DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
5090 8-1-2001
Ser 095/1265
27 AUG 2001

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
ATTN: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NSWC Crane) submits the Insect Report as enclosure (1). Note that in the Recommendations section, NSWC Crane recommends conducting another round of sampling to obtain a background level of metals on the local insect population. The permit required Certification Statement is provided as enclosure (2).

NSWC Crane point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-6160.

Sincerely,

James M. Hunsicker
Director, Environmental
Protection Department
By direction of the Commander

Encl:
(1) Insect Report
(2) Certification Statement

Copy to:
ADMINISTRATIVE RECORD
USFWS (Lori Pruitt)
SOUTHNAVFACENGCOM (Code ES324) (w/o encl)
IDEM (Doug Griffin)

INSECT CAPTURE AND ANALYSIS
FOR
EVALUATION OF CONTAMINANTS
IN THE
FORAGE AREA OF THE INDIANA BAT
AT
AMMUNITION BURNING GROUNDS

NAVAL SURFACE WARFARE CENTER
CRANE DIVISION
CRANE, INDIANA

AUGUST 2001

1. INTRODUCTION 1
2. BACKGROUND 1
2.1 FACILITY LOCATION 1
2.2 PROJECT BACKGROUND 2
2.3 PREVIOUS STUDIES 3
3. METHODOLOGY 4
3.1 FIELD 4
3.2 LABORATORY 6
3.2.1 Analytical Phases 6
3.2.2 Sample Preparation 6
4. ANALYTICAL RESULTS 7
4.1 INITIAL JUNE SPLIT 7
4.2 SAMPLES FOR ANALYSES 7
5. RESULTS 8
6. RECOMMENDATIONS 9
7. REFERENCES 11

Tables 12
Appendix A A-1
Appendix B B-1
Appendix C C-1

ACRONYMS

ABG = Ammunition Burning Grounds
CCRA = Current Conditions Risk Assessment
CoC = Chain of Custody
COPEC = Contaminant of Potential Ecological Concern
ECB = WES Environmental Chemistry Branch
LCS = Laboratory Control Spike
MDL = Method Detection Limit
MS = Matrix Spike
MSD = Matrix Spike Duplicate
NSWC = Naval Surface Warfare Center
QC = Quality Control
QAPP = Quality Assurance Project Plan
RCRA = Resource Conservation and Recovery Act
RFI = RCRA Facility Investigation
TtNUS = Tetra Tech NUS
U.S. EPA = United States Environmental Protection Agency
U.S. FWS = U.S. Fish and Wildlife Service
WES = Waterways Experiment Station, U.S. Army Corps of Engineers

1. INTRODUCTION

This report presents the results of the study to determine potential impacts to the food chain of the Indiana bat (*Myotis sodalis*) foraging in the riparian area south of the Ammunition Burning Grounds (ABG) at Crane Division, Naval Surface Warfare Center (NSWC Crane).

M. sodalis feeds strictly on flying insects, typically in riparian areas, consuming both terrestrial and aquatic insects. There is an on-going debate over opportunistic versus selective feeding in insectivorous bats. Diet apparently varies seasonally and within different ages, sexes, and reproductive-status groups. For example, the Indiana Bat Recovery Plan notes that moths (Lepidoptera) are major prey items identified in several studies, but caddisflies (Trichoptera) and flies (Diptera) are major prey items documented in another (UFWS 1999). Lee (1993) found that Lepidoptera was the most important prey item of *M. sodalis*, with some intraspecific variation (i.e., slight differences in feeding behavior between adult males versus juveniles and pregnant, lactating, and nonreproductive females). He also suggests that *M. sodalis* may switch between selective and opportunistic feeding depending on prey availability. Ultimately, the selection of prey depends on the environment in which they forage and hence, the insects that are available.

Contaminant concentrations in flying insects are needed to estimate the magnitude of contaminant exposure that *M. sodalis* may experience from consuming insects along Little Sulphur Creek below the ABG. Numerous studies have attempted to estimate the bioavailability of pollutants in the food chain to insectivorous animals through the use of sediment partitioning models. However, direct measurement of contaminants in flying insects is the preferred approach since it contributes the least uncertainty to exposure estimates. That is, direct sampling of the food chain allows better prediction of the actual contaminant loading to the bat.

The small size of most insects requires many individuals to be pooled to ensure that each sample has sufficient biomass to meet analytical detection limits for trace elements. This method sacrifices information on individual variation, but since *M. sodalis* is arguably an opportunistic feeder, differences between insect species is of little importance. What is important in this particular study is the differences between aquatic and terrestrial species in order to determine the potential contaminant migration route, if there is any. Lepidopterans were also separated out since, as stated previously there is indication that moths make up a majority of the bat's diet.

2. BACKGROUND

2.1 FACILITY LOCATION

NSWC Crane is located in southwestern Indiana, approximately 75 miles southwest of Indianapolis, and 71 miles northwest of Louisville, Kentucky. NSWC Crane occupies 62,463 acres (approximately 100 square miles) of the northern portion of Martin County and small portions of neighboring Greene, Daviess, and Lawrence Counties. The base is located in a rural agricultural and wooded area, and is situated on a topographic plateau known as the Crawford Upland, dissected by well-defined stream valleys, causing elevation differences of over 300 feet in some areas. Surficial geology consists of Pennsylvanian and Mississippian age sandstones, shales, and limestones.

Little Sulphur Creek is approximately 4.6 miles long from its northern most headwaters to its intersection of Sulphur Creek south of NSWC Crane. The creek consists of a north and a south fork emanating just west of the ABG operational area, which then joins approximately in the center of the ABG treatment area. From the ABG, a single, rocky and sandy channel

meanders south a distance of approximately 1.1 miles until reaching the southern installation boundary. The width of the channel varies in width from a few feet in the upper reaches to about 25 feet in the valley flats. The stream is intermittent in that its flow varies considerably with the seasons. Some flow is usually present in the north and south forks above the center of the ABG. Immediately downstream of the ABG operational area, surface flow ceases in the dry months as the surface water is captured by vertical infiltration into a pseudo-karst conduit leaving a dry stream bed. In dry weather, the stream bed remains dry downstream of the capture zone to about three-fourths of a mile below the ABG where Spring C issues from the Beech Creek limestone on the east valley wall and rejuvenates Little Sulphur Creek. Flow is further augmented downstream by ground water issuing from the Beech Creek limestone as springs A and B on the west valley wall. In the dry season, all of the water flowing in Little Sulphur Creek below the ABG originates from Springs A, B, and C. During times of heavy or extended periods of precipitation, the conduit fills and surface water then flows through the entire Little Sulphur Creek channel. Water from Spring A has been shown by dye trace tests to have connection to limestone openings beneath the east-central portion of the ABG (Murphy and Ciocco 1990, and Baedke 1998). Runoff from the ABG soils potentially contributes contamination to LSC. Prior operational practices no longer in use (e.g., open burning of explosives directly on the ground) have resulted in contamination of surface soils with metals and explosives. These contaminants may migrate to Little Sulphur Creek during large-scale rain events.

2.2 PROJECT BACKGROUND

Crane Division, Naval Surface Warfare Center (NSWC Crane) conducted an ecological risk assessment for Resource Conservation Recovery Act (RCRA) corrective action activities and to support a RCRA Subpart X (open burning-open detonation) permit. A bat survey along the streams near the areas of concern was included as part of the ecological risk assessment. On June 25, 1996, a single male Indiana bat was caught. The capture occurred south of the ABG on Little Sulphur Creek in the SE corner of Section 28, T5N, R3W. Figure (1) shows the approximate location where the Indiana Bat was captured.

Subsequent conversations with the United States Environmental Protection Agency (U.S. EPA) and the U.S. Fish and Wildlife Service (U.S. FWS) led to the recommendations for follow-on studies to determine if the operations at the ABG are impacting *M. sodalis*. NSWC Crane responded with a proposal to conduct a survey, such as a light trap survey, of the available prey in the area the bat was captured, in order to determine if contaminants are mobilizing through the bat's food chain.

The collection of insects is not an exact science. The mass collected is not controlled by the sampler, but rather influenced by such factors as climate (temperature, humidity, presence or absence of drought or rainfall, and cloud cover), number and size of insects available for capture, effectiveness of the traps at attracting available insects, time of year, etc. Therefore, it was agreed that three months of sampling would be needed in order to collect a sufficient mass of insects for analyses. The plan was to field sort the moths from the rest of the insects prior to freezing and shipping. Each month's collection would then be shipped to the laboratory for storage and sorting the rest of the insects into those that had aquatic vs. terrestrial juvenile life stages. Since the earliest shipment of insects would not be analyzed right away, the U.S. EPA recommended that NSWC Crane do an additional initial collection of insects. This initial set would be split at the laboratory and used to determine if any explosives degradation occurred during storage. As such, all parties agreed that this set would not be sorted in order to ensure sufficient mass for explosives analysis.

NSWC Crane contacted the U.S. Army Corps of Engineers, Waterways Experiment Station (WES) for assistance in the project. Dr. Al Cofrancesco, a research entomologist, provided support in field collection (i.e., collecting equipment and its usage) and insect identification. Ms. Karen Myers, a biologist for WES, assisted in preparation of the Quality Assurance Project Plan for this project and lead the analytical work.

Sampling took place in June, July, and August 2000. Experientially, June, July, and August are the peak times for insect availability in south central Indiana. Sampling across three months allowed for collecting insects that emerged at different times during the season, as well as providing for optimum sample volume. Additionally, this availability of the most insects, combined with the presence of the bats feeding, as well as full-scale operation of the ABG, allowed for a more representative sample of the bat's diet and greatest potential for identifying contamination in the bat's food chain.

The particulars of each field sampling event included:

- Insect collection;
- Sorting of Lepidopterans in the field; and
- Sample preservation, packaging, and shipping.

WES then took care of:

- Sorting fractions;
- Sample preparation;
- Analysis for inorganics and explosives; and
- Data reporting.

2.3 PREVIOUS STUDIES

Surface water and sediments of Little Sulphur Creek have been previously addressed in three studies: A RCRA Facility Investigation (RFI) Phase II Release Assessment conducted by WES (1998); an RFI Phase III Release Characterization conducted by TtNUS (2001); and a current contamination conditions risk assessment by Tetra Tech NUS (TtNUS 1999).

