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REVISED REMEDIAL ACTION PLAN FOR BIOAUGMENTATIOIN CORRECTIVE ACTION NS MAYPORT FL
8/1/1995
FIFCO INTERNATIONAL

REVISED REMEDIAL ACTION PLAN, (RAP)

Bioaugmentation Corrective Action

Naval Station, Mayport, Florida
Category #1, Area #1, Pesticide Area, SWMU 15

August 1995

For Submittal to:

DEPARTMENT OF THE NAVY

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Contract Number: N62467-94-D-0889

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FIFCO International, Inc. Project Number: 94-1021-NSMFL-CA

TABLE OF CONTENTS

Section Number and Title **Page**

1.0 SITE DESCRIPTION 1

1.1 General 1
1.2 Topography 1
1.3 Adjacent Properties 2
1.4 Contamination Levels 2
1.5 Soil Contamination Plume 6

2.0 SITE HISTORY AND BACKGROUND 6

2.1 General 6

3.0 PREVIOUS ENVIRONMENTAL ASSESSMENTS 7

3.1 General 7

4.0 SOIL SAMPLING PLAN 7

4.1 General 7
4.1.1 Sampling Location/Site Selection 8
4.2 Basic Considerations for Soil Sampling 9
4.2.1 Sampling Procedure 9
4.2.2 Random, Biased and Grid-Based Sampling 10
4.2.3 Surface and/or Subsurface Soil Samples 11
4.2.4 Grab verse Composite Samples 11
4.3 Manual (Hand Operated) Collection Techniques and Equipment 12
4.3.1 Surface Soils 12
4.3.2 Subsurface Soils 13
4.4 Powered Sampling Devices 14
4.4.1 Power Auger 14
4.4.2 Drill Rigs 14
4.4.3 Cone Penetrometer Rigs 15
4.4.4 Back-Hoes 15
4.5 Special Techniques and Considerations 16
4.5.1 Collection of Soil Samples for Purgeable Organic Compound (VOA) Analyses 16
4.5.2 Dressing Soil Surfaces 16
4.5.3 Sample Mixing 16
4.5.4 Special Precautions for Trace Contaminants Soil Sampling 16
4.5.5 Specific Sampling Equipment Quality Assurance Techniques 17
4.5.6 Auxiliary Data Collection 17
4.6 Chemical Analysis 17
4.7 Decontamination of Sampling Equipment 18
4.7.1 Drilling Rig/ Backhoe and Tools 18
4.7.2 Sample Containers 19
4.7.3 Monitoring Equipment 19
4.7.4 Respirators 19
4.7.5 Decontamination Trailer or Truck and Staging Area 20
4.7.6 Laboratory Equipment 20

5.0 CONFIRMATORY SAMPLING 20

TABLE OF CONTENTS

Section Number and Title — Page

5.1 General 20
5.2 Sampling Procedure and Scheduling 21
5.3 Field Screening/ Sampling 21
5.4 Field Screening/sampling Procedure and Scheduling 21

6.0 PROPOSED REMEDIAL TECHNOLOGY 22

6.1 General 22
6.2 Bioaugmentation Application Technique 22
6.2.1 Preparation 22
6.2.2 Application System 23
6.2.3 Introduction of Nutrient 23
6.2.4 Application of Nutrients and BR-650 24
6.2.5 Equipment List 25
6.2.6 Permeability Rates of Bioaugmentation Additives 26

7.0 GROUNDWATER MONITORING 26

7.1 On-Site Groundwater Monitoring Wells 26

FIGURES:

FIGURE 1 - VICINITY MAP
FIGURE 2 - SITE PLAN
FIGURE 3 - ISOCONCENTRATION OF CONTAMINANTS
FIGURE 4 - PROPOSED CONTROL SOIL SAMPLE LOCATION
FIGURE 5 - APPLICATION SYSTEM PLAN
FIGURE 6 - FIELD SCREENING SOIL SAMPLE LOCATION
FIGURE 7 - APPLICATION SYSTEM DETAILS
FIGURE 8 - APPLICATION DATA

APPENDICES:

APPENDIX A - LIST OF REFERENCES

August 8, 1995

Mr. Dwight Cargile
Department of the Navy
SOUTHNAVFACENGCOM
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Regarding: **REVISED REMEDIAL ACTION PLAN (RAP)**
Naval Station, Mayport, Florida
Contract Number: N62467-94-D-0889
FIFCO Project Number: 94-1021-NSMFL-CA

Dear Mr. Cargile:

The following describes the proposed corrective action planned for the subject property. The work will involve bioaugmentation corrective action of soils within the defined contamination plume at Solid Waste Management Unit (SWMU) 15, Naval Station (NAVSTA), Mayport. The contamination was a result of mixing and storage of pesticides handled on the subject site.

1.0 SITE DESCRIPTION

1.1 General

The subject site defined as SWMU 15, consists of approximately 0.48 acres and is located in the western portion of the NAVSTA, Mayport, Jacksonville, Florida. The NAVSTA, Mayport has been designated a pilot facility under the Navy's Environmental Leadership Program (NELP).

1.2 Topography

The topography across the site is essentially flat. The surface drainage is directed as sheet flow toward St. Johns River to the northwest.

1.3 Adjacent Properties

The NAVSTA, Mayport, is surrounded on the north and west boundaries by the St. Johns River, on the south by Sherman Creek, and on the east by the Atlantic Ocean.

1.4 Contamination Levels

There are three (3) main contaminants that are of interest at this subject site, 4,4'-DDE, 4,4'-DDT and Chlordane. The range of detected concentrations of surface soil at SWMU 15 along with the Florida Clean-up Goal as established by FDEP are provided in the table below:

Chemical	Range of Detected Concentrations	Florida Clean-up Goals
Pesticides/PCBs (ug/kg)		
4,4'-DDE	0.935 - 2,800	2,900
4,4'-DDT	1.6 - 790,000	3,100
Chlordane	20 - 9,000	800

Note: The above information was supplied to **FIFCO International, Inc.** by **ABB Environmental Services, Inc.** on August 1, 1995.

The demonstration will run approximately 6 months, from mobilization to de-mobilization. The treatment period will be 60 days and will begin approximately 30 days are mobilization. By the end of the 60 day treatment period FIFCO will have met or exceeded the Florida Clean-up goals for the above mentioned Pesticides.

Other SWMU 15 contamination levels are specified in the U.S., NAVSTA, Mayport, Florida, Resource Conservation and Recovery Act (RCRA) Facility Investigation Workplan, Addendum 4, Job Number 06-94-0889 on:

- Figure 4-22, Organic and Inorganic Chemicals Detected in Surface Soil Samples (0-1 feet below land surface) at SWMU 15, Old Pesticide Handling Area.
- Figure 4-23, Organic and Inorganic Chemicals Detected in Surface Soil Samples (1-2 feet below land surface) at SWMU 15, Old Pesticide Handling Area.

- Figure 4-24, Organic and Inorganic Chemicals Detected in Subsurface Soil Samples at Monitoring Well MPT-15MW1S at SWMU 15.
- Figure 4-26, Organic and Inorganic Chemicals Detected in Groundwater Samples at SWMU 15.

Tables 1.4a - 1.4d, below, list contamination levels detected at SWMU 15. The maximum heavy metal concentrations are measured in mg/kg, and the maximum VOCs and SVOCs are measured in µg/kg, as indicated on Tables 1.4a -1.4d below.

Table-1.4a
CHEMICALS DETECTED IN SOIL (0-1) FEET

Chemicals Detected	Unit	MPT-15-SS11	MPT-15-SS21	MPT-15-SS31	MPT-15-SS41	MPT-15-SS51	MPT-15-SS61	MPT-15-SS71	MPT-15-SS81	MPT-15-SS81-DUP
Acetone	µg/kg	4.0 J			2.0 J	30.0 J	9.0 J			
Bis(2-ethylhexyl) phthalate	µg/kg							200.0 J		
Butylbenzylphthalate	µg/kg					18,000	640.0 J		180.0J	250.0 J
Dichlorophenyl dichloroethene (4,4-DDE)	µg/kg	24.0	28.0	160.0	49.0	100.0 J	72.0 J	2,800	260.0 J	230.0 J
Dichlorophenyl dichloroethane (4,4,-DDT)	µg/kg	9.2	22.0	34.0	18.0	100.0 J	84.0 J	1,500	110.0 J	140.0 J
Chlordane	µg/kg					5,600	1,100		1,000	710.0
Heptachlor	µg/kg					16.0 J				
Heptachlor epoxide	µg/kg					85.0 J				
Antimony	mg/kg	2.8								
Arsenic	mg/kg	1.3	1.2 J	1.2 J	1.4 J	2.9 J	5.0	3.0 J	2.9 J	2.9 J
Barium	mg/kg	7.1	5.1 J	4.3 J	5.5 J	7.5 J	4.5 J	30.6 J	27.7 J	21.8 J
Beryllium	mg/kg	0.16	0.12	0.14	0.17	0.09	0.10	0.07	0.09	0.09
Cadmium	mg/kg		0.62		0.59			0.5	0.8	0.84
Chromium	mg/kg	4.3	5.4	3.2	4.0	2.5	8.7	14.6	9.1	10.9
Cobalt	mg/kg	0.48	0.51	0.7	0.36	0.26	0.38	0.59	0.66	0.65
Copper	mg/kg	8.2	4.5	2.3	2.3	2.0	1.1 J	11.4	9.3	10.8
Lead	mg/kg	17.1	26.3	15.5	2.4	8.9	4.9	107.0 J	257.0 J	325.0 J
Mercury	mg/kg							0.07	0.53	0.62
Nickel	mg/kg		1.6					1.4		[illegible]
Selenium	mg/kg	0.81	0.64	0.5 J	1.9	0.57 J	0.74 J	0.73 J	0.27 J	0.59 J
Tin	mg/kg			4.2	0.48 J				3.7	3.8
Vanadium	mg/kg	2.1	3.2	3.2	3.6	1.6 J	1.8	3.7	3.0	3.3
Zinc	mg/kg	22.8 J	53.6 J	72.6 J	28.5 J	39.6 J	9.1 J	165.0 J	169.0 J	174.0 J

Table-1.4b
CHEMICALS DETECTED IN SOIL (1-2) FEET

Chemicals Detected	Unit	MPT-15-SS12	MPT-15-SS22	MPT-15-SS32	MPT-15-SS42	MPT-15-SS52	MPT-15-SS62	MPT-15-SS72	MPT-15-SS82	MPT-15-SS82-DUP
Acetone	µg/kg	4.0 J	2.0 J	2.0 J	3.0 J	5.0 J	46.0 J			
Butylbenzylphthalate	µg/kg					380.0				
Dichlorophenyl dichloroethene (4,4-DDE)	µg/kg	28.0			2.1	1.9 J				
Dichlorophenyl dichloroethane (4,4,-DDT)	µg/kg	22.0			2.4					
Chlordane	µg/kg					180.0				
Arsenic	mg/kg	1.2 J	1.1 J	1.5 J	1.5 J	2.5 J	5.1	2.1	1.5 J	1.5 J
Barium	mg/kg	2.9 J	2.1 J	2.9 J	3.9 J	4.5 J	2.8 J	4.8 J	5.0 J	4.7 J
Beryllium	mg/kg	0.12	0.12	0.11	0.14	0.05	0.07	0.07	0.09	0.07
Chromium	mg/kg	2.0	1.8	2.0	2.5	0.86	2.9	1.9	1.3	0.93
Cobalt	mg/kg	0.24	0.31	0.49	0.35	0.41			0.37	
Copper	mg/kg	0.28 J	0.33 J	0.46 J	0.5 J	0.44 J	0.54 J	1.6 J	1.1 J	1.3 J
Lead	mg/kg	0.9	1.5	1.0	2.6	0.5	0.3	0.86	0.5	0.41
Selenium	mg/kg	0.52 J	0.54 J		0.37 J	0.44 J	0.62 J	0.64 J	0.46 J	0.46 J
Tin	mg/kg			4.2						
Vanadium	mg/kg	1.6	2.0	1.5	2.2	0.86	0.97	1.6	1.2	1.1
Zinc	mg/kg	1.3 J	1.5 J	3.6 J	3.1 J	3.5 J	2.6 J	7.8 J	5.0 J	2.4 J

Table 1.4c
CHEMICALS DETECTED IN SOIL AT MPT-15-MW1S (1-2) FEET, (5-6) FEET (Prior to installation of monitoring well MPT-15-MW1S)

Chemicals Detected	Unit	MPT-15-MSI-2	MPT-15-MS1-6
Acetone	µg/kg		150.0
Antimony	mg/kg		3.0
Arsenic	mg/kg	0.9	0.53
Barium	mg/kg	2.3 J	5.1 J
Chromium	mg/kg		1.5 J
Copper	mg/kg	1.7	2.4
Lead	mg/kg	0.63	0.56
Mercury	mg/kg		0.03 J
Thallium	mg/kg		0.22
Vanadium	mg/kg	0.96 J	1.8 J
Zinc	mg/kg	3.6 J	2.9 J

J = Estimated Value

Table 1.4d
CHEMICALS DETECTED IN GROUNDWATER AT MPT-15-MW1S

Chemicals Detected	Unit	MPT-15-MW1S
a-BHC	µg/kg	0.035
b-BHC	µg/kg	0.68
g-BHC (Lindane)	µg/kg	0.027
Arsenic	mg/kg	9.0
Barium	mg/kg	28.4
Beryllium	mg/kg	0.44
Chromium	mg/kg	17.1
Cobalt	mg/kg	3.3
Copper	mg/kg	8.8
Iron	mg/kg	8630.0 J
Lead	mg/kg	38.1
Manganese	mg/kg	65.3
Vanadium	mg/kg	14.5
Zinc	mg/kg	79.1 J

1.5 Soil Contamination Plume

The highest level(s) of pesticide contamination recorded on the site were from samples MPT-15-SS5 and MPT-15-SS7. The highest level of VOC (Acetone) contamination was recorded from sample MPT-15-SS5. The highest level(s) of 2 SVOCs bis(2-Ethylhexyl) phthalate and butylbenzylphthalate recorded on the site were from samples MPT-15-SS5 and MPT-15-SS7. The highest level(s) of heavy metals contamination recorded were from samples MPT-15-SS7, MPT-15-SS8, MPT-15-SS6 which were located in the northern portion of the site. The highest concentration of heavy metals, such as Antimony, Beryllium, Cobalt, Tin, and Nickel were from soil samples MPT-15-SS1, MPT-15-SS4, MPT-15-SS3 and MPT-15-SS2, respectively, located in the southern portion of the site. The isoconcentration of contaminants are shown on Figures 3A through 3W *Isoconcentration of Contaminants*. Additional surface and subsurface samples will be required to assess the horizontal and vertical extent of contamination at SWMU 15. Locations of proposed soil samples prior to the treatment application are shown on Figure 4, *Proposed Control Soil Sample Location*.

2.0 SITE HISTORY AND BACKGROUND

2.1 General

It is represented that from 1963 to 1964, a former building (Building No. 48A) designated as the "Old Pesticide Handling Area" was located on the western side of NAVSTA, Mayport, approximately 350 feet from the western boundary. A shed attached to former building 48A (located on the southwest corner) was used to store pesticides and related application equipment. It is represented that the pesticide application equipment was washed in a designated area near the building and that the rinse waters were likely to have been disposed of at this rinse area. It is also believed that small quantities of pesticides were disposed of in the near vicinity of Building 48A.

The Old Pesticide Handling Area was identified in the Initial Assessment Study (IAS) as Site 15, and was not included in the Expanded Site Investigation (ESI). No previous environmental data have been collected at this location. The Old Pesticide Handling Area was identified as an SWMU requiring a Resource Conservation and Recovery Act

Facility Investigation (RFI) in the NAVSTA, Mayport, Hazardous and Solid Waste Amendment (HSWA) permit.

3.0 PREVIOUS ENVIRONMENTAL ASSESSMENTS

3.1 General

The rationale for the data gathering activities at SWMU 15 is described in Volume I, Section 3.5.8 of the RFI Workplan (ABB-ES, 1991). The exploration program at SWMU 15 consisted of:

- Collection of eight (8) surface (from 0 to 1 foot in depth) and near surface (from 1 to 2 feet in depth) soil samples.
- Collection of two (2) subsurface soil samples from one soil boring at depths of approximately 1 to 2 feet below surface and immediately above the groundwater table (5 to 6 feet below surface).
- Installation of one (1) monitoring well screened from 5 to 15 feet below surface.
- Collection of groundwater samples for analysis.

4.0 SOIL SAMPLING PLAN

4.1 General

It is understood that the SOUTHNAVFACENGCOM, will make arrangements for confirmatory sampling for the treatment operations. However, **FIFCO International, Inc's** personnel will be present during application operations and are prepared and qualified to obtain samples for analytical testing upon request. Sampling will follow the protocol detailed in the Quality Assurance Project Plan (QAPP).

Soil sampling at hazardous waste sites will typically be approached in a totally different manner than sampling of other media. Sampling locations and rationale for other media are usually easily defined. For example, ground water samples may be collected at existing monitoring wells; surface water and sediment samples are usually collected from well defined surface drainage patterns at easily rationalized locations with respect to the suspected problem; and waste sources, such as drums, tanks and piles, are

easily identified sampling targets. Occasionally,surface soils may be stained or show evidence of vegetative stress, indicating that a contaminant may be present, but in many cases there may not be any direct evidence to suggest that a particular location is a candidate for soil sampling. The sampler may, in fact, be faced with investigating a virtually invisible contaminant distribution pattern, both in the surficial material, as well as in the subsurface region.

4.1.1 Sampling Location/Site Selection

Areas selected for soil sampling shall be strategically located in order to collect a representative fraction of the soils with the minimum number of samples. Although it is not always feasible to conduct a site reconnaissance prior to an investigation, a site reconnaissance can eliminate many uncertainties with respect to site characteristics and result in more complete and successful soil sampling studies. A surface inspection of the subject area should be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface run-off, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosioal areas, depositional areas, etc.) add to evaluate the relationship between these features and potential sources of pollution. A knowledge of these relationships and conditions, particularly soil conditions (type and thickness of soil overburden) and water table conditions are extremely important in developing sampling plans.

In addition to what is normally considered soil, i.e., in situ weathered rock overburden, soil samples may also consist of what is more correctly considered sediment, which has been deposited by both overland sheet runoff, as well as flow in normally dry wet-weather swales. The location of sediment sampling locations in those types of depositional areas is a useful screening tool, providing an indication of the presence of contaminants from the larger area contributing the sediment.

Initial investigations at most sites will consist of "screening-type" studies. Sampling for these investigations will generally be confined to a small number of surface or shallow subsurface samples. Typically, samples would be collected from depositional areas within and around the periphery of the site, as well as from obviously contaminated

areas. Based on the results of the initial site-screening studies, more detailed studies, involving considerably more samples and with a greater emphasis on subsurface sampling, are usually required to fully characterize soil contamination at a site.

Study plans or work plans for soil sampling investigations must be carefully conceived with respect to the study objectives. This, in turn, requires a careful consideration of the types of samples to be collected, as well as the sampling methods to be employed. These areas are discussed below.

4.2 Basic Considerations for Soil Sampling

Three basic considerations, with respect to sample type, should be evaluated when developing a soil sampling plan and establishing investigation objectives. Should the samples be random, biased, or grid-based? Will they be collected from the surface or subsurface? Will a particular sample be a grab sample or a composite sample?: When all of these questions are answered, it will be found that many investigations will involve the collection of most combinations of the above types of samples. A discussion of these considerations is found in the following sections.

4.2.1 Sampling Procedure

An in-situ soil sample will be obtained utilizing equipment approved by the Department of the Navy's SOUTHNAVFACENGCOM. Clear plastic, brass, stainless steel and/or Teflon sampling tubes or rings are considered acceptable provided the sampling protocol is followed. Once the sample insert is retrieved, the ends will be cleaned off with a knife, flush with the tube ends to prevent voids from forming. The tube ends will then be covered with aluminum foil, and plastic caps secured. Next, duct tape will be applied around the tube ends between the tube surface and the plastic caps. The samples will then be marked and immediately placed inside an ice chest with cube ice for transportation to the designated analytical laboratory. Relative density, moisture content, and sediment type should be described and logged for each sample prior to preparing them for shipment to the analytical laboratory. Head space should be measured in each sample by use of a Photo Ionization Detector (PID).

4.2.2 Random, Biased and Grid-Based Sampling

Generally, unless there is a strong indication of contamination, such as staining, or there are distinct depositional areas which provide excellent screening samples, soil samples collected for small investigations with limited areal extent, such as screening site investigations, must be randomly selected from several areas within the suspected area of contamination. Random in this sense is synonymous with casual, i.e., locations are often subjectively selected based purely on personal judgment.

If any areas show evidence of contamination, such as staining or vegetative stress, biased samples should be collected from each of the areas to characterize the contamination present in each area. If surface drainage patterns such as dry washes or swales are discernible, soil/sediment samples may be collected from the deposits in these features to characterize the immediate areas. Background and control samples are also biased, since they are collected in locations dictated by expected clean conditions or by anticipated impact from adjacent off-site areas.

