ACTION MEMORANDUM FOR BASE REALIGNMENT AND CLOSURE FAST TRACK SOIL REMOVAL PARCELS WITH TRANSMITTAL LETTER NAS KEY WEST FL

12/21/1998

TETRA TECH NUS

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AIK-98-0556

December 21, 1998

Project Number HK 7593 *Via US Mail*

Mr. Dudley Patrick - Code 1858
Southern Division
NAVFACENGCOM
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 032

Subject: Action Memorandum – BRAC Fast Track Soil Removals and Engineer's Evaluation/Cost Analysis for BRAC Fast Track Soil Removal Parcels, Rev. 2
Naval Air Station Key West, Florida

Dear Mr. Patrick:

Tetra Tech NUS, Inc. is pleased to submit the final Action Memorandum – BRAC Fast Track Soil Removals and Engineer's Evaluation/Cost Analysis for BRAC Fast Track Soil Removal Parcels, Rev. 2, Naval Air Station (NAS) Key West, Florida. This version contains the corrected NAS Key West signature block as requested by NAS Key West personnel. In addition, the original TtNUS signature page with signatures are included with the NAS Key West copies at its request.

Please call me at (803) 649-7963, extension 345, if you have any questions regarding the enclosed documents.

Sincerely,

C. M. Bryan
Task Order Manager

Q A Record

Enclosures

c: Ms. D. Evans-Ripley, SouthDiv (w/o encl.)
Ms. M. Berry, EPA
Mr. J. Caspary, FDEP
Mr. R. Demes, NAS Key West
Mr. P. Williams, NAS Key West (2 copies via FedEx)
Mr. R. Hoekstra, Bechtel Environmental, Inc.
Mr. M. Perry, TtNUS Technical Coordinator
Files: 7593-7.9.3

AIK-98-0556

ACTION MEMORANDUM

FOR

BRAC FAST TRACK SOIL REMOVAL PARCELS
NAVAL AIR STATION
KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0032

December 1998

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ACTION MEMORANDUM
BRAC Fast Track Soil Removals

This action memorandum is the decision document that describes future soil remediation activities at five Base Realignment and Closure (BRAC) Sites, Naval Air Station (NAS) Key West. Contamination has been detected at portions of these sites and an Interim Remedial Action (IRA) is planned. The IRA involves the excavation of contaminated soil specified in the *Remedial Work Plan, Delivery Order No. 101, BRAC Parcels Fast Track Soil Removals* [Bechtel Environmental, Inc. (BEI), 1998]. The areas undergoing an IRA are based on recommendations from the *Site Inspection (SI) Report for Nine BRAC Parcels* (Brown & Root Environmental, 1998) and the *Supplemental Site Inspection (SSI) Report* [Tetra Tech NUS (TtNUS), 1998a]. Additional details and site-specific maps depicting the areas to be excavated can be found in the remedial work plan (BEI, 1998).

Five BRAC sites are involved in the Fast Track Soil Removal at NAS Key West. Contamination at these Parcels is indicative of potential carcinogenic or noncarcinogenic human health risks. Areas at Hamaca Hawk Missile Site (Parcel A) and at Truman Annex (Parcels C, D, E, and F) will be excavated. The following sections summarize the areas undergoing the IRA.

PARCEL A - HAMACA HAWK MISSILE SITE

The U.S. Army created Hamaca Hawk Missile Site in 1964 by filling salt ponds. This facility was built as a defense site to repel an expected Cuban and Russian assault as a result of the Cuban Missile Crisis. The site was transferred to the Navy in the early 1980's but was not used by the Navy. The property was used as a refuge for homeless veterans in 1994 and 1995. During the 10 months the veterans occupied the site, wastewater from showers and washing machines was discharged into the surrounding wetlands.

Two areas at Hamaca Hawk Missile Site are included in the BRAC Fast Track Soil Removals. The Sewage Lift Station, designated as subzone 4 in the SI Report (B&R Environmental, 1998) soil has arsenic contamination exceeding the action level. An area surrounding the Sewage lift station, 25-foot by 35-foot in size, needs to be excavated to a depth of at least 2 feet below ground surface (bgs). The wetland area sediment adjacent to Government road (subzone 9) at Hamaca Hawk Missile Site also exceeds action levels for inorganics, semivolatile organic compounds (SVOCs), and a pesticide. The area (25-foot by 25-foot to a depth of 2 feet) surrounding sediment sample SD-08 will be excavated. In addition, the pond on the western portion of the site where sediment sample SD-05 was taken will require remediation of all sediment located on the bottom of the pond. The total volume of contaminated soil being excavated at Hamaca Hawk Missile Site is approximately 135 cubic yards (cy).