WES conducted a Phase II RFI for surface water and sediment in 1992 and published a report in 1998. This report concluded that contaminants were generally detected more frequently in sediments than in surface waters. This implies that contaminants accumulate and persist in sediments but are diluted and flushed seasonally in the surface waters. When compared to background levels, the report found that aluminum, antimony, arsenic barium, cadmium, chromium, copper, lead, nickel, manganese, magnesium, mercury, silver, thallium, vanadium, and zinc were potential site-related contaminants at various points along Little Sulphur Creek in surface water and/or sediments. Three explosives, RDX, HMX, and 2,4-DNT were detected only at three surface water sites below the ABG.

TtNUS conducted a Phase III RFI in 2001. Only the unvalidated data was available. Initial indication is that levels of antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, thallium, and zinc exceeded risk-based target levels in surface water and/or sediments. Detected explosives below the ABG in surface water and sediments include TNT, 2,4-DNT, 2-Amino-4,6-Dinitrotoluene, 4-Amino-4,6-Dinitrotoluene, RDX, and HMX.

The 1999 Current Conditions Risk Assessment (CCRA) by TtNUS included a ecological risk assessment. The report included an evaluation of the data from the 1998 WES report, but stated that the metals data for the surface water and sediment were rejected for use in the CCRA due to questionable QA/QC. The CCRA sampled surface water and sediment to fill data gaps created by the rejected data. For surface water, five inorganics exceeded ambient water quality criteria (AWQC): aluminum (included since there was no AWQC), cadmium, lead, mercury, and zinc. Sediment inorganic contaminants of potential ecological concern (COPECs) that exceeded screening criteria: aluminum, antimony, arsenic, barium, cadmium, copper, lead, and zinc (aluminum and barium were included since there was no sediment screening criteria). However, through population sampling, the CCRA did determine the presence of pollution intolerant macroinvertebrate species including mayfly nymphs, stonefly larvae, and caddisfly larvae. In summary, the U.S. EPA approved CCRA states, "The majority of ecological risks posed by COPECs at the ABG/OJT, appear to be limited to the aquatic habitats at this SWMU. Elevated levels of barium, lead, and zinc in the sediments at the site may have slight adverse effects to wildlife; however, population studies and tissue samples for fish and macroinvertebrates did not show any evidence of adverse effects. Elevated levels of various compounds in the surface water may have a potential adverse impact to wildlife at this site; however, impacts as a result of these COPECs would be very localized and unlikely to impact the viability of any one species at the site given the availability of similar habitat in close proximity to these locations. Population studies at this SWMU support this conclusion, as animal, fish, macroinvertebrate, and vegetation species are diverse and abundant, and are similar to what would be expected to occur in a non-impacted area" (TtNUS 1999).

3. METHODOLOGY

3.1 FIELD

On October 19, 1999, representatives from the USFWS, U.S. EPA, and NSWC Crane met to review and agree upon the proposed sampling locations at the ABG. Appendix A contains the letter from the USFWS dated October 20, 1999, wherein agreement was made by all parties on the locations for insect collection. One of the light traps was situated on the Jeep Trail below the ABG, near Bridge 3090. The second light trap was placed in the floodplain adjacent to Little Sulphur Creek immediately downstream of the ABG, as shown on Figure 1.

Two types of traps were used for field collection. The first collecting apparatus was a large light trap that utilized both black lights and a mercury vapor lamp. Using different light sources, this light trap produced a wide spectrum of light stimulus to attract phototropic insects from a considerable distance (see Figure 2). The trap contained three large drawers. The bottom drawer contained a metal pan, wherein, sheets of cotton were placed and then approximately 800 ml of ethyl acetate was poured over the cotton. The ethyl acetate would evaporate up through the two upper drawers and funnel area where the insects landed. After breathing the chemical most of the insects fell through the collecting funnel and into the top drawer. This drawer is composed of large mesh screen, allowing smaller insects to drop through to the second drawer containing a fine mesh screen.

Since not all insects are attracted to light, a second trap type was also used. This type of trap, known as a Malaise trap, consists of insect netting designed in a configuration to funnel flying insects into a collecting container (Figure 3).

The Malaise Trap was set up on the Old Jeep Trail area of the ABG so as not to be influenced by the two light traps. The Malaise collecting container was initially operated with a small amount of water in an attempt to drown any collected insects. However, relatively few insects

were found in the water. This, along with the fact that the water seemed only to complicate emptying the container, the decision was made, after a few sampling events, to operate the collecting head dry. As expected, the mass of insects from the Malaise trap was much less than the mass of insects collected by the two light traps. All traps were set up in late afternoon so as to reduce the potential for collecting insects that fly only during daylight hours.

All three traps were operated for four nights in each of the months of June, July, and August 2000, resulting in 36 trap nights. However, an initial collection of insects was made June 12, 2000 – June 19, 2000 for the purposes of determining if explosives degradation would occur in the insect tissue while the insects were stored over the summer. This first set of June collections were not sorted in the field or the laboratory, but rather combined in order to ensure that a sufficient mass of tissue would be available for comparison of analytical splits. The container was taken back to Building 3245 and placed in a freezer. Each morning's collection was placed in a separate container so as to prevent thawing of the previous night's sample. Initially, the plan was to operate the traps for four nights for the initial June collection. However, on the morning of June 14, 2000, both light traps were off with no insects collected. Therefore, an additional night of sampling was done the evening of June 18, 2000. Appendix B contains the field sampling logs. Sampling containers were packed into two coolers, each containing a chain-of-custody (CoC). The coolers were then sent to the WES Environmental Chemistry Branch (ECB). The CoCs and shipping documents are provided in Appendix C.

The upper drawer of the light traps typically contained only the largest of insects, such as the Regal moth (*Citheronia regalis*), Imperial Moth (*Eacles imperialis*), and Luna Moth (*Actias Luna*). Though other large insects were initially trapped in the upper drawer, presumably they were able to crawl through the screen to the lower drawer prior to being overcome by the ethyl acetate. Even then, numerous beetles appeared to be only mildly intoxicated by the ethyl acetate.

After the first June sampling event to examine contaminant degradation, the intent was to place insects from the upper drawers and lower drawers into separate containers for the subsequent sampling events. However, after removal of the Lepidopterans, there were so few insects in the upper drawers, the decision was made to place all insects in one container. Additionally, numerous smaller insects were present on the upper portion of the traps around the lights above the funnel, as well as on the exterior portions of the traps. An attempt was made to collect all insects on the traps, not just from the drawers. Some insects that had not been affected by the ethyl acetate were able to escape from the hands of the samplers and the fate that awaited the other insects at WES. All identifiable Lepidopterans (post-initial June sampling effort) were field sorted and containerized apart from the rest of the insects.

Paint chips occasionally would flake off and fall into the drawers. These were typically easily removed. However, occasional heavy rains resulted in numerous very small crumbled paint flakes in the samples. Attempts were made to remove these paint chips with tweezers, but it was difficult to differentiate between insect parts and the black paint pieces beyond a certain size of chip. Removal efforts were further hampered by the agglomeration of wet insects. Climatological data is also provided in Appendix B.

Sample shipments took place in two coolers accompanied by CoCs on June 19, June 26, July 24, and August 28, 2000. Samples were shipped via overnight courier to Dr. Cofrancesco at WES for storage and sorting. The CoCs and shipping documents are provided in Appendix C, while Appendix B contains the field sampling logs.

3.2 LABORATORY

3.2.1 Analytical Phases

From an analytical perspective, the project involved three primary phases. The initial, or preliminary phase, was to refine existing methods and document the procedures for analyzing explosives, metals, and phosphorus in an insect matrix. The second phase was to collect macroinvertebrate samples associated with the food chain of the federally endangered Indiana Bat in the area of the ABG associated with the location of the capture of a single male bat. In the third phase, the insect samples were sorted and analyzed to determine concentrations of metals and explosives. This information will then be used to determine the need for other studies, that may entail additional sampling of insects or use of a surrogate bat to determine possible contaminant effects to the bat.

The sample size ultimately controlled the extent that project objectives could be pursued, especially with respect to the total number of analyses and quality control (QC) efforts. In order to maximize the QC and total number of analyses, crickets were obtained and used as surrogates for the initial phase of the project. Work with the crickets assisted in determining changes to preparation and analytical procedures, interferences, lower reporting and method detection limits (LRL and MDL, respectively), required sample volumes, and the extent of QC. The initial surrogate cricket work, along with a pre-obtained insect sample volume, determined the actual detection limits achievable for this project. Table 3 of the approved Quality Assurance Project Plan (QAPP) (NSWC 2000) for this project lists the LRLs & MDLs derived from the cricket studies.

The first phase of refining existing methods and documenting the procedures for analyzing explosives and metals in an insect matrix was completed in December 1997. The second, or insect collection phase was completed August 2000. The third, or analytical phase was completed November 2000.

3.2.2 Sample Preparation

Two coolers were received by the WES ECB on 20 June 00. Upon receipt of the first June collection of insects from NSWC Crane, the WES ECB checked the temperature inside the coolers (-1° and -4°C). The samples were stored in their freezer prior to processing. The insects were not sorted. The individual samples were weighed. The total weight was 616.61 grams. Processing included the addition of 60mLs of Mili Q water to facilitate grinding. After the grinding, the ground insects were combined and weighed again. This wet weight was 654.49 grams, with the additional weight being due to the water that was added prior to grinding. This sample was then split into two aliquots. The first portion was submitted for further analyses. The wet weight of the first aliquot was 330.12 grams.

On 21 June 2000, the insect tissue was placed in a freeze drier until 26 June 2000. The dry weight was 101.52 grams equating to 31% solids.

The second half of the split was stored frozen (-20°C) until all the other insect samples arrived. The remaining samples would then be processed and analyzed simultaneously. All samples were stored in the same manner (same freezer, same type of holding container, etc.). Results from the two splits would then be compared to see if any degradation of explosives takes place in the insects while frozen. This was important since additional insect samples would arrive later in June and remain frozen until sampling was completed in August and the insects could later be analyzed.

4. ANALYTICAL RESULTS

All samples were analyzed for explosives, metals, and total phosphorus according to the methods described in the approved QAPP. As outlined in the QAPP, crickets were obtained for use as laboratory controls spikes (LCS) or method blanks. Summary results of explosives, total phosphorus, and metals analyses are presented in Table 1, Table 2 and, Table 3, respectively.

4.1 INITIAL JUNE SPLIT

Explosives
The split composited insect tissue was analyzed with a matrix duplicate, a matrix spike (MS), and a matrix spike duplicate (MSD). Recoveries ranged from 84.0% for the MSD for TNB to 125.9% for the MS for TNX. Table 5 of the approved QAPP contains the accuracy requirements for this project. The crickets were sacrificed with ethyl acetate and processed in the same manner as the rest of the insects. The LCS ranged from 88.5% for 3-NT to 111.5% for 2A-DNT. Tetryl was not reported because there was no recovery demonstrated in insect tissue during MDL studies.