When soil sampling investigations involve large areas, measured in acres for example, a systematic approach must be taken, not necessarily to the exclusion of other approaches, to characterize the presence and distribution of contaminants. In these situations, a grid-based soil sampling program is employed. There is no single grid size that is appropriate for all sites; however, in most cases, the smaller the site, the smaller the grid size. Please refer to figure 6 - Confirmatory Soil Sample location Plan to be followed at the subject site.

When the site is extremely large, over several acres for example, it may be impossible to consider sampling every grid and it will be necessary to statistically select a sub-set of the total number of grids in order to reduce the number of samples collected for the study. On the other hand, it may sometimes be appropriate to sample every grid and use relatively inexpensive and quick screening-level analytical techniques used to define the areas which must be sampled and analyzed for a higher level of data quality. Because the screening level analysis is relatively quick the second phase sampling can sometimes be conducted during the same investigation. In all cases, however, the grid

centers should be located using a site survey and semi-permanently marked to facilities relocating the sample locations for subsequent sampling.

4.2.3 Surface and/or Subsurface Soil Samples

In most initial investigations, particularly site screening-type studies, surface soil samples may comprise the great majority of soil samples collected. These are collected to look for the possible presence and distribution of contaminants in surficial materials. Subsurface soil sampling may be limited during initial investigations, but it may comprise the major portion of the soil sampling effort during subsequent phases of the investigation where the vertical extent of contamination in identified areas of surface contamination is the major objective.

4.2.4 Grab versus Composite Samples

When a sample is needed to identify and quantify compounds at a specific location or interval, a grab sample is collected. Grab samples are limited in areal extent (for surface samples) or vertical extent (for subsurface samples). The sample should be comprised of no more than the minimum amount of soil necessary to make up the volume of sample dictated by the required sample containers. Composite samples are a mixture of a; given number of subsamples and are collected to characterize the average composition of a given surface area or vertical surface within the selected area. The number of subsamples forming a composite should remain consistent within the context of the study, i.e., a number and pattern for collection of subsamples within a grid should be selected and, for a given grid size, should not be changed. Likewise, if one of the objectives of the study is to determine if any contamination is present within a particular vertical interval, a vertical composite sample, comprised of vertically discrete samples collected over the selected interval may be collected. As with the areal composites, the number of subsamples is dependent on the objectives of the study. With the low analytical detection limits available today, compositing can usually be used to determine the presence or absence of compounds in the area or interval sampled.

There are two potential problems associated with compositing for which the sampler must be aware. Even though modern analytical detection limits allow for qualitative screening in many cases using compositing techniques, the risk still remains that low concentrations, present in individual composite aliquots, may be diluted to the extent that the total composite concentration is below the minimum quantification limit. Also, if the subsamples are predominantly moist and clayey, it will be very difficult to produce a homogenous mixture. The resulting sample, as represented by the portion selected by the analytical chemist, may not be representative, either qualitatively or quantitatively, of an average of all of the subsamples.

4.3 Manual (Hand Operated) Collection Techniques and Equipment

These methods are used primarily to collect surface and shallow subsurface soil samples. Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface to a site-specific depth at which sample collection be 12 a depth at which sample collection using, i.e., hand-powered, methods becomes impractical.

4.3.1 Surface Soils

Surface soils may be collected with a wide variety of equipment. spoons, shovels, hand-augers, push tubes, and post-hole diggers, made of the appropriate material, may be used to collect surface soil samples. As discussed in the section on powered equipment, surface soil samples may also be collected in conjunction with the use of heavy equipment.

Surface samples are removed from the ground and placed in pans, where mixing, as appropriate and occurs prior to filling of sample containers. Section 4.5 contains specific procedures for handling samples for purgeable organic compounds analyses. If a thick, matted root zone is encountered at the surface, it should be removed before the sample is collected.

4.3.2 Subsurface Soils

Hand-augering is the most common manual method used to collect subsurface samples. Typically, 4-inch auger-buckets with cutting heads are pushed and twisted into the ground and removed as the buckets are filled. The auger holes are advanced one bucket at a tie. The practical depth of investigation using a hand-auger is related to the material being sampled. In sands, augering is usually easily accomplished, but the depth of investigation is controlled by the depth at which sands begin to cave. At this point, auger holes usually begin to collapse and cannot practically be advanced to lower depths, and further samples, if required, must be collected using some type of pushed or driven device. hand-auguring may also become difficult in tight clays or cemented sands. At depths approaching 20 feet, torquing of hand-auger extensions becomes so severe that in resistant materials, powered methods must be used if deeper samples are required. Some powered methods, discussed later, are not acceptable for actual sample collection, but are used solely to gain easier access to the required sample depth, where hand-augers or push tubes are generally used to collect the sample.

When a vertical sampling interval has been established, one auger-bucket is used to advance the auger hole to the first desired sampling depth. If the sample at this location is to be a vertical composite of all intervals, the same bucket may be used to advance the hole, as well as collect subsequent samples in the same hole. However, if discrete grab samples are to be collected to characterize each depth, a new bucket must be placed on the end of the auger extension immediately prior to collecting the next sample. The top several inches of soil should be removed from the bucket to minimize the chances of cross-contamination of the sample from fall-in of material from the upper portions of the hole. Section 4.5 contains additional sample handling procedures.

Another hand-operated piece of soil sampling equipment commonly used to collect shallow subsurface soil samples is the Shelby or "push tube". This is simply a thin-walled tube, generally of stainless steel construction and having a beveled leading edge, which is twisted and pushed directly into the soil. This type of sampling device is

particularly useful if a relatively undisturbed sample is required. The sampling device is removed from the push;-head, then the sample is extruded from the tube into the pan with a spoon or special extruder. Even though the push-head is equipped with a check valve to help retain samples, the Shelby tube will generally not retain loose and watery soils, particularly if collected at lower depths.

4.4 Powered Sampling Devices

Powered sampling devices and sampling aids may be used to acquire samples from any depth but they are generally limited to depths of 20 feet or less. Among the common types of powered equipment used to collect or aid in the collection of subsurface soil samples are Little Beaver'-type two-man power augers; split-spoon samplers; specialized hydraulic cone penetrometer rigs; and back-hoes. The use of each of these is described below.

4.4.1 Power Augers

Two-man power augers of the Little Beaver' variety, are commonly used to aid in the collection of subsurface soil samples at depths where hand auguring is impractical. This type of equipment is technically a sampling aid and not a sampling device, and 20 to 25 feet is the typical lower depth range for this equipment. It is used to advance a hole to the required sampling depth, at which point a hand auger is usually used to collect the sample.

4.4.2 Drill Rigs

Drill rigs offer the capability of collecting soil samples from greater depths. For all practical purposes, the depth of investigation achievable by this method is controlled only by the depth of soil overlying bedrock, which may be in excess of 100 feet.

When used in conjunction with drilling, split-spoon samplers are usually driven either inside a hollow-stem auger or inside an open ;borehole after rotary drilling equipment has been temporarily removed. The spoon is driven with a 140-pound hammer through a distance of up to 24 inches and removed. If geotechnical data are also required, the number of blows with the hammer for each six-inch interval is also recorded.

Continuous split-spoon samplers may be used to obtain five-foot-long, continuous samples approximately 3 to 5 inches in diameter. These devices are located inside a five-foot section of hollow-stem auger and advanced with the auger during drilling. As the auger advances, the central core of soil moves into the sampler and is retained until retrieval.

4.4.3 Cone Penetrometer Rigs

A recent innovation is now available, which involves the modification of a standard split-spoon. The spoon has been modified with a releasable tip which keeps the spoon closed during the sampling push. Upon arrival at the desired depth, the tip can be remotely released and the push continued. During the subsequent push, the released tip floats freely up the inside of the spoon as the soil core displaces it. Split-spoon soil samples, therefore, can be collected without drilling, as has historically been required, by simply pushing the device to the desired depth. This technique is particularly beneficial at highly contaminated sites, because cuttings are not produced as with drill rigs. The push; rods are generally retrieved with very little residue. This results in minimal exposure to sampling personnel and very little contaminated residue is produced as a result of equipment cleaning.

4.4.4 Back-Hoes

Back-hoes are often utilized shallow subsurface soil sapling programs. Samples may either be collected directly from the back-hoe bucket or they may be collected from the trench wall if proper safety protocols are followed. Trenches offer the ability to collect samples from very specific intervals and allow visual correlation with vertically and horizontally adjacent material. Prior to collecting samples from trench walls, the wall surface must be dressed with a stainless steel shovel, spatula, knife, or spoon to remove the surface layer of soil which was smeared across the trench wall as the bucket passed. If back-hoe buckets are not cleaned, samples must be collected from material which has not been in contact with the bucket surface.

4.5 Special Techniques and Considerations

4.5.1 Collection of Soil Samples for Purgeable Organic Compound (VOA) Analyses

These samples should be collected in a manner that minimizes disturbance of the sample. For example, when sampling with a hand auger, the VOA sample may be collected directly from the auger bucket or immediately after an auger bucket is emptied into the pan. The sample should be placed in the appropriate container with no head-space, if possible, as s the practice with water samples. Samples for VOA analysis are not mixed Section 4.2.10).

4.5.2 Dressing Soil Surfaces

Any time a vertical or near vertical surface, such as is achieved when shovels or back-hoes are used for subsurface sampling, is sampled, the surface should be dressed to remove smeared soil. This is necessary to minimize the effects of cross-contamination due to smearing of material from other levels.

4.5.3 Sample Mixing

It is extremely important that soil samples be mixed as thoroughly as possible to ensure that the sample is representative of the interval sampled. Soil samples should be mixed as specified in Section 4.2.10.

4.5.4 Special Precautions for Trace Contaminant Soil Sampling

All soil sampling equipment used for sampling for trace contaminants should be constructed of stainless steel where possible. Pans used for mixing shall be made of Pyrex', or equivalent, glass. In no case with chromium, cadmium, or galvanized plated or coated equipment be used for soil sampling operations. Similarly, no painted or plastic equipment shall be used. All paint and primer must be removed from soil sampling equipment by sandblasting or other means before such equipment can be used for collecting soil samples.

4.5.5 Specific Sampling Equipment Quality Assurance Techniques

Drilling rigs and other major equipment used to collect soil samples shall be identified so that this equipment can be traced through field records. A log book shall be established for this equipment so that all cleaning, maintenance and repair procedures can be traced to the person performing these procedures and to the specific repairs made. Sampling spoons, hand augers, Shelby tubes, and other minor disposable type equipment are exempted from this equipment identification requirement.

- FIFCO International, Inc. will utilize hand held sampling equipment: A "split spoon' sampler will be used for shallow sampling operations (upper 2 feet of surface). The hand held sampler equipment utilized by **FIFCO International, Inc.** consists of a 2.5" O.D. stainless steel split spoon sampler with three inch (3") brass sampling tubes
- All equipment used to collect soil samples shall be cleaned as outlined in SHSP section 12.0, if necessary, before being stored at the conclusion of field studies.
- Any cleaning conducted in the field or field repairs should be thoroughly documented in field records.

4.5.6 Auxiliary Data Collection

In addition to information pertaining to an area or specific site/location that may be available in EPA files from previous investigations (:i.e., site screenings, water quality, well monitoring studies, etc.), information and data may be obtained from various city, county, state, and other federal agencies.

Samples should be accurately tagged and labeled with all pertinent site information at the time of sampling. See Section 6 of the QAPP for sample labeling and field recording procedures. The attitude and longitude shall be obtained for each site for future STORET date entry.

4.6 Chemical Analysis

The samples selected for chemical analysis will be transported to a Navy approved testing laboratory after the last sample is taken. At the minimum, the samples will be

analyzed for Pesticides USEPA Method 8080. Any additional test required by the Department of the Navy (DON) will be conducted per DON's request. The proper chain-of-custody procedure will be observed during the soil sampling and transportation operations.

4.7 Decontamination Procedures

Equipment to be decontaminated during the project may include:

1. Drill Rig.
2. Tools.
3. Monitoring Equipment.
4. Respirators.
5. Sample Containers.
6. Truck or Trailer.
7. Laboratory Equipment.

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, determined by the Site Safety Officer. The decontamination work tasks will be split or rotated among support and work crews. Decontamination procedures within the trailer (if used) should take place only after other personnel have cleared the "hot area", moved to the clean area and the door between the two closed.

Miscellaneous tools and samplers will be dropped into a plastic pail, tub or other container. They will be brushed off and rinsed (outside, if possible) and transferred into a second pail to be carried to further decontamination stations. They will be washed with a non-phosphate detergent solution rinsed with deionized water, rinsed with pesticide grade organic free water if available. Decontaminated sampling equipment will then be wrapped in aluminum foil (shiny sideout) and stored in an uncontaminated area. The resultant waste water will be contained within 55 gallon DOT barrels and stored on-site for subsequent disposal under the direction of DON's SOUTHNAVFACENGCOM.

4.7.1 Drilling Rig/Backhoe and Tools.

In the event that a drilling Rig/Backhoe is needed or used, it is anticipated that the drill rigs/backhoes will be contaminated during test pit/borehole activities. They will be

cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Other solvents may be used if necessary. Loose material will be removed by brush. The person performing this activity will usually be at Level D protection plus splash protection.

4.7.2 **Sample Containers.**

Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site, but it will be difficult to keep the sample containers completely clean. The samples will be taken to the decontamination area. Here they will be further cleaned as necessary and transferred to a clean carrier and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

4.7.3 **Monitoring Equipment.**

Monitoring equipment will be protected as much as possible from contamination by draping, masking or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNU meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any direct or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

4.7.4 **Respirators.**

Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be pre-coded, e.g.,#1 on all parts of mask #1.) After an appropriate time

within the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be marked so as to indicate length of usage (if means to evaluate the cartridges' remaining utility are available) or will be discarded into the contaminated trash container for disposal. In the morning the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit.

4.7.5 **Decontamination Trailer or Truck and Staging Area.**

The decontamination trailer or truck, if used, will be cleaned daily. This will include vacuuming with a vacuum having a water filter to capture dust particles. The area will be wet mopped with cleanser and again with clean water. Work bench areas will be wiped down. Wash buckets and the cleaning area will be decontaminated and made ready for the next day's use.

4.7.6 **Laboratory Equipment.**

Sample handling areas and equipment will be cleaned/wiped down daily. Disposable wipes will be used and discarded into a plastic bag. These will subsequently be taken to and placed in the disposal drum for final disposition. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed of (e.g., glassware, covers for surfaces) as previously indicated.

5.0 CONFIRMATORY SAMPLING

5.1 General

Sampling should be taken shall be taken by **ABB-Environmental Services, Inc.** at three (3) different stages during the treatment operations as follows:

a) **Control Samples:** Control samples should be taken prior to bio-remediation operations in order to establish characterization and concentration levels within the test area (Figure 4, *Proposed Control Soil Sample Location)*.

b) **Confirmatory Samples:** The first confirmatory samples should be taken 7-days, 10-days and 28-days after initial application. Modifications to the sampling schedule may be necessary based upon test results (Figure 6, *Confirmatory Soil Sample Location)*.

c) **Final Confirmatory Sampling:** The final confirmatory sampling schedule is 60-days after initial application. However, will be made upon receipt of test results confirming attainment of background levels. Meeting DON's SOUTHNAVFACENGCOM requirements (Figure 6, *Confirmatory Soil Sample Location)*.

5.2 Sampling Procedure and Scheduling

A minimum of three (3) episodes of confirmatory sampling will be accomplished at the subject site and will be performed by **ABB-Environmental Services, Inc**. The confirmatory sampling locations will be spread evenly throughout the subject site, and will be used to evaluate the degree of contamination reduction levels accomplished during the initial application. The need for further treatment will be determined by the test results at that time. The sampling schedule and general outline is as follows:

1) Twelve (12) control samples will be obtained prior to treatment applications at the locations indicated on Figure 4 *Proposed Control Soil Sample Location* .

2) Twenty (20) sites will be sampled 7-days, 10-days, and 28-days after the initial application of **Bac-Terra™** at the proposed locations shown on Figure 6 *Confirmatory Soil Sample Location*.

3) Twenty (20) sites will be sampled during the final episode sampling. The locations are shown on Figure 6 *Confirmatory Soil Sample Location*. Final confirmatory sampling will be performed approximately 60-days after the initial treatment.

5.3 Field Screening/Sampling

Field screening/sampling shall be taken by **FIFCO International, Inc**. at three (3) different stages during the treatment operations as follows:

a) **Control Samples:** Control samples should be taken prior to bio-remediation operations in order to establish characterization and concentration levels within the test area (Figure 4, *Proposed Control Soil Sample Location)*.

b) **Field Screen Samples:** The first field screen samples should be taken 4-days, 14-days, 21-days, 40-days and 50-days after initial application if necessary. Modifications to the sampling schedule may be necessary based upon test results (Figure 6, *Field Screen Soil Sample Location)*.

5.4 Field Screening/Sampling Procedure and Scheduling

A minimum of three (3) episodes of field screen sampling will be accomplished at the subject site and will be performed by **FIFCO International, Inc.**. The field screen

sampling locations will be spread evenly throughout the subject site, and will be used to evaluate the degree of contamination reduction levels accomplished during the initial application. The need for further treatment will be determined by the test results at that time. The sampling schedule and general outline is as follows:

1) Four (4) control samples will be obtained prior to treatment applications at the locations indicated on Figure 4 *Proposed Control Soil Sample Location*.

2) Four (4) sites will be sampled 4-days, 14-days, 21-days, 40-days and 50-days after the initial application of **Bac-Terra™** at the proposed locations shown on Figure 6 *Field Screen Soil Sample Location*.

6.0 PROPOSED REMEDIAL TECHNOLOGY

6.1 General

Bac-Terra™ Remedial Technology will be utilized for the soil clean-up. " **Bac-Terra™** " is manufactured by **FIFCO International, Inc.** The liquid **Bac-Terra™** product used in soil corrective action is known as "BR-650", which will digest 4,4'-DDE, 4,4'-DDT and Chlordane when added to contaminated soil with other nutrients. BR-650 is comprised of a non-chemical, non-corrosive blend of 100 percent symbiotic organic matter. This blend contains beneficial micro-organisms which are capable of degrading Chlorinated hydrocarbons.

6.2 Bioaugmentation Application Technique

6.2.1 Preparation

BR-650 is prepared by mixing it on-site with appropriate amounts of water in incubation tanks. Both BR-650 and the nutrient mixture are agitated for several minutes to assure even distribution within the solution. The activator for the bacteria is mixed in a separate tank, and consists of organic nutrients. **Bac-Terra™,** BR-650 is comprised of only beneficial micro-organisms and is capable of rapid reproduction, thus allowing the nitrogen stressed environment to release and utilize its nitrogen. As a result of this process, molecularly bound oxygen is released as free oxygen, which aids the reproduction of the aerobic micro-organisms in BR-650.

6.2.2 Application System

The nutrients and BR-650 are introduced into the soil through a drip irrigation system (Roberts "RO-DRIP®" 8 mil 12" 24 G.P.H) and an impact sprinkler head (Rain Bird 2045 PJ MaxiBird) irrigation system. The drip irrigation system being utilized for this project is, "RO-DRIP®". "RO-DRIP®" is a high performance drip tape for sub-surface or above ground irrigation. The drip tape will be placed at 12" on center in order to provide a uniform and timely application of the **Bac-Terra™ BR-650** liquid. (see Figure 5 *Application System Design Detail*).. The impact irrigation system will be utilized in the application of both **Bac-Terra™ BR-650** and nutrients. The application systems will be placed on the surface of the subject site and anchored with a jute staples at five (5) feet on center. The Rainbird impact sprinkler heads around the perimeter of the treatment zone will face toward the plume center so that the application of nutrients and microbial organisms will be properly directed. The interior Rainbird impact sprinkler heads will be adjusted so that a 360 degree dispersion of nutrients and BR-650 may occur.

