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INFORMAL REPORT

TRANSFORMER SITE DECONTAMINATION TECHNOLOGY ASSESSMENT REPORT

Kimberley A. Kearney

EG&G Idaho

Work performed under DOE Contract No. DE-AC07-76ID01570

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Naval Civil Engineering Laboratory
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and
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EXECUTIVE SUMMARY

The Naval Civil Engineering Laboratory (NCEL) contracted with the Idaho National Engineering Laboratory (INEL) to do a Polychlorinated Biphenyl (PCB) transformer spill cleanup methodology assessment at the Naval Air Station North Island (NASNI). The Public Works Center (PWC) at NASNI has implemented a program to have all PCB transformers retrofilled or replaced by 1992 to reduce their legal liability under the Toxic Substance Control Act (TSCA). PWC also wanted to reduce their liability by ensuring that the cleanup method employed sufficiently decontaminated spill surfaces as outlined in the federal regulations.

Although all past spill sites have been cleaned, the examination of the PCB spill cleanup data from NASNI identified several conditions under which the effectiveness and efficiency of the current cleanup technology (double wash/rinse) could have been improved. For future PCB spills on surfaces in good condition, it is suggested that a spray-foam vacuum system be employed to clean the spill. This system uses a foam applied aqueous based solvent sprayed on the contaminated surface. Then a vacuum similar to a shop vacuum is used to remove the PCB ladened foam from the surface. After use the solvent can be sent to hazardous waste facility for incineration.

For PCB spill locations that are six months old or older, it is suggested that the surface undergo partial removal. This can be accomplished by several different techniques such as; scarifying, shot blasting, etc. These techniques are used primarily on concrete surfaces and operate by sanding or chipping away the contaminated part of the surface. These methods differ in the depth of removal of the surface and the abrasive substance used. It is suggested that a contracted environmental service company do the partial surface removal on the identified pad surfaces all at once, as well as encapsulate the clean surface afterwards.

The current cleaning technique ("double wash/rinse") is best suited for spills in very confined spaces, spills that are too small for the spray-vacuum system to handle efficiently, and spills that are on the actual transformer surface. However, it is not recommended that the "double wash/rinse" system be replaced with the spray foam equipment at this time, since all PCB equipment at NASNI is being replaced or retrofilled and the future need for PCB spill cleanup will be absent.

During the investigation of the PCB spills at NASNI, it was determined that there were no concrete pads badly fractured or damaged enough to warrant having them be completely replaced. Complete removal of concrete pads is both labor intensive and time consuming. Also, this technique will not aide in the cleanup of any future spills, unless the surface is encapsulated or the pad has a new non-PCB transformer placed on it. However, there are wooden pads that should be replaced since cleaning them to meet the federal regulatory requirements would be very difficult and time consumming due to the high permeability of wood.

ACRONYMS

EPA ..... Environmental Protection Agency
EPRI ..... Electric Power Research Institute
HEPA ..... High Efficiency Particulate Air
INEL ..... Idaho National Engineering Laboratory
NASNI ..... Naval Air Station North Island
NCEL ..... Naval Civil Engineering Laboratory
OSHA ..... Occupational Safety and Health Administration
PCB ..... Polychlorinated Biphenyls
PPM ..... Part Per Million
PWC ..... Public Works Center

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TRANSFORMER SITE DECONTAMINATION TECHNOLOGY ASSESSMENT REPORT

1.0 INTRODUCTION

1.1 Background

The Naval Air Station North Island (NASNI) has approximately 350 electrical transformers that are considered polychlorinated biphenol (PCB) equipment according to the Environmental Protection Agency's (EPA) standards. The EPA has set a deadline for the complete reclassification or replacement of the PCB transformers currently in use in commercial settings by 1990, which does not apply to the industrial transformers found on North Island. However it is the Public Works Center's (PWC) policy to replace or retrofill all of the PCB and PCB contaminated transformers on North Island by 1992. In response to these deadlines, through the Naval Civil Engineering Laboratory (NCEL), the PWC has contracted with the Idaho National Engineering Laboratory (INEL) to assess the transformer situation and provide the actual reclassification and certain replacement services. This work is currently in progress and is expected to be completed in 1992.

Another facet of these services is to analyze the Navy's current PCB spill cleanup policy to determine its efficiency and effectiveness to clean PCB spills to regulatory limits. NASNI has had PCB oil leaks from most of the 350 PCB transformers on the base. A large portion of the leaks, however, are minor in nature, not amounting to more than a few ounces. When these leaks are discovered, they are cleaned with the standard "double wash/rinse" method approved by the EPA and an effort is made to repair the transformer. However, most of these repairs are not permanent, and as a result the leaks are recurring or continuous on many of the transformers. These spill reoccurrences require the transformer pad surface be cleaned over and over again. In addition, the double wash/rinse method is not always effective on the first wash, and as such may require several repeated washings over time to meet regulatory specifications. The standard approach is to clean the surface using the double wash/rinse method, then sample using an EPA approved sampling

procedure. If the results come back as contaminated then the entire process is repeated until the samples come back "clean" with the results under the regulatory limits as described in 40 CFR Part 761.120.

1.2 Federal PCB Spill Cleanup Regulations

Several assumptions have been made to narrow the scope of the regulations that apply to this particular situation. First, it was assumed that the spills occurred in all types of areas, restricted, nonrestricted, and outdoor substation locations. The following definitions can be found in 40 CFR Part 761. EPA's definition of restricted areas is as follows: "... areas other than electrical substations that are at least 0.1 km from a residential/commercial area and limited by man-made barriers, (e.g. fences, and walls) or substantially limited by naturally occurring barriers such as mountains, cliffs, or rough terrain. These areas generally include industrial facilities and extremely remote rural locations." The definition of outdoor substation is "... outdoors, fenced-off, and restricted access area used in the transmission and/or distribution of electrical power." Nonrestricted access areas are "... any area other than restricted access, outdoor electrical substations, and other restricted locations."

The second assumption made was that the spills contain high concentrations of PCBs. According to EPA, High concentration PCBs " means PCBs materials that contain 500 ppm or greater PCBs, or those materials which EPA requires to be assumed to contain 500 ppm or greater PCBs in absence of testing".

Several other definitions are included that are needed to clarify the regulations. Double wash/rinse "...means a minimum requirement to cleanse solid surfaces, both impervious, and nonimpervious, two times with an appropriate solvent or other material in which PCBs are at least 5 percent soluble by weight. A volume of PCB-free fluid sufficient to cover the contaminated surface completely must be used in each wash/rinse..."

Chemical waste landfill " means a landfill at which protection against risk or injury to health or the environment from migration of PCBs to land, water, or the atmosphere is provided from PCBs and PCB items deposited therein by locating, engineering, and operating the landfill."

High contact industrial surface " means a surface in an industrial setting which is repeatedly exposed for long periods of time. Manned machinery and control panels are examples of high contact industrial surfaces. High-contact industrial surfaces are generally of impervious solid materials."

Spill is defined as ..." both intentional and unintentional spills, leaks, and other uncontrolled discharges where the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases. The PCB spill cleanup policy applies to spills of 50 ppm PCB or greater."

Standard wipe test "...means for spills of high concentration PCBs on solid surfaces, a cleanup to numerical surface standards and sampling by a standard wipe test to verify that the numerical standards have been met. This definition constitutes the minimum requirements for an appropriate wipe testing protocol. A standard size template (10 cm X 10 cm) will be used to delineate the area of cleanup; the wiping medium will be a gauze pad or glass wool of known size which has been saturated with hexane. It is important that the wipe be performed very quickly after the hexane is exposed to air. EPA strongly recommends that the gauze (or glass wool) be prepared with hexane in the laboratory and that the wiping medium be stored in sealed glass vials until it is used for the wipe test. Further, EPA requires the collection and testing of field blanks and replicates."

A PCB reportable quantity according to 40 CFR Part 761 is ".... spills of 10 lbs or more by weight of PCBs, not PCB-contaminated material."

With these definitions in mind, the requirements for cleanup of high concentration spills in restricted access, nonrestricted access and outdoor substations areas are presented below. Figures 1., 2., and 3. are representative flowcharts of the following information[1].

1. Restricted Access Areas

   a) High contact solid surfaces shall be cleaned to 10 ug/100 cm^2 (as measured by the standard wipe test).

   b) Low contact, indoor impervious solid surfaces will be decontaminated to 10 ug/100 cm^2.

   c) At the option of the responsible party, low contact, indoor, nonimpervious surfaces will be cleaned either to 10 ug/100 cm^2 or to 100 ug/100 cm^2 and encapsulated.

   d) Low contact, outdoor surfaces, both impervious, and nonimpervious, shall be cleaned to 100 ug/100 cm^2.

   e) Soil contaminated by the spill will be cleaned to 25 ppm PCBs by weight.

2. Non-Restricted Access Areas

   a) Indoor solid surfaces and high-contact outdoor surfaces shall be cleaned to 10 ug/100 cm^2.

   b) Indoor vault areas and low-contact, outdoor, impervious solid surfaces shall be decontaminated to 10 ug/100 cm^2.

   c) At the option of the responsible party, low-contact, outdoor, nonimpervious solid surfaces shall be either cleaned to 10 ug/100 cm^2 or cleaned to 100 ug/100 cm^2 and encapsulated.

ASSUMPTIONS:

1. SOLID SURFACE AREA
2. HIGH CONCENTRATION SPILL (>500ppm PCBs)
3. RESTRICTED ACCESS AREA
4. SOIL CONTAMINATED UNDER THESE ASSUMPTIONS SHALL BE CLEANED TO 25ppm BY WEIGHT BY EITHER INCINERATION OR PLACEMENT IN CHEMICAL LAND FILL.

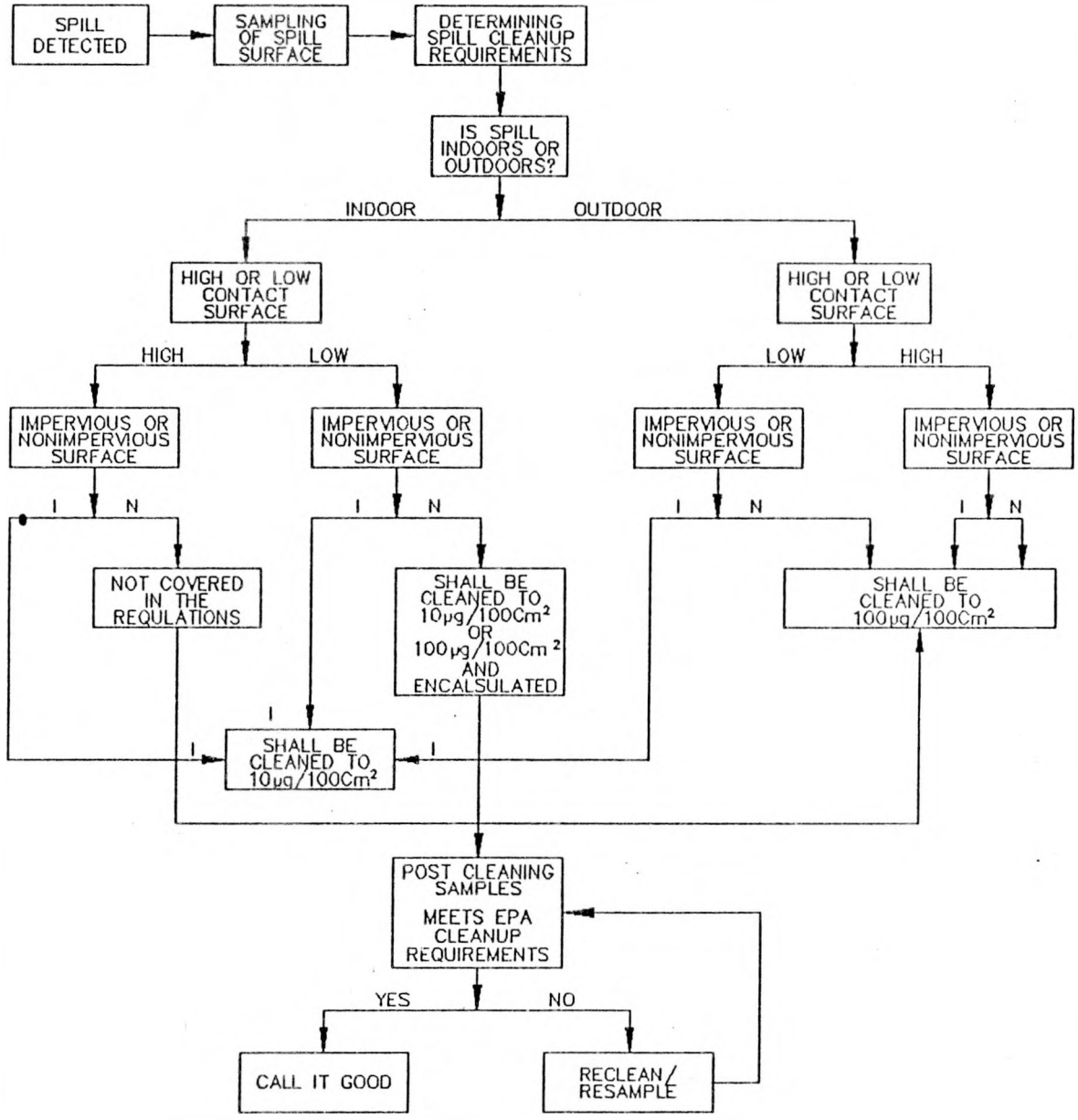

FIGURE 1
CLEANUP REQUIREMENTS FOR RESTRICTED ACCESS AREAS

ASSUMPTIONS:

1. SOLID SURFACE AREA
2. HIGH CONCENTRATION SPILL (>500ppm PCBs)
3. NON-RESTRICTED ACCESS AREA
4. SOIL CONTAMINATED UNDER THESE ASSUMPTIONS SHALL BE CLEANED TO 10ppm PCBs PROVIDED THE SOIL IS EXCAVATED AND REPLACED WITH CLEAN SOIL CONTAINING 1ppm PCBs.
5. SAMPLE METHOD IS THE STANDARD WIPE TEST.

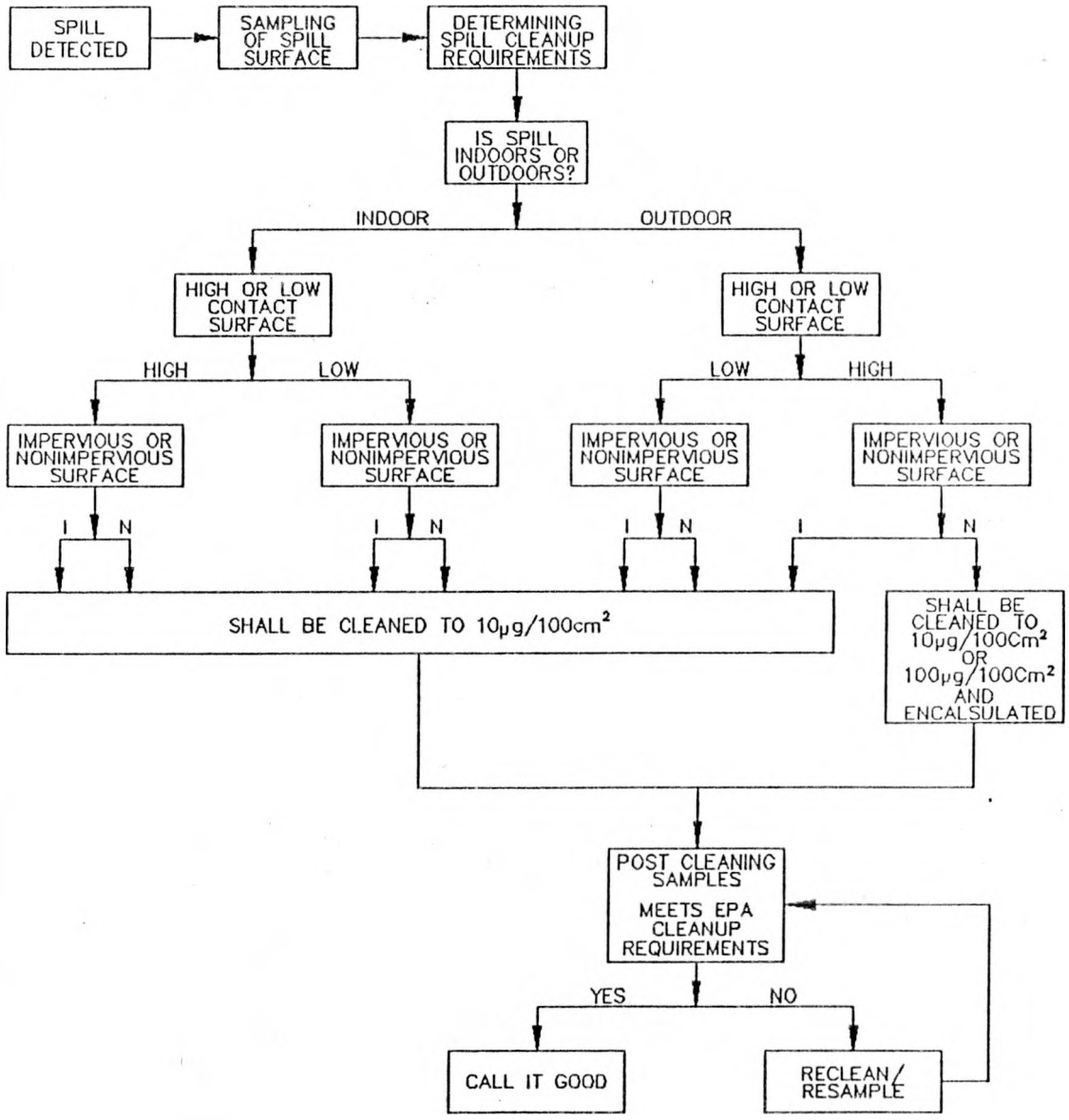

FIGURE 2
CLEANUP REQUIREMENTS FOR NON-RESTRICTED ACCESS AREAS

ASSUMPTIONS:

1. SOLID SURFACE AREA
2. HIGH CONCENTRATION SPILL (>500ppm PCBs)
3. OUTDOOR ELECTRICAL SUBSTATION
4. SOIL CONTAMINATED UNDER THESE ASSUMPTIONS SHALL BE CLEANED TO EITHER 25ppm PCBs BY WEIGHT OR 50 ppm PCBs BY WEIGHT PROVIDED THAT A LABEL OR NOTICE IS VISIBLY PLACED IN THE AREA.
5. SAMPLE METHOD IS THE STANDARD WIPE TEST.

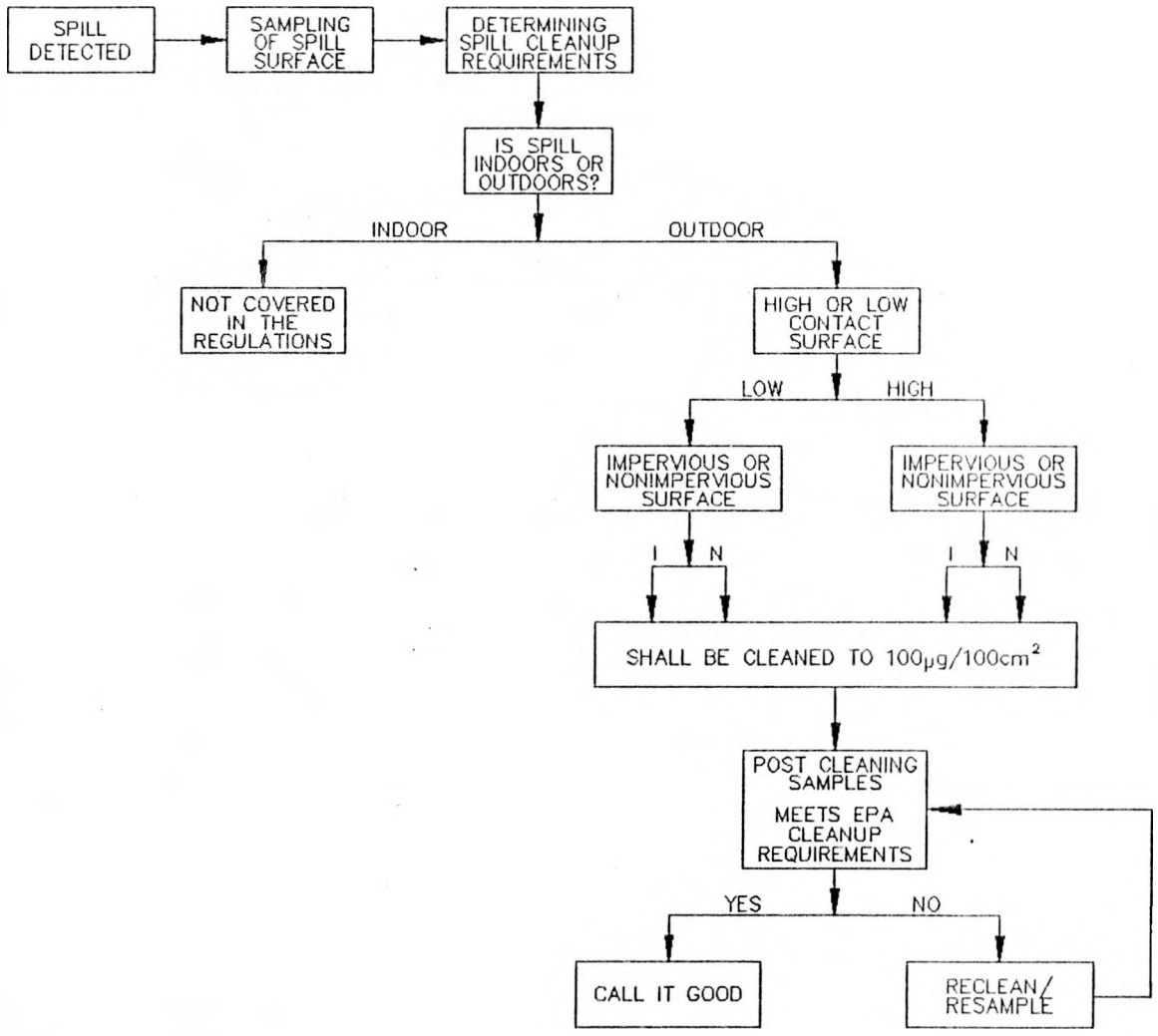

FIGURE 3
CLEANUP REQUIREMENTS FOR OUTDOOR ELECTRICAL SUBSTATIONS

d) Soil contaminated by the spill will be decontaminated to 10 ppm PCBs by weight provided the soil is excavated to a minimum depth of 10 inches. The excavated soil will be replaced with clean soil, i.e., containing less than 1 ppm PCBs, and the spill site restored.

3. Outdoor Substation Areas

a) Contaminated solid surfaces, both impervious and nonimpervious, shall be cleaned to a PCB concentration of 100 ug/100 cm^2 as measured by the standard wipe test.

b) At the option of the responsible party, soil contaminated by the spill will be cleaned to either 25 ppm PCBs by weight, or to 50 ppm PCBs by weight provided that a label or notice is visibly placed in the area.

1.3 System Requirements

The following system requirements provide guidance on the performance of the proposed decontamination process:

1. The decontamination system must be designed to meet existing and projected hazardous and toxic spill regulations at the local, state and federal level.

2. The system must require minimal or no electrical transformer outages for operation.

3. The system equipment must be portable and flexible enough for work in confined spaces.

4. The system equipment must be capable of being completely operated by one person.

5. The system must comply with applicable Occupational Safety and Health Act (OSHA) regulations, as well as any Navy health and safety standards.

2.0 DATABASE DEVELOPMENT

2.1 Data Records History and Evaluation

As part of this project, PWC wanted their transformer equipment, inspection, cleanup, and sample reports organized to make the information they contain more accessible. To accomplish this, the reports have been compiled and entered into a computerized database, which allows for easy manipulation of the data. The data tracking system the PWC currently uses has holes in the data records and needs to be reorganized to provide cost effective access to the data. Not all the transformers on NASNI have records in this database; only the ones that had inspection, equipment, cleanup, or sample forms filled out by PWC were included.