4.2 SAMPLES FOR ANALYSES

Over the course of the summer, samples were sent from NSWC Crane to Dr. Cofrancesco. These samples were placed in the freezer with the ground composite sample (the second half of the split from the degradation sample). Once all of the samples were received, sorting began. Sorting was done tray by tray in a room kept at approximately 4°C. Subsequent insect samples (June, July, and August) were grossly sorted into aquatic and terrestrial juvenile life stages plus Lepidopterans (moths). These samples were delivered to the WES Chemistry Branch on 1 Nov 00 along with previously ground composite insects.

For processing, the sorted insects were removed from their containers, weighed, and ground in a blender as previously described. The composited insects were thawed, placed in freeze drier vessels and processed as well. Tissue was weighed, blended, and placed in the freeze drier on 15 Nov 00. Tissue was removed from the freeze drier on 20 Nov 00. Afterward the sample was ground and placed in jars in the freezer.

The total weights shown in Table 4 are the weights of the insects as received by the WES laboratory from NSWC Crane prior to addition of the Mili Q water. For the sample that was composited in June and then split, the initial total weight is listed since the total weight of the splits is unknown. The Wet Weight lists the weights of the selected aliquots from the sorted fractions, after processing. For the composited June sample, out of the initial wet weight of 654.49 grams, 330.12 grams were analyzed during the first round, leaving a total of 324.37 grams from which the 295.44 gram sample was pulled (note that the large sample size is due WES analyzing inorganic fractions as well as explosives. Since these were not required nor lend themselves to useful interpretation, they are not discussed in this report). The listed Dry Weights are the weights of the aliquots after drying.

Explosives
The second half of the split from the composited insects was analyzed with MS/MSD. Spike recoveries ranged from 112.5% for 2A-DNT to 83% for 2,2'-Dinito-4,4'-Azoxytoluene. As before, the cricket control tissue was used as the matrix blank and LCS. LCS values ranged from 112% for DNX and 4,4'-Dinitro-2,2'-Azoxytoluene to 86% for 2,2'-Dinitro-4,4'-Azoxytoluene. Similar to the initial split, no data was reported for Tetryl.

Inorganics
Total Phosphorus: Due to changes in laboratory structure, management and procedures, samples for total phosphorus were sent to the part of the WES laboratory located in Omaha, Nebraska. The SOP for their analytical method was previously submitted to the Navy.

Metals: The Terrestrial insect tissue was analyzed for an MS/MSD. Matrix spike recoveries ranged from 119.2% for Manganese to 93.6% for silver and zinc. LCS recoveries ranged from 81.6% for zinc to 102.5% for manganese. No LCS data were reported for aluminum and magnesium.

5. RESULTS

As seen from Table 4, the traps produced sufficient mass for analyses. The process of operating three traps for four nights in each of the months of June, July, and August resulted in a wide spectrum of insect species collected. Lepidoptera constituted the greatest mass collected, followed by terrestrials, then aquatic.

Explosives
As shown in Table 1, explosives were not detected. Since no explosives were found in either the initial June split or any subsequent samples, the degradation of explosive compounds in an insect matrix could not be quantified. Here is possibly an example of where direct measurement of contamination in the food chain is preferable to a sediment partitioning model. Previous studies have found explosives in sediments (WES 1999, TtNUS 2001). If one used a partitioning model, explosives contamination of the food chain may have been indicated.

Inorganics
Total Phosphorus: The total phosphorus results are presented in Table 2. Though phosphorus compounds have been treated at the ABG (e.g., red and white phosphorus), phosphorus is also found in nearly every living organism. As can be seen in Table 2, none of the phosphorus results for the NSWC Crane insects exceeded the values of the cricket control.

Metals: An attempt was made to compare the results of the NSWC Crane metals analyses to values reported in journal articles. The only literature found was for metals in pre-emergent aquatic macroinvertebrates. Obviously, this study analyzed the adults. However, most adult forms typically do not feed - at least not on contaminated sediments. The primary role of the adult aquatic insect is to reproduce. A few live less than one day. So some extrapolations can be made. However, little is known about the levels of various metals left behind in the transformation from the nymph to the adult form.

Another difficulty encountered is in finding whole body data from a control setting. Since the bat ingests the entire insect, the NSWC Crane study examined whole-insect body burdens. In reality, bats will often consume only parts of insects - which is why wings of moths are often found below outdoor lights - and portions of the insects will also pass through the bat's gut. The purpose of this study however, is to quantify contaminant concentrations in whole-insect bodies in order to conservatively qualify the potential for harmful effects to the bat through bioaccumulation. Almost all of the literature sources examined depurated (i.e., gut content removed) collections from a contaminated setting. Some researchers have attempted to compare gut content with respect to whole body contaminant burdens. Unfortunately, only one published report was found that provided a few trace element concentrations for non-depurated insects from a non-contaminated source.

Cain (1995) evaluated the influence of gut content on immature caddisflies (Trichoptera) and stoneflies (Plecoptera). The insects evaluated were collected from a reportedly uncontaminated stream in western Montana and looked only at four metals: cadmium, copper, iron, and lead.

Since iron was not an element evaluated in the NSWC Crane study, only cadmium, copper, and lead results are presented (see Table 5).

Cadmium: Cain reported a potential maximum cadmium value of 0.3 mg/kg (Table 5), which is less than the reported value of 0.83 mg/kg for the NSWC Crane aquatics (Table 3). The highest value for cadmium (0.871 mg/kg) was found in the terrestrial insects. The lowest was for lepidoptera at 0.698 mg/kg and exceeded the respective cricket control by 3262%.

Copper: Cain reported copper values of a potential maximum value of 28 mg/kg (Table 5). The NSWC Crane aquatics reported a value greater than this. Table 3 shows that the aquatic copper value was 114 mg/kg, the highest value for copper of the NSWC Crane insects. Note that the lowest NSWC Crane value was for Lepidoptera at 36.1 mg/kg. Though this value is more than twice the cricket control, it is within an order of magnitude.

Lead: Cain reported a potential maximum value of 1.4 mg/kg. The NSWC Crane aquatics had the highest lead value of the three groups at 16.5 mg/kg. Again, the lepidoptera had the lowest lead value at 1.75 mg/kg. This value however, exceeded the respective cricket control by 3813%.

Adequate outside data was not available for comparison of the other eleven metals. The following is simply a synopsis of the data.

Table 6 shows the maximum and minimum percentage differences for the metals in the insects over the controls. The maximum values are highlighted, while the minimum values are in bold. Since Antimony, mercury, and silver, were not detected in the cricket controls, one-half of the detection limit was used for the percentage calculation.

The lowest metal concentrations for 13 of the 14 analytes were found in Lepidoptera. The exception being for silver wherein the lowest value was found in the terrestrial insects. Interestingly, the insects with the lowest recorded concentrations for 13 out of the 14 metals, also constituted the largest mass collected (Table 4). Unless this is some artifact of collection bias, this possibly benefits the bat, if indeed Lepidoptera constitute the majority of the prey for *M. sodalis*.

Paragraph 8 of Section 3.1 briefly discussed the presence of paint flakes in the samples. Though this might account for some elevated levels of metals, Dr. Cofrancesco provided assurance that he did not use metal based paints, and certainly not lead containing paint.

6. RECOMMENDATIONS

Since no explosive compounds were detected in any of the samples there is no need to evaluate explosives any farther. Furthermore, since the total phosphorus results were less than or equal to the crickets used as controls, there does not appear to be a problem with total phosphorus. Metals are clearly a concern identified in this project. The levels of metals seem to indicate contaminated conditions. However, it may be premature at this point to act upon this conclusion. First of all, most of the data comparison assumes that crickets serve as a suitable control. Clearly, all Orders of insects inherently contain naturally different levels of metals, possibly even down to the Species level.

Secondarily, little outside data was found for comparative purposes. Only one article was identified that was sufficiently similar so as to be useful for comparison (Cain 1995). Cain looked at four metals. Only three of which were the same looked at in this project. Then in only four Species of two Orders of immature aquatic insects. The other eleven metals for the aquatics, plus all 14 for the terrestrial and Lepidoptera did not have outside data to evaluate

against. Possibly another difference is the location. Cain studied insects from the Clark Fork River in western Montana. It is unclear, yet quite likely that insects will have different levels of naturally occurring metals based upon location. Additionally, some reported concentration differences may be attributable to differences in preparation and analytical techniques between the Cain and NSWC Crane studies.

So why was the Cain study even used for evaluation? One reason was to show that efforts had been made to find articles for comparison. Section 1.4.2 of the approved QAPP stated that the data would be compared to published literature values for metals. The result was that there seems to be suprisingly little data reported on the background levels of metals in insects. Another reason was to get an indication as to whether or not there may be a problem with contamination in the NSWC Crane insects. Since the Cain article was found to be reasonably similar, it was presented to show the need for additional studies.

Remember, as stated in section 2.3, the ecological portion of the approved CCRA concluded that though contamination was present, it did not appear to impact macroinvertebrate populations. Population studies identified animal, fish, macroinvertebrate (including pollution intolerant organisms), and vegetation species similar to what would be expected to occur in a non-impacted area.

In conclusion, to adequately quantify whether or not the metals found in the NSWC Crane insects are abnormally high, more data is needed. Unfortunately, we only have one data point. Therefore, the recommendation is to collect a background sample of insects using the same materials and methods, or similar if equipment is unavailable. Since the question of the paint from the traps is a possible source of contamination, the same traps should be used for the background collection. If the same traps are not available, then one of the set of traps should be used to collect an additional round of insects from the ABG area. For simplicity, since the Malaise trap produced very few insects, the Malaise would not be used in the background study. If there is indeed a contaminant problem, collecting a background sample would allow NSWC Crane to more closely determine the true magnitude of the problem.