6.2.3 Introduction of Nutrient

Introduction of nutrients shall be regulated by meter, allowing for the amount of liquid (1.5 gallons per cubic yard) which the soil will receive. A two (2) horsepower pump to provide adequate pressure for the application system will be utilized. Nutrient and **Bac-Terra™** disbursement will occur through the impact sprinkler head irrigation system. The application system will be used on an "as-needed" basis until the required gallons/cubic yard volume has been attained. This will be determined by **FIFCO International, Inc**. The maximum mass loading of nutrient is presented on Table-6.2.3, below:

Table-6.2.3
Mass Loading of Nutrient for Bioaugmentation Operations

Nutrients	Matrix	Concentration (Per L)	Mass (Per Gal.)	Mass (Per 5800 Gal.)
Org. Carbon	Water	442 mg	1673.0 mg	9.7 kg
Nitrate (NO_3)	Water	0.93 mg	3.5 mg	20.3 g
Phosphorus (P)	Water	3.9 mg	14.8 mg	85.8 g

6.2.4 Application of Nutrients and BR-650

We will apply 1.5 gallons of nutrients and 1.5 gallons of **Bac-Terra™** per cubic yard of contaminated soil to be metered and controlled utilizing the equipment provided in Table-6.2.4, below:

Table-6.2.4
Pump and Metering Equipment Specifications

Description	Manufacturer	Stock Number	Configuration
Water Pump	Dayton 1 h.p.	607096B	Centrifugal Pump
Liquid Flow Meter	Fill Rite	3P-729	Standard Flow Meter
Pressure Gauge	U.S. Gauge	P555L-30	2½" Pressure Gauge
Regulator	Wilkins	500-HLR	Standard Regulator

Bac-Terra™ has been determined safe in chronic toxicity tests done under the **Department of Water Resources** protocol as outlined in the California Ocean Plan. The nutrient mixture is introduced into the plume first. The liquid nutrient is pumped into the application system to ensure adequate saturation of the soil. The nutrients are allowed to equilibrate within the plume for at least 24 hours prior to the introduction of the **BR-650**. This promotes good distribution of nutrients throughout the areas to be treated. The liquid **BR-650** is introduced into the soil through the application system. The additional oxygen necessary for the degradation of the target contaminants will come from the molecularly bound oxygen in the nutrients which is released as a by-product of the anaerobic micro-organisms metabolism in **BR-650**.

6.2.5 Equipment List

Table 6.2.5 lists the materials and personnel required to complete the application of **Bac-Terra™** Remedial Technology for the subject operations:

Table-6.2.5
Materials and personnel required

No.	Item	Description	Quantity
1.	Nutrient (liquid)	Nutrient Injection to establish microbial colony.	5,805 gal.
2.	**BAC-TERRA™, BR-650**	Bioaugmentation Product.	11,610 gal.
3.	10000 gal. Holding Tank	**BR-650** Incubation tank prior to injections.	1
4.	5000 gal. Holding Tank	Nutrient Incubation tank prior to injections.	1
5.	2 h.p. Water Pump	Water Pump for liquid nutrient and **BR-650** injections.	1
6.	Generator	Electrical power supply for pumping equipment.	1
7.	11/4" Class 200 P.V.C. pipe	Approximately 40 feet PVC main line	40 ft.
8.	11/2" x 11/4" fitting	Reducer SxS bush fitting	1
9.	11/2" valve	Dura Import Ball Valve Slip	1
10.	11/2" x 1" fitting	Reducer SxS bush fitting	1
11.	1" fitting	PVC Slip Tee	1
12.	1" Class 200 P.V.C. pipe	Approximately 180 feet PVC main line	180 ft.
13.	1" x 1" x 3/4" fitting	Tee Slip Fitting	4
14.	1" x 3/4" fitting	Reducer, 90 degree elbow slip	2
15.	3/4" Class 200 P.V.C. pipe	Approximately 360 feet PVC irrigation pipe	360 ft.
16.	3/4" x 3/4" x 1/2" fitting	Reducer Tee Slip	12
17.	3/4" x 1/2" fitting	Reducer SxS Bushing	6
18.	1/2" Class 200 P.V.C. pipe	Approximately 360 feet of PVC irrigation pipe	360 ft.
19.	1/2" fitting	90 degree elbow slip	6
20.	1/2" riser	12" schedule 40 PVC	20
21.	1/2" fitting	Female adapter	18
22.	Impact Head	RainBird 2045 PJ MaxiBird Sprinkler head	18
23.	2" Class 200 P.V.C.	Approximately 60 feet PVC main line	60 ft.
24.	2" Valve	Dura Import Slip Ball Valve	1
25.	2" x 2" x 1/2" fitting	Reducer Slip Tee	1
26.	1/2" x 1/4" fitting	Reducer SxT Bushing	1
27.	Pressure Gauge	Irrometer 0-30 P.S.I. pressure Gauge	1

28.	3" x 2" fitting	Reducer Bushing	1
29.	3" fitting	Female Adapter	1
30.	3" fitting	Insert by Male Adapter	2
31.	3" Oval Hose	Oval Hose Main Feed to Ro-Drip 1 roll (120 feet)	120 ft.
32.	3" clamps	Hose Clamps	4
33.	3" Cap	Threaded end cap	1
34.	Loc. Sleeve	AG Products Loc Sleeve x .250 Barb.	120
35.	Drip irrigation pipe	Roberts RO-DRIP ,8 mil, 12", 24 G.P.H. , 3 rolls @ 7,500 ft per roll	21,600 ft.
36.	Sampling Equipment	Standard 2½ inch diameter "split-spoon" soil sampler.	1
37.	Photo Ionization Detector (PID)	Safety equipment required by Soil Sampling Plan	1
38.	Brass Sampling Tubes	Brass sampling tubes for initial and post application sampling.	55
39.	Water Supply	Chlorine free water supply	17,415 gal.
40.	Transportation Vehicles	Transportation, supply and application vehicles	2
41.	Van mounted Geo-Probe (if required)	Soil sampling	1
42.	Personnel	Engineering, application and sampling personnel	4

6.2.6 Permeability Rates of Bioaugmentation Additives

The affected soils contained within the contamination plume at the NAVSTA, Mayport, will be described after receipt of Geotechnical and geologic characteristics of soil sampled.

7.0 GROUNDWATER MONITORING

7.1 On-Site Groundwater Monitoring Wells

Monitoring of existing monitoring wells is not within the scope of work to be performed for SWMU 15. However, it is recommended that monitoring of pertinent wells be conducted in order to evaluate impact to the water table.

If you have any further questions regarding the Remedation Action Plan, please contact John Bullington or Kenneth Oftedal at **FIFCO International, Inc.** at (619) 259-7710 or the Project EngineerJohn R. Edwards or the Project Geologist, Duane Dungan at the **ECT's** office in Fort Myers, Florida, (941) 277-0003 / FAX (941) 277-1211.

Respectfully submitted,

ECT, Inc.

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Distribution:

8 - Addressee

Remediation Action Plan reviewed by FIFCO International, Inc.

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KENNETH R. OFTEDAL
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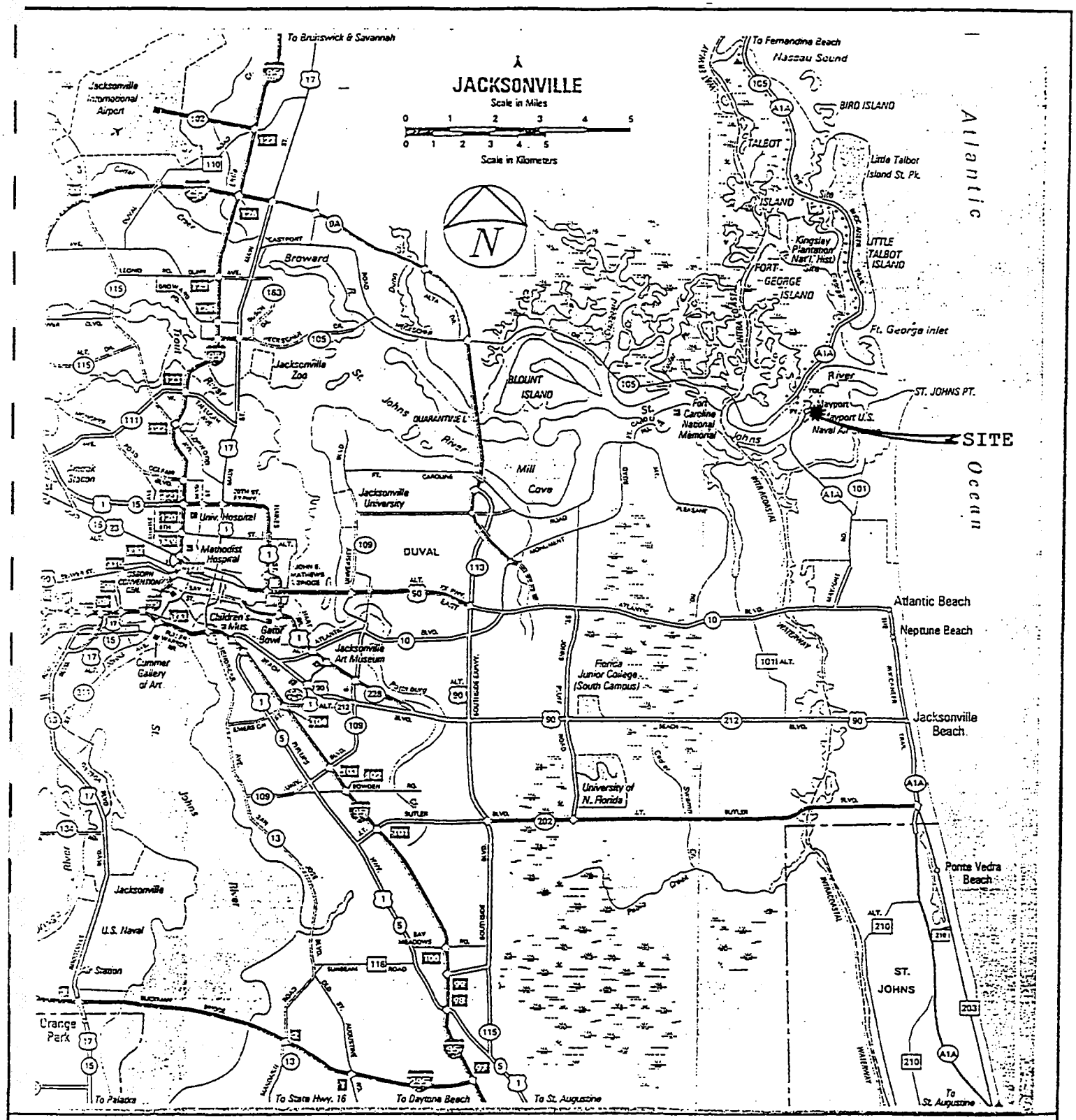
John Bullington
FIFCO International, Inc.
President

Figure 1 - Vicinity Map



REFERENCE:

MAP OF FLORIDA, JACKSONVILLE AREA

PUBLISHED BY AAA, 1993, C-54

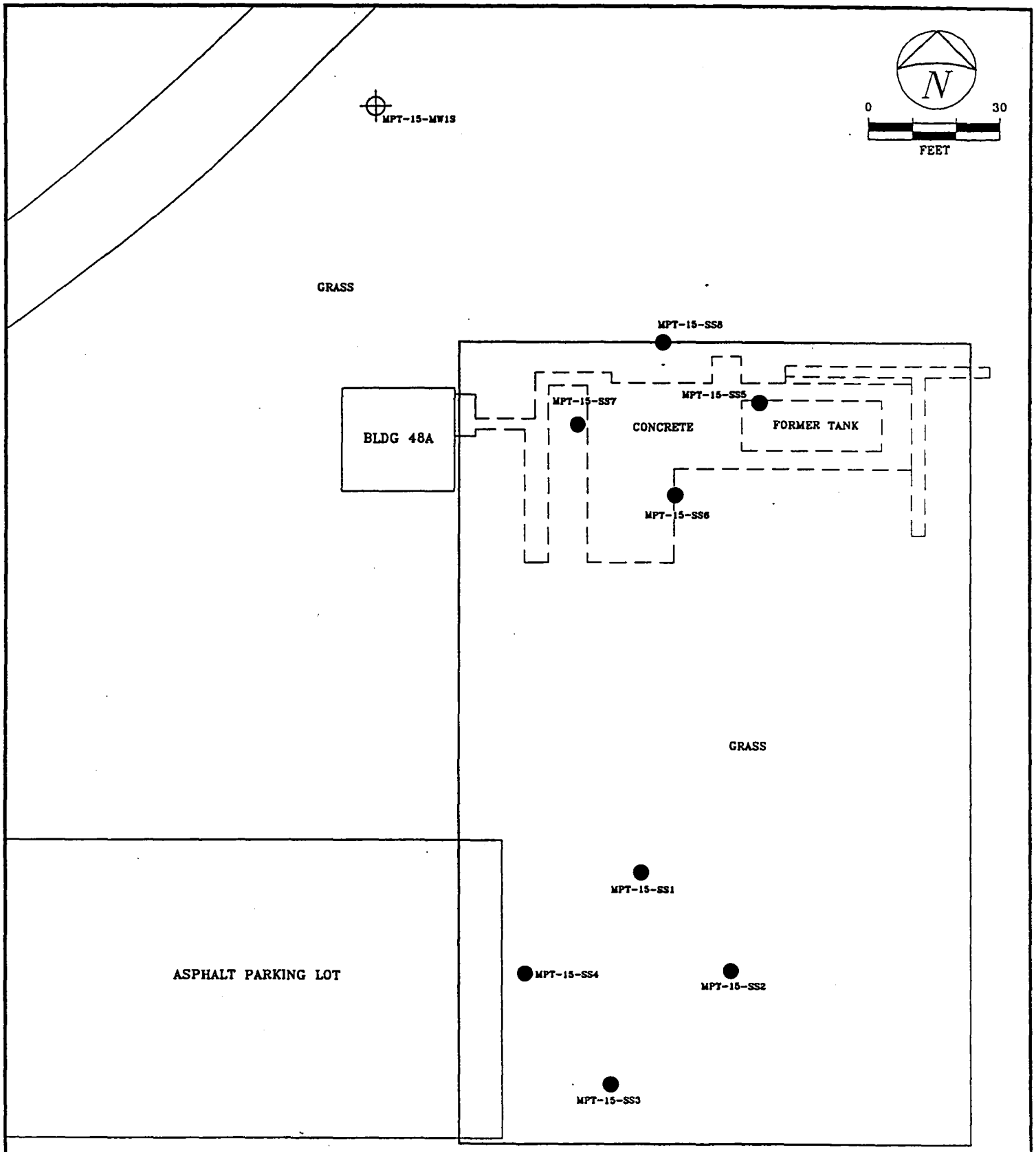
VICINITY MAP

U.S. NAVAL STATION

MAYPORT, FLORIDA

Figure 1

Figure 2 - Site Plan



LEGEND

MPT-15-SS1 LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991

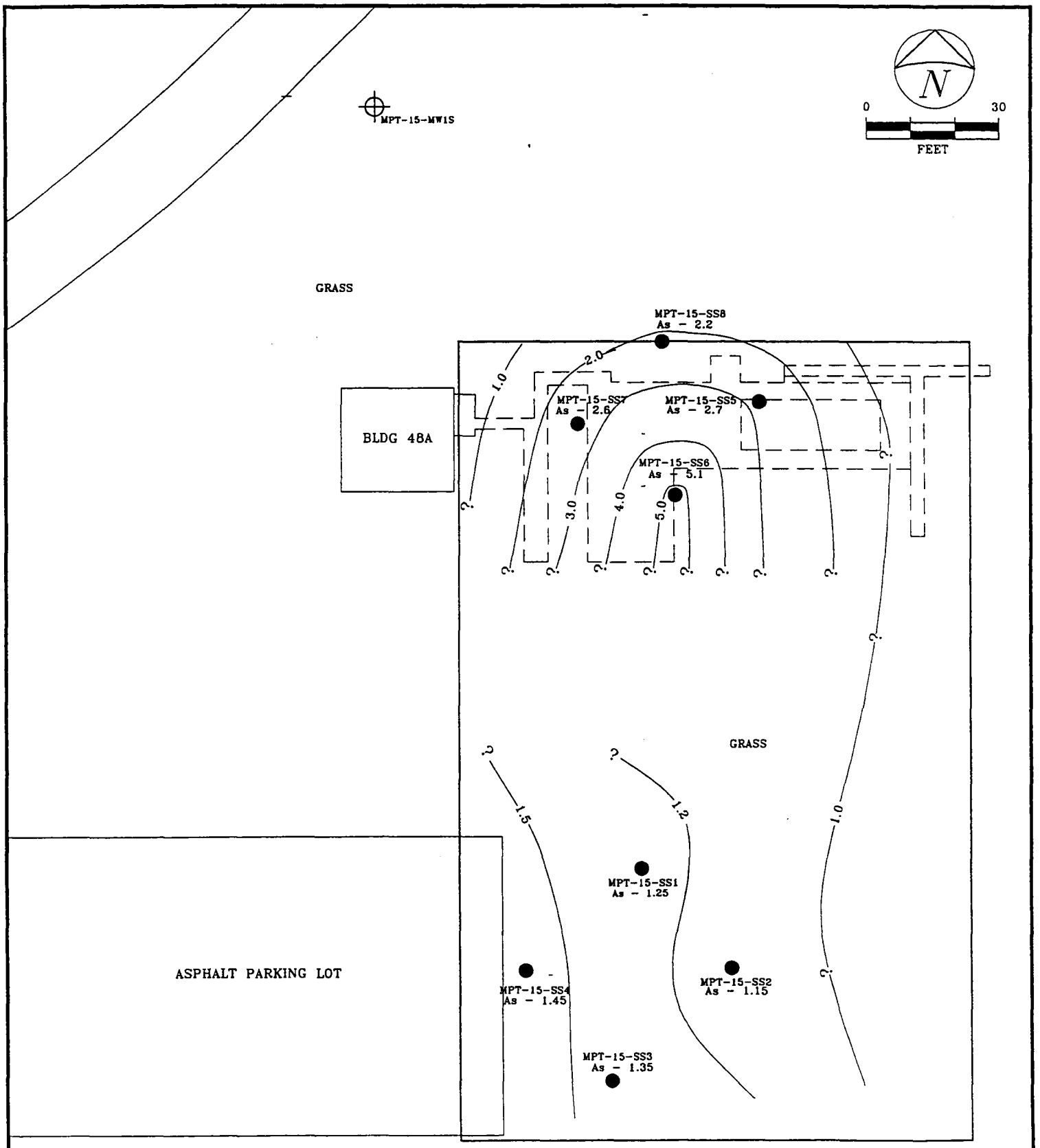
MPT-15-MW1S LOCATION OF EXISTING MONITORING WELL

— — — OUTLINE OF FORMER SIDEWALKS AND SURFACE STRUCTURE

SITE PLAN
SWMU 15, Old Pesticide Handling Area
U.S. Naval Station, Mayport, Florida

Figure 2

Figure 3 - Isoconcentration of Contaminants



LEGEND

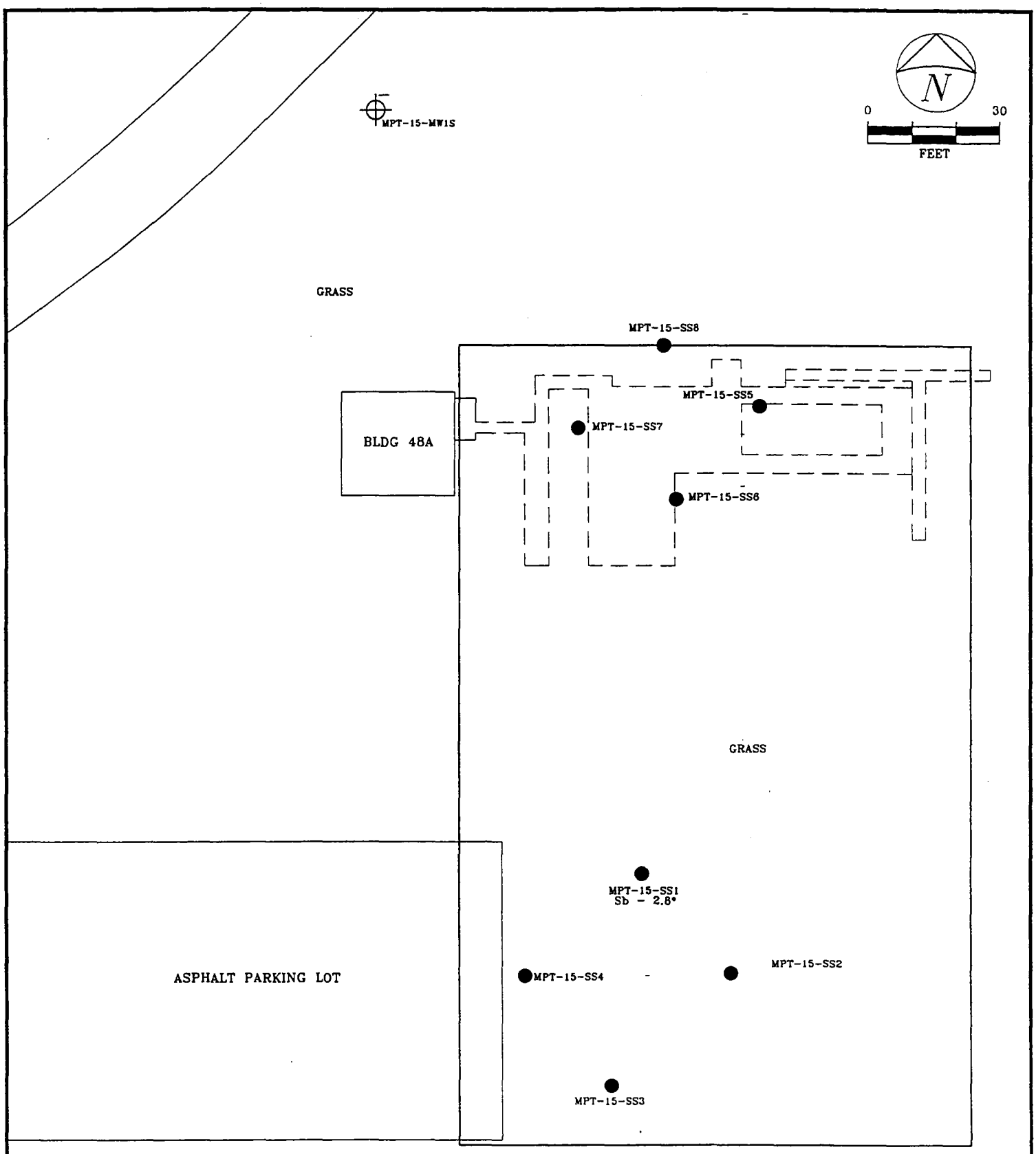
MPT-15-SS1 As - 5.1 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING CONTAMINATION VALUE (mg/kg)