PARCEL C - TRUMAN ANNEX DRMO STORAGE AREA

Truman Annex DRMO Waste Storage Area (Parcel C) includes the Former Oil Container and Scrap Metal and Refugee Item Storage Areas. Fuel, oil, and metal from past storage activities were considered to be potential soil contaminants. The soil area between Building 261 and Building 284 (subzone 1) contains polychlorinated biphenyls (PCBs), lead, and polynuclear aromatic hydrocarbons (PAHs) that exceed action levels and requires remedial action. Approximately 390 cy of soil will be excavated during the IRA at Building 261.

In addition, the Former Oil Container and Scrap Metal and Refugee Item Storage Areas and Former Scrap Metal Storage Areas (subzones 3 and 4) require remediation because of inorganic and SVOC contamination in surface and subsurface soil. Further action was recommended in the SI Report (B&R Environmental, 1998). Delineation sampling during the Supplemental Site Inspection (SSI) confirmed that an IRA is necessary at DRMO and delineated the specific areas requiring excavation. Approximately half the surface area of both subzones will be excavated to a depth of 2 feet with select areas excavated to a depth of 4 feet below ground surface (bgs). Figure 6 in the remedial work plan (BEI, 1998) illustrates the areas to be excavated and depths of excavation. An estimated 12,300 cy of contaminated soil will be removed from DRMO Storage Area (subzones 3 and 4).

PARCEL D - TRUMAN ANNEX SEMINOLE BATTERY

Truman Annex Seminole Battery (Parcel D) refers to the Seminole Battery and an adjacent area that includes a former fueling area and grease rack that operated in the 1940s and 1950s (B&R Environmental, 1996). The Seminole Battery (subzone 1) was the only area of concern in this Parcel. Surface soil sample results exceeded the action levels for arsenic and PAHs in one soil sample location (SS-03). A 25-foot by 25-foot area around surface soil sample SS-03 will be excavated to 2 feet. This is approximately 46 cy of soil.

PARCEL E - TRUMAN ANNEX BUILDINGS 102, 103, AND 104

Truman Annex Buildings 102, 103, and 104 are in an area known as Parcel E. Former Building 136 (subzone 2), a Plate and Mold Shop that was demolished and buried onsite, is included in Parcel E. Debris, lead, metal, solvents, and oils were considered to be potential soil contaminants. Inorganics and SVOCs were detected in excess of action levels. Most of the location of former Building 136 will be excavated to a depth of 2 feet bgs. Approximately 1,900 cy of soil will be excavated during the IRA. Figure 8 in the remedial work plan (BEI, 1998) illustrates the excavation area at Former Building 136.

The IRA also addresses Buildings 102, 103 and 104 soil (subzones 3 and 9 at Parcel E). Subzone 3 includes Buildings 102 and 104 soil. Subzone 9 includes Building 103 soil. Acids, solvents, and fuels were considered potential contaminants in the surface soil at Buildings 102 and 104. Further action was recommended for the soil at these buildings in the SI Report (B&R Environmental, 1998) based on potential carcinogenic human health risks posed by SVOCs. Fuels, oils, and PCBs were considered to be potential contaminants in surface soil at Building 103. Elevated levels of PAHs were detected at several sample locations at Buildings 102, 103, and 104. Several areas will be excavated in the vicinity of these buildings to depths of 2 feet or 6 feet bgs (approximately 1,390 cy). The remedial work plan (BEI, 1998) includes a map of the areas to be excavated (Figure 9).

PARCEL F - TRUMAN ANNEX BUILDING 223

Truman Annex Building 223 (Parcel F) contains two areas involved in the IRA: Building 1287, the Former Lube Area (subzone 1) and the Equipment Repair Shop area (subzone 3). Arsenic contamination at the Former Lube Area is driving further action at this site. The area around soil sample SS-04 at the Former Lube Area will be excavated to 2-foot bgs (25-foot by 25-foot). An estimated 46 cy of soil will be removed from the Former Lube Area.