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Tables

Table 1 - Explosive Results

Description		Units	MDL	Terrestrial	Aquatic	Lepidoptera	1st June Split	2nd June Split	1st Cricket Control	2nd Cricket Control
HMX	HMX	mg/kg dry	3.2	<3.2	<3.2	<3.2	<3.2	<3.2	< 3.2	<3.2
RDX	RDX	mg/kg dry	0.80	<0.80	<0.80	<0.80	<0.80	<0.80	< 0.8	<0.80
TNB	1,3,5-Trinitrobenzene	mg/kg dry	1.2	<1.2	<1.2	<1.2	<1.2	<1.2	< 1.2	<1.2
DNB	1,3-Dinitrobenzene	mg/kg dry	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	< 1	<1.0
TETRYL	Tetryl	mg/kg dry	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TNT	2,4-6-Trinitrotoluene	mg/kg dry	1.3	<1.3	<1.3	<1.3	<1.3	<1.3	< 1.3	<1.3
4A-DNT	4-Amino-2,6-Dinitrotoluene	mg/kg dry	2.50	<2.50	<2.50	<2.50	<2.50	<2.50	< 2.5	<2.50
2A-DNT	2-Amino-4,6-Dinitrotoluene	mg/kg dry	1.20	<1.20	<1.20	<1.20	<1.20	<1.20	< 1.2	<1.20
2,6-DNT	2,6-Dinitrotoluene	mg/kg dry	1.30	<1.30	<1.30	<1.30	<1.30	<1.30	< 1.3	<1.30
2,4-DNT	2,4-Dinitrotoluene	mg/kg dry	0.70	<0.70	<0.70	<0.70	<0.70	<0.70	< 0.7	<0.70
NB	Nitrobenzene	mg/kg dry	1.70	<1.70	<1.70	<1.70	<1.70	<1.70	< 1.7	<1.70
2-NT	2-Nitrotoluene	mg/kg dry	1.90	<1.90	<1.90	<1.90	<1.90	<1.90	< 1.9	<1.90
3-NT	3-Nitrotoluene	mg/kg dry	1.60	<1.60	<1.60	<1.60	<1.60	<1.60	< 1.6	<1.60
4-NT	4-Nitrotoluene	mg/kg dry	2.10	<2.10	<2.10	<2.10	<2.10	<2.10	< 2.1	<2.10
MNX	MNX	mg/kg dry	1.80	<1.80	<1.80	<1.80	<1.80	<1.80	< 1.8	<1.80
TNX	TNX	mg/kg dry	1.80	<1.80	<1.80	<1.80	<1.80	<1.80	< 1.8	<1.80
DNX	DNX	mg/kg dry	1.80	<1.80	<1.80	<1.80	<1.80	<1.80	< 1.8	<1.80
4,4-AZOX	2,2'-Dinitro-4,4'-Azoxytoluene	mg/kg dry	2.10	<2.10	<2.10	<2.10	<2.10	<2.10	< 2.1	<2.10
2,2-AZOX	4,4'-Dinitro-2,2'-Azoxytoluene	mg/kg dry	2.10	<2.10	<2.10	<2.10	<2.10	<2.10	< 2.1	<2.10
3,5-DNA	3,5-Dinitroaniline			92.80%	86%	100%	100%	102%	100.2	84.20%

Table 2 - Total Phosphorus Results	
Description	Ttl. Phosphorus
Units	$^{mg}/_{kg}$ dry
MDL	1
Terrestrial	6600
Aquatic	5900
Lepidoptera	5400
Cricket control	6600

Table 3 - Metals Results							
Description		Units	MDL	Terrestrial	Aquatic	Lepidoptera	Cricket Control
Sb	Antimony	$^{mg}/_{kg}$ dry	0.014	0.138	0.113	0.0205	<0.014
As	Arsenic	$^{mg}/_{kg}$ dry	0.073	3.25	0.597	0.169	0.0745
Cd	Cadmium	$^{mg}/_{kg}$ dry	0.005	0.871	0.83	0.698	0.0214
Cr	Chromium	$^{mg}/_{kg}$ dry	0.065	38.6	209	28.6	0.23
Cu	Copper	$^{mg}/_{kg}$ dry	0.05	74.8	114	36.1	17.1
Pb	Lead	$^{mg}/_{kg}$ dry	0.007	16	16.5	1.75	0.0459
Hg	Mercury	$^{mg}/_{kg}$ dry	0.2	0.083	0.072	<0.040	<0.040
Ni	Nickel	$^{mg}/_{kg}$ dry	0.032	30.5	147	21.1	0.249
Ag	Silver	$^{mg}/_{kg}$ dry	0.026	0.0515	0.55	0.0942	<0.026
Zn	Zinc	$^{mg}/_{kg}$ dry	0.19	582	913	234	143
Al	Aluminum	$^{mg}/_{kg}$ dry	0.078	93.8	134	10.7	7.77
Ba	Barium	$^{mg}/_{kg}$ dry	0.009	11.7	20.7	6.58	0.476
Mg	Magnesium	$^{mg}/_{kg}$ dry	0.13	1510	1430	1300	1190
Mn	Manganese	$^{mg}/_{kg}$ dry	0.01	74.2	77.4	28.5	27.3

Table 4– Insect Weight Summaries (grams)				
Group	Total Weight (grams)[1]	Wet Weight (grams)[2]	Dry Weight (grams)[3]	Avg. % Solids
1st June Split	616.61[4]	330.12	101.52	0.3092
Aquatic	54.56	82.78	27.33	0.3302
Terrestrial	438.74	213.27	71.48	0.3367
Lepidoptera	649.51	440.19	101.08	0.2243
2nd June Split	616.61[4]	295.44	96.57	0.3268

[1]Actual total weights received by the laboratory
[2]Weight of aliquots selected for sampling post-processing (e.g., water added, blended, etc.)
[3]Aliquots after removal from freeze drier
[4]Total weight prior to split (½ were analyzed during the first phase)

Table 5 - Whole Body Metal Concentration (mg/kg dry weight)[1]			
	Cd	Cu	Pb
Stonefly	0.2±0.02	22±2	0.4±0.1
Caddisfly	0.2±0.1	20±8	0.8±0.6

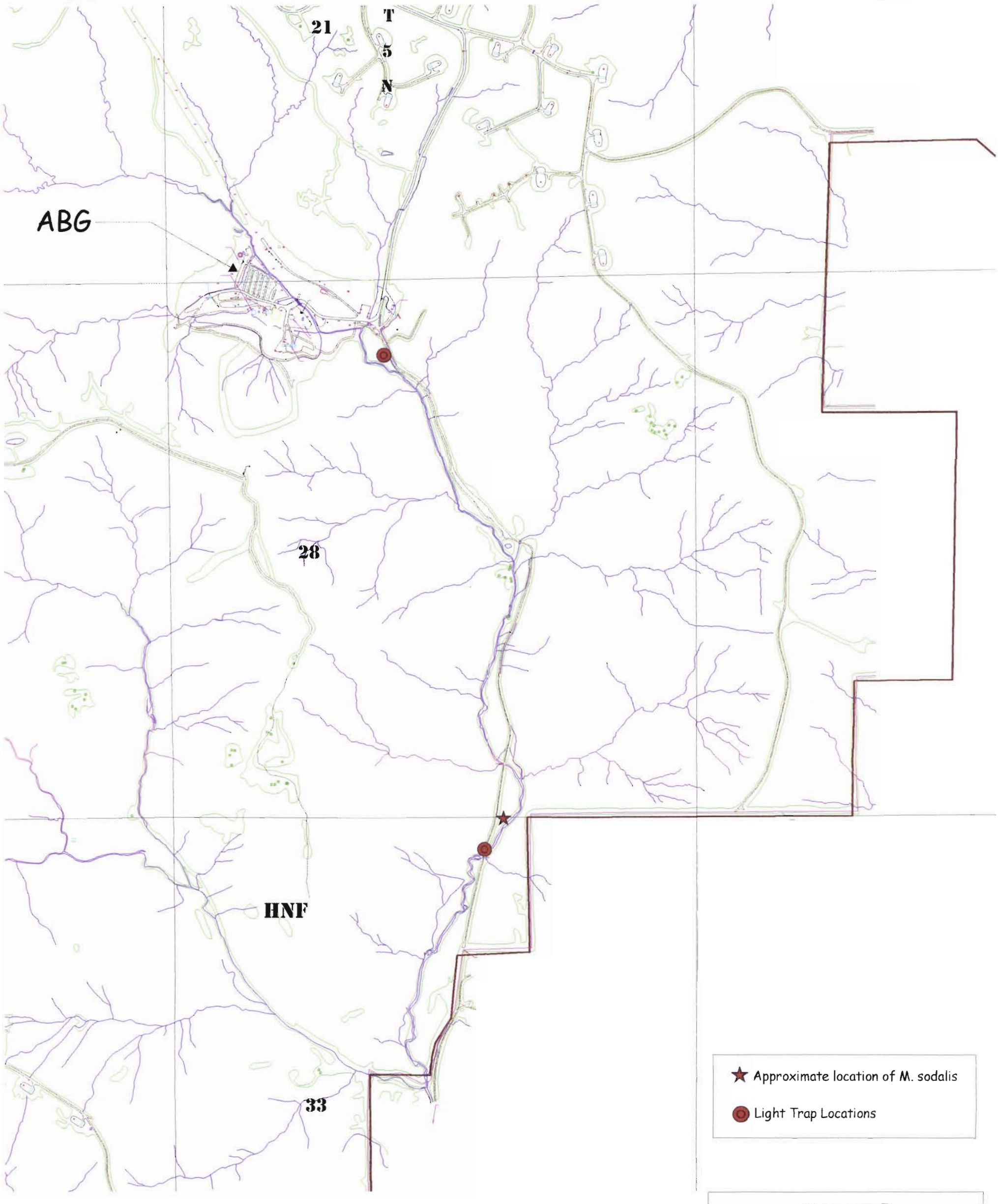
[1]After Cain (1995)

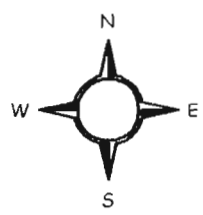
Table 6 - Max. & Min. %s Compared to Cricket Control

Description		Units	MDL	Terrestrial	Aquatic	Lepidoptera	Cricket Control	% Exceed. by Min.	% Exceed. by Max.
Sb	Antimony	mg/kg dry	0.014	0.138	0.113	**0.0205**	<0.014	293	1971
As	Arsenic	mg/kg dry	0.073	3.25	0.597	**0.169**	0.0745	227	4362
Cd	Cadmium	mg/kg dry	0.005	0.871	0.83	**0.698**	0.0214	3262	4070
Cr	Chromium	mg/kg dry	0.065	38.6	209	**28.6**	0.23	12435	90870
Cu	Copper	mg/kg dry	0.05	74.8	114	**36.1**	17.1	211	667
Pb	Lead	mg/kg dry	0.007	16	16.5	**1.75**	0.0459	3813	35948
Hg	Mercury	mg/kg dry	0.2	0.083	0.072	**<0.040**	<0.040	1	415
Ni	Nickel	mg/kg dry	0.032	30.5	147	**21.1**	0.249	8474	59036
Ag	Silver	mg/kg dry	0.026	**0.0515**	0.55	0.0942	<0.026	396	4231
Zn	Zinc	mg/kg dry	0.19	582	913	**234**	143	164	638
Al	Aluminum	mg/kg dry	0.078	93.8	134	**10.7**	7.77	138	1725
Ba	Barium	mg/kg dry	0.009	11.7	20.7	**6.58**	0.476	1382	4349
Mg	Magnesium	mg/kg dry	0.13	1510	1430	**1300**	1190	109	127
Mn	Manganese	mg/kg dry	0.01	74.2	77.4	**28.5**	27.3	104	284