5.0 ? ? ? — LINE OF EQUAL ARSENIC CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF ARSENIC CONTAMINATION IN SOIL @0-2'. SWMU 15

U.S. Naval Station, Mayport, Florida

Figure 3A



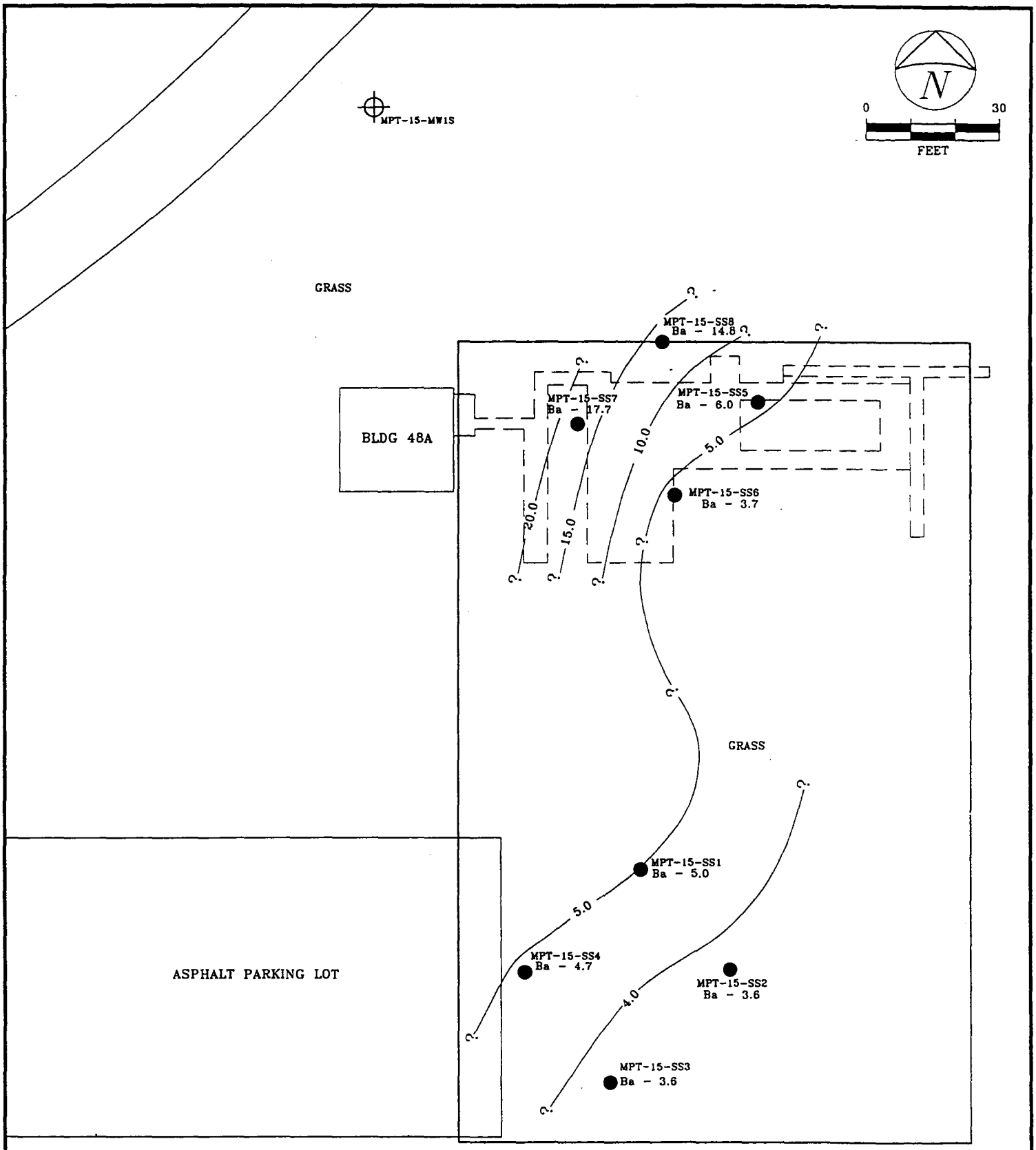
LEGEND

MPT-15-SS1
Sb - 2.8*

LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF ANTIMONY CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3B



LEGEND

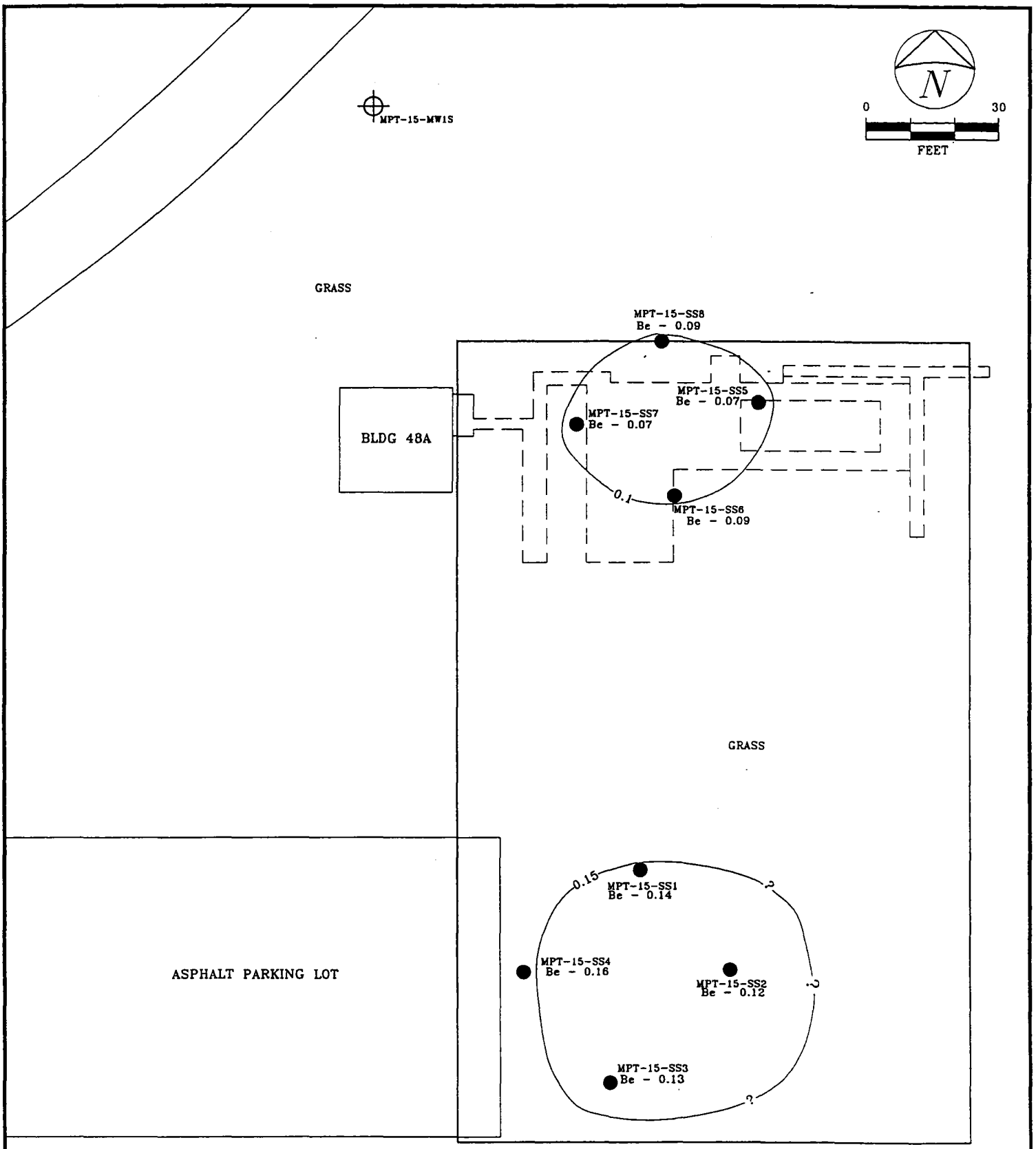
MPT-15-SS1 Ba - 4.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'

5.0 — LINE OF EQUAL BARIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF BARIUM CONTAMINATION IN SOIL @0-2'. SWMU 15

U.S. Naval Station, Mayport, Florida

Figure 3C



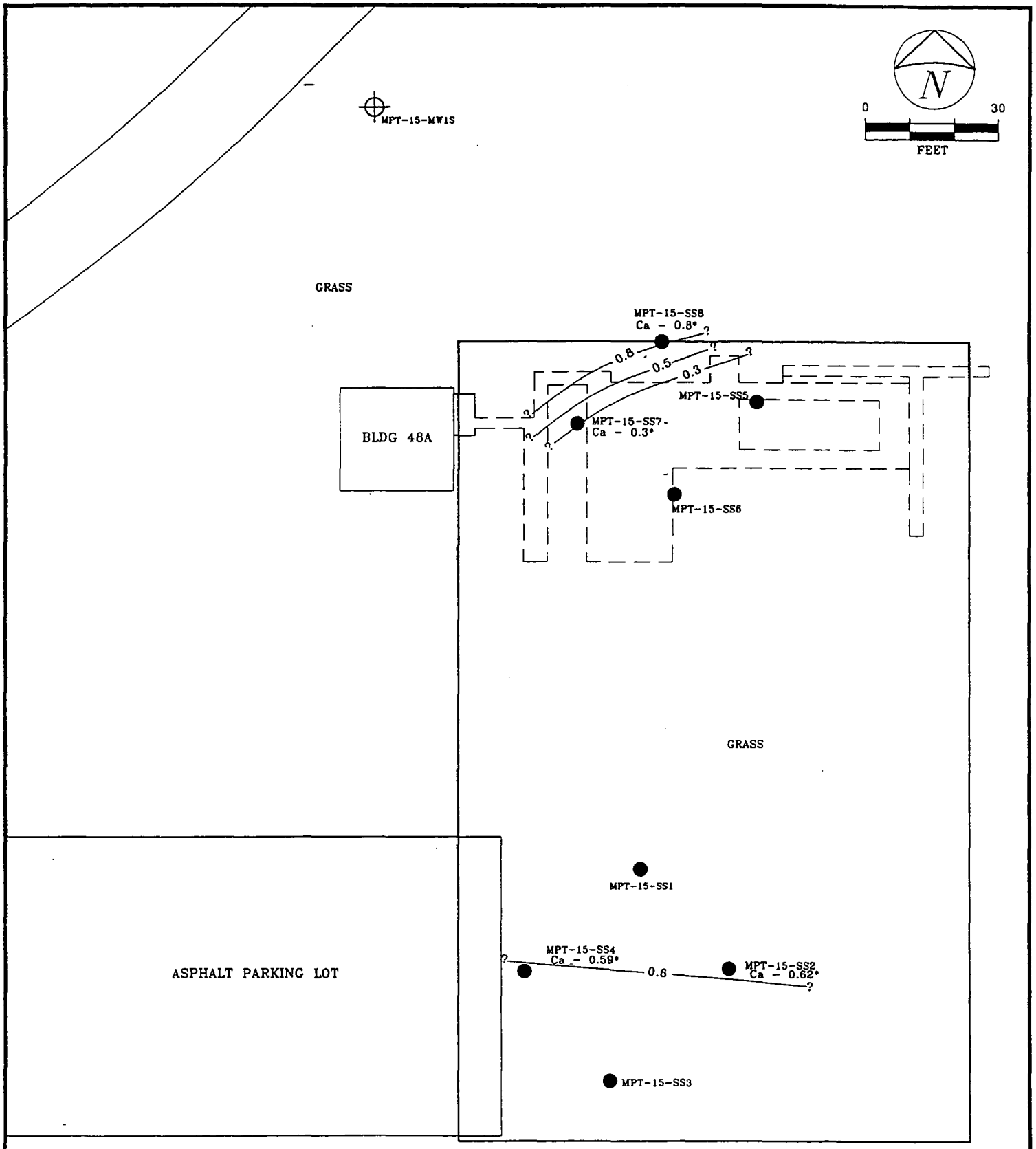
LEGEND

MPT-15-SS1 Be - 0.1 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'

0.1 ? ? ? — LINE OF EQUAL BERYLLIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF BERYLLIUM CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3D



LEGEND

MPT-15-SS1
Ca - 0.3*

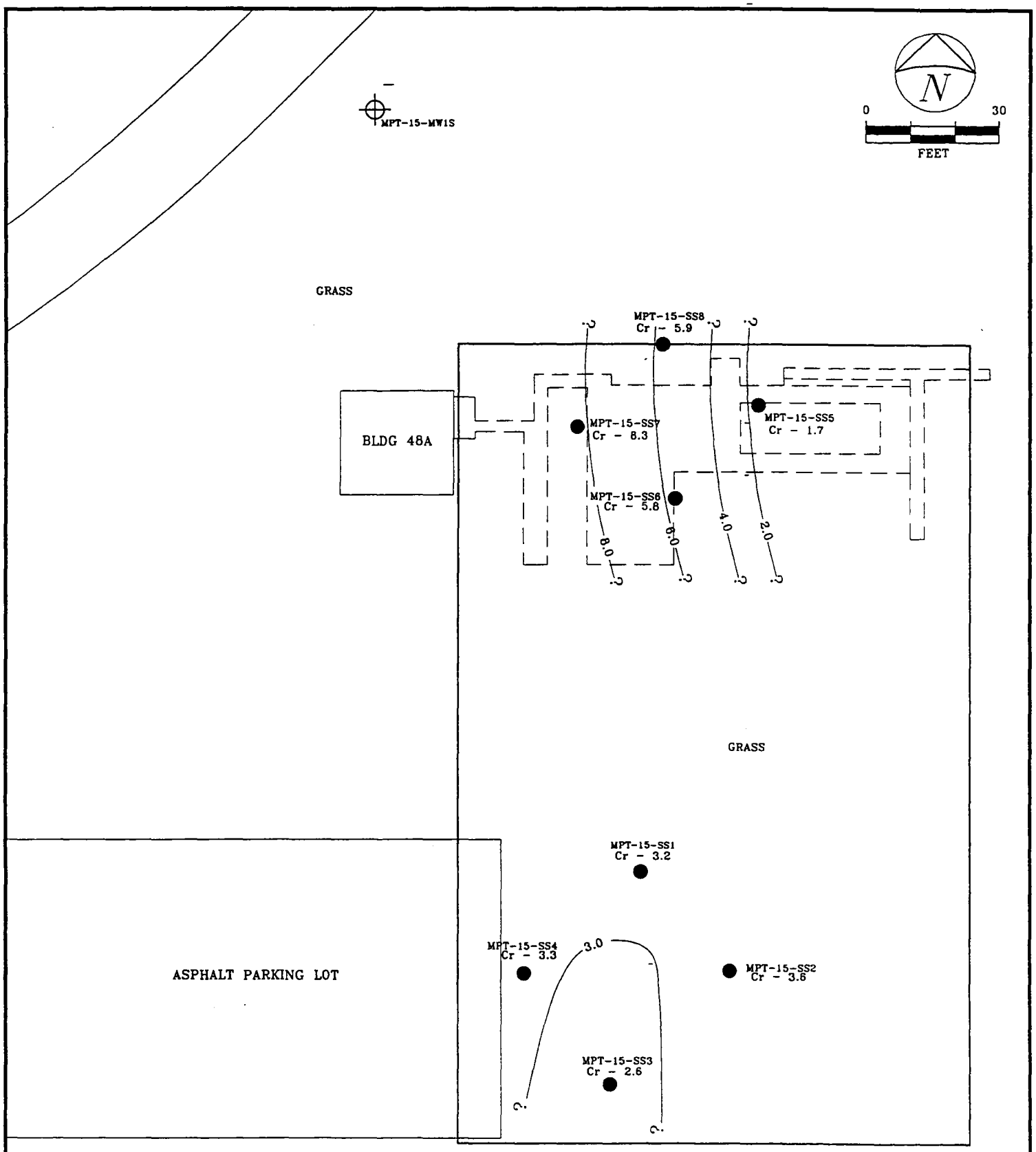
LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

0.1

LINE OF EQUAL CADMIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF CADMIUM CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3E



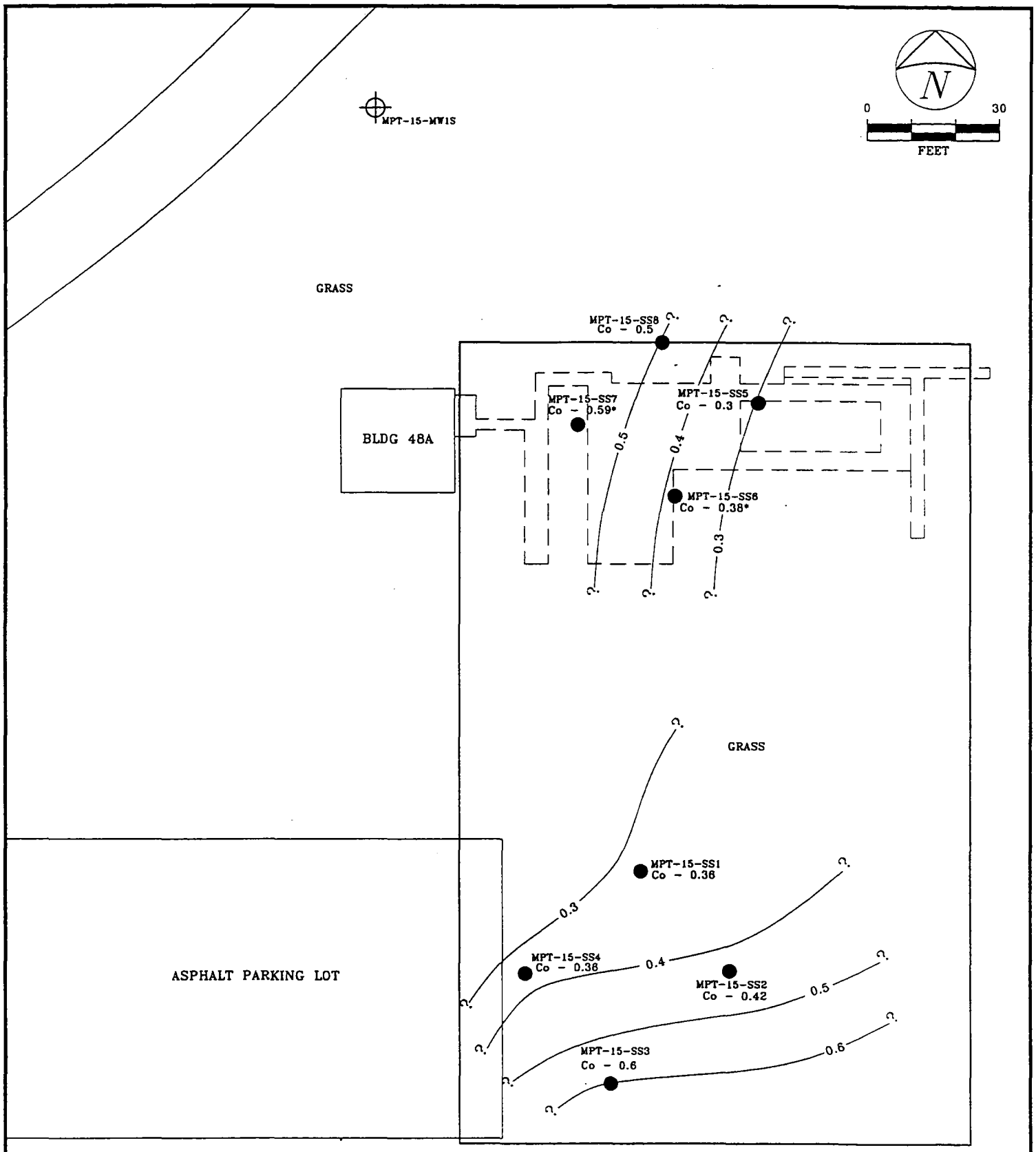
LEGEND

MPT-15-SS1 Cr - 3.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

3.0 — LINE OF EQUAL CHROMIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF CHROMIUM CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3F