The Former Hazardous Waste Storage Area to the south of Building 223 (subzone 3) is the second area of concern in the Truman Annex Building 223 area because arsenic was detected in excess of its action level. For this reason, the area around sample location SS-04 requires remediation. A 25-foot by 25-foot area around this sample will be excavated to a depth of 2 feet bgs. Approximately 46 cy of soil will be removed from the Former Hazardous Waste Storage Area at BRAC Parcel F.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Excavation of soil with contaminant concentrations in excess of action levels is protective of human health and the environment. This soil removal will eliminate the potential for exposure to contamination in excess of action levels. Excavation and disposal is the preferred remediation choice since it permanently removes the contamination. It is important that the solution be permanent and extremely protective because future plans for BRAC Parcels include a deed transfer.

ATTAINMENT OF ARARS

All sites undergoing this IRA will fall under the residential-use cleanup levels for soil and sediment. The sites to be excavated are those areas that contain contamination in excess of action levels and pose potential carcinogenic or noncarcinogenic human health risks. Some contamination in excess of action

levels will not be excavated. However, risk estimates for these areas indicate that the contamination present does not pose potential human health risks. In addition, contaminants in these areas, including naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene are not of concern at BRAC sites as decided at the Partnering Meeting on October 6, 1998 (NAS Key West Tier 1 Partnering Team Meeting Summary, October 6-7, 1998). These chemicals do not pose human health risks at the levels detected at NAS Key West.

COST

Approximately 15,500 cy of soil will be removed and disposed of at a Resource Conservation and Recovery Act (RCRA) treatment, storage, and disposal facility (TSDF). Excavation and disposal is a proven cost effective remediation technology. In addition, excavation does not require a treatability study, as do most new and alternative technologies. The approximate cost for remediation for all BRAC Fast Track Soil Removal sites is $1.9 million.

SELECTED ALTERNATIVE

Excavation and Disposal is a proven and reliable method of remediation. This solution provides a permanent removal of contamination at the selected sites at NAS Key West. The *Engineer's Estimate/Cost Analysis (EE/CA) for BRAC Fast Track Soil Removals, NAS Key West* (TtNUS, 1998b) presents a comparison of the alternatives considered at the BRAC sites, and reasons for the selection of excavation and disposal as the IRA.

Reasons for using excavation and disposal as the remediation method at BRAC Fast Track Soil Removal sites include protection of human health and the environment; source control; long-term reliability and effectiveness; reduction in toxicity, mobility, and volume; short-term effectiveness; implementability; and cost. The EE/CA (TtNUS, 1998b) explains in more detail how excavation and disposal meets these criteria.

CONCLUSION

As presented, excavation and disposal is the remediation choice at BRAC Fast Track Soil Removal sites. Most included sites will undergo excavation of several small areas to various depths. The DRMO Storage Area as well as Former Building 136 will undergo more extensive remediation due to the extent of contamination. The *Remedial Work Plan for BRAC Parcels Fast Track Soil Removals at NAS, Key West* (BEI, 1998) includes figures showing all areas to be excavated and depths of excavation.

APPROVAL

Conditions at the site meet the NCP section 300.415(b)(2) criteria for a removal action.

APPROVED: _____ **DATE:** _____

B. Wild
Acting
Commanding Officer
Naval Air Station Key West

Concurrence: D. Patrick _____
Remedial Project Manager, Naval Facilities Engineering Command

REFERENCES

BEI (Bechtel Environmental, Inc.), 1998, Remedial Work Plan Delivery Order No. 101, BRAC Parcels Fast Track Soil Removals at Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Divisi0on, Naval Facilities Engineering Command, Oak Ridge, Tennessee, November.

B&R Environmental (Brown and Root Environmental), 1998a, Site Inspection Report for Nine BRAC Parcels for Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, June.

TtNUS (Tetra Tech NUS), 1998a, Supplemental Site Inspection Workplan for BRAC Parcels at Truman Annex, Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, August.

TtNUS (Tetra Tech NUS), 1998b, Engineer's Estimate/Cost Analysis for BRAC Fast Track Soil Removals, Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, December.

AIK-98-0557

ENGINEER'S EVALUATION/COST ANALYSIS FOR ALTERNATIVES

FOR

BRAC FAST TRACK SOIL REMOVAL PARCELS
NAVAL AIR STATION
KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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ENGINEER'S EVALUATION/COST ANALYSIS FOR ALTERNATIVES FOR BRAC FAST TRACK SOIL REMOVAL PARCELS, NAS KEY WEST

This Engineer's Evaluation/Cost Analysis (EE/CA) compares the remedial alternatives developed for five Base Realignment and Closure (BRAC) sites at Naval Air Station (NAS) Key West. A detailed description of each alternative and the results for each specific evaluation standard are included.