2.2 Assessment Methodology

In preparing the database the following elements were given higher priority:

1. The new computerized reports (equipment, inspection, cleanup, and sample) have little or no duplicate information, thereby shortening their hardcopy length, they will also take less memory space on the computer. The transformer serial number is the key field that ties the reports together.

2. There are certain fields within each of the reports that must be filled in prior to the record being added to the database. These include, but are not limited to serial number, location, and restriction.

3. Also the information to be entered into the database must be compatible with the field type. For example, a restriction type would not be accepted into the sample number field.

2.3 Database Format

Appendix A gives examples of the data reports that PWC is currently employing. The database is based on R:BASE software and is user friendly, explaining steps as they are required. Appendix B is the user documentation for the database, showing the layout of the various fields and reports[2]. It briefly describes the databases' capabilities. Appendix C of this report gives examples of the various formats that can be generated with the database.

2.4 Database Utilization

The database was utilized in the evaluation of the various decontamination techniques selected for this project by showing whether or not NASNI has spill sites that would be compatible with certain technologies available. The site selection was based on location type and spill/cleanup history provided by the database. A more detailed explanation of the site determination methodology will be discussed later.

Currently, there is information on 235 out of the 350 transformers at NASNI in the database, with 192 of them having spill histories. There is a total of 638 separate spills for the 192 transformers. Using the double wash/rinse clean-up procedure, it took an average of 3 separate cleanings with an average cleaning time of 70 minutes each to bring the spill surface in-line with regulatory standards.

3.0 TECHNOLOGY DESCRIPTION AND EVALUATION

For this project it was assumed that the majority of the PCB leaks occurred on cement or metal surfaces. Also it was assumed there were not sufficient spills on soil to warrant selecting a technology to address soil cleanup. The available technology that was selected for further study for the cement and metal surfaces are:

1. Spray-foam vacuum equipment

2. Partial surface removal

3. Complete surface removal

4. Manual double wash/rinse

5. Encapsulation

The general approach used in this project was to review the nature of the spills at NASNI and existing spill cleanup practices, then determine which of the above technologies would be suitable for use at NASNI. Cleanup of porous surfaces exposed to PCBs has generally been approached in two ways: (a) repeated manual scrubbing and mopping with detergent and/or solvent such as kerosene and hexane or (b) complete removal and disposal of the contaminated material[3]. Both approaches are costly and labor-intensive. There are, however, several technologies that are currently being applied that have labor and cost savings over the traditional methods. These methods are presented below.

3.1 Spray-Foam System

The spray-foam vacuum system seems to be the most promising of the evaluated technologies for NASNI. Because there are frequent leaks, the spray-foam vacuum system would be ideally suited for use. The spray-foam

vacuum system is anticipated to take less time and effort to clean a contaminated surface of the same size than using the "double wash/rinse" technique, and since the spray-foam vacuum system is less labor intensive there would be less chance for personnel contamination during the cleaning process. This technology has been demonstrated numerous times by the Electric Power Research Institute (EPRI) and others with favorable results[4]. This technology is simple in design and use, while moderate in cost.

3.1.1 Process Description

This method employs a foam-applied, aqueous based solvent system with emulsifiers specifically developed for the cleanup of PCBs[5]. The foam is applied to contaminated surfaces and then allowed to set a certain time with or without agitation being applied. The foam is then vacuumed with equipment very similar to a standard shop vacuum. The surface is rinsed with water and vacuumed again. This entire process is repeated three times for most PCB spills. The vacuumed liquid can be sent for disposal to a permitted hazardous waste facility for incineration. The vacuum systems that are adequate for this process make use of High Efficiency Particulate Air (HEPA) filters to prevent airborne releases of PCBs.

There are two different routes that can be taken with this equipment. The equipment may be purchased from the various vendors, and used by PWC personnel to cleanup spills or leaks as they occur. There are also several companies that offer cleaning-decontamination services as well as the products and equipment needed. These include but are not limited to ENSR Operations, Quadrex Environmental, and Unison[6,7]. They will provide a full range of services from environmental consulting, sampling and analysis, scope determination and feasibility, a decontamination plan, regulatory agency assistance, equipment and facility decontamination, waste packaging and disposal, and environmental public relations. This route has the drawback of not having the equipment on hand for immediate use, should the need arise, and could be quite costly for infrequent spill situations. The

spray-foam equipment is only a onetime cleaning solution, in that it won't aid in future spills. It is highly recommended that the pad surface be encapsulated after it has been cleaned to the regulatory limits.

3.1.2 Cost

The cost of purchasing the equipment required for the spray-foam vacuum is as follows[8]:

Foam Applicator:	$3,600.00
Cleaning reagent (foam)	$40.50/gallon
Vacuum with HEPA filters	$2,300.00

There would also be associated disposal costs for the contaminated foam. For the environmental service companies, no current cost could be estimated without a tour of the types and sizes of the spill locations to be decontaminated. Also, the cost would depend on the size of the spill, which of course would be different for every spill situation. However, an estimate of $ 5/ft^2 was recently given for NASNI[9].

3.2 Partial Surface Removal

A major consideration when developing an approach to PCB removal from porous surfaces concerns the depth of penetration of PCBs[10]. If the depth of penetration is such that surface cleaning is not expected to reduce the PCB level to an acceptable value, the contaminated surface material has to either be completely removed or partially removed to sufficiently exhume the PCB contamination from the surface.

3.2.1 Process Description

There are several techniques for partial surface removal of concrete. They include: sandblasting, shot blasting, scarifying, and acid etching[11,12]. Constant air-monitoring will be required to ensure that PCBs are not becoming airborne. These methods will generally remove the top

0.5 - 2.0 inch of the surface. These techniques differ in the way in which they remove the concrete surface, and the amount by-products generated. Some will leave a smoother surface, as does sandblasting, while others penetrate and scour the surface deeper as odes shot-blasting. The partial surface removal by the above methods is also a complete service offered by several environmental service companies. The partial surface removal equipment needed can also be purchased separately and used by the PWC as the pads are identified that are potential candidates for this treatment.

This method can achieve fairly good PCB removal results, but has several drawbacks. First the transformer should be removed from the pad, so the entire pad can be cleaned, although it is conceivable that the pad could be cleaned with the transformer still in place. Not removing the transformer would only be suggested where there has been no spill occurrences under the transformer. Second, partial surface removal is only a one time solution, as it won't aid in future spill or leak cleanup at the same location. However, this method would be ideal for pads on which new non-PCB transformers are to be placed. Also this method would have greater utility if used in conjunction with encapsulation of the pad surface.

3.2.2 Cost

The actual costs could not be calculated until more information is obtained on the size and condition of the surface that is contaminated. However, the following is a recent estimate of cost per cubic foot[13]:

	FT^3			
DEPTH	0-5	5-25	25-100	>100
0 - 1/8"	$550	$450	$425	$400
0-1/8" to rebar	$625	$500	$475	$425
below rebar	$700	$550	$525	$500

The differing techniques will have costs that are roughly similar. The disposal costs would be variable depending on the partial surface removal technique employed, as they generate differing amounts of waste.

3.3 Complete Surface Removal

For PCB removal from other materials such as badly fractured concrete, asphalt, brick and wood, few feasible alternatives are available. Independent sources have stated that PCB contaminated asphalt and wood surfaces should be removed, rather than attempt another cleaning operation[14,15]. Also, asphalt may have residual PCBs from its initial manufacture, which could mask the magnitude of a spill and complicate evaluation of the cleanup progress. Complete concrete removal is only recommended for areas where no other method will meet the regulatory limits. It is highly recommended that wooden pads be replaced with either an encapsulated metal or concrete pad if.

3.3.1 Process Description

As the name implies, the entire pad is removed and replaced with a new pad, whether it be concrete or another material. The transformer will have to be shut down and removed prior to the beginning of this operation. As with partial surface removal, if the surface is concrete, constant air monitoring is required to ensure that the PCBs in the cement are not becoming airborne. Special vacuum systems with HEPA filter attachments are required to clean the dust generated from the concrete demolition[15]. After the new concrete pad has been poured, a settling time of seven days is required to let the concrete setup and cure. Replacing a contaminated concrete pad is only recommended when the transformer is also being replaced or retrofilled. This is because the high moisture content in the newly poured cement is believed to inhibit the action of the solvents for PCB removal. If this method is used, it is suggested that the new pad also be encapsulated to protect it from possible future spills of PCB-containing liquid.

3.3.2 Cost

The actual cost of pad replacement varies due to several factors: pad size, pad location, and type of concrete required. The actual cost of replacing the pad would be small compared to the work and time loss due to the outage. As with the previous two methods, an environmental service company can provide all the equipment and services needed for the project.

3.4 Manual Double Wash/Rinse

The PCB Spill Cleanup Policy requires that small, low concentration spills of PCBs on surfaces are to be removed by a double wash/rinse procedure[16]. The objectives of the double wash/rinse procedure are: (a) to recognize the lesser hazard resulting from these small quantity spills and from the cleanup of such spills, and (b) to cleanup the easily removable PCB material thoroughly and quickly. Although the EPA describes a manual method in 40 CFR Part 761, there are mechanical methods also available, as described earlier.

3.4.1 General Requirements

For spills where there is still visible PCB-containing liquid present on the surface, a pre-cleaning step is first required before the double wash/rinse procedure is initiated. This step includes thoroughly wiping or mopping up the entire surface with absorbent paper or cloth material, so there are no visible signs of liquid on the surface. The double wash/rinse procedure calls for two washing and two rinsing steps in the cleanup of surfaces contaminated by small spills. The washing and rinsing steps are slightly different depending on (a) whether a contaminated surface was relatively clean before the spill, or (b) whether a surface was coated/covered with some sort of absorbent material, such as dust, dirt, grime, or grease. Minimization of the residual PCBs following the double wash/rinse procedure is facilitated by the proper selection and use of cleanup equipment. Scrubbers and absorbent pads used in the double

wash/rinse procedures shall not be dissolved by solvents or cleaners used. Scrubbers and absorbent pads shall not be reused or contain greater than 2 parts per million (PPM, weight per weight) PCBs. Rinsing scrubbers and absorbent pads may be reused as washing scrubbers or absorbent pads if necessary, but this is not recommended. All double wash/rinse cleaning/ absorbent materials must remain intact (i.e. will not shred, crumble, or leave visible fragments on the surface) after the double wash/rinse operation. During the double wash/rinse process, all washing and rinsing liquids and/or solvents must be contained, captured, and properly disposed of in accordance with local, state, and federal regulations. The federal regulations for disposal of contaminated cleaning supplies can be found in 40 CFR Part 761.60. Following use in the double wash/rinse process, all contaminated equipment and absorbent materials must also be disposed of in accordance with local, state, and federal regulations.

3.4.2 Specific Process Description

As stated earlier, the double wash/rinse procedure has two different washing/rinsing steps depending on the condition of the surface to be cleaned.

1. Cleanup procedures for relatively clean surfaces:

   Wash 1 - If there is no visible liquid or after having removed the visible liquid, cover the entire area with organic solvent in which PCBs are at least 5% soluble by weight. Contain and collect any runoff solvent for disposal. Scrub rough surfaces with a scrub brush or a disposable scrubbing pad. Add solvent such that surface is always very wet, washing for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Wipe, mop, and/or absorb the solvent onto absorbent material until no visible traces of the solvent remain.

Rinse 1 - Wipe the surface with an absorbent pad soaked with the same organic solvent for one minute per square foot. Any surface less than one square foot shall also be washed for one minute. Immediately wipe/mop up the solvent on the surface with a dry absorbent.

Wash 2 - Repeat as Wash 1.

Rinse 2 - Repeat as Rinse 1.