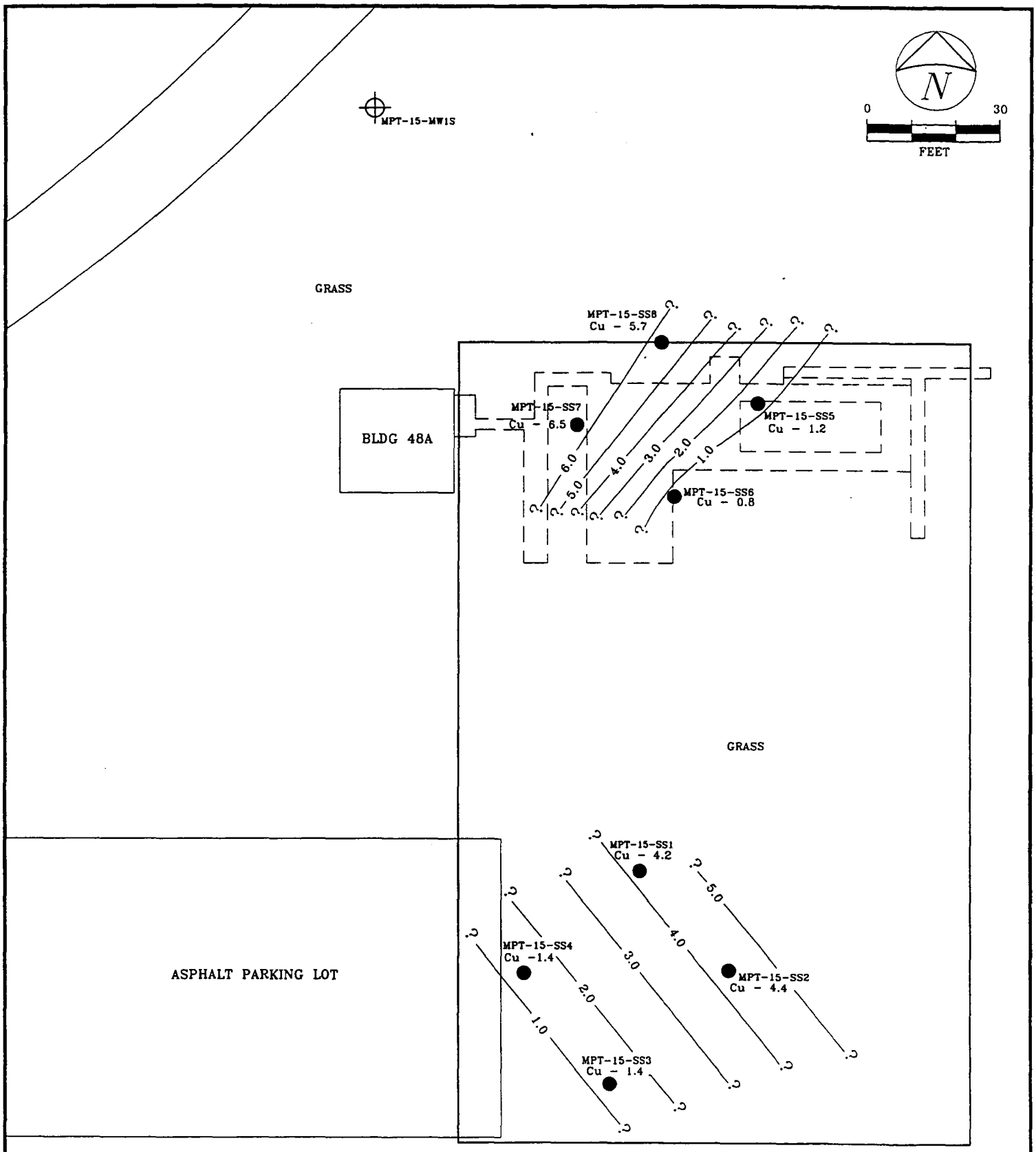
LEGEND

● MPT-15-SS1 Co - 0.5* — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

5.0 — LINE OF EQUAL COBALT CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF COBALT CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3G



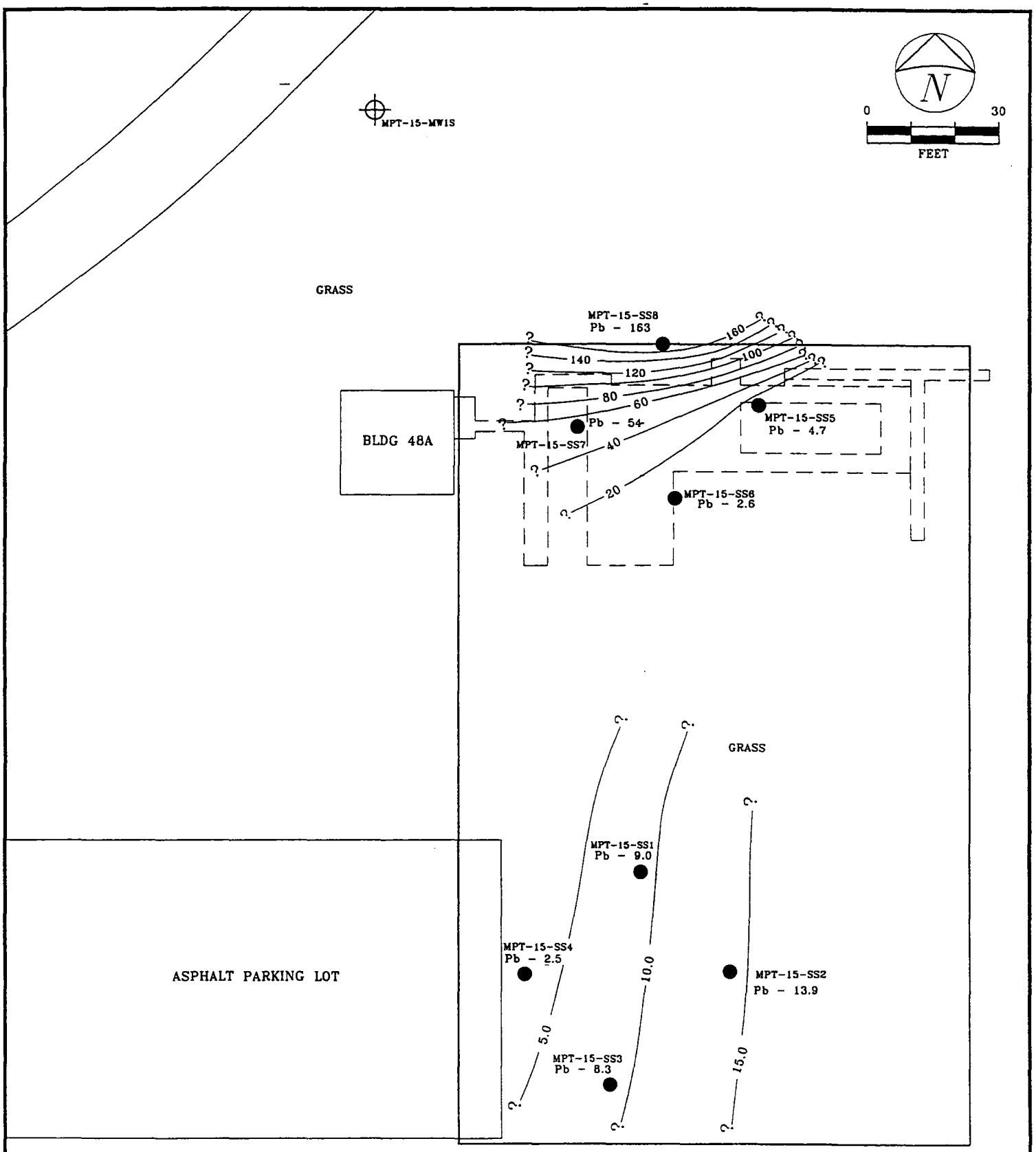
LEGEND

MPT-15-SS1 Cu - 4.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

3.0 — LINE OF EQUAL COPPER CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF COPPER CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3H



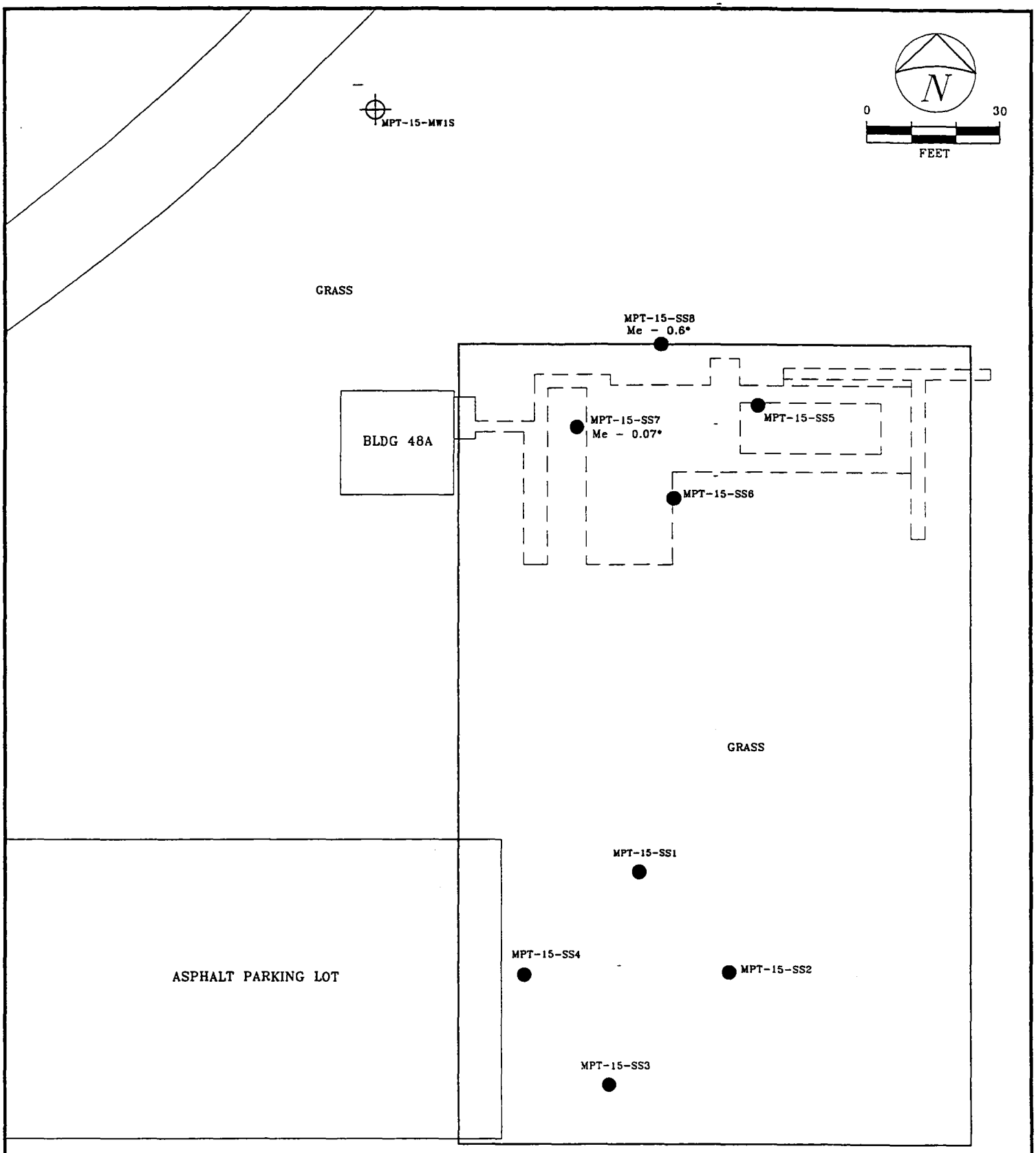
LEGEND

MPT-15-SS1 Pb - 9.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

10 — LINE OF EQUAL LEAD CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF LEAD CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3I



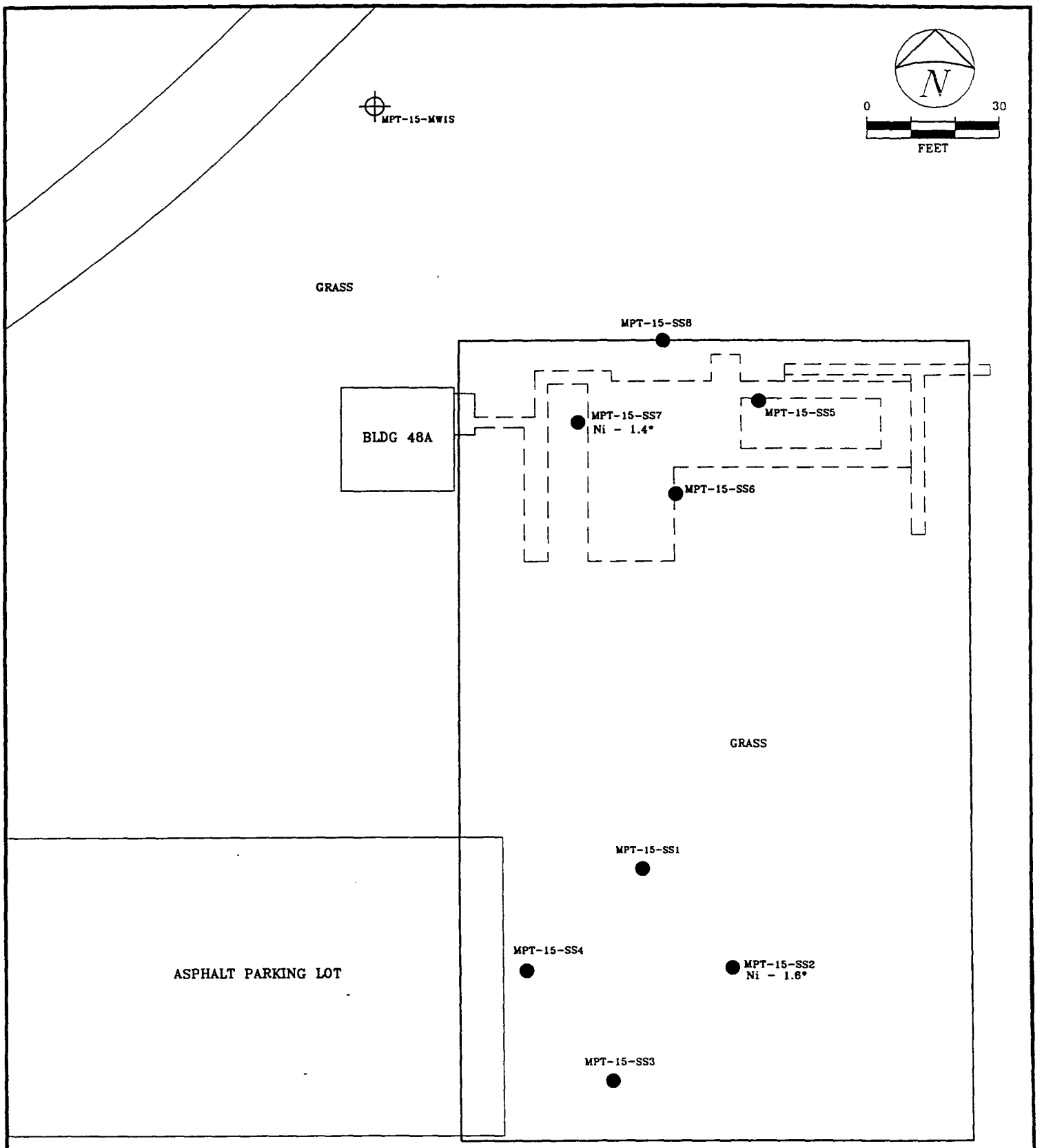
LEGEND

MPT-15-SS1 Pb - 9.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'

* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF MERCURY CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3J

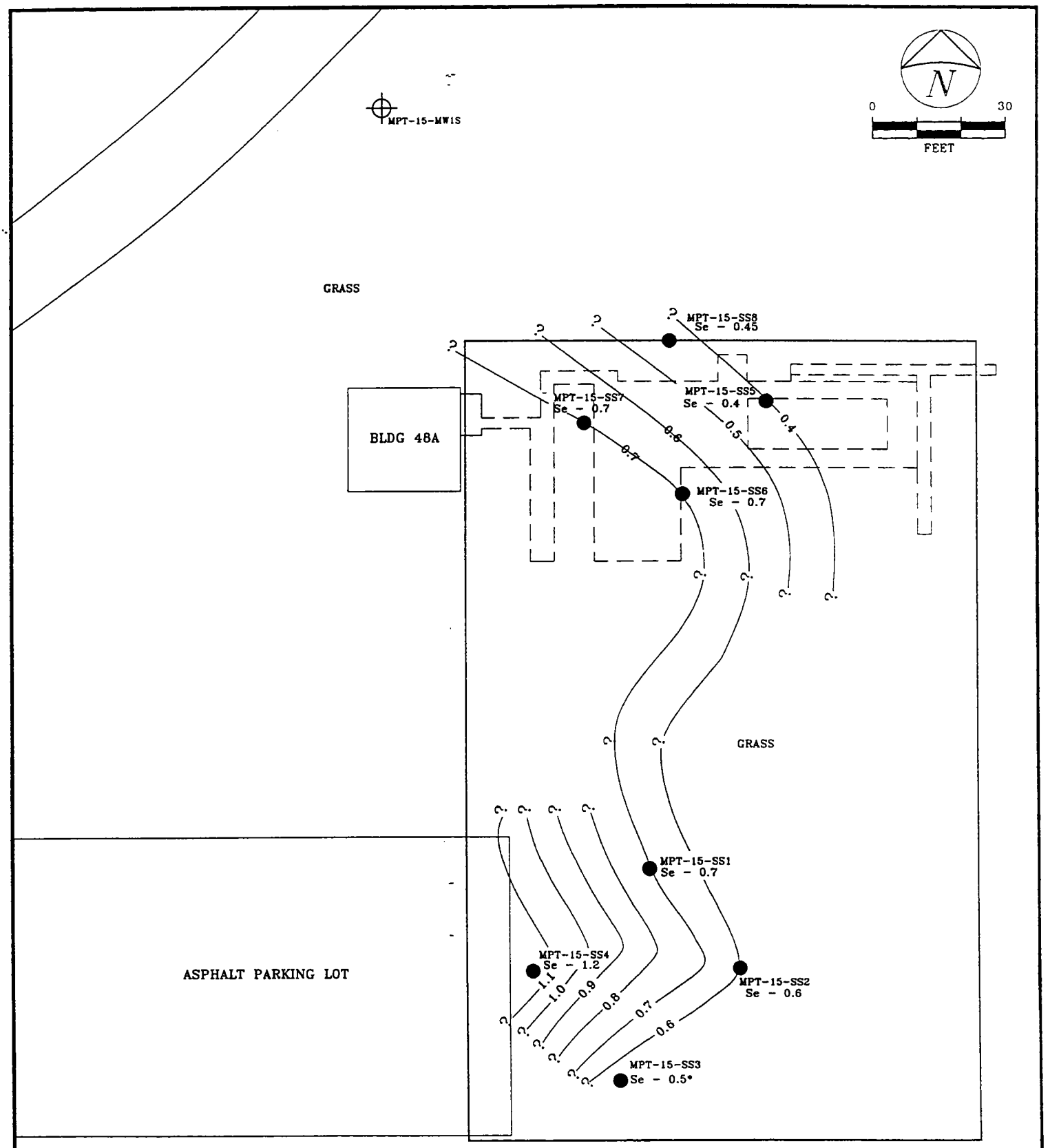


LEGEND

MPT-15-SS1 Ni - 1.3* LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF NICKEL CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3K