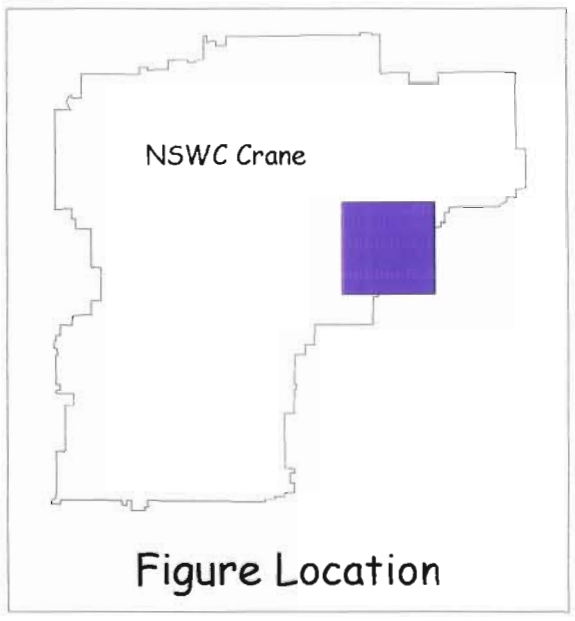
Figure 1

Sampling Location





800 0 800 Feet



Location of ABG wrt Bat Capture & Trap Locations

Figure (1)

Figure 2

Light Trap

Figure 3

Malaise Trap

Appendix A

Letter from USFWS

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

BLOOMINGTON FIELD OFFICE (ES)
620 South Walker Street
Bloomington, IN 47403-2121
(812) 334-4261 FAX (812) 334-4273

October 20, 1999

Mr. Thomas J. Brent
Department of the Navy
Crane Division - Code 09510
Naval Surface Warfare Center
300 Highway 361
Crane, Indiana 47522-5000

Dear Mr. Brent:

As you requested, this letter is intended to follow up on the site inspection that was conducted on Crane yesterday. Specifically, potential insect collection sites along Little Sulphur Creek were inspected by you, Daniel Mazur (EPA), Scott Pruitt (USFWS, Bloomington Field Office), and me. After inspecting these sites, we concurred that the 2 sampling sites should include: 1) 1 site in floodplain vegetation adjacent to Little Sulphur Creek immediately downstream of the Ammunition Burning Grounds (ABG); and 2) a second site further downstream (near the previous sampling site).

If you have any questions please contact me at (812) 334-4261, extension 211.

Sincerely,

Lori Pruitt

Lori Pruitt

cc: Peter Ramanauskas, EPA

Appendix B

Field Sample Logs

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 1a

TRAP TYPE	TRAP SITE
Light	B3080
SAMPLE DATE	**TIME OF TRAPPING**
6/12 - 6/13/00	1730 - 0735

OBSERVATIONS

p.m. - Cloudy/humid 1st June Sample (degradation study)
a.m - Raining (hard).
Trap was running. All lights on. Bottom drawer covered/full w/of small moths.

SAMPLE DATE	TIME OF TRAPPING
6/13 - 6/14/00	1710 - ?

OBSERVATIONS

Removed screen from "water collector". p.m. Clear/humid
a.m. Trap off - no bugs. Will have to do an addl. collection this weekend.
Possibly due to position of gas can & there being less gas than last night.
Skies were clear

SAMPLE DATE	TIME OF TRAPPING
6/14 - 6/15	1655 - 0720

OBSERVATIONS

p.m. ptly. Cloudy.
a.m. Cloudy. 1 Floures. lt. burned out. Fewer insects (esp moths) than 6/13 a.m. collection. Larger moths than 6/13 a.m.

SAMPLE DATE	TIME OF TRAPPING
6/15 - 6/16/00	1710 - 0713

OBSERVATIONS

p.m. mostly clear. Warm. Not as humid
a.m. Warm, mostly cloudy. Not as humid.

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 1a

TRAP TYPE	TRAP SITE
Light	B3090
SAMPLE DATE	**TIME OF TRAPPING**
6/18 - 6/19/00	1745-0730

OBSERVATIONS

p.m. Cloudy - ~72°F

a.m. partly cloudy. cool & hazy. Top light off (Hg-Vapor).

Changed transformer.

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 16

TRAP TYPE	TRAP SITE
Light	LSC Floodplain
SAMPLE DATE	TIME OF TRAPPING (took ~30 min. to set up Malaise)
6/12 - 6/13/00	1800 - ?

OBSERVATIONS

p.m. Cloudy

a.m. Raining (hard). Trap was off upon arrival. May be due to failure to pull gas from external tank. Will try to set up higher tonight. Had ~75% vol. of B3050 trap. Lots of moths, some large beetles.

SAMPLE DATE	TIME OF TRAPPING
6/13 - 6/14/00	1730 - ~~07~~ ?

OBSERVATIONS

Removed screen from water collector. p.m. Clear + humid

a.m. Trap off. Will have to do an add'l. collection this wknd. Possibly due to cam being shut (unable to vent/drain) &/or gas may have been shut off. Skies were clear.

SAMPLE DATE	TIME OF TRAPPING
6/14/00 - 6/15/00	1720 - 0714

OBSERVATIONS

PM partly cloudy

a.m. Cloudy. Fewer insects than B3050 L.T. No large moths.

SAMPLE DATE	TIME OF TRAPPING
6/15 - 16/00	1730 - ~~0710~~ COF 0705

OBSERVATIONS

p.m. mostly clear, warm, not as humid

a.m. Warm. Mostly cloudy. Generator ran out of gas as I was walking toward it, ∴ didn't get to check lights.

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet #/bj

TRAP TYPE	TRAP SITE
Light	Flood plain LSC
SAMPLE DATE	**TIME OF TRAPPING**
6/18 - 6/19/00	1805 - ?

OBSERVATIONS

p.m. cloudy ~72°F

Trap off in a.m. Partly cloudy, cool & hazy

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 1c

TRAP TYPE	TRAP SITE
Malaise	Near 03-07 well
SAMPLE DATE	**TIME OF TRAPPING**
6/12 - 6/13/00	1750 - 0800

OBSERVATIONS

p.m. cloudy
a.m. raining (hard).
fair collection of insects. Still probably <0.1% of Light traps.
More than I recall from last year.

SAMPLE DATE	TIME OF TRAPPING
6/13 - 6/14/00	1650 - 0735

OBSERVATIONS

p.m. Clear / humid
a.m. Clear - not as humid. Due to other traps having ~~Ø~~ bugs, placed this Collection in w/ Yesterday's.

SAMPLE DATE	TIME OF TRAPPING
6/14 - 6/15/00	1700 - 0716

OBSERVATIONS

p.m pttly cloudy
a.m Cloudy

SAMPLE DATE	TIME OF TRAPPING
6/15 - 16/00	1655 - ~~0705~~ CDF 0710

OBSERVATIONS

p.m. mostly clear - warm, not as humid.
a.m. Mostly cloudy, Not as humid.

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 1ci

TRAP TYPE	TRAP SITE
Malaise	Near WL0307
SAMPLE DATE	**TIME OF TRAPPING**
6/18 - 6/19/00	1750 - 0725

OBSERVATIONS

p.m. Cloudy ~72°F

a.m. Partly cloudy, cool, & hazy. Least amt. of insects so far.

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE DATE	TIME OF TRAPPING

OBSERVATIONS

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 2a

TRAP TYPE	TRAP SITE
Light	B 3090
SAMPLE DATE	**TIME OF TRAPPING**
6/19 - 6/20/00	1700 - ??

OBSERVATIONS

p.m. clear ~70°F Removed flaking paint
a.m. Cool & sprinkling. Trap off in a.m. Practically no insects other than moths in upper drawer. ∴ elected to just use 2 containers instead of 3. Emptied trap: D720

SAMPLE DATE	TIME OF TRAPPING
6/20/00 - 6/21/00	~~1605~~ 1715 - 0735

OBSERVATIONS

p.m. Δ start time due to generator problems (low oil). Cloudy
a.m. Treedown on way to this trap. Had to get moved. Heavy rains overnight → lots of small insects & paint chips from L.T. Few bugs in upper drawer, ∴ placed all in lower drawer container. (only 1 lg. orange moth)

SAMPLE DATE	TIME OF TRAPPING
6/21/00 - 6/22/00	1705 - 0710

OBSERVATIONS

p.m. Clear. Had to fill this gen. w/oil again.
a.m. Mostly cloudy

SAMPLE DATE	TIME OF TRAPPING
6/22/00 - 6/23/00	1645 - 0730

OBSERVATIONS

p.m. Mostly clear — lower bridge Crane-INS-62300
a.m. clear sunny — Crane - LEP-62300 bridge

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 2b

TRAP TYPE	TRAP SITE
Light	LSC Flood Plain
SAMPLE DATE	**TIME OF TRAPPING**
6/19 - 6/20/00	1635 - 0710

OBSERVATIONS

p.m. Clear - ~70°F Removed flaking paint.

a.m. Sprinkling. Used 2 containers instead of 3 due to lack of insects in upper drawer.

SAMPLE DATE	TIME OF TRAPPING
6/20/00 - 6/21/00	1735 - 0705

OBSERVATIONS

p.m. Cloudy.

a.m. Heavy rain o-night.

Began emptying @ 0830. Used separate container for lower drawer. No large moths

Malaise insects included in lower drawer container

SAMPLE DATE	TIME OF TRAPPING
6/21/00 - 6/22/00	1720 - 0700

OBSERVATIONS

p.m. clear. oil in gen. OK.

a.m. mostly cloudy. Finished emptying @ 0815. By then skies were clear. No med. size "Megaloptera" (or (g.).