2. Cleanup procedures for soiled surfaces.

Wash 1 - If there is no visible liquid or after removal of any visible liquid, cover the entire surface with concentrated or industrial strength detergent or non-ionic surfactant solution. Contain and collect all cleaning solutions for proper disposal. Scrub rough surfaces with a scrub brush or scrubbing pad, adding cleaning solution such that the surface is always very wet, scrubbing for one minute per square foot. Wipe smooth surfaces with a cleaning solution-soaked disposable absorbent pad for one minute per square foot. Any surface with less than one square foot shall also be cleaned for one minute. Mop up or absorb the residual cleaner solution and suds with an absorbent pad until the surface appears dry. This cleaning should remove any residual dirt, dust, grime or other sorbent materials left on the surface following step one above.

Rinse 1 - Rinse off the wash solution with one gallon of water per square foot and capture the rinse water. Mop up the wet surface until the surface appears dry.

Wash 2 - Next, cover the entire dry surface with an organic solvent into which PCBs are at least 5% soluble by weight. Scrub rough surfaces with a scrub brush or scrubbing pad for one minute per square foot, adding solvent such that the surface is always very wet. Wipe smooth surfaces with a solvent-soaked disposable absorbent pad for one

minute per square foot. Any surface less than one square foot shall also be cleaned for one minute. Wipe, mop, and/or absorb the solvent onto absorbent material until no visible traces of the solvent remain.

Rinse 2 - Wipe the surface with an absorbent pad soaked with the same organic solvent as in Rinse 1 and immediately wipe up the solvent on the surface with a dry absorbent.

3.4.3 Cost

This method has the advantage of being currently in use, however it is proving not to be either cost or labor effective because it often requires two or three washings to get a surface clean down to regulatory limits. This method is undoubtedly the least expensive of all the options in up front costs, but is also the most labor intensive and time consuming. There is also a higher chance of personnel exposure to PCBs with this method than with one of the more mechanical methods. The actual cost of this method is simply the time of the people who perform this technique, as well as the supplies they use, and the disposal costs for the supplies that receive contamination.

3.5 Encapsulation

Encapsulation is the process of putting a sealant or coating on a cement, concrete, or metal surface. Some examples of sealants are: polysulfide epoxy resins, linseed oil, coal tar, and polyeurathanes[17,18]. This impervious coating prevents future PCB spill penetration into the floor medium. However, encapsulation has several drawbacks; (a) the transformer has to be removed from the pad so it can be first cleaned to regulatory limits, and (b) the sealant location has to be approved by the EPA Region IX Administrator. If a spill doesn't go under the transformer, it is still recommended that the transformer be lifted and the entire area cleaned and encapsulated, because if a future spill occurs and it goes under the transformer, the EPA requires that the spill be promptly cleaned, which

would involve lifting the transformer[19]. However, if lifting the transformer, is not practical or feasible, for encapsulation of the entire area, sealing just the area around the transformer would then be suggested, but must be approved by the EPA Region IX Administrator.

Encapsulation was not pursued as an cleanup option for NASNI due to the uncertainties in the transformer replacement schedule at this time. It would ideally be used after a transformer has been retrofilled or replaced, so that leach back of PCBs will not occur. It is expected, however, that encapsulation will significantly increase the amount of time required for an outage to be completed, but it is strongly recommended by the EPA. This option is not suggested for surfaces that are highly fractured, or crumbled, as the sealant will not give adequate protection from future PCBs spills. As with the other options, an environmental service contractor can perform the entire process[20,21].

3.5.1 Cost

Costs could not be very accurately estimated for the service companies until they have visited and inspected the possible sites. However, an estimate of $\$10/ft^2$ was given for applying two coat of epoxy[22]. The cost of the sealant itself is not extreme, and should not be a consideration in the evaluation of this option.

4.0 SITE SELECTION

4.1 Process and Requirements

The site selection process for the technology demonstration was driven by several factors:

1) The federal regulation specifying cleanup levels required in certain areas[23].
2) The spill history, i.e. amount of spill, age of spill, and number of repetitive spills at the same location.
3) The condition of the pad surface; smooth, cracked, or fractured.
4) The location of the pad, and its ease of access.
5) The age and type of the transformer.

PCB cleanup capabilities differ depending upon the type of surface to be cleaned, the age of the surface, the elapsed time since the spill occurred, the ability of the technology to remove the cleanup chemicals, the type of PCB, and if the cleanup is in an area of repeated spills. Five site selections were made for the spray-foam vacuum and the partial surface removal pad cleaning techniques based on the above criteria. It was decided to limit the number of site selections per technology to save time and cost. The other technologies; double wash/rinse and encapsulation, did not have specific site selections made due to reasons discussed under each topic in the next section.

4.1.1 Spray-Foam Vacuum

Serial Number	Building	Pad
6900965	356	V1
1S24P268	378	1
3414214	378	1
35412	378	6
28585	599	V1

4.1.2 Partial Surface Removal

Serial Number	Building	Pad
6814653	1	V2
6585054	C87	
6585146	C87	
B972435	572	1
6948735	252	1

4.1.3 Complete Surface Removal

After a thorough search no concrete transformer pads can be found that are sufficiently damaged enough to warrant completely removing and/or replacing them. If there is no justified need for it, this technology can be quite costly and labor intensive. However, some wooden pads were identified that are good candidates for replacement. The transformers that are on these pads are to be scheduled for replacement some time in early 1990, so it is strongly recommended that the pads listed below be replaced at that time.

Serial Number	Building	Pad
2608-1	379	3
2608-2	379	3
2608-3	379	3

4.1.4 Encapsulation

Any pad surface approved by the EPA Region IX Administrator that has been cleaned to regulatory limits can be encapsulated. Again, it should be emphasized that any pad cleaned to the regulatory limits that has future spill potential should be encapsulated, thereby easing the difficulty of future cleanups. The cost of this operation is expected to be minimal in comparison with the advantages in the way of future cleanup efforts. The

only drawback is having the requirement that the EPA Region IX Administrator must approve all encapsulation locations. Once the candidate pads have been cleaned by the method of choice, it could be advantageous to have an environmental service company arrange for the encapsulation locations with the Administrator.

5.0 CONCLUSIONS

The PCB spill and cleanup database that was developed for this project is anticipated to greatly reduce the amount of paperwork and inconvenience found in the current system. The user friendly computerized database has organized the information into easily accessible reports and categories that can be readily manipulated to display the data in several different forms.

A schedule could not be put together for any technology demonstrations, due to the uncertainties involved in the replacement or retrofilling schedule. It is anticipated that the preparation of a cleanup technology demonstration schedule will be difficult due to the variability of the actual spill occurrences. Due to PWC's PCB electrical equipment replacement/retrofill program it is anticipated that no additional cleanup technology/program will be required at NASNI. At this point it would not be cost effective to purchase additional equipment or training involved in a new cleanup technology. However if a new technology is desired, the spray foam system is recommended. The information in the database indicates that all the past spill sites have been cleaned to regulatory limits, even though the method used might not have been the most efficient.

Complete surface removal is not recommended for any of the concrete pads at NASNI, however there are wooden pads that should be replaced as soon it is feasible to do so, as it not practical or cost effective to try and clean them to meet regulatory limits.

6.0 RECOMMENDATIONS

The NASNI PCB double wash/rinse spill cleanup procedures currently being employed are not effective or efficient in most instances of spill occurrences. Also, this method is more labor intensive than the other options being considered in this paper. It is believed that for future spills, the spray-foam vacuum system could offer higher cleaning efficiency for the same level of effort sufficiently to reduce the extra cost of cleaning required, even though at this time it would not be practical to

invest or implement this new cleanup program at NASNI. However, if a new program is implemented with the spray-foam system, it is recommended that the equipment and training be purchased by PWC to be used whenever the spill cleanup need arises, rather than through the use of a contractor.

It is also highly recommended that all pads that have the spray-foam vacuum or the partial surface removal performed on them, be immediately encapsulated with a sealant.

Partial surface removal would be recommended in areas that have spills older than six months, as typically these spills are hard to clean to regulatory levels without expending a large amount of effort. If one of the partial surface removal techniques is ever considered, (i.e. scarifying, shot blasting), it is recommended that one of the environmental service companies be contracted to do all the candidate pads simultaneously rather than having PWC purchase the equipment and/or personnel to do this. Cleaning the entire spill surface promptly after the spill is discovered is required by the EPA in all spill instances, whether the spill goes under the transformer or not. It is also highly recommended by the EPA that after the pad has been cleaned, it should be encapsulated, especially if the transformer was lifted during cleaning.

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24. Code of Federal Regulations, 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," Office of the Federal Register, August 1988.

APPENDIX A
SAMPLE PWC REPORTS

POLYCHLORINATED BIPHENYL EQUIPMENT INSPECTION FORM

ITEM (TRANSFORMER, CAPACITOR, ETC...): transformer

SERIAL NUMBER: 6456568 MANUFACTURER: GE

BUILDING: 549 549-1 STATION: NASNI

DATE	INSPECTOR'S NAME	AREAS OF INSPECTION* BUSHINGS	GAUGES	VALVES	FINS	OTHER***	COMMENTS**
8006							
-6-88	T Blyth D Dubert	U	S	S	S	Top Fill Plug - Both Sample Valves - Entire Deck 4'X9'?	
	Looks like 2 or so XFMRS Removed, Spill was made prior or while removal. Entire Deck 4'X9' discolored. Samples taken —						
7-25-88	W [illegible] D Dubert	Cleaned & Repaired Leak per [illegible] Inspection [illegible] Also Removed Hi reading Areas —					7-[illegible] 8269-1
10-24-88	"	Cleaned Areas of previous Hi Sample Readings					8298-4
11-22-88	"	"	"	" "	"	" "	8327-5

* RESULTS OF INSPECTION ARE INDICATED WITH AN "S" FOR SATISFACTORY AND "U" FOR UNSATISFACTORY. UNSATISFACTORY MUST BE FOLLOWED WITH COMMENTS.

** COMMENTS INCLUDE SPILL REPORT NUMBER.

*** OTHER INCLUDES INSPECTING SURROUNDING AREA FOR COMBUSTIBLE MATERIALS WITHIN 5 METERS

Mop & GLO

PBC TRANSFORMER INSPECTION REPORT

DATE: 12/16/87.

SER. NO: 6456568. SIZE: 10 KVA. MFG: GE.

LOCATION: 549-1. CKT: B4. VOLTAGE PRI. 2.4 SEC _____

TYPE PCB: PYRANOL. QTY PCB: _____ GAL.

URWG BEING PERFORMED: ( ) 6081 (✓) 6041 ( ) 6043

Check Discrepancy

(✓) Leaking at bushing.

( ) Leaking at welded seam.

( ) Leaking at fin.

( ) Leaking at cover plate, gauge or drain plug.

( ) Other discrepancy. Explain; _____

ACTION TAKEN:

(✓) Cleaned and repaired.

( ) Outage requested for transformer.

( ) Hazardous Waste Handlers notified

( ) Report forwarded to UTILITIES DIRECTOR.

( ) Report forwarded to ENVIRONMENTAL AUTHORITY.