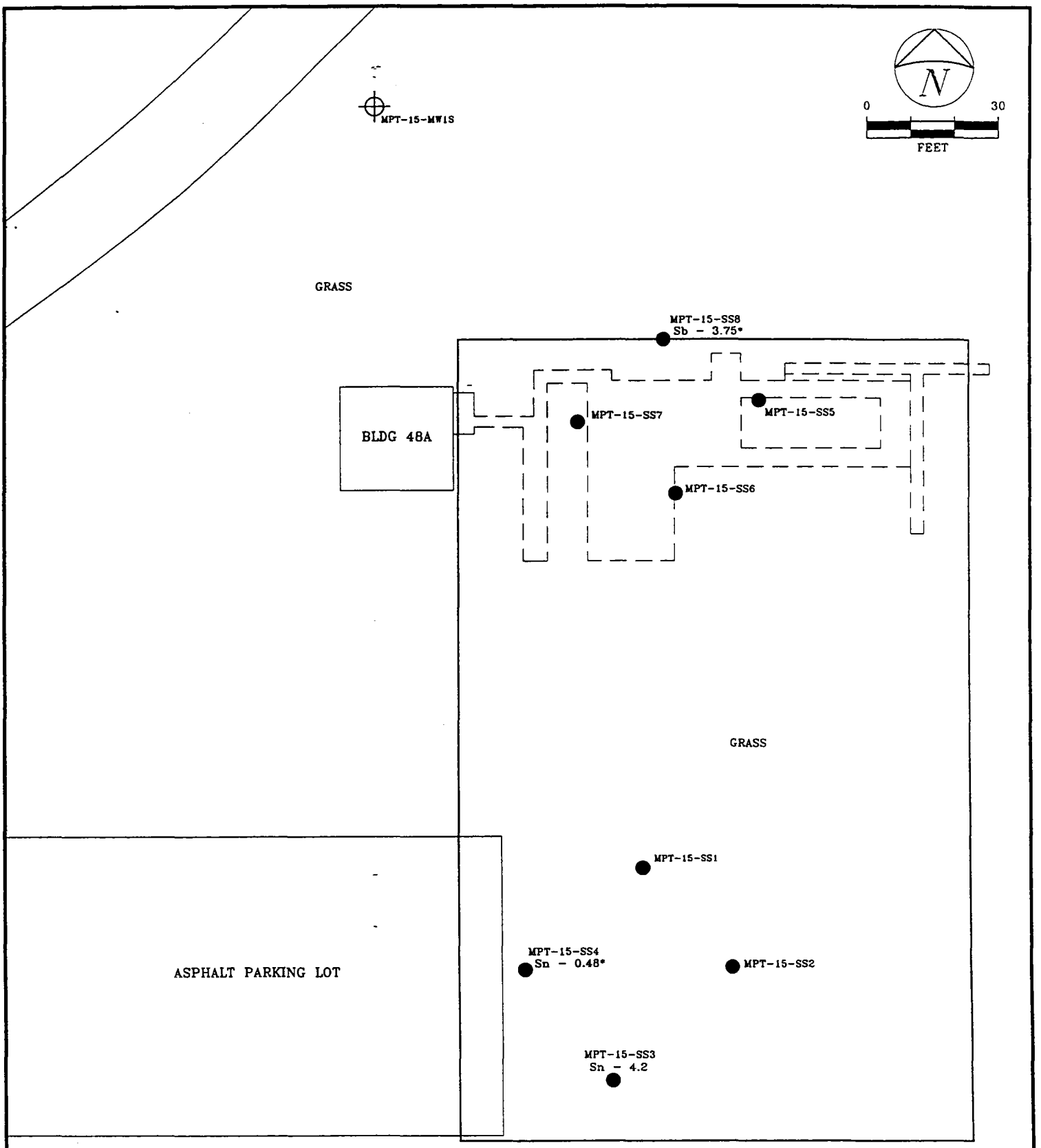
LEGEND

MPT-15-SS1 Se - 0.7 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPE WAS ANALYZED @ 0-1' OR @ 1'-2'

0.7 — LINE OF EQUAL SELENIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF SELENIUM CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3L



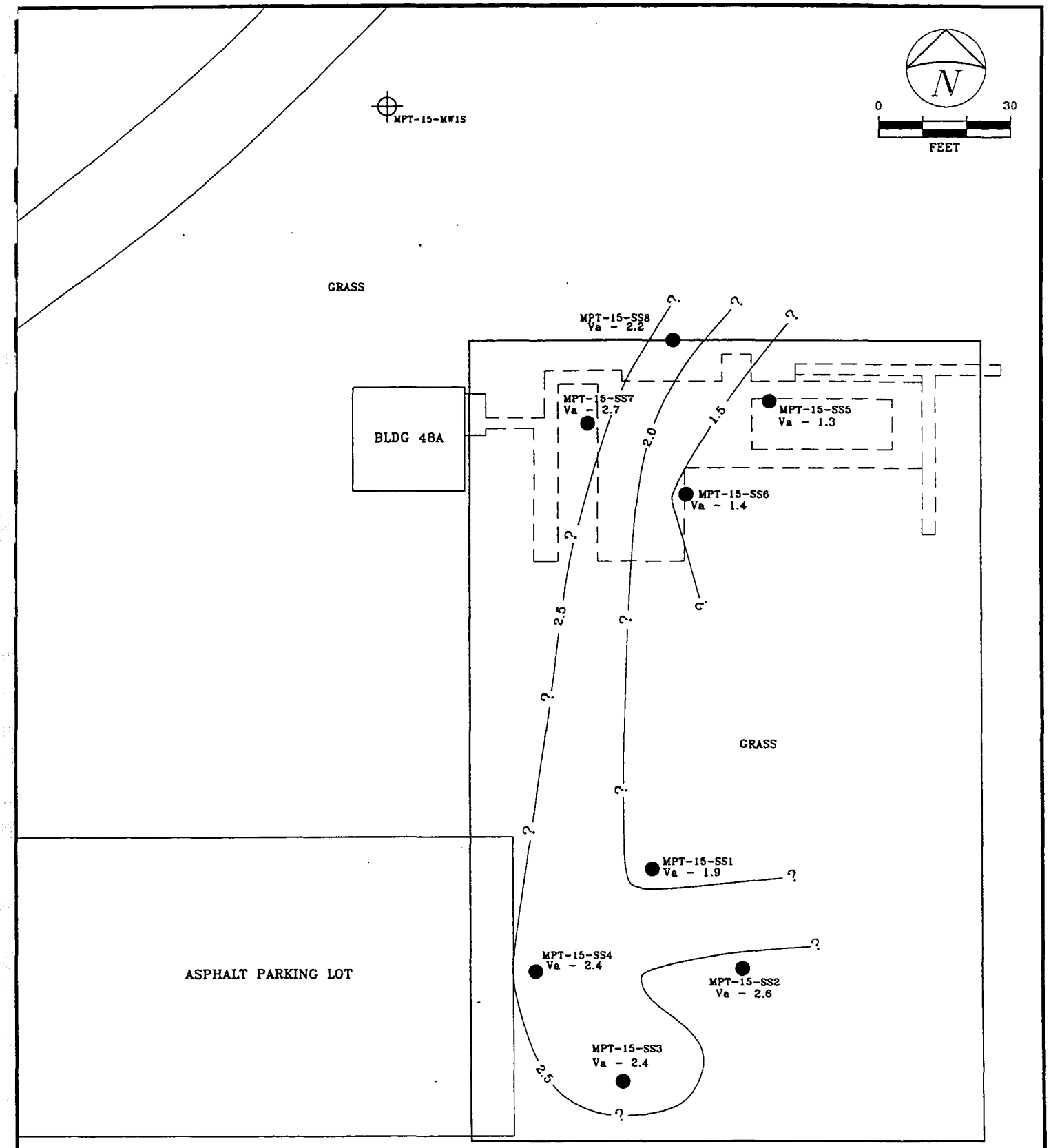
LEGEND

MPT-15-SS1
Sn - 4.2

LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF TIN CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3M



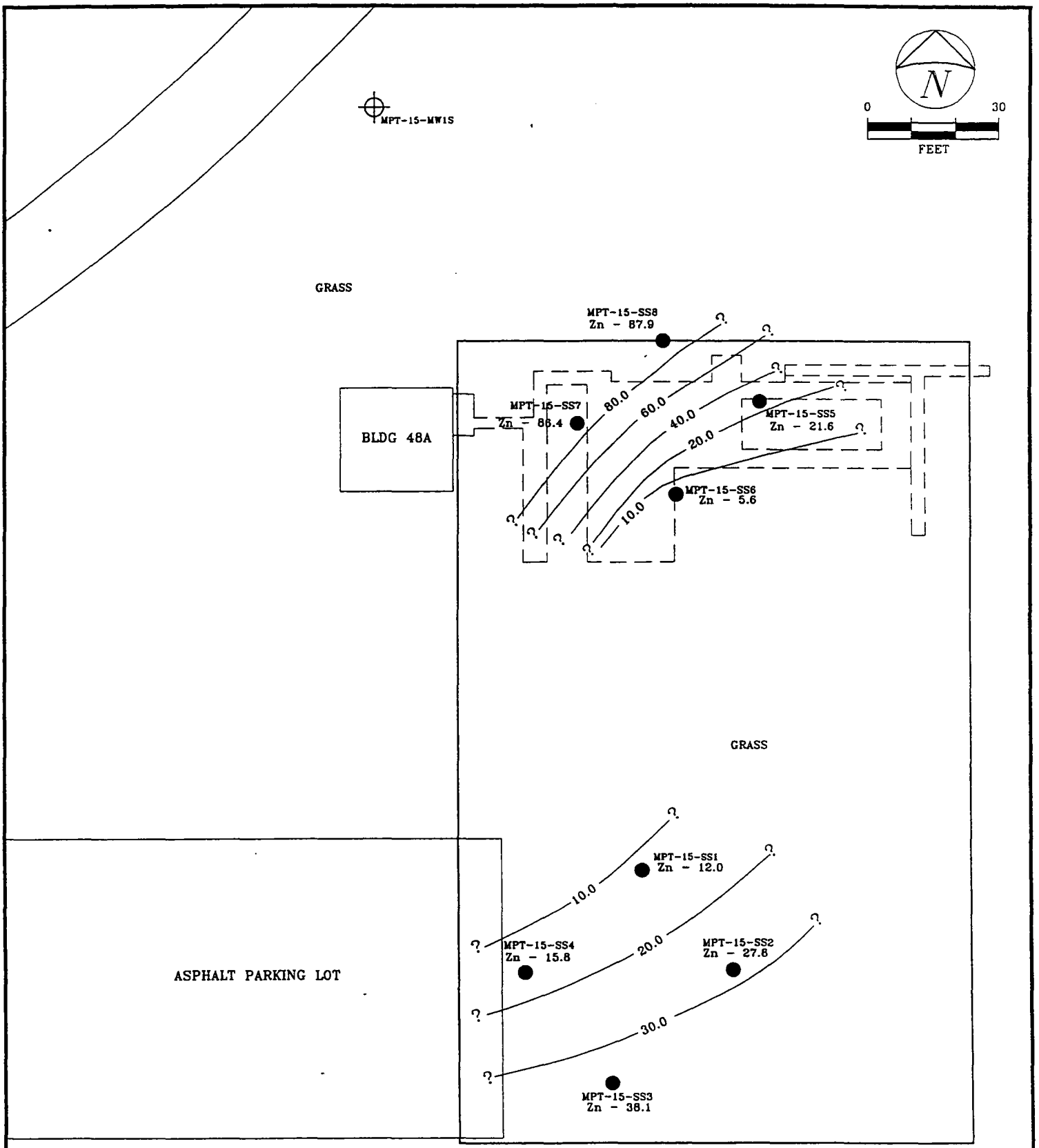
LEGEND

MPT-15-SS1 Va - 1.9 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

5.0 — LINE OF EQUAL VANADIUM CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF VANADIUM CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3N



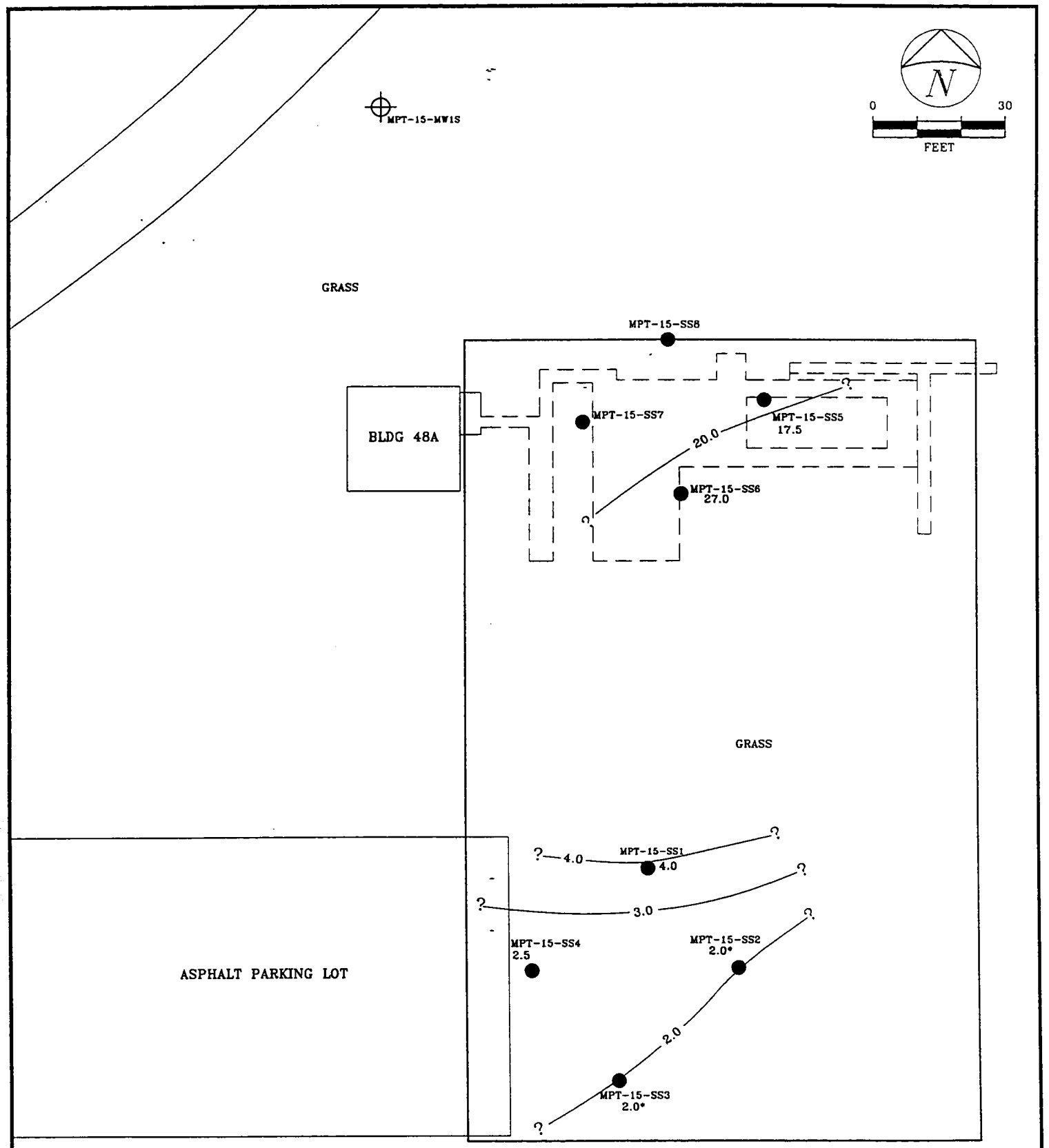
LEGEND

MPT-15-SS1 Zn - 12.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

3.0 — LINE OF EQUAL ZINC CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF ZINC CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3-0



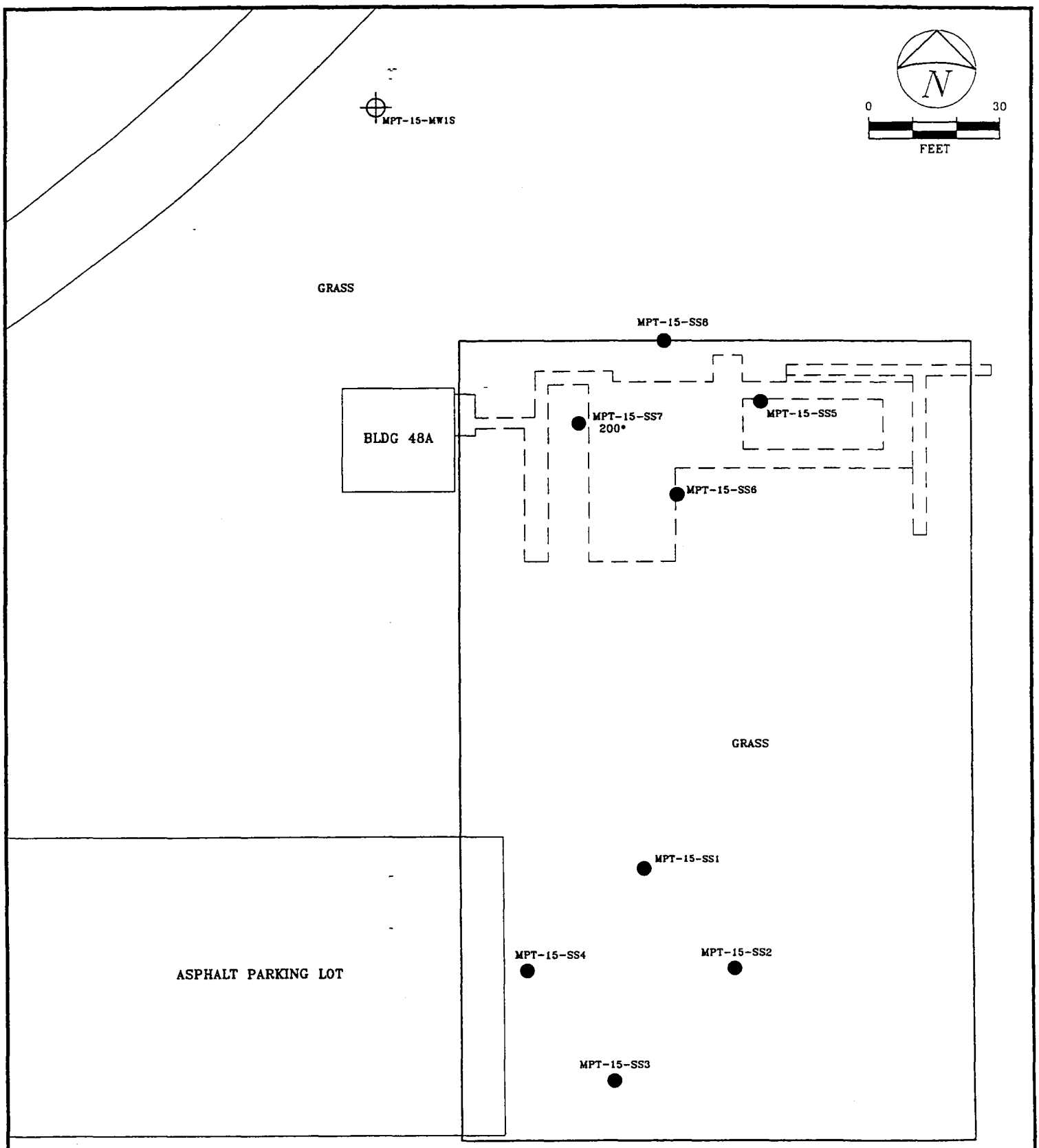
LEGEND

MPT-15-SS1 4.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

3.0 — LINE OF EQUAL ACETON CONTAMINANT CONCENTRATION QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF ACETON CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3P

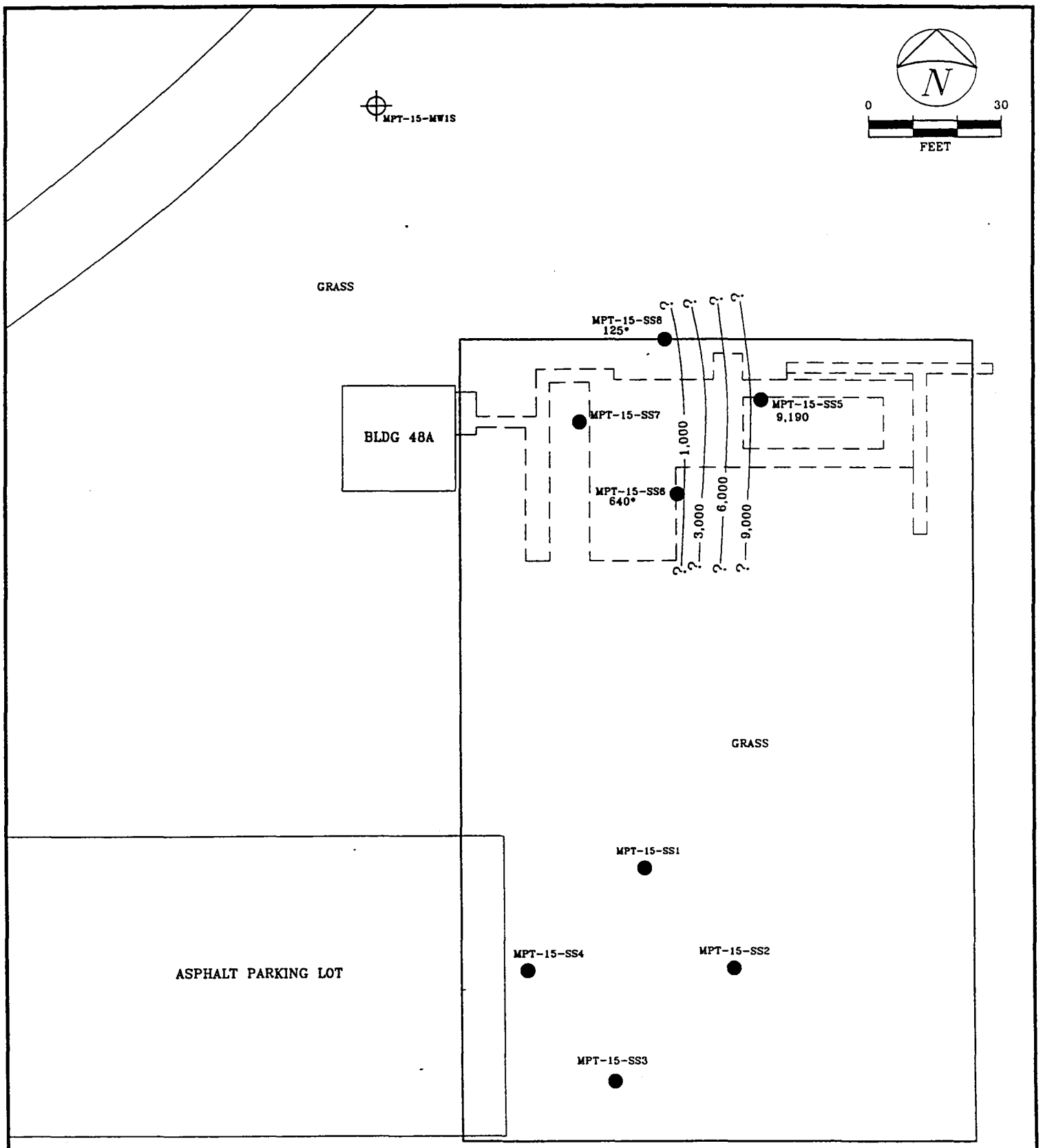


LEGEND

MPT-15-SS7 200* — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF 2-ETHYLHEXYL PHTALATE CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3Q