SAMPLE DATE	TIME OF TRAPPING
6/22/00 - 6/23/00	1700 - 0720

OBSERVATIONS

p.m. mostly clear emptied: 0825 lower Floodplain Crane-MS-62300

a.m. sunny clear Crane-LEP-62300 Floodplain ~~Floodplain~~

malaise in floodplain sample

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet #2e

TRAP TYPE	TRAP SITE
Malaise	Well 0307

SAMPLE DATE	TIME OF TRAPPING
6/19 - 6/20/00	1730 - 0715

OBSERVATIONS

p.m. clear ~70°F
a.m. sprinkling.

SAMPLE DATE	TIME OF TRAPPING
6/20/00 - 6/21/00	1720 - 0730

OBSERVATIONS

p.m. Cloudy.
a.m. Heavy rains o-night.
Insects included in lower drawer Floodplain sample

SAMPLE DATE	TIME OF TRAPPING
6/21/00 - 6/22/00	1710 - 0705

OBSERVATIONS

p.m. clear
a.m. mostly cloudy

SAMPLE DATE	TIME OF TRAPPING
6/22/00 - 6/23/00	1650 - 0725

OBSERVATIONS

p.m. mostly clear a.m. sunny clear
malaise in floodplain sample

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 3a

TRAP TYPE	TRAP SITE
Light	B-3090
SAMPLE DATE	**TIME OF TRAPPING**
7/17/00 – 7/18/00	1745 – 0722

OBSERVATIONS

p.m. Cloudy warm
1 f/o. Light out p.m. overcast
Finished collection @ 0812 Top drawer placed in bottom drawer (only 6 beetles)

SAMPLE DATE	TIME OF TRAPPING
7/18/00 – 7/19/00	1653 – 0725

OBSERVATIONS

p.m. partly cloudy
a.m. cloudy/rainy (heavy rain overnight) Finished @ 0815
Due to quantity of wet bugs, Bridge collection (upper & lower drawers are in a seperate container from Floodplain. Few bugs in upper drawer).

SAMPLE DATE	TIME OF TRAPPING
7/19/00 – 7/20/00	1643 – 0712

OBSERVATIONS

P.M. Cloudy
a.m. Sunny & Cool. Fewer insects than previous mornings, but not as active due to cool temps. Stopped (finished) emptying @ 0744.
No "top drawer" collection – too few bugs.

SAMPLE DATE	TIME OF TRAPPING
7/20–7/21/00	1656 – 0715

OBSERVATIONS

p.m. Cool & mostly sunny
a.m. Cool & clear (almost cold). Finished emptying @ 0742
1 large megalopteran

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 3a

TRAP TYPE	TRAP SITE
Light	LSC Floodplain
SAMPLE DATE	**TIME OF TRAPPING**
7/17/00 - 7/18/00	1800 - 0713.

OBSERVATIONS

p.m. Cloudy warm

a.m. overcast. Emptied @ 0825 finish collection @ 0900

Top drawer placed w/ Bottom drawer (only 6 beetles).

SAMPLE DATE	TIME OF TRAPPING
7/18/00 - 7/19/00	1716 - 0714

OBSERVATIONS

p.m. partly cloudy

a.m. Dragon Fly + 2 locusts. Obvious signs of bat feeding @ this trap (wings) - practically every a.m.

a.m. Heavy rain overnight. Mornings - Cloudy Started Collection @ 0840 finished @ 0922

Due to lg. qty. of wet bugs, we collected the Bridge samples separate from the Floodplain sample. Too few bugs in top drawer to collect seperately (mostly Leps.).

SAMPLE DATE	TIME OF TRAPPING
7/19/00 - 7/20/00	1702 - 0705

OBSERVATIONS

p.m. cloudy

a.m. sunny & cool. started emptying @ 0751. Finished @ 0834. (now - partly cloudy).

Bugs were more active than those in the B3090 light trap.

No "top drawer" collection - too few insects.

SAMPLE DATE	TIME OF TRAPPING
7/20/00 - 7/21/00	1708 - 0708

OBSERVATIONS

p.m. cool + mostly sunny

a.m. Cool & clear (almost cold). started emptying @ 0752

finished @ 0820

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 3a

TRAP TYPE	TRAP SITE
Malaise	Well 0307
SAMPLE DATE	TIME OF TRAPPING
7/17/00 - 7/18/00	1755 - 0719

OBSERVATIONS

p.m. Cloudy warm
a.m. overcast. Contained 1 hornet - probably from a.m., but left w/in.

SAMPLE DATE	TIME OF TRAPPING
7/18/00 - 7/19/00	1703 - 0718

OBSERVATIONS

p.m. Partly Cloudy.
a.m. Heavy rain overnight (Cloudy in a.m.).

SAMPLE DATE	TIME OF TRAPPING
07/19/00 - 07/20/00	1650 - 0708

OBSERVATIONS

p.m. cloudy

SAMPLE DATE	TIME OF TRAPPING
07/20/00 - 07/21/00	1700 - 0712

OBSERVATIONS

p.m. cool + mostly sunny
a.m. Cool & Clear (almost cold).

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 4a

TRAP TYPE	TRAP SITE
Light	B-3090
SAMPLE DATE	**TIME OF TRAPPING**
8/21 - 22/00	1725 - 0704

OBSERVATIONS

p.m. Clear
a.m. Mostly Cloudy Did some sorting in field, but ret'd to office for most (placed in a 3rd box). Only used 2 containers when done.
No large moths (Regal or Imperial). in cooler until sorted. Finished @ 0843

SAMPLE DATE	TIME OF TRAPPING
8/22 - 23/00	1650 - 0706

OBSERVATIONS

p.m. partly cloudy
a.m. Heavy rain. No Regal or Imperial Moths. Most Placed insects in a separate box to be sorted back @ B3245

SAMPLE DATE	TIME OF TRAPPING
8/23 - 24/00	1715 - ??

OBSERVATIONS

p.m. Clear
a.m. Cloudy - Rain overnight. Generator ~~Trap~~ had quit running sometime last night. Cool & ~~touch~~. However, there were several bugs, although not as many as usual. Did some sorting in field, but brought most back for sorting @ B3245

SAMPLE DATE	TIME OF TRAPPING
8/24 - 25/00	1712 - ??

OBSERVATIONS

p.m. Clear. Had to use alternate generator as Honda gen. had apparently seized up. a.m. Alt. gen. apparently quit early in the eve. Very few insects. ∴ sorted in field.

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 46

TRAP TYPE	TRAP SITE
Light	LSC Floodplain
SAMPLE DATE	**TIME OF TRAPPING**
8/21-22/00	1738 - 0658

OBSERVATIONS

p.m. Clear

~~p.m.~~ a.m. Mostly cloudy. Thousands of small winged insects. No large (Regal or imperial) moths. Placed insects & leps. from lower drawer into a 3rd container for sorting later. Placed in cooler & kept there. Finished @ 0843

SAMPLE DATE	TIME OF TRAPPING
8/22-23/00	1707 - 0659

OBSERVATIONS

p.m. partly cloudy

a.m. Heavy rain. ~4 Hornets (European?). No Regal or Imperial ~~moths~~

Most Insects placed in a separate container to be sorted back @ B3245.

SAMPLE DATE	TIME OF TRAPPING
8/23-24/00	1732 - 0704

OBSERVATIONS

p.m. Clear

a.m. Cloudy. Rain one night. 2 June moths & 1 Megaloptera. Mass of (in lower drawer) tiny black bugs we determined inseparable containing paint chips → discarded. Did some sorting in field. Rest via cooler to B3245 to sort there.

SAMPLE DATE	TIME OF TRAPPING
8/24-25/00	1726 - 0710

OBSERVATIONS

p.m. Clear

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

INDIANA BAT FOOD CHAIN STUDY
SAMPLE LOG

Department of the Navy
Naval Surface Warfare Center
Crane, IN 47522

sheet # 4c

TRAP TYPE	TRAP SITE
Malaise	Near 03-07 Well
SAMPLE DATE	**TIME OF TRAPPING**
8/21-22/00	1732 - 0702

OBSERVATIONS

p.m. Clear
a.m mostly Cloudy

SAMPLE DATE	TIME OF TRAPPING
8/22-23/00	1657-0702

OBSERVATIONS

p.m. partly cloudy
a.m. Heavy rain-

SAMPLE DATE	TIME OF TRAPPING
8/23-24/00	1722-0708

OBSERVATIONS

p.m. Clear
a.m. Cloudy - Rain Overnight

SAMPLE DATE	TIME OF TRAPPING
8/24-25/00	1719-0714

OBSERVATIONS

p.m. Clear
a.m. light fog - otherwise clear

SAMPLE NUMBER	NUMBER OF CONTAINERS

SAMPLER'S SIGNATURE	CODE

DATE SAMPLES SENT	ANALYTICAL LAB

TODAY'S DATE: 18-SEP-00

JUN-00 FOR BLOOMINGT, IN (824')

LAT=39.2N LON= 86.5W

	TEMPERATURE							PRECIPITATION			
	ACTUAL			NORMAL							
	HI	LO	AVG	HI	LO	AVG	DEPT	AMNT	SNOW	SNCVR	HDD
1	87	62	75	79	57	68	+7	0.00	0.0	0	0
2	83	60	72	79	58	68	+4	0.00	0.0	0	0
3	73	50	62	79	58	69	-7	0.00	0.0	0	3
4	79	54	67	79	58	69	-2	0.06	0.0	0	0
5	70	52	61	80	59	69	-8	0.03	0.0	0	4
6	71	47	59	80	59	70	-11	0.00	0.0	0	6
7	78	43	61	80	59	70	-9	trace	0.0	0	4
8	84	57	71	81	60	70	+1	0.00	0.0	0	0
9	87	56	72	81	60	70	+2	0.00	0.0	0	0
10	89	66	78	81	60	71	+7	0.01	0.0	0	0
11	87	72	80	81	60	71	+9	0.25	0.0	0	0
12	90	70	80	82	61	71	+9	0.01	0.0	0	0
13	88	71	80	82	61	71	+9	0.33	0.0	0	0
14	87	69	78	82	61	72	+6	0.84	0.0	0	0
15	80	67	74	82	62	72	+2	0.00	0.0	0	0
16	80	68	74	82	62	72	+2	1.05	0.0	0	0
17	75	63	69	83	62	72	-3	0.71	0.0	0	0
18	70	61	66	83	62	73	-7	0.08	0.0	0	0
19	80	58	69	83	62	73	-4	0.00	0.0	0	0
20	86	62	74	83	63	73	+1	trace	0.0	0	0
21	79	66	73	83	63	73	+0	0.41	0.0	0	0
22	84	64	74	84	63	73	+1	0.00	0.0	0	0
23	87	63	75	84	63	74	+1	0.00	0.0	0	0
24	84	67	76	84	64	74	+2	0.84	0.0	0	0
25	84	67	76	84	64	74	+2	0.01	0.0	0	0
26	80	64	72	84	64	74	-2	0.01	0.0	0	0
27	81	62	72	85	64	74	-2	0.21	0.0	0	0
28	78	57	68	85	64	75	-7	trace	0.0	0	0
29	78	57	68	85	64	75	-7	0.00	0.0	0	0
30	78	53	66	85	65	75	-9	0.00	0.0	0	0