OTHER ACTION TAKEN: Transformer Leaking at Primary bushings Please sign when cleaned

SIGNATURE: R. Dubert T. Blyth

1-6-88

NAVY PUBLIC WORKS CENTER, SAN DIEGO
POLYCHLORINATED BIPHENYL SPILL CLEANUP REPORT (DRAFT 10/87)

SPILL REPORT NUMBER: 6456568

ITEM: 8006-01549-1-001 SERIAL NUMBER: ←

BUILDING: 549 pad 549-1 STATION: NASNI

SITE CONTACT: _____ TELEPHONE NO.: _____

ESTIMATED QUANTITY: _____ DATE/TIME OCCURRED: _____

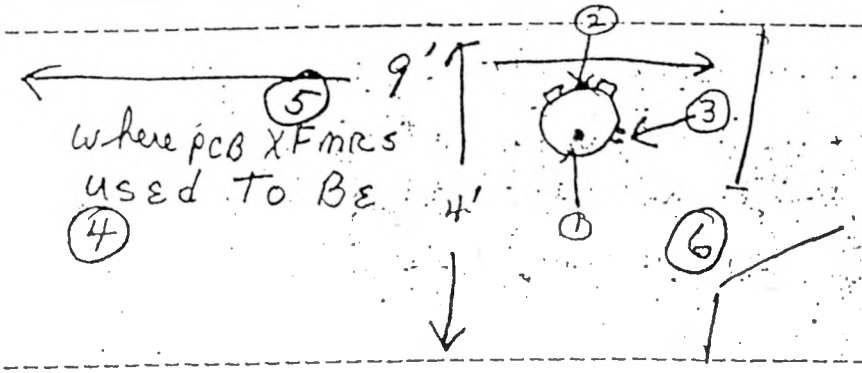
CLEANUP DATE	START TIME	COMPLETION TIME
1-6-88	1330	1530

DESCRIPTION OF AFFECTED AREA (LOCATION AND NATURE): ① Top Filler plug ② on XFMR Between Bushings ③ under Sample Valves on XFMR 4, 5, 6 Random Leak (Looks like old spill when XFMRs being Removed)

DOUBLE WASH/RINSE (DESCRIBE SURFACE): 1-3 Metal 4-6 cement

SOIL REMOVAL: WIDTH _____ LENGTH _____ DEPTH _____

SITE DIAGRAM (SHOW SAMPLE LOCATIONS AND BOUNDARIES AND DIMENSIONS):



PRE-CLEANUP SAMPLE NUMBER	DESCRIPTION	RESULTS	UNITS	COMMENTS

POST-CLEANUP SAMPLE	DESCRIPTION	RESULTS	UNITS	COMMENTS
8006-01549-1-001	Top Filler plug	ND	mg/100cm²	
8006-01549-1-002	Between 2 pri Bushings	0.071		
8006-01549-1-003	on XFMR under SAMPLE Values	ND <0,001mg		
8006-01549-1-004	Random	1.619		
8006-01549-1-005	Check	1.000		
8006-01549-1-006	Samples	0,053		

MBERS OF CLEANUP TEAM (INCLUDE CODE, ACTIVITY AND EQUIPMENT UTILIZED BY NO.)

1. Blyth 640 PC155 Steel Brush, foxtail Steelwool
2. Dubert 622 10 Rags

OTECTIVE EQUIPMENT UTILIZED:

1. VITON GLOVES
2. APR
3. ORGANIC VAPOR CART.
4. SCBA
5. BOOT COVERS
6. COVERALLS

(2) Safety glasses

SPONDER'S SIGNATURE: _____ DATE: _____

RTIFICATION: THIS IS TO CERTIFY THAT THE PCB CLEANUP REQUIREMENTS TABLISHED IN 40 CFR 761 HAVE BEEN MET AND THAT THE INFORMATION CONTAINED IN IS RECORD IS TRUE TO THE BEST OF MY KNOWLEDGE.

GNATURE: _____ DATE: _____

PRODUCT OF GOVERNMENT EXPENS

Golf Course Bunker

8209-1

PBC TRANSFORMER INSPECTION REPORT

DATE: 7/12/88.

SER. NO: 6456568. SIZE:______ KVA. MFG:____________________.

LOCATION: Bldg 549. ~~CKT~~: 549-1. VOLTAGE PRI.______ SEC________

TYPE PCB:___________. QTY PCB:_______ GAL.

NASNI SP# 01-061

URWG BEING PERFORMED: ( ) 6081 ( ) 6041 ( ) 6043

Check Discrepancy

(✓) Leaking at bushing. Left Secondary

( ) Leaking at welded seam.

( ) Leaking at fin.

( ) Leaking at cover plate, gauge or drain plug.

( ) Other discrepancy. Explain; ____________________

ACTION TAKEN:

(✓) Cleaned and repaired. 7-25-88

( ) Outage requested for transformer.

( ) Hazardous Waste Handlers notified

( ) Report forwarded to UTILITIES DIRECTOR.

( ) Report forwarded to ENVIRONMENTAL AUTHORITY.

OTHER ACTION TAKEN: [illegible] - Repaired and [illegible] Bushing - Cleaned & Sampled

SIGNATURE: [illegible signature]

NAVY PUBLIC WORKS CENTER
SAN DIEGO, CALIFORNIA 92136-5113

Polychlorinated Biphenyl Spill Cleanup Report (Rev. 12/87)

8209-1

ERAL INFORMATION

3: 549 Station: NASNI Site Contact: _____

ource of Spill): ☐ OFC ☑ Transformer ☐ Switch ☐ Other _____ Serial Number: 6456568

centration (ppm) If known: _____ Sample Number: _____

ed Quantity: _____ Total Surface Area Contaminated: _____ Date/Time Occurred: _____

Date(s)	Elapsed Time (Hours)	Cleanup Crew (Print Name and initial)
1-25-88	8.0	W. Wyckoff D. Dubert

SCRIPTION OF AFFECTED AREA(S), SURFACE(S), AND CLEANUP METHODS

Location: (Check one in each column)
☐ Substation ☐ Outdoor ☐ High Contact
☑ Restricted Access ☑ Indoor ☑ Low Contact
☐ Non-restricted Access

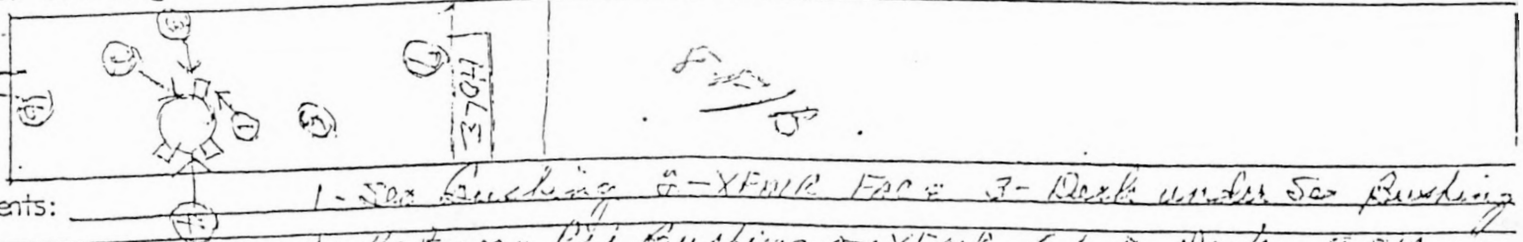
Surface:
Impervious: ☑ Metal ☐ Aluminum Siding ☐ Glass ☐ Enameled/Laminated ☐ Other
Pervious: ☐ Soil ☑ Concrete ☐ Wood ☐ Plasterboard ☐ Asphalt ☐ Other

Cleanup Method(s) Utilized:

☑ Double Wash/Rinse
☐ Removal of free liquids Estimated quantity: _____ Removed with: ☐ Absorbent ☐ Bulk Pumping
☐ Removal of contaminated surface/item — Dimensions: Width _____ Length _____ Depth _____
☐ Soil ☐ Cement ☐ Asphalt ☐ Wood

Protective Equipment Utilized: ☐ Level A ☐ Level B ☑ Level C ☐ Level D ☐ Other

Site Diagram (Show sample locations, spill boundaries and dimensions)



ments: 1 - Start Washing 2 - XFMR Pad 3 - Dock under Sec Building
4 - Between Pole Washing to XFMR 5, 6, 7, Weeds 8 - P/C

RTIFICATION: This is to certify that the PCB cleanup requirements established in 40 CFR 761 have been met and that formation contained in this records is true to the best of my knowledge.

gnature: _____ Date: _____

tle: _____

GOVERNMENT EXPENDITURE

Polychlorinated Biphenyl Spill Cleanup Sampling Report

2209-1

80738 -17

Sample Number	Sample Type: Pre-Clean	Sample Type: Post Clean	Description: Location	Description: Wipe	Description: Liq	Description: Solid	Results (mg/100 cm² indicate otherwise)	Date of Analysis	Analyst Initials
-01		✓	Bunker	✓			0.0126	2 AUG 88	NAA
-02		✓	X-mantle	✓			0.0025	"	NAA
-03		✓	Beam	✓			0.0446	"	NAA
-04		✓	Between Pipes	✓			0.0011	"	NAA
-05		✓	Beam	✓			0.0152	"	NAA
-06		✓	"	✓			ND	"	NAA
-07		✓	"	✓			0.0086	"	NAA
-08		✓	F/B	✓			ND	"	NAA
-09									
-10									
-11									
-12									
-13									
-14									
-15									
-16									
-17									
-18									
-19									
-20									

80738-1 thru -17

Cleanup Performance Standard Limit Considered Clean

ce Type	Limit	Sample No.:	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Water/Oil	<5 ppm																					
Surface																						
station/Low	0.1 mg/ 100 cm²																					
act Outdoor																						
ntiers	0.01 mg/ 100 cm²																					

mits:

ND = none detected

detection limit = 0.001 mg

Spill Report No. 8298-4

UTILITIES DEPARTMENT
NAVY PUBLIC WORKS CENTER
SAN DIEGO, CALIFORNIA 92136-5113

Polychlorinated Biphenyl Spill Cleanup Report (Rev. 12/87)

ERAL INFORMATION

g: 549 Station: NASNI 01 Site Contact: _____

ource of Spill): ☐ OFC ☑ Transformer ☐ Switch ☐ Other _____ Serial Number: 6456568
ncentration (ppm) if known: _____ Sample Number: _____
ed Quantity: _____ Total Surface Area Contaminated: _____ Date/Time Occurred: _____

Date(s)	Elapsed Time (Hours)	Cleanup Crew (Print Name and initial)
5-24-88	1.8	W. My NATT D. Dubert

SCRIPTION OF AFFECTED AREA(S), SURFACE(S), AND CLEANUP METHODS

Location: (Check one in each column)
☐ Substation ☐ Outdoor ☑ High Contact
☐ Restricted Access ☑ Indoor ☐ Low Contact
☑ Non-restricted Access

Surface:
Impervious
☑ Metal ☐ Aluminum Siding
☐ Glass ☐ Enameled/Laminated
☐ Other

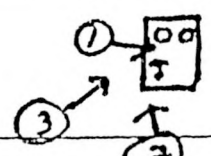
Pervious
☐ Soil ☑ Concrete
☐ Wood ☐ Plasterboard
☐ Asphalt ☐ Other

Cleanup Method(s) Utilized:

☑ Double Wash/Rinse
☐ Removal of free liquids Estimated quantity: _____ Removed with: ☐ Absorbent ☐ Bulk Pumping
☐ Removal of contaminated surface/item — Dimensions: Width _____ Length _____ Depth _____
☐ Soil ☐ Cement ☐ Asphalt ☐ Wood

Protective Equipment Utilized: ☐ Level A ☐ Level B ☑ Level C ☐ Level D ☐ Other

Site Diagram (Show sample locations, spill boundaries and dimensions)



ts: 1- See Bleaching 2+3 Deck

ICATION: This is to certify that the PCB cleanup requirements established in 40 CFR 761 have been met and that ation contained in this records is true to the best of my knowledge.

ure: _____ Date: _____

Spill Report No. 8327-5

UTILITIES DEPARTMENT
NAVY PUBLIC WORKS CENTER
SAN DIEGO, CALIFORNIA 92136-5113

Polychlorinated Biphenyl Spill Cleanup Report (Rev. 12/87)

GENERAL INFORMATION

ilding: 549 Station: NASNI 01 Site Contact: _____

m (Source of Spill): ☐ OFC ☑ Transformer ☐ Switch ☐ Other _____ Serial Number: 6456568

B Concentration (ppm) if known: _____ Sample Number: _____

timated Quantity: _____ Total Surface Area Contaminated: _____ Date/Time Occurred: _____

eanup Date(s)	Elapsed Time (Hours)	Cleanup Crew (Print Name and initial)
11-22-88	.5	W. MyNATT D. DuBeau

DESCRIPTION OF AFFECTED AREA(S), SURFACE(S), AND CLEANUP METHODS

a. Location: (Check one in each column)
☐ Substation ☐ Outdoor ☑ High Contact
☐ Restricted Access ☑ Indoor ☐ Low Contact
☑ Non-restricted Access

b. Surface:
Impervious: ☑ Metal ☐ Aluminum Siding ☐ Glass ☐ Enameled/Laminated ☐ Other
Pervious: ☐ Soil ☑ Concrete ☐ Wood ☐ Plasterboard ☐ Asphalt ☐ Other

c. Cleanup Method(s) Utilized:

☑ Double Wash/Rinse
☐ Removal of free liquids Estimated quantity: _____ Removed with: ☐ Absorbent ☐ Bulk Pumping
☐ Removal of contaminated surface/item — Dimensions: Width _____ Length _____ Depth _____
☐ Soil ☐ Cement ☐ Asphalt ☐ Wood

d. Protective Equipment Utilized: ☐ Level A ☐ Level B ☑ Level C ☐ Level D ☐ Other

e. Site Diagram (Show sample locations, spill boundaries and dimensions)

mments: 1-Bushing 2-XFmr Face 3-Deck

RTIFICATION: This is to certify that the PCB cleanup requirements established in 40 CFR 761 have been met and that nformation contained in this records is true to the best of my knowledge.

gnature: _____ Date: _____

tle: _____

APPENDIX B
USER DOCUMENTATION FOR THE DATABASE

SAN DIEGO CLEANUP SYSTEM

(SDC)

USER DOCUMENTATION

Prepared by EG&G Idaho, Inc.

