER |      |
| 0701            |      |
| OWNER NUMBER    |      |
| 0038            |      |
| APPROVED BY     | DATE |
| DRAWING NO.     | REV  |
| FIGURE 3B       | 0    |