LEGEND

MPT-15-SS1
15.6

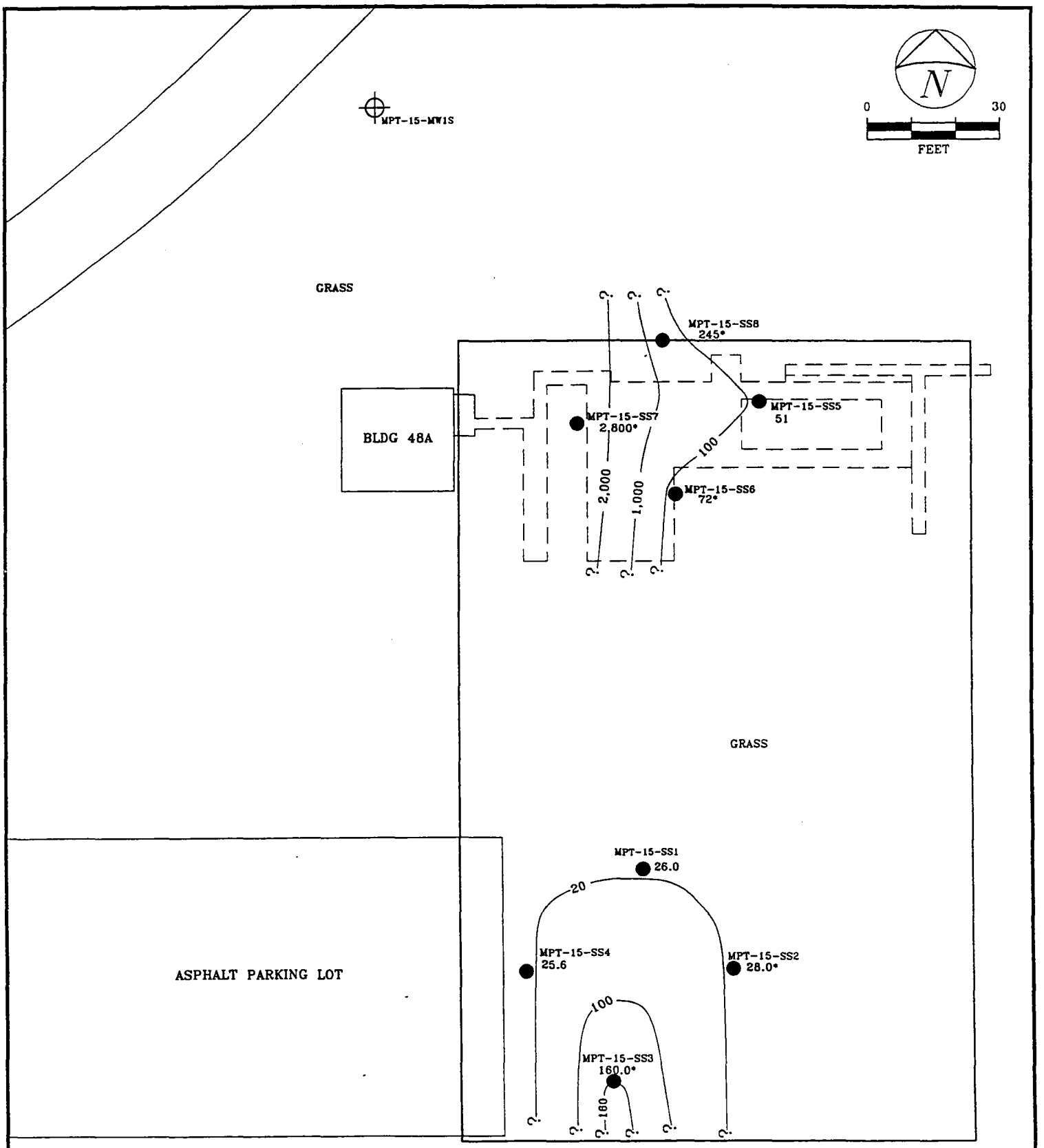
LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

20

LINE OF EQUAL BUTYLBENZYLPHTHALATE CONTAMINANT CONCENTRATION, QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF BUTYLBENZYLPHTHALATE CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3R



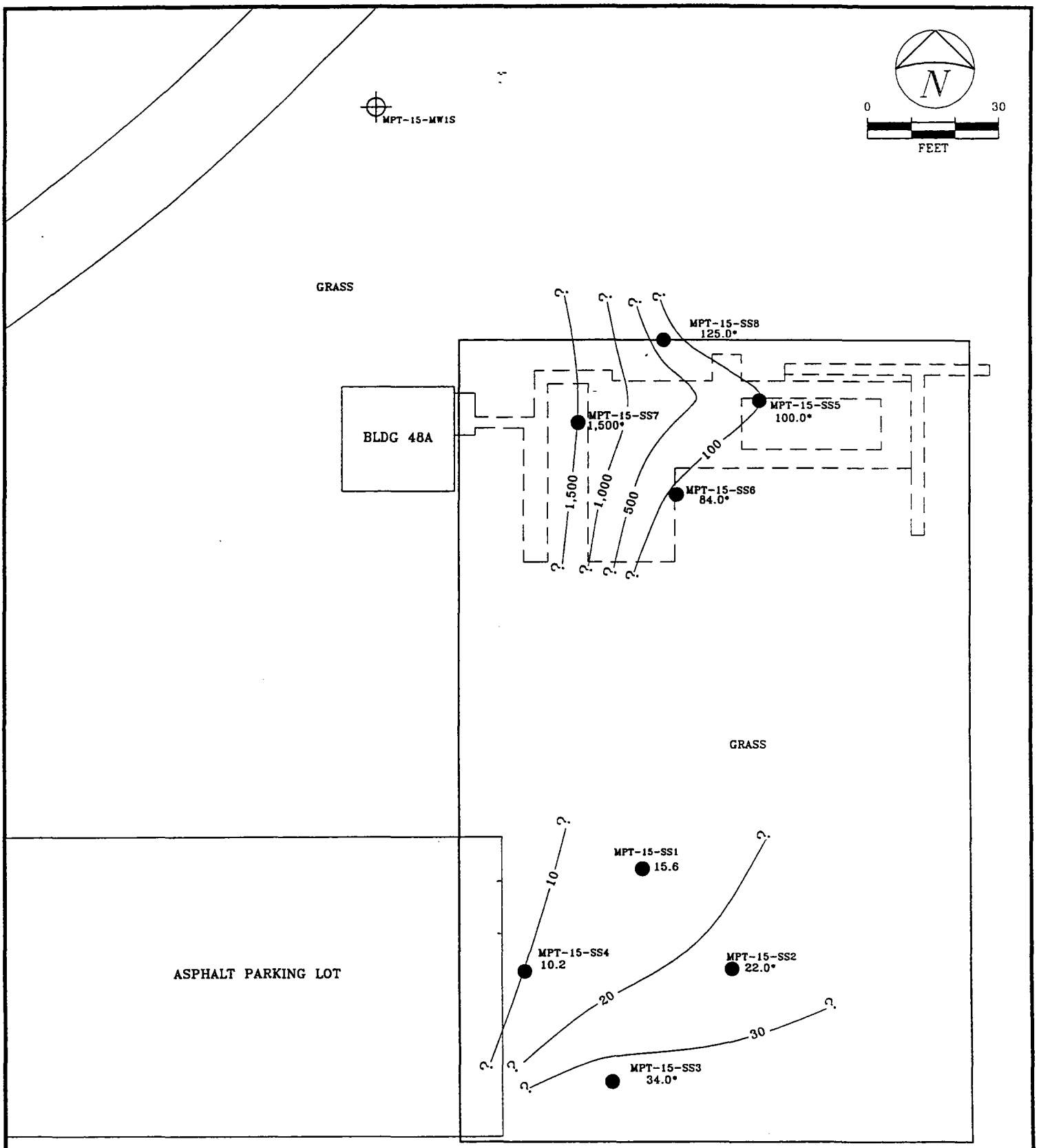
LEGEND

MPT-15-SS1 26.0 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

20 — LINE OF EQUAL DICHLOROPHENYL DICHLOROETHENE (4,4-DDE) CONTAMINANT CONCENTRATION, QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF 4,4-DDE CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3S



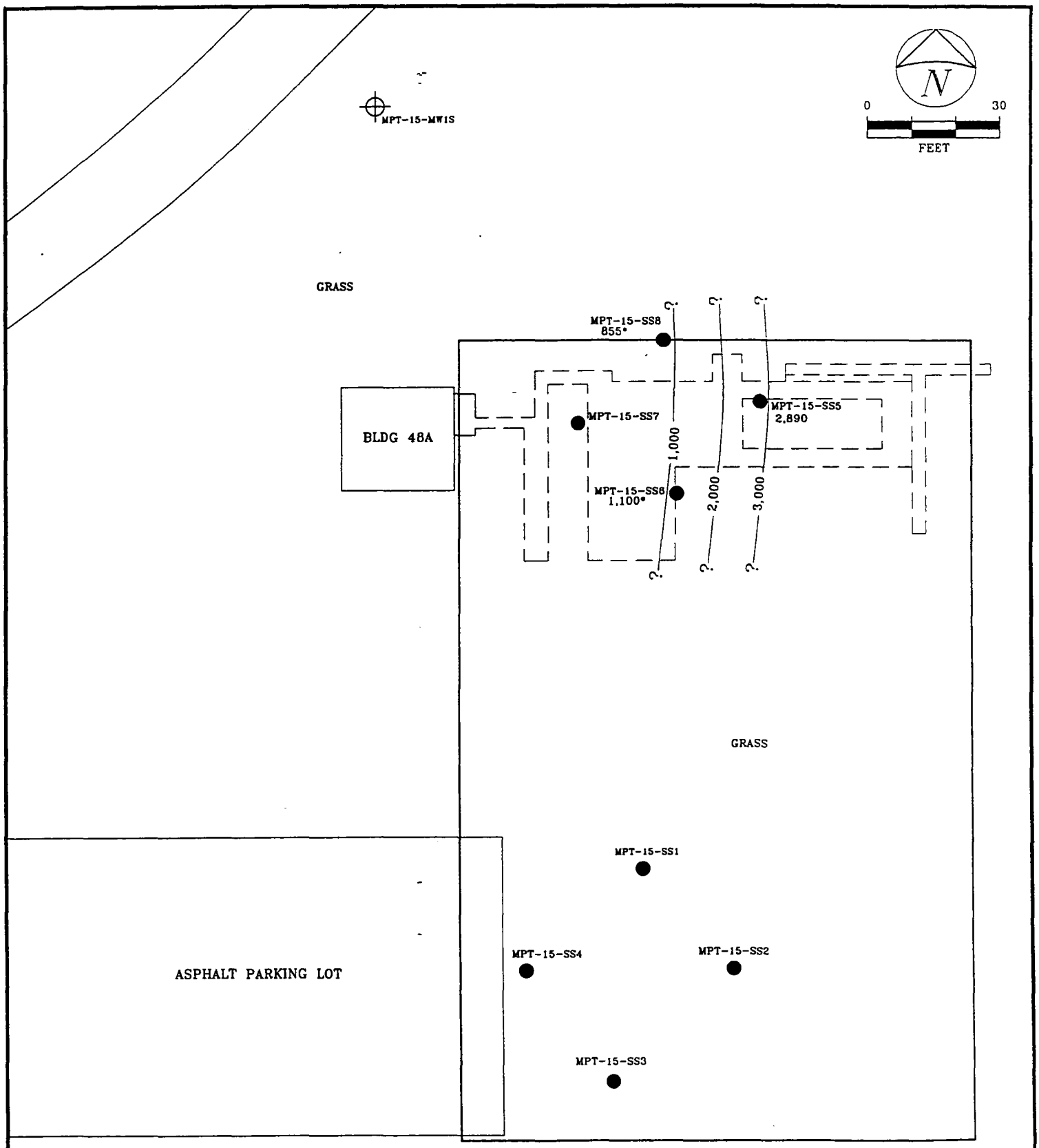
LEGEND

MPT-15-SS1 15.6 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

20 — LINE OF EQUAL DICHLOROPHENYL DICHLOROETHANE (4,4-DDT) CONTAMINANT CONCENTRATION, QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF 4,4-DDT CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3T



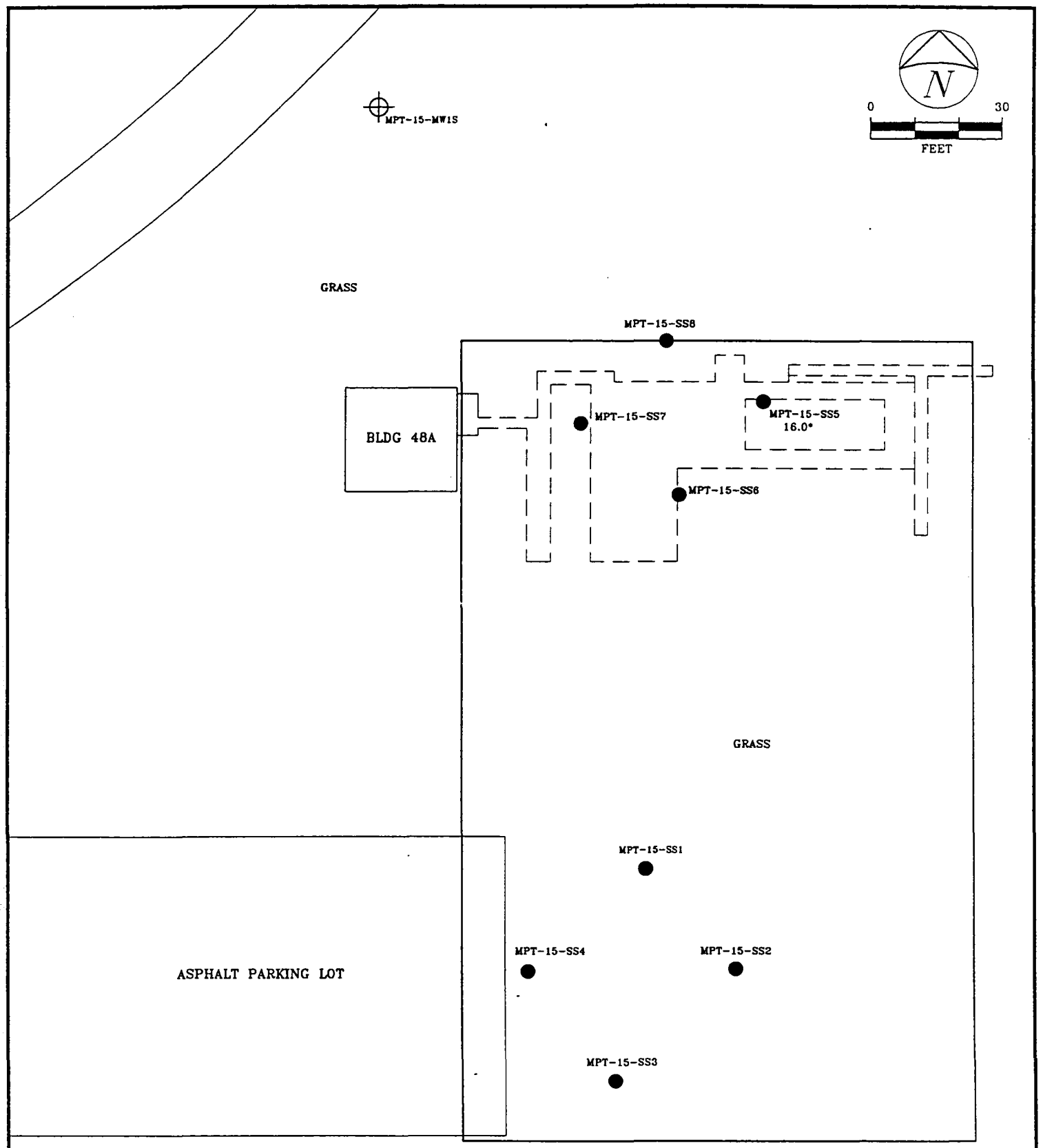
LEGEND

MPT-15-SS6 1,100* — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

1,000 — LINE OF EQUAL CHLORDANE CONTAMINANT CONCENTRATION, QUERRIED WHERE UNCERTAIN

ISOCONCENTRATION OF CHLORDANE CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3U

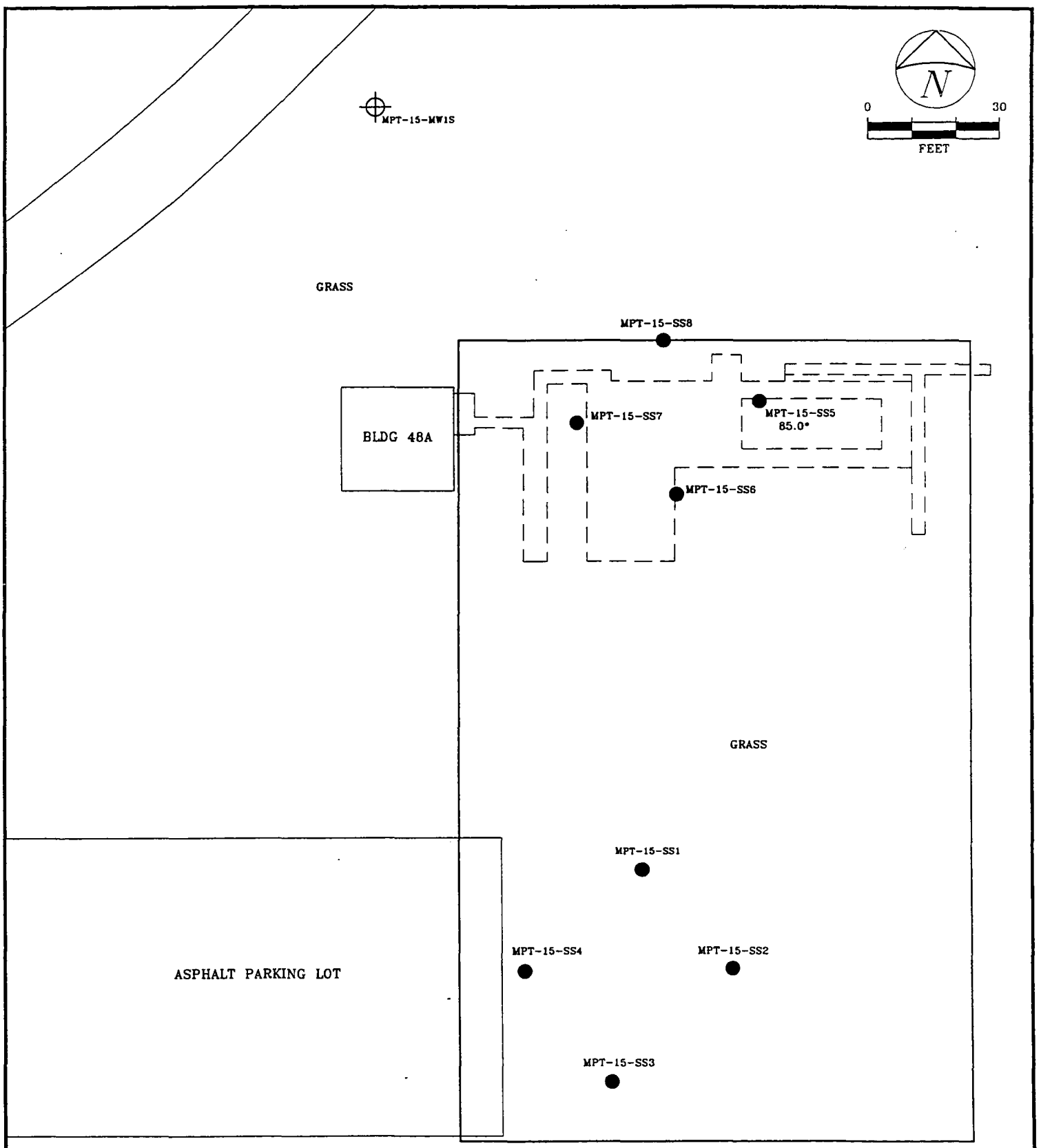


LEGEND

MPT-15-SS5 16.0* — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF HEPTACHLOR CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3V