July 1989

SAN DIEGO CLEANUP SYSTEM

The San Diego Cleanup system is designed to store and manipulate data relating to the inspection of several different kinds of equipment containing PCBs and the cleanup and sampling of any spills. Due to the wide variety of manual forms used to collect the data, a system design has been chosen that incorporates general formats for input screens and reports.

The system is centered around four major data sets: 1) Equipment - this data set contains records relating to the hardware specifics of the individual pieces of equipment that are examined during the inspections 2) Inspection - this data set relates to a particular inspection performed on a single date including one or more pieces of equipment and may also relate to a cleanup report if any spills were discovered 3) Cleanup - this data set is concerned with the data provided by the inspectors if a spill or leak is discovered. Each record relates to a single spill/leak on a single transformer. 4) Sample - Samples of the PCB spills are collected and the information from one individual sample on a single piece of equipment at a single location is tracked in this data set.

Startup

To start the system, type SDC and the following menu will appear:

```
0 - San Diego Cleanup   MAIN MENU
        (1)  Data Maintenance
        (2)  Reports
        (3)  Utilities
```

Fig. 1

The SDC system is divided into three sections: 1) Data Maintenance - the entry and maintenance of information within the four major data sets 2) Reports - the ability to report on that information and 3) Utilities - some procedures used mainly for data backup. The system is in a hierarchial structure, you will be presented with a series of menus until you get to the function you want. You can determine the level you are at by the numbers displayed in the screen title area. For example, if you see 124 in the screen title, that means you have selected the first option, then the second option, and finally the fourth option from the various menus as you proceed down through the system.

To select an option, move the highlighted square up or down using the arrow keys or press the number key. When the highlighted bar is on the appropriate line, press the <ENTER> key.

> Note: within the SDC system, the <ESC> key is the universal way to exit any screen without performing an operation. You may use this key at any time to back out of a screen or a report.
>
> Also: at various times on the report options, you may be given the ability to route your printing by using the following menu. Move the cursor to your preference and press <ENTER>.

```
Select Print Routing
 Printer  Screen   Both
```

Section 1 - Data Maintenance

If you selected option 1 from the main menu, the data maintenance menu will appear:

```
═══════════════════1 - Data Maintenance   MENU═══════════════════
                        (1)  Equipment
                        (2)  Inspections
                        (3)  Cleanups
                        (4)  Samples
```

Fig. 2

This menu allows access to each of the four data sets. Depending on your selection you will be presented with one of the following menus:

```
═══════════════11 - Equipment Data Maintenance   MENU═══════════════
                        (1)  Add
                        (2)  Change
                        (3)  Delete
```

```
═══════════════12 - Inspection Data Maintenance  MENU═══════════════
                        (1)  Add
                        (2)  Change
                        (3)  Delete
```

```
═══════════════13 - Cleanup   Data Maintenance   MENU═══════════════
                        (1)  Add
                        (2)  Change
                        (3)  Delete
```

```
═══════════════14 - Sample    Data Maintenance   MENU═══════════════
                        (1)  Add
                        (2)  Change
                        (3)  Delete
```

Fig. 3

At this point, you are at the final level of menus in the data maintenance section. You may now select a mode; either add, change or delete. Each mode will present the same format for the maintenance screen. The difference between the modes is in how the fields and records are processed and in the prompting prior to the presentation of the screen. For example, the add screen assumes that you are adding a new record and does not access the data base while the change and delete options prompt you for the necessary keys to look up a particular record's information. The prompts are simple and look something like this:

```
Enter serial #:
```

After each prompt, the key is validated against the data base and any error messages will appear in red at the top of the screen. If the keys are correct the appropriate screen will appear with the data already loaded.

Equipment

The Equipment Data Maintenance portion of the system uses the screen in Fig 4. This screen accesses only the Equipmnt data set within the SDC system and performs certain edit checks based on known requirements for the field values.

11X - Equipment XXX

```
serial #:                  device type: TRANSFORMER        station:
                                                          building:
                                                               pad:
-------------------------------------------------------------------
     manufacturer:                          restriction:
PCB concentration:
                                          indoors/outdoors:
       KVA rating:                               contact:
          circuit:
  primary voltage:
secondary voltage:                      retro fill (Y/N):
         comments:
```

Fig. 4

For the add and changes modes, you fill-in or change the necessary fields and press <ESC>. You will then see one of the menus in Fig 5. at the top of the screen.

```
111 - Equipment ADD
Add  Edit again
```

```
112 - Equipment CHANGE
Edit  Save
```

Fig. 5

When you use the Add or Save options, edit checks are automatically performed against all field values. Any errors terminate the procedure and display an error message on the top line of screen. For the Add option, if the field values are correct, the record is added to the data base and a new screen is presented. For the Save option, if the field values are correct, the current record in the data base is updated and you are returned to the mode menu.

For the Delete mode, all of the fields are protected - the screen is presented with information as a check to make sure you have the correct record. In addition the option menu is automatically at the top of the screen (Fig. 6).

```
═══════════════════════════113 - Equipment DELETE═══════════════════════════
 Delete
```

Fig. 6

When you use the Delete option, there are no checks performed other than to simply delete the record and return you to the mode menu.

Inspection

The Inspection Data Maintenance portion of the system uses the screen in Fig 7. This screen accesses only the Inspectn data set within the SDC system and performs certain edit checks based on known requirements for the field values.

```
                        12X - Inspection  XXXXXX

┌──────────────────────────────────┬──────────────────────────────────┐
│ inspection # (internal):         │          date:                   │
│               serial #:          │                                  │
│                                  │   inspector 1:                   │
│                                  │   inspector 2:                   │
├──────────────────────────────────┴──────────────────────────────────┤
│     drainplug  :                                                    │
│     bushings   :                        leaking:                    │
│     gauges     :                                                    │
│     valves     :                  spill report #:                   │
│     fins       :                                                    │
│     welded seam:                                                    │
│           other:                                                    │
├─────────────────────────────────────────────────────────────────────┤
│    action taken:                                                    │
│                                                                     │
│                                                                     │
│        comments:                                                    │
└─────────────────────────────────────────────────────────────────────┘
```

Fig. 7

For the add and changes modes, you fill-in or change the necessary fields and press <ESC>. You will then see one of the menus in Fig 8 at the top of the screen.

```
═══════════════════════════121 - Inspectn  ADD═══════════════════════════
 Add  Edit again

═══════════════════════════122 - Inspectn  CHANGE═══════════════════════
 Edit  Save
```

Fig. 8

When you use the Add or Save options, edit checks are automatically performed against all field values. Any errors terminate the procedure and display an error message on the top line of screen. For the Add option, if the field values are correct, the record is added to the data base and a new screen is presented. For the Save option, if the field values are correct, the current record in the data base is updated and you are returned to the mode menu.

For the Delete mode, all of the fields are protected - the screen is presented with information as a check to make sure you have the correct record. In addition the option menu is automatically at the top of the screen (Fig. 9).

123 - Inspection DELETE

Delete

Fig. 9

When you use the Delete option, there are no checks performed other than to simply delete the record and return you to the mode menu.

Cleanup

The Cleanup Data Maintenance portion of the system uses the screen in Fig 7. This screen accesses only the Cleanup data set within the SDC system and performs certain edit checks based on known requirements for the field values.

13X - Cleanup XXX

spill report #: serial #: previous report #:	date: time required:
spill location: impervious/pervious: surface type 2:	
quantity: method: type of protection:	

Fig. 10

For the add mode, you fill-in the necessary fields and press <ESC>. You will then see the menu in Fig 11 at the top of the screen.

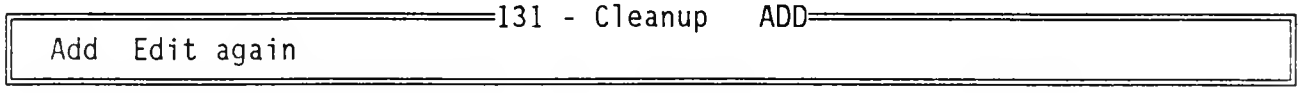


Fig. 11

When you use the Add option, edit checks are automatically performed against all field values. Any errors terminate the procedure and display an error message on the top line of screen. If the field values are correct, the record is added to the data base and a new screen is presented.

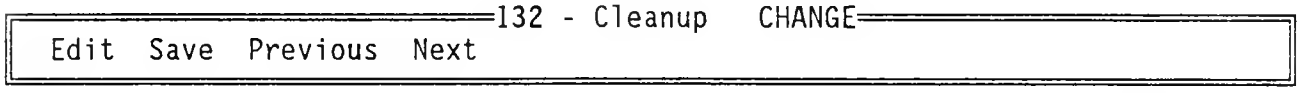


Fig. 12

The Cleanup CHANGE screen (Fig 12) differs from the other change screens in the SDC system in that it has the capability of scrolling back and forth between records within the Cleanup data set. This is to allow retrieval of several cleanup records all relating to one piece of equipment for the same spill report but with different locations. The records are retrieved in sorted order and the system will beep when the end of the set in encountered. When you select the Save option, edit checks will automatically be performed and if the fields have permissible data, the record will be updated and the system will move on to the next record within the sequence and load its data to the screen. Any errors encountered within the fields will generate an error message at the top of the screen.

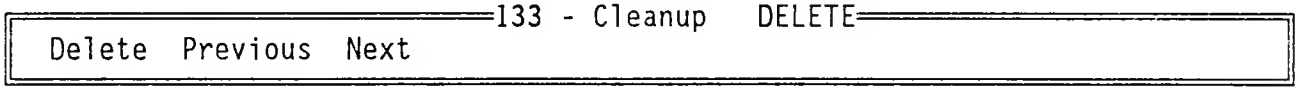


Fig. 13

For the Delete mode, all of the fields are protected - the screen is presented with information as a check to make sure you have the correct record. In addition the option menu is automatically at the top of the screen (Fig. 13). As with the change screen, the delete mode allows scrolling between records with the same equipment serial number and spill report.

When you use the Delete option, there are no checks performed other than to simply delete the record and return you to the next record in sequence.

Cleanup

The Cleanup Data Maintenance portion of the system uses the screen in Fig 14. This screen accesses only the Sample data set within the SDC system and performs certain edit checks based on known requirements for the field values.

14X - Sample XXX

```
        sample #:                          date:
   spill report #:
    report site #:
        serial #:                  greater than min allowed:
  original site #:

      type:          result:          pre/post:        blank: Y
```

Fig. 14

For the add and changes modes, you fill-in or change the necessary fields and press <ESC>. You will then see one of the menus in Fig 15 at the top of the screen.

```
=============141 - Sample    ADD=============
 Add  Edit again

=============142 - Sample    CHANGE==========
 Edit  Save
```

Fig. 15

When you use the Add or Save options, edit checks are automatically performed against all field values. Any errors terminate the procedure and display an error message on the top line of screen. For the Add option, if the field values are correct, the record is added to the data base and a new screen is presented. For the Save option, if the field values are correct, the current record in the data base is updated and you are returned to the mode menu.