1.0 DESCRIPTION OF SITES

Five sites are being considered for soil or sediment remediation at NAS Key West. These areas include Hamaca Hawk Missile Site (Parcel A), the Defense Reutilization and Marketing Office (DRMO) Waste Storage Area (Parcel C), Truman Annex Seminole Battery (Parcel D), Truman Annex Buildings 102, 103, and 104 (Parcel E), and Truman Annex Building 223 (Parcel F). The following paragraphs describe each site in detail.

1.1 Parcel A - Hamaca Hawk Missile Site

Hamaca Hawk Missile Site is located on Government Road to the northwest of Key West International Airport. Based on historical maps and aerial photographs, the land for the Hamaca Hawk Missile Site was previously occupied by salt ponds that were filled by the U.S. Army in order to adapt the area for use as a missile site. This facility was built in 1964 as a defense site to repel an expected Cuban and Russian assault as a result of the Cuban Missile Crisis. The site was transferred to the Navy in the early 1980's but was not used by the Navy. The property was used as a refuge for homeless veterans in 1994 and 1995. During the time the veterans occupied the site, wastewater from showers and washing machines was discharged into the surrounding wetlands. Two areas at Hamaca Hawk Missile Site are included in the BRAC Fast Track Soil Removals. The Sewage Lift Station (subzone 4) soil has arsenic contamination exceeding the action level. The wetland Area adjacent to Government road (subzone 9) at Hamaca Hawk Missile Site also has soil and sediment contamination in exceedance of action levels.

1.2 Parcel C - Truman Annex Drmo Waste Storage Area

Truman Annex DRMO Waste Storage Area (Parcel C) includes the Former Oil Container and Scrap Metal and Refugee Item Storage areas. Fuel, oil, and metal from past oil and metal storage activities were considered to be potential soil contaminants. Three sites at DRMO Waste Storage Area are considered in this EE/CA. Building 261 (subzone 1) soil contains polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), and lead contamination that exceeds action levels. In addition, the Former Oil Container and Scrap Metal and Refugee Item Storage Area (subzone 3) and Former Scrap

closed galley facility that operated during the 1960s. Adjacent to Building 1287 was a motor pool area that operated during the 1950s. The Former Lube Area (subzone 1) contains arsenic contamination, which is driving further action at this site.

A closed hazardous waste storage area is present to the south of Building 223. The Former Hazardous Waste Storage Area soil (subzone 3) is the second area of concern at the Truman Annex Building 223 area because arsenic was detected in excess of its action level. The maximum concentration of arsenic detected was indicative of potential carcinogenic and noncarcinogenic human health risks. For this reason, the area around this sample requires remediation.

2.0 ALTERNATIVES

Preliminary remedial alternatives considered for these sites included soil washing, encapsulation, excavation and disposal, solidification, electrokinetic separation, chemical extraction, and capping. Based on several criteria, the alternatives considered for all sites were narrowed down to three alternatives.

- Alternative 1 - Soil Washing
- Alternative 2 - Encapsulation/Stabilization in an asphalt emulsion
- Alternative 3 - Excavation and Disposal

3.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

An alternative is selected based on a comparison of possible alternatives using the following criteria:

- Protection of human health and the environment
- Media clean-up standards
- Source control
- Waste management standards
- Other factors
    - Long-term reliability and effectiveness
    - Reduction in toxicity, mobility, or volume
    - Short-term effectiveness
    - Implementability
    - Cost

This section discusses the evaluation criteria and how well each alternative meets each criterion.

3.1 Protection Of Human Health and The Environment

The protection of human health and the environment is the overriding goal of any remedy that would be appropriate for the sites at NAS Key West. This criterion considers the extent to which an alternative mitigates potential short- and long-term exposure to residual contamination and how the remedy would protect human health and the environment both during and after implementation of the alternative. In addition, the levels and characterization of contaminants remaining in situ, potential exposure pathways, potentially affected populations, their level of exposure to contaminants, and the reduction of exposure over time are considered. For management of mitigation measures, the relative reduction of environmental impacts for each alternative is determined by comparing residual levels for each alternative with existing criteria, standards, and guidelines. The ecological considerations for this evaluation criterion include potential short- and long-term beneficial or adverse effects of the corrective measure, adverse effects on environmentally sensitive areas, and an analysis on how to mitigate adverse effects.