TOTALS FOR BMG

HIGHEST TEMPERATURE	90	TOTAL PRECIP	4.85
LOWEST TEMPERATURE	43	TOTAL SNOWFALL	0.0
AVERAGE TEMPERATURE	71.1	NORMAL PRECIP	3.60
DEPARTURE FROM NORM	-0.7	% OF NORMAL PRECIP	135
HEATING DEGREE DAYS	17		
NORMAL DEGREE DAYS	8		

TODAY'S DATE: 18-SEP-00

JUL-00 FOR BLOOMINGT, IN (824')

LAT=39.2N LON= 86.5W

	TEMPERATURE							PRECIPITATION			
	ACTUAL			NORMAL							
	HI	LO	AVG	HI	LO	AVG	DEPT	AMNT	SNOW	SNCVR	HDD
1	82	53	68	85	65	75	-7	trace	0.0	0	0
2	85	66	76	85	65	75	+1	trace	0.0	0	0
3	86	73	80	85	65	75	+5	0.54	0.0	0	0
4	86	70	78	85	65	75	+3	0.48	0.0	0	0
5	82	71	77	86	65	76	+1	0.06	0.0	0	0
6	88	71	80	86	65	76	+4	0.00	0.0	0	0
7	82	61	72	86	66	76	-4	0.00	0.0	0	0
8	83	57	70	86	66	76	-6	trace	0.0	0	0
9	85	58	72	86	66	76	-4	trace	0.0	0	0
10	88	71	80	86	66	76	+4	0.18	0.0	0	0
11	81	70	76	86	66	76	+0	0.96	0.0	0	0
12	82	70	76	86	66	76	+0	0.00	0.0	0	0
13	86	67	77	86	66	76	+1	trace	0.0	0	0
14	85	64	75	86	66	76	-1	0.00	0.0	0	0
15	82	63	73	86	66	76	-3	0.00	0.0	0	0
16	80	58	69	86	66	76	-7	0.00	0.0	0	0
17	82	57	70	86	66	76	-6	0.00	0.0	0	0
18	83	67	75	86	66	76	-1	0.02	0.0	0	0
19	75	63	69	86	66	76	-7	0.42	0.0	0	0
20	74	58	66	86	66	76	-10	0.00	0.0	0	0
21	77	56	67	86	66	76	-9	0.00	0.0	0	0
22	77	51	64	86	66	76	-12	0.00	0.0	0	1
23	77	53	65	86	66	76	-11	0.00	0.0	0	0
24	80	54	67	86	66	76	-9	0.00	0.0	0	0
25	80	51	66	86	66	76	-10	trace	0.0	0	0
26	82	56	69	86	66	76	-7	0.00	0.0	0	0
27	85	57	71	86	66	76	-5	0.00	0.0	0	0
28	82	63	73	86	66	76	-3	0.13	0.0	0	0
29	72	64	68	86	66	76	-8	0.77	0.0	0	0
30	79	67	73	86	66	76	-3	0.10	0.0	0	0
31	77	63	70	86	65	76	-6	0.03	0.0	0	0

TOTALS FOR BMG

HIGHEST TEMPERATURE	88	TOTAL PRECIP	3.69
LOWEST TEMPERATURE	51	TOTAL SNOWFALL	0.0
AVERAGE TEMPERATURE	71.7	NORMAL PRECIP	4.72
DEPARTURE FROM NORM	-4.2	% OF NORMAL PRECIP	78
HEATING DEGREE DAYS	1		
NORMAL DEGREE DAYS	0		

TODAY'S DATE: 18-SEP-00

AUG-00 FOR BLOOMINGT, IN (824') LAT=39.2N LON= 86.5W

	TEMPERATURE							PRECIPITATION			
	ACTUAL			NORMAL							
	HI	LO	AVG	HI	LO	AVG	DEPT	AMNT	SNOW	SNCVR	HDD
1	82	61	72	86	65	76	-4	0.03	0.0	0	0
2	84	64	74	86	65	76	-2	0.27	0.0	0	0
3	80	63	72	86	65	75	-3	0.00	0.0	0	0
4	80	61	71	86	65	75	-4	0.00	0.0	0	0
5	77	57	67	86	65	75	-8	0.11	0.0	0	0
6	86	73	80	85	65	75	+5	0.67	0.0	0	0
7	82	67	75	85	65	75	+0	1.14	0.0	0	0
8	79	67	73	85	65	75	-2	0.22	0.0	0	0
9	88	73	81	85	64	75	+6	0.08	0.0	0	0
10	83	62	73	85	64	75	-2	trace	0.0	0	0
11	82	59	71	85	64	74	-3	trace	0.0	0	0
12	80	55	68	85	64	74	-6	0.00	0.0	0	0
13	79	52	66	85	64	74	-8	0.00	0.0	0	0
14	83	58	71	84	64	74	-3	0.00	0.0	0	0
15	87	65	76	84	63	74	+2	0.00	0.0	0	0
16	85	60	73	84	63	74	-1	0.00	0.0	0	0
17	89	60	75	84	63	74	+1	0.68	0.0	0	0
18	79	63	71	84	63	73	-2	0.12	0.0	0	0
19	77	55	66	84	63	73	-7	0.00	0.0	0	0
20	76	54	65	84	63	73	-8	0.00	0.0	0	0
21	80	52	66	83	62	73	-7	0.00	0.0	0	0
22	79	62	71	83	62	73	-2	trace	0.0	0	0
23	83	68	76	83	62	73	+3	0.53	0.0	0	0
24	80	61	71	83	62	72	-1	0.02	0.0	0	0
25	81	55	68	83	62	72	-4	0.00	0.0	0	0
26	78	58	68	83	62	72	-4	0.10	0.0	0	0
27	83	61	72	82	61	72	+0	trace	0.0	0	0
28	81	60	71	82	61	72	-1	0.02	0.0	0	0
29	85	66	76	82	61	71	+5	0.00	0.0	0	0
30	88	67	78	82	61	71	+7	trace	0.0	0	0
31	88	62	75	82	60	71	+4	trace	0.0	0	0

TOTALS FOR BMG

HIGHEST TEMPERATURE	89	TOTAL PRECIP	3.99
LOWEST TEMPERATURE	52	TOTAL SNOWFALL	0.0
AVERAGE TEMPERATURE	71.7	NORMAL PRECIP	3.99
DEPARTURE FROM NORM	-1.9	% OF NORMAL PRECIP	100
HEATING DEGREE DAYS	0		
NORMAL DEGREE DAYS	0		

Appendix C

Shipping Documents

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE / SHIPPING DOCUMENT

Form Approved OMB No. 0704-0246

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0246), Washington, DC 20503.

1. FROM: (Include ZIP Code)
NAVSURFWARCENDIV
CODE 1121 BLDG 415E
300 HIGHWAY 361
CRANE, IN 47522-5001

2. TO: (Include ZIP Code)
USAE Waterways Experiment Station
3909 Halls Ferry Road
CEWES ERD-A
Vicksburg, MS 39180

3. SHIP TO - MARK FOR
Al Cofrancesco (PH 601-634-3182)
OR Mike Grodowitz (PH 601-634-2972)

SHEET NO. 1 | NO. OF SHEETS | 5. REQUISITION DATE 1000-06-19 | 6. REQUISITION NUMBER

7. DATE MATERIAL REQUIRED (YYMMDD) 00/06/30 | 8. PRIORITY 03

9. AUTHORITY OR PURPOSE

10. SIGNATURE CODE 095 | 11a. VOUCHER NUMBER & DATE (YYMMDD) N00164-0170-A934

12. DATE SHIPPED (YYMMDD) | b.

13. MODE OF SHIPMENT | 14. BILL OF LADING NUMBER

15. AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS SYMBOL AND SUBHEAD	OBJ. CL.	BUR. CONT. NO.	SUBAL-LOT.	AUTHORIZATION ACCT'G ACTIVITY	TRANS. TYPE	PROPERTY ACCT'G ACTIVITY	COUN-TRY	COST CODE	AMOUNT
	97X4930	NH1J	000	77777	0	000164	2F	000000 096958373454	

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIAL AND / OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CON-TAINER (f)	CON-TAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
01	SHIP TWO (2) COOLERS CONTAINING SAMPLES FOR ANALYSIS PO	EA	2					

16. TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

ISSUED BY	TOTAL CON-TAINERS	TYPE CON-TAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

CONTAINERS RECEIVED EXCEPT AS NOTED	DATE (YYMMDD)	BY	SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED	DATE (YYMMDD)	BY	GRAND TOTAL
POSTED	DATE (YYMMDD)	BY	20. RECEIVER'S VOUCHER NO.

DD Form 1149, DEC 93
306/080

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Previous editions are obsolete.

S/N 0102-LF-017-7900

(Navy Overprint 1994)

Cooler 2/2

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURFWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
6/13,15,16,18/00	CRAN-DEG-600	EXPLOSIVES

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Thomas J. Grant	ALGO FRANCESCO	6/19/00		NSWC → WES

Cooler 1/2

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURFWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
6/13,15,16,19/00	CRANE-DEG-600	EXPLOSIVES

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Thomas J. Brant	AL COFRANCESCO	6/19/00		NSWC → WES

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE/SHIPPING DOCUMENT

Form Approved
OMB No. 0704-02
Expires Dec 31, 1999

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0246), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondants should be awere that not withstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THIS ADDRESS. RETURN COMPLETED FORM TO THE ADDRESS IN ITEM 2.