For the Delete mode, all of the fields are protected - the screen is presented with information as a check to make sure you have the correct record. In addition the option menu is automatically at the top of the screen (Fig. 16).

```
=============143 - Sample     DELETE==========
 Delete
```

Fig. 16

When you use the Delete option, there are no checks performed other than to simply delete the record and return you to the mode menu.

Section 2 - Reports

If you selected option 2 from the main menu, the Reports menu will appear:

```
2 - Reports   MENU
(1)  General
(2)  Ad Hoc
(3)  Equipment by Station
(4)  Cleanup Totals
```

Fig. 17

This menu allows access to 2 other report menus and 2 specialized reports.

General

The general reports menu (Fig 1) gives you access to each data set one record at a time or to all of the records at once. If you select single access, you will be prompted for the appropriate keys. The data is presented in rows horizontally the field names have been made more descriptive.

```
21 - General Reports  MENU
(1)  Equipment    - single
(2)                 all
(3)  Inspections  - single
(4)                 all
(5)  Cleanup      - single
(6)                 all
(7)  Sample       - single
(8)                 all
```

Fig. 18

AD Hoc

The Ad Hoc option allows access to the individual data sets but gives you the ability to select specific search criteria and to choose those fields you would like to see on the report. There are 4 reports, each report is restricted to a single data set.

```
22 - Ad Hoc Reports    MENU
(1)  Equipment
(2)  Inspections
(3)  Cleanups
(4)  Samples
```

Fig. 19

When you select an Ad Hoc Report you will see one of the following screens:

221 - Equipment Ad Hoc Report Selection

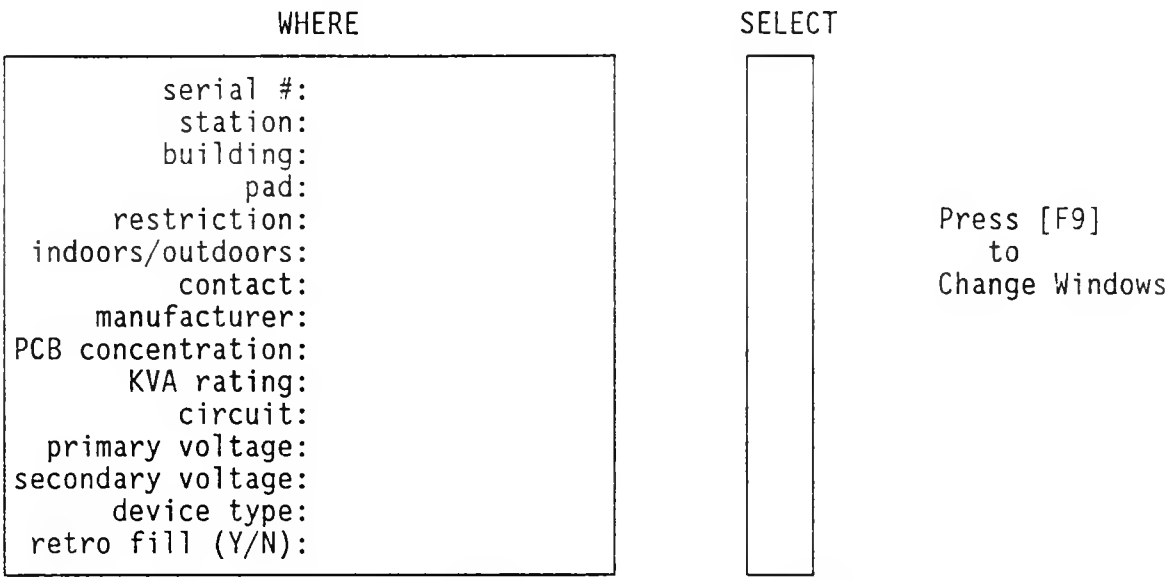


Fig. 20

222 - Inspection Ad Hoc Report Selection

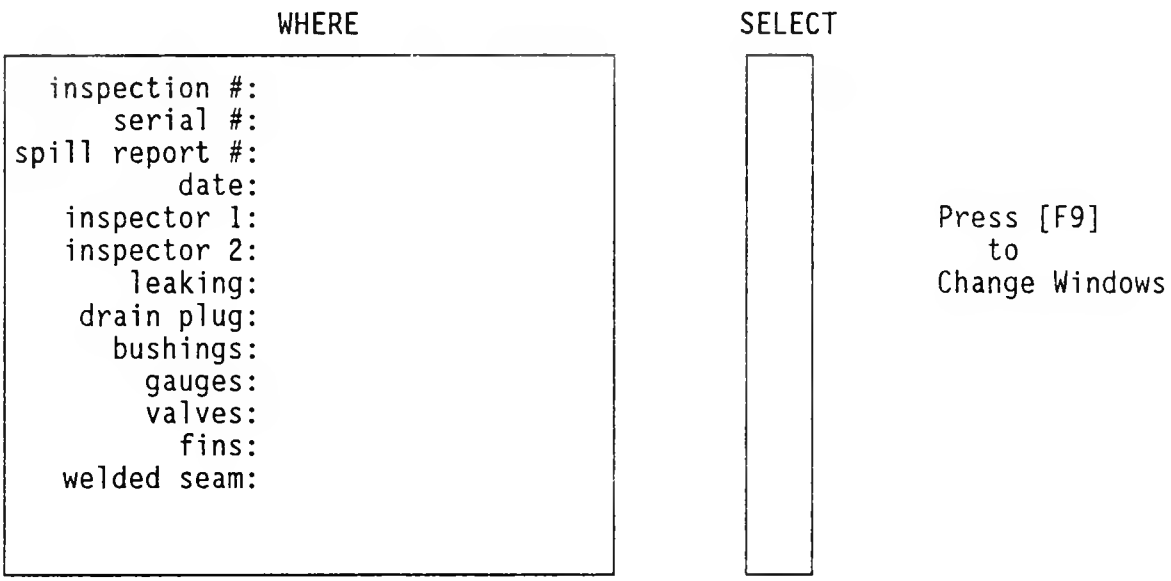


Fig. 21

223 - Cleanup Ad Hoc Report Selection

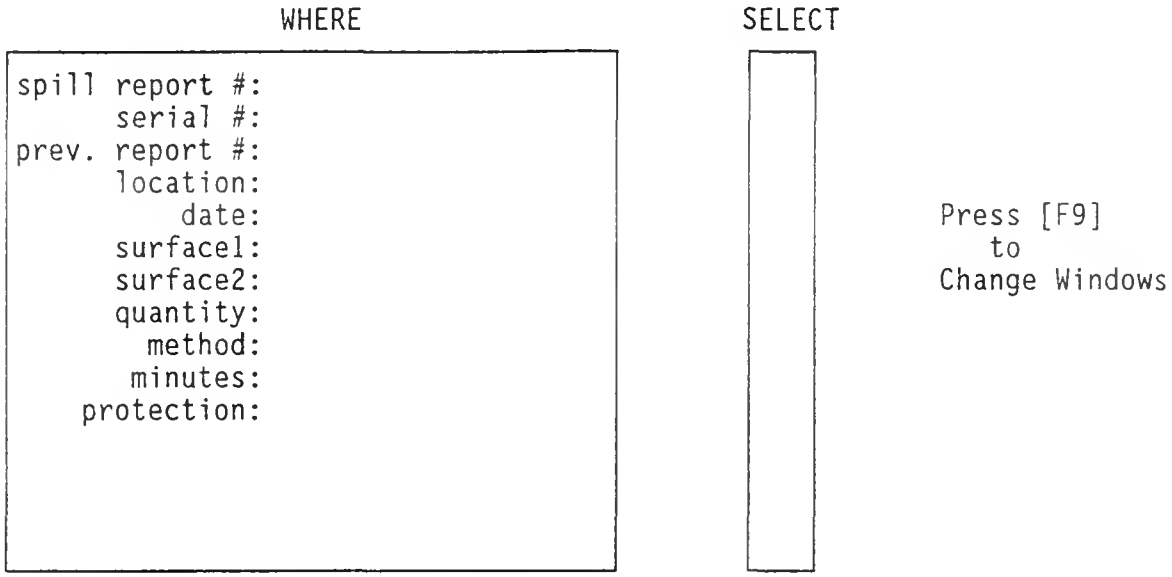


Fig. 22

224 - Cleanup Ad Hoc Report Selection

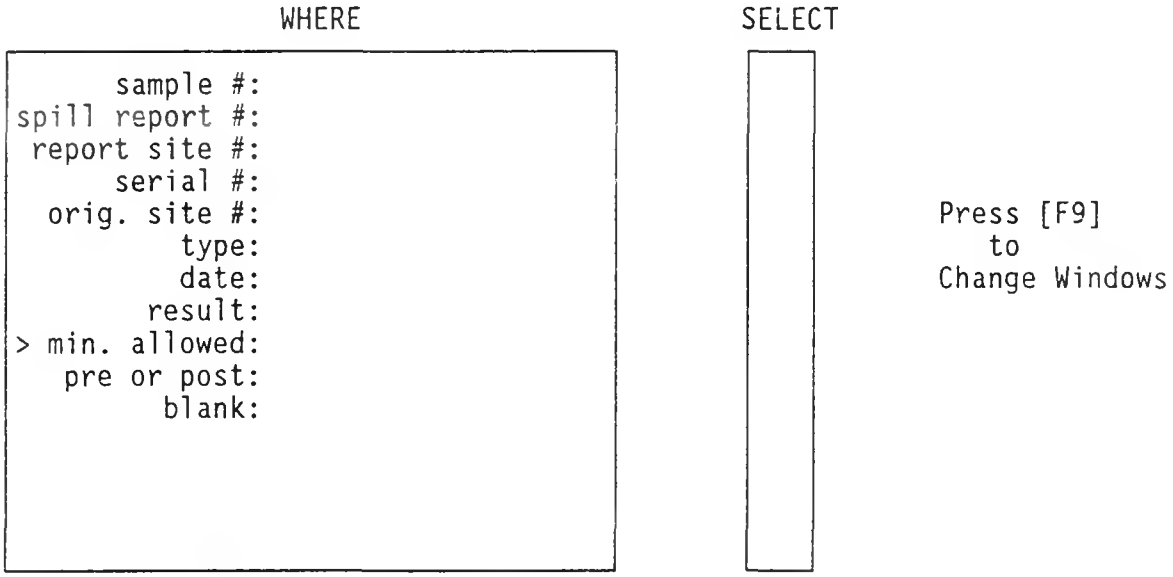


Fig. 23

All of the Ad Hoc reports operate in the same fashion. The WHERE window allows you to restrict the report to only those records that have field values matching the ones you enter. You may enter field values by moving the cursor opposite the field name and typing in the data. If you leave the WHERE window blank, all records are retrieved. The SELECT window allows you to pick those fields you would like to see on the report by entering an "x" on the same row as the field name. If you leave the SELECT window blank, the system will notify you that you have not selected any information to be printed at the time you leave the Ad Hoc menu screen. You may toggle back and forth between windows by pressing <F9>.

Once you have formatted your report, press <ESC> and you will see a menu similar to the one in Fig 24.

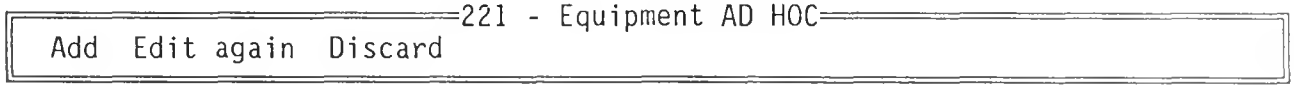


Fig. 24

You may now add the report to the print que, edit it again or discard all of the field selections and start over. If you choose to add the selection, the system will return you to the Ad Hoc screen again with the fields cleared.