- Alternative 1 would be protective of human health and the environment because soil washing would reduce contaminant levels in the soil, reducing risk to human and ecological receptors. However, soil washing may be only partially effective for certain SVOCs, PAHs, and PCBs.
- Alternative 2 would be protective of human health and the environment because encapsulation/stabilization would prevent migration of the contaminants. However, as with soil washing, encapsulation/stabilization may be only partially effective for certain SVOCs, PAHs, and PCBs.
- Alternative 3 would eliminate the potential for exposure because the contamination would be removed from the site.

3.2 Media Clean-Up Standards

This criterion considers whether the alternative would achieve the media clean-up standards. In addition, it assesses relevant institutional needs for each alternative. The effects of federal, state of Florida, and local environmental regulations also are considered. In all sites being considered, the remediation must comply with residential media-cleanup standards.

- Alternatives 1 and 3 would comply with the media-cleanup standards.
- Alternative 2 would not reduce contamination to media-clean up standards, but would reduce mobility of contaminants.

3.3 Source Control

This criterion evaluates the ability of each alternative to control of the source of contamination so as to reduce or eliminate further releases that could pose a threat to human health and the environment. The criterion addresses whether source control measures are necessary and if so, what source control actions would be appropriate.

- Alternatives 1 and 2 would provide some source control by reducing or containing the contamination.
- Alternative 3 would provide effective control of contaminant sources in soil by removing the most contaminated soil.

3.4 Waste Management Standards

The selected alternative must comply with applicable standards for the management of wastes. These standards require a description of how the specific waste management activities would be conducted in order to maintain compliance with all applicable state and federal regulations.

- Alternatives 1 and 2 would require treatment and/or disposal of wastes generated by soil washing and encapsulation/stabilization.
- Alternative 3 would remove and dispose of the soil with contaminant concentrations in excess of industrial standards. Soil removal would be conducted in accordance with the Resource Conservation and Recovery Act (RCRA)(40 CFR 262, 263, 264, and 268) and the state of Florida regulatory requirements (Chapter 62-730 F.A.C.), as well as equivalent requirements of the state in which the treatment, storage, and disposal facility (TSDF) is located. Since contaminant concentrations may exceed Land Disposal Restrictions (LDRs), an approved TSDF would be utilized for receipt of the contaminated soil. In addition, a licensed waste hauler would be used to transport the containerized waste to the permitted TSDF. All applicable RCRA and state of Florida waste management requirements would be adhered to in the containerization, labeling, and manifesting of the waste materials.

3.5 Long-Term Reliability and Effectiveness

Evaluation of long-term reliability and effectiveness of the alternatives includes an assessment of their useful life, operation and maintenance procedures, and demonstrated reliability.

- Alternative 1 would be reliable and effective in the long term since the contamination would be reduced in the soil, provided a treatability study proves that soil washing is a valid remediation method for the contamination.
- Alternative 2 does not have a proven record for long-term reliability and effectiveness for encapsulation of organics. The asphalt mix may not stabilize the contaminated soil indefinitely.
- Alternative 3 would remove the contaminated soil from the site, which would be a very reliable and effective alternative in the long-term.

3.6 Reduction in Toxicity, Mobility, or Volume

This criterion evaluates the ability of the alternative to reduce the toxicity, mobility, or volume of the contaminants or media through treatment.

- Alternative 1 would reduce the toxicity and volume of the contaminants in the soil.
- Alternative 2 would reduce the mobility of the contaminants by encapsulating them in an asphalt emulsion. However, there would be no reduction of toxicity or volume of contamination.
- Alternative 3 may include treatment of the soil, if required. Any treatment would be designed to reduce the toxicity and mobility of contaminants remaining in the soil before being sent to a TSDF. Toxicity at the excavation site would be reduced due to the removal of contaminated soil.

3.7 Short-Term Effectiveness

This criterion evaluates the potential effects to the workers and community during implementation of the corrective measures.

- No significant risks to the community are anticipated from any of the three alternatives, other than the minimal risk associated with transportation of the contaminated media through the community and during off-site treatment and disposal under Alternative 3.
- All alternatives would have some short-term risk to workers because of their exposure to the contaminated soil. These risks would be adequately controlled by the adherence to appropriate health and safety procedures.

3.8 Implementability

This criterion evaluates the relative ease of implementation, availability of equipment and services, the technical complexity of the process, and the ability to obtain required permits.