1. FROM: (Include ZIP Code)
NAVSURFWARCENDIV
CODE 1121 BLDG 41SE
300 HIGHWAY 361
CRANE, IN 47522-5001

SHEET NO. 1 | NO. OF SHEETS 1 | 5. REQUISITION DATE 2000-06-26 | 6. REQUISITION NUMBER

7. DATE MATERIAL REQUIRED (YYYYMMDD) 2000-06-27 | 8. PRIORITY 03

2. TO: (Include ZIP Code)
USAE WATERWAYS EXPERIMENT STATION
3909 HALLS FERRY ROAD (CEWES ERD-A)
VICKSBURG, MS 39180

9. AUTHORITY OR PURPOSE
SAMPLES FOR ANALYSIS

10. SIGNATURE DANA WILLIAMS | 11a. VOUCHER NUMBER & DATE (YYYYMMDD) N00164-0178-8105

3. SHIP TO - MARK FOR
AL COFRANCESCO (601)634-3182 OR
MIKE GRODOWITZ (601)634-2972

12. DATE SHIPPED (YYYYMMDD) | b.

13. MODE OF SHIPMENT | 14. BILL OF LADING NUMBER

15. AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS DATA | AMOUNT

TRANSPORTATION: 97X4930. NH1J 000 77777 0 000164 2F 000000 837345409695
LABOR: 97X4930. NH1J 000 77777 0 000164 2F 000000 711240009695
MATERIAL: 97X4930. NH1J 000 77777 0 000164 2F 000000 711240009695

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIAL AND/OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CONTAINER (f)	CONTAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
	POC: DANA WILLIAMS PHONE NO: 812-854-3590 RETURN COPY TO: TOM BRENT SHOP CD: 09695							
01	TWO (2) COOLERS OF SAMPLES	EA	2					

16. TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

ISSUED BY	TOTAL CONTAINERS	TYPE CONTAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
DW3948					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

CONTAINERS RECEIVED EXCEPT AS NOTED	DATE (YYYYMMDD)	BY	SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED	DATE (YYYYMMDD)	BY	GRAND TOTAL
POSTED	DATE (YYYYMMDD)	BY	20. RECEIVER'S VOUCHER NO.

DD FORM 1149, JAN 1997

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

PREVIOUS EDITION MAY BE USED.

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURFWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
6/22/00	CRANE-LEP-6220	Inserts/metals + Expl.
6/20/00	CRANE-LEP-6200	" "
6/20/00	CRANE-INS-6200	" "
6/23/00	CRANE-INS-6230	" "
6/23/00	CRANE-LEP-6230	" "

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Thomas J. Bent	AL [illegible]	6/26/00	1200	NSWC → WES

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURFWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
6/21/00	CRANE-INS-62100	INSECTS (Metals + EXPL).
6/21/00	CRANE-INS-62100	INSECTS (Metals + EXPL).
6/21/00	CRANE-LEP-62100	" "
6/22/00	CRANE-INS-62200	" "
6/23/00	CRANE-LEP-62300	" "
6/23/00	CRANE-INS-62300	" "

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
[illegible]	AL [illegible]	6/26/00	1200	NSWC → WES

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE/SHIPPING DOCUMENT

Form Approved
OMB No. 0704-02
Expires Dec 31, 1999

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0246), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that not withstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THIS ADDRESS. RETURN COMPLETED FORM TO THE ADDRESS IN ITEM 2.

1. FROM: (Include ZIP Code)
NAVSURFWARCENDIV
CODE 1121 BLDG 41SE
300 HIGHWAY 361
CRANE, IN 47522-5001

SHEET NO. 1 | NO. OF SHEETS 1 | 5. REQUISITION DATE 2000-07-24 | 6. REQUISITION NUMBER

7. DATE MATERIAL REQUIRED (YYYYMMDD) 2000-07-25 | 8. PRIORITY 03

2. TO: (Include ZIP Code)
USAE WATERWAYS EXPERIMENT STATION
3909 HALLS FERRY ROAD (CEWES ERD-A)
VICKSBURG, MS 39180

9. AUTHORITY OR PURPOSE
SAMPLES FOR ANALYSIS

10. SIGNATURE DANA WILLIAMS | 11a. VOUCHER NUMBER & DATE (YYYYMMDD) N00164-0206-9103

3. SHIP TO - MARK FOR
AL COFRANCESCO (601) 634-3182 OR
MIKE GRODOWITZ (601) 634-2972

12. DATE SHIPPED (YYYYMMDD) | b.

13. MODE OF SHIPMENT | 14. BILL OF LADING NUMBER

15. AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS DATA

			AMOUNT
TRANSPORTATION:	97X4930.	NH1J 000 77777 0 000164 2F 000000 837345409695	
LABOR:	97X4930.	NH1J 000 77777 0 000164 2F 000000 711240009695	
MATERIAL:	97X4930.	NH1J 000 77777 0 000164 2F 000000 711240009695	

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODING OF MATERIAL AND/OR SERVICES (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CONTAINER (f)	CONTAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
	POC: DANA WILLIAMS PHONE NO: 812-854-3590 RETURN COPY TO: TOM BRENT SHOP CD: 09695							
01	TWO (2) COOLERS OF SAMPLES	EA	2					

16. TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

ISSUED BY	TOTAL CONTAINERS	TYPE CONTAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
DW3948					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

CONTAINERS RECEIVED EXCEPT AS NOTED	DATE (YYYYMMDD)	BY	SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED	DATE (YYYYMMDD)	BY	GRAND TOTAL
POSTED	DATE (YYYYMMDD)	BY	20. RECEIVER'S VOUCHER NO.

DD FORM 1149, JAN 1997

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

PREVIOUS EDITION MAY BE USED.

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
7/18/00	CRANE-LEP-71800	Insects (Metals + Explosives)
7/18/00	CRANE-INS-71800	" (" + ")
7/19/00	CRANE-LEP-71900	" (" + ")
7/19/00	CRANE-INS-71900	" Bridge (" + ")
7/19/00	CRANE-INS-71900	" Floodplain (" + ")

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Christine D. Freeman	Al Cofrancesco	7/21/00	1200	NSWC → WES

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
MILITARY WARRANTY 5090/3 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
7/20/00	CRANE-LEV-72000	Insects (Metals + Explosives)
7/20/00	CRANE-INS-72000	" (" + ")
7/21/00	CRANE-LEV-72100	" (" + ")
7/21/00	CRANE-INS-72100	" (" + ")

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Christine D. Freeman	Al Cofrancesco	7/24/00	1200	NSWC → WES

SHIPPING CONTAINER TALLY → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

REQUISITION AND INVOICE/SHIPPING DOCUMENT

Form Approved
OMB No. 0704-02
Expires Dec 31, 19[illegible]

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PLEASE DO NOT RETURN YOUR FORM TO THIS ADDRESS. RETURN COMPLETED FORM TO THE ADDRESS IN ITEM 2.

1. FROM: (Include ZIP Code)
NAVSURFWARCENDIV
CODE 1121 BLDG 41SE
300 HIGHWAY 361
CRANE, IN 47522-5001

SHEET NO. 1 | NO. OF SHEETS 1 | 5. REQUISITION DATE 2000-08-28 | 6. REQUISITION NUMBER

7. DATE MATERIAL REQUIRED (YYYYMMDD) 2000-08-28 | 8. PRIORITY 03

2. TO: (Include ZIP Code)
USAE WATERWAYS EXPERIMENT STATION
3909 HALLS FERRY ROAD (CEWES ERD-A)
VICKSBURG, MS 39180

9. AUTHORITY OR PURPOSE
SAMPLES FOR ANALYSIS

10. SIGNATURE
DANA WILLIAMS

11a. VOUCHER NUMBER & DATE (YYYYMMDD)
N00164-0241-0267

3. SHIP TO - MARK FOR
AL COFRANCESCO (601)634-3182 OR
MIKE GRODOWITZ (601)634-2972

12. DATE SHIPPED (YYYYMMDD)

b.

13. MODE OF SHIPMENT

14. BILL OF LADING NUMBER

15. AIR MOVEMENT DESIGNATOR OR PORT REFERENCE NO.

4. APPROPRIATIONS DATA

			AMOUNT
TRANSPORTATION:	97X4930.	NH1J 000 77777 0 000164 2F 000000 837345409695	
LABOR:	97X4930.	NH1J 000 77777 0 000164 2F 000000 837345409695	
MATERIAL:	97X4930.	NH1J 000 77777 0 000164 2F 000000 837345409695	

ITEM NO. (a)	FEDERAL STOCK NUMBER, DESCRIPTION, AND CODE (b)	UNIT OF ISSUE (c)	QUANTITY REQUESTED (d)	SUPPLY ACTION (e)	TYPE CONTAINER (f)	CONTAINER NOS. (g)	UNIT PRICE (h)	TOTAL COST (i)
	POC: DANA WILLIAMS PHONE NO: 812-854-3590 RETURN COPY TO: TOM BRENT SHOP CD: 09695							
01	TWO (2) COOLERS OF SAMPLES	EA	2					

16. TRANSPORTATION VIA MATS OR MSTS CHARGEABLE TO

17. SPECIAL HANDLING

18. RECAPITULATION OF SHIPMENT

ISSUED BY	TOTAL CONTAINERS	TYPE CONTAINER	DESCRIPTION	TOTAL WEIGHT	TOTAL CUBE
DW3948					
CHECKED BY					
PACKED BY					
			← TOTAL →		

19. RECEIPT

	DATE (YYYYMMDD)	BY	
CONTAINERS RECEIVED EXCEPT AS NOTED			SHEET TOTAL
QUANTITIES RECEIVED EXCEPT AS NOTED			GRAND TOTAL
POSTED			20. RECEIVER'S VOUCHER NO.

DD FORM 1149, JAN 1997

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

PREVIOUS EDITION MAY BE USED.

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURWARCENDIV 5090/6 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
8/21/00	CRANE-INS-82400	Insects (Metals + Explosives)
8/24/00	CRANE-LEP-82400	" (" + ")
8/25/00	CRANE-INS-82500	" (" + ")
8/25/00	CRANE-LEP-82500	" (" + ")

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Christine D. [illegible]	Al Cofrancesco	8/28/00	1200	NSWC → WES

CHAIN OF CUSTODY

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
ENVIRONMENTAL PROTECTION DEPT.
NAVSURFWARCENDIV 5080/8 (REV. 5/93)

SAMPLING DATE	SAMPLE I.D.	CONTAINER (PARAMETERS)
8/22/00	CRANE-INS-82200	Insects (Metals + Explosives)
8/22/00	CRANE-LEP-82200	" (" + ")
8/23/00	CRANE-INS-82300	" (" + ")
8/23/00	CRANE-LEP-82300	" (" + ")

SAMPLER PREPARER (SIGNATURE)	TRANSFERRED TO (SIGNATURE)	DATE	TIME	ORGANIZATION
Christina D. Freeman	Al Cofrancisco	8/22/00	1200	NSWC → WES

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Environmental Protection Department Manager
TITLE

8/27/01
DATE