To print the report, press <ESC> twice, the system will automatically check for any requests and route them to the printer. (Note: the que will hold multiple requests but will not begin printing until you return to the Ad Hoc menu).

Section 3 - Utilities

If you selected option 3 from the Main Menu, you will see the Utilities Menu in Fig 25.

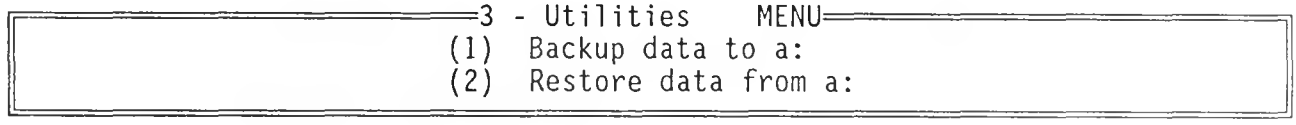


Fig. 25

The utilities currently available are used to backup and restore system data to and from the a: drive. To use a utility procedure, place the backup disk in the a: drive and make your selection. The system will examine the disk for the necessary information and may prompt you for further details. Currently, only the information from the four major data sets are backed up. Each data set is loaded into an individual file with the name of the data set and the BUP extension. If the backup procedure runs out of space on the disk in a: drive, you will be prompted to enter a new disk. During restore procedures, the system prompt you through each individual data set with identical messages. If you wish to only restore certain files, you may skip the current data set.

Section 4 - Special Notes

Printing: The SDC system is designed for use with printers capable of printing special graphic characters (e.g. HP Lasarjets). If your printer does not have those characters in its standard font, you may have to reconfigure it. For example, you can print the special characters using an Epson printer if you reconfigure the DIP switch settings to have the Epson print in IBM Proprinter mode.

Maintenance: The SDC system is written in Rbase which does not do automatic recovery of deleted file space. To avoid performance degradation, PACK or RELOAD commands have not been used in the system except after the RESTORE options. As part of the normal data base maintenance, it would be wise to do periodic reordering of the system using the Rbase PACK command, in particular after large deletions have been performed.

APPENDIX C
SELECTED DATABASE REPORT PRINTOUTS

:511- Equipment Report

```
        serial #: 6456568
         station: NASNI
        building: 549
             pad: V1
     restriction: NON-RESTRICTED
indoors/outdoors: INDOOR
         contact: HIGH
    manufacturer: GE
cb concentration:     478581
      kva rating:         10
         circuit: -0-
 primary voltage: 2400
econdary voltage: 208Y/120
     device type: TRANSFORMER
       retrofill: N
        comment1: UNABLE TO LOCATE BLDG THIS XFMR IS IN.
        comment2: -0-
```

?12 - Inspection Report

insp#: 1
serial#: 6456568
spill#: 8006
nspdate: 12/16/87
nspctr1: DUBERT
nspctr2: BLYTH
leaking: Y
drnplug: -
ushings: Y
gauges: -
valves: -
fins: -
eldseam: -
other1: -0-
other2: -0-
action1: -0-
action2: -0-
omment1: -0-
omment2: -0-

?13 - Cleanup Report

```
        spill report #: 8209-1
              serial #: 6456568
revious spill report #: 8006
        spill location: 10-DECK UNDER SEC. BUSHING
          cleanup date: 07/25/88
   impervious/pervious: PERVIOUS
              surface2: CONCRETE
              quantity: -0-
        cleanup method: DOUBLE WASH/RINSE
               minutes:        120
            protection: C

        spill report #: 8209-1
              serial #: 6456568
revious spill report #: 8006
        spill location: 4-DECK
          cleanup date: 07/25/88
   impervious/pervious: PERVIOUS
              surface2: CONCRETE
              quantity: -0-
        cleanup method: DOUBLE WASH/RINSE
               minutes:        120
            protection: C

        spill report #: 8209-1
              serial #: 6456568
revious spill report #: 8006
        spill location: 5-DECK
          cleanup date: 07/25/88
   impervious/pervious: PERVIOUS
              surface2: CONCRETE
              quantity: -0-
        cleanup method: DOUBLE WASH/RINSE
               minutes:        120
            protection: C

        spill report #: 8209-1
              serial #: 6456568
evious spill report #: 8006
        spill location: 6-DECK
          cleanup date: 07/25/88
   impervious/pervious: PERVIOUS
              surface2: CONCRETE
              quantity: -0-
        cleanup method: DOUBLE WASH/RINSE
               minutes:        120
            protection: C
```

spill report #: 8209-1
serial #: 6456568
revious spill report #: 8006
spill location: 8-SEC. BUSHING
cleanup date: 07/25/88
impervious/pervious: IMPERVIOUS
surface2: METAL
quantity: -0-
cleanup method: DOUBLE WASH/RINSE
minutes: 120
protection: C

spill report #: 8209-1
serial #: 6456568
revious spill report #: 8006
spill location: 9-FACE
cleanup date: 07/25/88
impervious/pervious: IMPERVIOUS
surface2: METAL
quantity: -0-
cleanup method: DOUBLE WASH/RINSE
minutes: 120
protection: C

spill report #: 8209-1
serial #: 6456568
revious spill report #: 8006
spill location: 2-BETWEEN PRI. BUSHING
cleanup date: 07/25/88
impervious/pervious: IMPERVIOUS
surface2: METAL
quantity: -0-
cleanup method: DOUBLE WASH/RINSE
minutes: 120
protection: C

SAN DIEGO PCB CLEANUP TRACKING SYSTEM

221 - Equipment Ad Hoc Report

serial#	building	pad	restrctn	in/out	contact	pcbconc	rtrofill
6456568	549	V1	NON-RESTRICTED	INDOOR	HIGH	478581	N

.. END OF REPORT

SAN DIEGO PCB CLEANUP TRACKING SYSTEM

222 - Inspection Ad Hoc Report

insp#	serial#	spill#	inspdate	inspctrl	leaking
1	6456568	8006	12/16/87	DUBERT	Y
2	6456568	8209-1	07/12/88	DUBERT	Y
3	6456568	8298-4	10/24/88	MYNATT	N
4	6456568	8327-5	11/22/88	MYNATT	N

.. END OF REPORT

SAN DIEGO PCB CLEANUP TRACKING SYSTEM

223 - Cleanup Ad Hoc Report

spill#	serial#	prvspll#	spillloc	clndate
3209-1	6456568	8006	10-DECK UNDER SEC. BUSHING	07/25/88
3006	6456568	-0-	2-BETWEEN BUSHINGS	01/06/88
3006	6456568	-0-	3-UNDER SAMPLE VALVES	01/06/88
3006	6456568	-0-	4-DECK	01/06/88
3006	6456568	-0-	5-DECK	01/06/88
3006	6456568	-0-	6-DECK	01/06/88
3006	6456568	-0-	1-TOP FILLER PLUG	01/06/88
3209-1	6456568	8006	4-DECK	07/25/88
3209-1	6456568	8006	5-DECK	07/25/88
3209-1	6456568	8006	6-DECK	07/25/88
3209-1	6456568	8006	8-SEC. BUSHING	07/25/88
3209-1	6456568	8006	9-FACE	07/25/88
3209-1	6456568	8006	2-BETWEEN PRI. BUSHING	07/25/88
3298-4	6456568	8209-1	8-SEC. BUSHING	10/24/88
3298-4	6456568	8209-1	4-DECK	10/24/88
3298-4	6456568	8209-1	5-DECK	10/24/88
3327-5	6456568	8298-4	8-BUSHING	11/22/88
3327-5	6456568	8298-4	9-FACE	11/22/88
3327-5	6456568	8298-4	4-DECK	11/22/88

. END OF REPORT

SAN DIEGO PCB CLEANUP TRACKING SYSTEM
EG&G Idaho, Inc.

---

224 - Sample Ad Hoc Report

---

sample#	serial#	spill#	rptsite#	sampdate	result	blank
3006015491001	6456568	8006	1	-0-	0.	N
3006015491002	6456568	8006	2	-0-	0.071	N
3006015491003	6456568	8006	3	-0-	0.	N
3006015491004	6456568	8006	4	-0-	1.619	N
3006015491006	6456568	8006	6	-0-	0.053	N
3006015497005	6456568	8006	5	-0-	1.	N
32090154901	6456568	8209-1	8	08/02/88	0.0126	N
32090154902	6456568	8209-1	9	08/02/88	0.0025	N
32090154903	6456568	8209-1	10	08/02/88	0.0446	N
32090154904	6456568	8209-1	2	08/02/88	0.0011	N
32090154905	6456568	8209-1	4	08/02/88	0.0152	N
32090154906	6456568	8209-1	5	08/02/88	0.	N
32090154907	6456568	8209-1	6	08/02/88	0.0086	N
32090154908	6456568	8209-1	7	08/02/88	0.	Y
32980154901	6456568	8298-4	8	10/31/88	0.	N
32980154902	6456568	8298-4	4	10/31/88	0.0017	N
32980154903	6456568	8298-4	5	10/31/88	0.0057	N
33270154901	6456568	8327-5	8	11/28/88	0.	N
33270154903	6456568	8327-5	4	11/28/88	0.	N

. END OF REPORT

tion	Bldg	Pad	Serial#	Restriction	In/Out	Contact
NI	473	1	13276-1	RESTRICTED	OUTDOOR	LOW
NI	474	0	13275-1	NON-RESTRICTED	OUTDOOR	HIGH
NI	483	1	18506	RESTRICTED	INDOOR	HIGH
NI	489	1	H883331	RESTRICTED	OUTDOOR	LOW
NI	497	1	PFG-3459	RESTRICTED	OUTDOOR	LOW
NI	500	1	5842265	RESTRICTED	INDOOR	LOW
NI	501	1	5842194	RESTRICTED	INDOOR	LOW
NI	503	1	5842195	RESTRICTED	INDOOR	LOW
NI	503	MH	72200899	RESTRICTED	INDOOR	LOW
NI	513	MH	6490240	RESTRICTED	INDOOR	LOW
NI	516	V1	5743-1	RESTRICTED	INDOOR	LOW
NI	516	V1	6666-1	RESTRICTED	INDOOR	LOW
NI	549	V1	6455568	NON-RESTRICTED	INDOOR	HIGH
NI	572	V1	B972435	RESTRICTED	INDOOR	LOW
NI	599	V1	28585	RESTRICTED	INDOOR	HIGH
NI	6	V1	6454276	RESTRICTED	INDOOR	HIGH
NI	6	V1	7090949	RESTRICTED	INDOOR	HIGH

rial #: 6455908

ill Rpt. #	Date	Quantity	Time (min)
40	12/06/87	<3oz	110
96	10/23/87	<3oz	15
296	10/23/87	<3oz	15

Total - # of cleanups: 3
time required: 140 (min)

erial #: [redacted]

pill Rpt. #	Date	Quantity	Time (min)
8209-1	07/25/88	-0-	120
8209-1	07/25/88	-0-	120
8209-1	07/25/88	-0-	120
8209-1	07/25/88	-0-	120
8209-1	07/25/88	-0-	120
8006	01/06/88	-0-	120
8006	01/06/88	-0-	120
8006	01/06/88	-0-	120
8298-4	10/24/88	-0-	110
8298-4	10/24/88	-0-	110
8006	01/06/88	-0-	120

8298-4	10/24/88	-0-	110
8006	01/06/88	-0-	120
8209-1	07/25/88	-0-	120
3006	01/06/88	-0-	120
327-5	11/22/88	-0-	30
327-5	11/22/88	-0-	30
327-5	11/22/88	-0-	30
209-1	07/25/88	-0-	120

Total - # of cleanups: 19
time required: 1980 (min)

erial #: 6487396

ill Rpt. #	Date	Quantity	Time (min)
66	09/22/88	1oz	-0-

Total - # of cleanups: 1
time required: 0 (min)

rial #: 6545243

ill Rpt. #	Date	Quantity	Time (min)
63	06/12/89	-0-	-0-

Total - # of cleanups: 1
time required: 0 (min)

ial #: 6545263

ill Rpt. #	Date	Quantity	Time (min)
9	11/16/87	-0-	-0-