- Alternatives 1 and 2 would both require a treatability study, making them more difficult to implement. In addition, the treatability studies could determine that the alternative would be ineffective.
- Alternative 3 would remove the contaminated soil, which would be readily implementable because it would use proven and commercially available technologies.

3.9 Cost

A cost estimate of each of the corrective measures includes capital, operation, and maintenance costs. Capital costs include both direct and indirect costs. Operating and Maintenance (O&M) costs include post-construction activities that are necessary to ensure the continued effectiveness of an alternative.

Alternative	Capital ($)
1	3,112,000
2	1,562,000
3	1,860,000

Cost calculations were done with the assumption that one cubic yard of soil weighs approximately one ton. Costs for alternatives 1 and 2 are based on an average cost per ton provided by the Department of Energy (DOE) Remediation Technologies Screening Matrix and Reference Guide (DOE 1998). According to this resource, the average cost for soil washing can be up to $200/ton. The cost for stabilization/encapsulation is approximately $100/ton. A treatability study cost of $12,000 was added for Alternatives 1 and 2. The cost for Excavation and Disposal approximately $120/ton, based on approximations provided by Bechtel Environmental, Inc. (BEI) and previously calculated excavation costs. The cost for Excavation and Disposal is approximately $300,000 more than the estimated cost for stabilization/encapsulation. However, a treatability study may prove that stabilization/encapsulation could not be implemented at some or all of the sites proposed.

4.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 1 summarizes results of the comparative analysis of alternatives.

5.0 RECOMMENDED ALTERNATIVE

The recommended alternative for the BRAC sites is Alternative 3 – Excavation and Disposal. Alternative 3 is viewed as appropriate for the sites for several reasons. Since Alternative 3 would remove the contamination, this alternative would be the most protective of human health and the environment. This alternative also is readily implementable because it uses proven and commercially available technologies. In addition, Alternative 3 would not require a treatability study, where Alternatives 1 and 2 would require

this additional study. In summary, Alternative 3 was chosen because of the ease of implementation, the proven reliability, and the effective control of contamination.

6.0 REFERENCES

B&R Environmental (Brown and Root Environmental), 1998a, Site Inspection Report for Nine BRAC Parcels for Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, June.

DOE (United States Department of Energy)," Federal Remediation Technologies Roundtable," http://www.frtr.gov/ , July 1998.

TtNUS (Tetra Tech NUS), 1998, Supplemental Site Inspection Workplan for BRAC Parcels at Truman Annex, Naval Air Station, Key West, Florida, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Aiken, South Carolina, August.TABLE 1

Alternative 1 : Soil Washing	Alternative 2: Encapsulation	Alternative 3: Excavation and Disposal
Protection of Human Health and the Environment		
If feasible for soil contaminants, would be protective of human health and the environment by reducing contamination.	If feasible for soil contaminants, would be protective of human health and the environment by preventing migration of the contaminant and preventing exposure.	Would eliminate the potential for exposure since the contamination would be removed from the site.
Media Clean-Up Standards		
Would comply with media clean-up standards.	Would not reduce contamination, but would reduce mobility of contaminants.	Would comply with media clean-up standards.
Source Control		
Would provide some source control by reducing contamination.	Would provide some source control by containing contamination.	Would provide partial source control by removing the most contaminated part of the soil.
Waste Management Standards		
Would require treatment and/or disposal of wastes generated by this process.	Would require treatment and/or disposal of wastes generated by this process.	Would comply with all applicable waste management standards during implementation.
Long-Term Reliability and Effectiveness		
Depending on results of a treability study, could be reliable and effective since the contamination would be reduced in the soil.	No proven record for reliability and effectiveness with organic contaminants. May not encapsulate soil contamination indefinitely.	Since soil would be removed from the site, this alternative is very reliable and effective in the long-term.
Reduction in Toxicity, Mobility, or Volume through Treatment		
Would reduce the toxicity and volume of the contaminants in the soil.	Would reduce the mobility of the contaminants by encapsulating them in an asphalt emulsion.	May include treatment of the soil at the TSDF, if required. Any treatment would reduce toxicity and mobility.
Short-Term Effectiveness		
Short-term risk to workers would occur during treatment.	Short-term risk to workers would occur during treatment.	Short-term risk to workers would occur during the removal, potential treatment, and disposal of contaminated soil. Community risk would occur only during transport of contaminated media.
Implementability		
Would require a treatability study.	Would require a treatability study.	Readily implementable because of the use of proven and commercially available technologies.
Cost		
$3,112,000	$1,562,000	$1,860,000