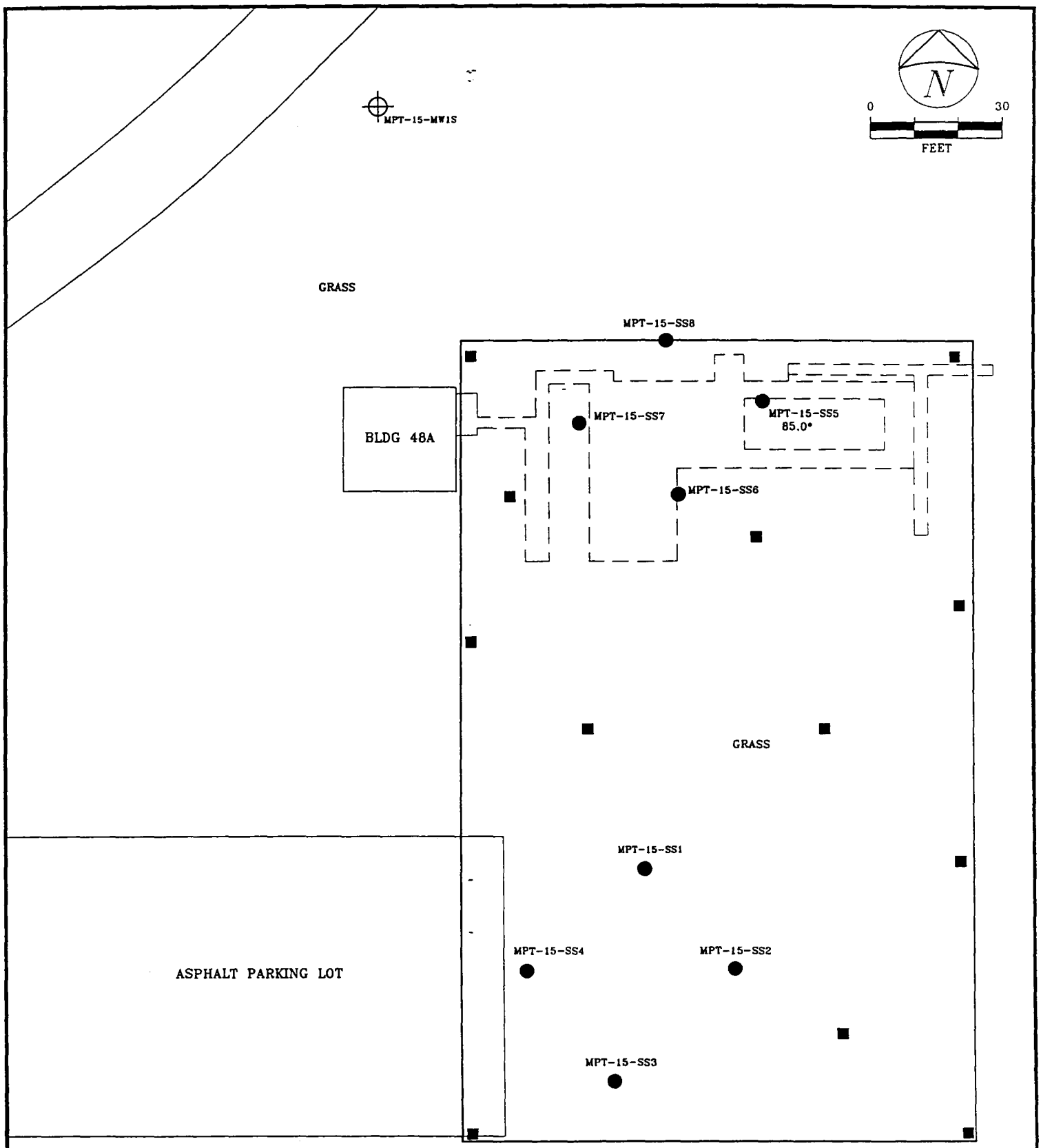
LEGEND

MPT-15-SS5 85.0* — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991 SHOWING AVERAGE CONTAMINATION VALUE (mg/kg) @ 0-2'
* INDICATES A SINGLE SAMPLE WAS ANALYZED @ 0-1' OR @ 1'-2'

ISOCONCENTRATION OF HEPTACHLOR EPOXIDE CONTAMINATION IN SOIL @0-2'. SWMU 15
U.S. Naval Station, Mayport, Florida

Figure 3W

Figure 4 - Proposed Control Soil Sample Location



LEGEND

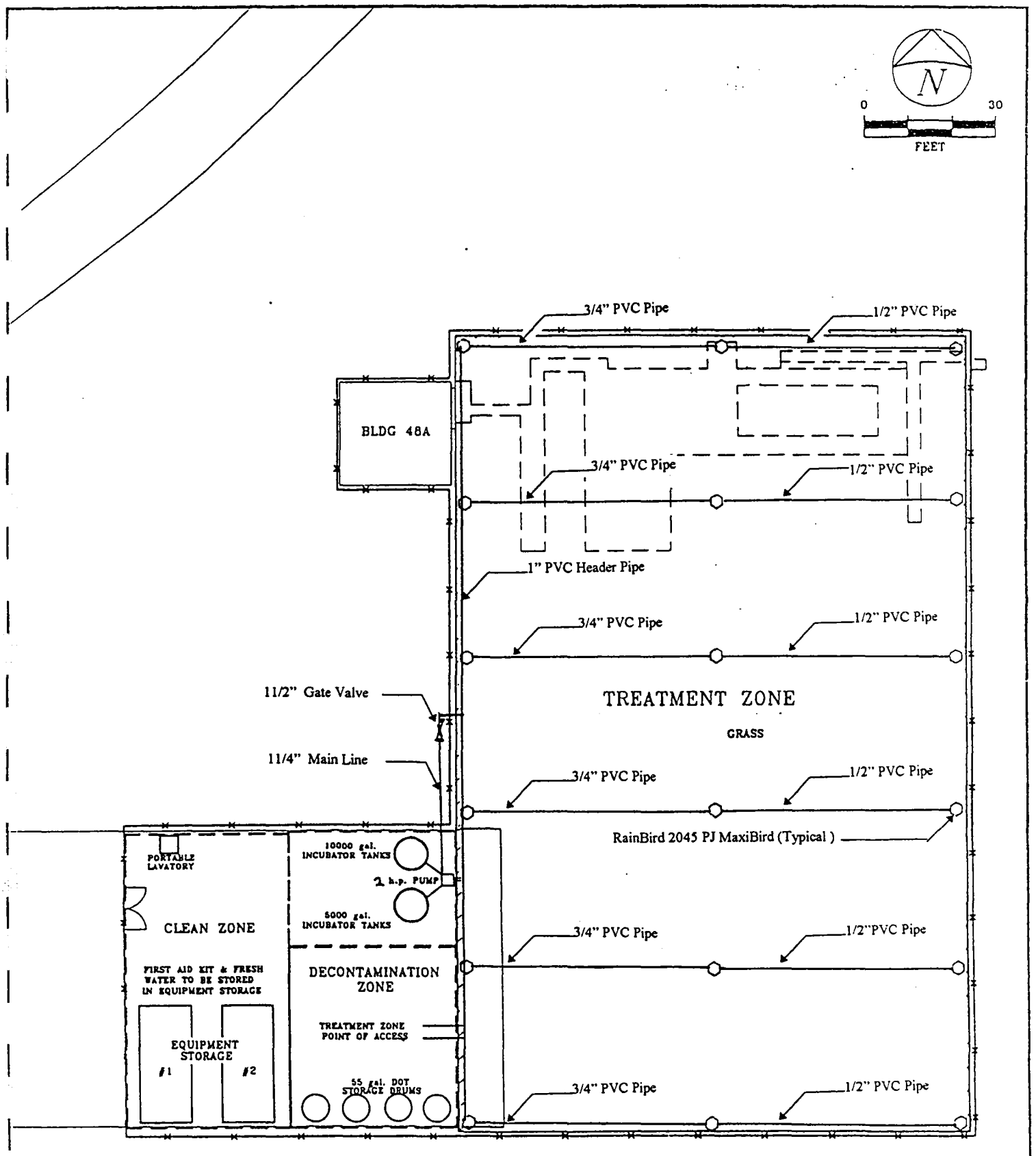
MPT-15-SS5 LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991

LOCATION OF PROPOSED CONTROL SURFACE AND SUBSURFACE SOIL SAMPLE (12 SAMPLES)

PROPOSED CONTROL SOIL SAMPLE LOCATION
Solid Waste Management Unit 15
U.S. Naval Station, Mayport, Florida

Figure 4

Figure 5 - Application System Plan



LEGEND

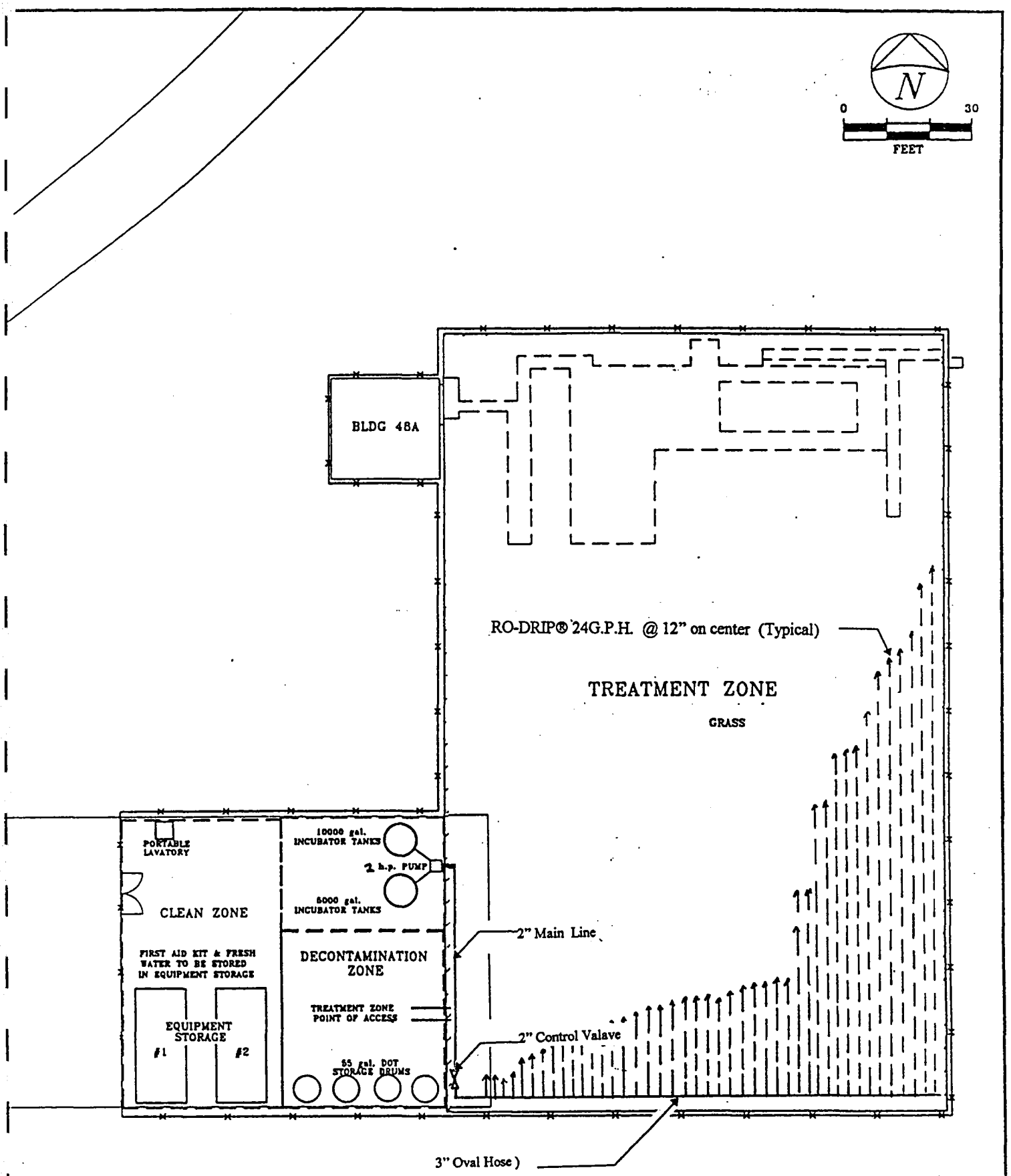
4' SAFETY ORANGE SNOW FENCE

CLASS 200 IRRIGATION PIPE

RAIN BIRD 2045 PJ MAXIBIRD

TREATMENT STAGING AREA SITE PLAN
SMWU 15, Old Pesticide Handling Area
U.S. Naval Station, Mayport, Florida

APPLICATION SYSTEM | *Figure 5*



LEGEND

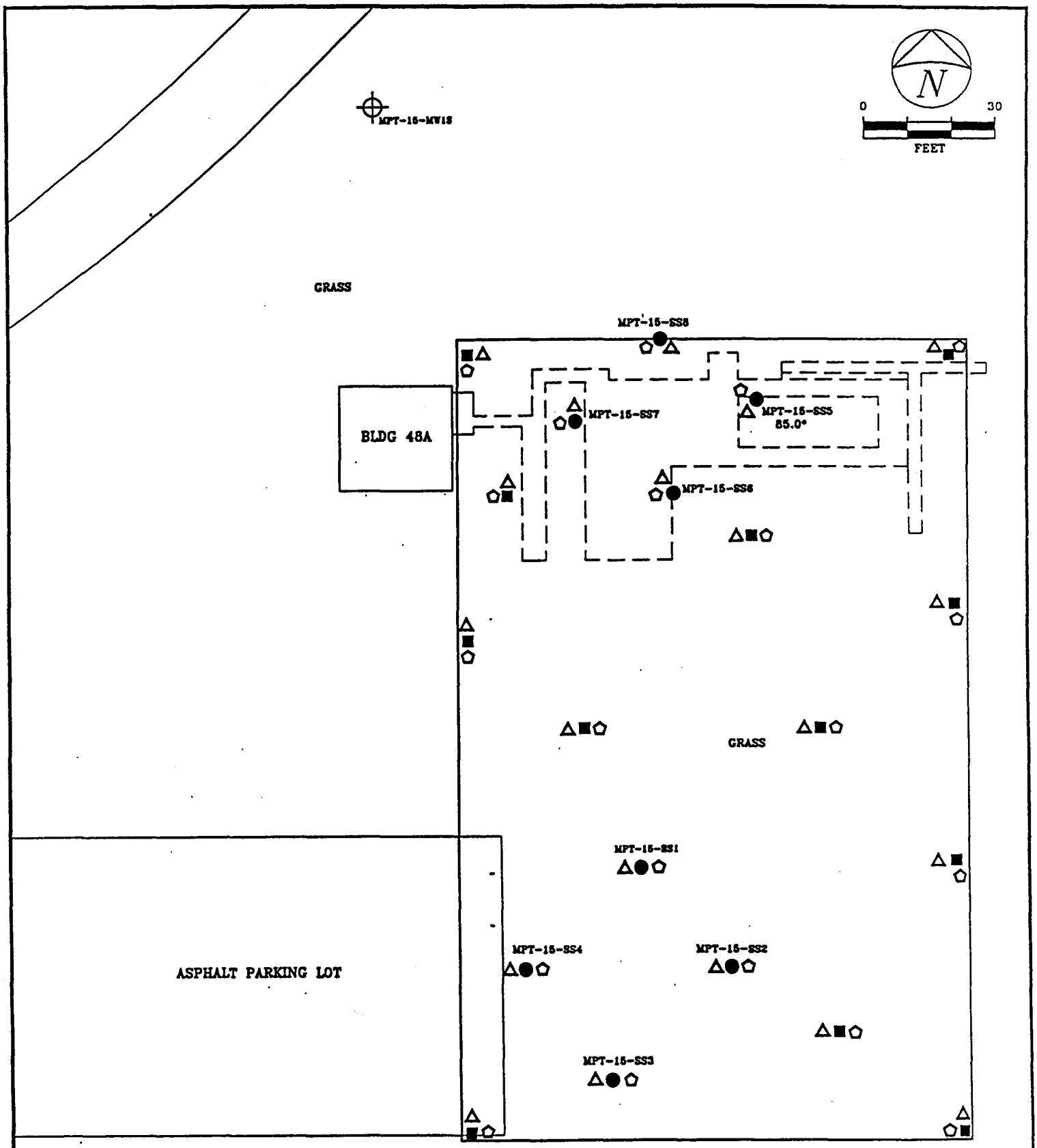
4' SAFETY ORANGE SNOW FENCE

RO-DRIP® 24G.P.H. @ 12" on center

TREATMENT STAGING AREA SITE PLAN
SMWU 15, Old Pesticide Handling Area
U.S. Naval Station, Mayport, Florida

APPLICATION SYSTEM | *Figure 5A*

Figure 6 - Field Screening Soil Sample Location



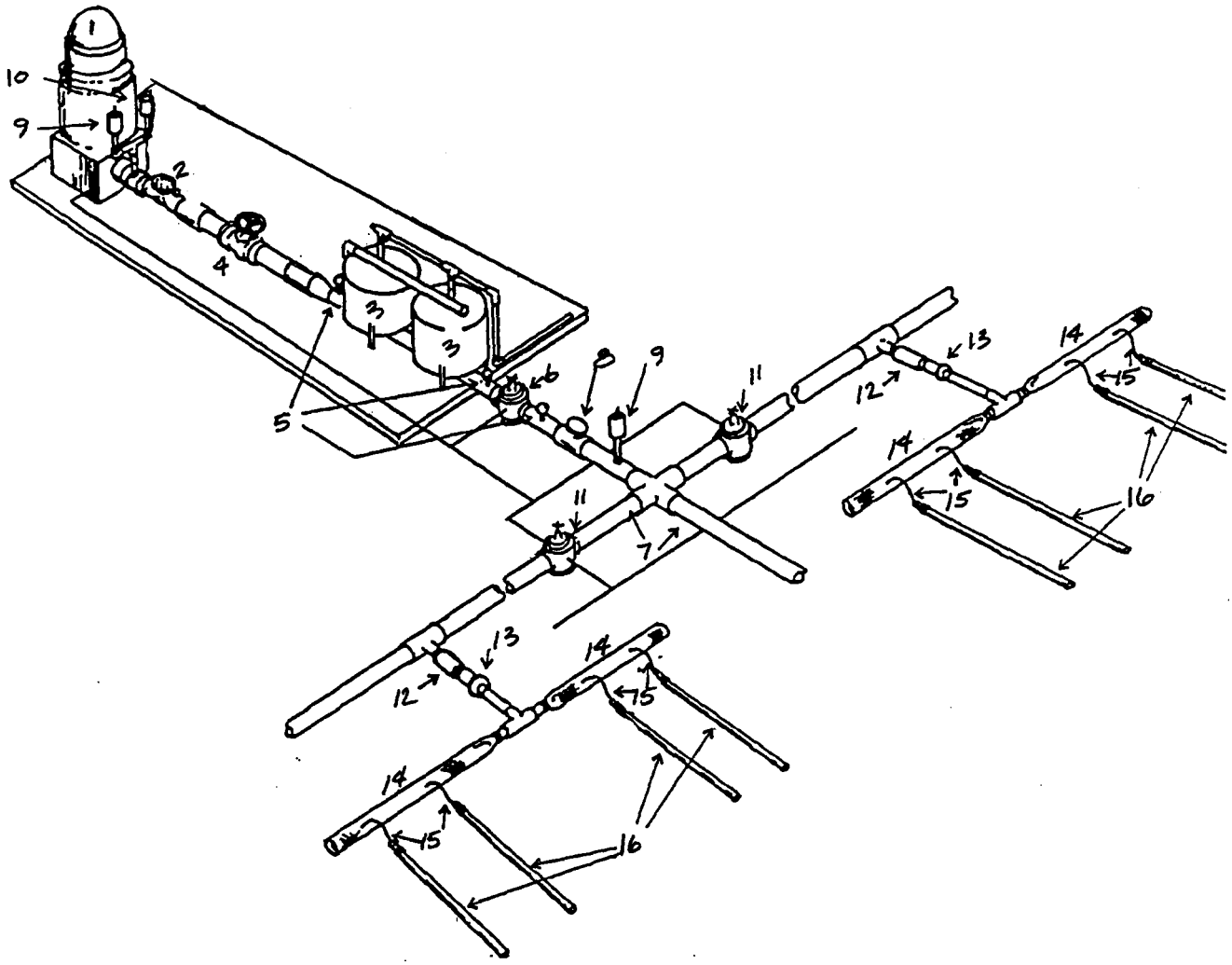
LEGEND

- ● MPT-15-SS5 — LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991
- ■ LOCATION OF CONTROL (prior to treatment) SOIL SAMPLE (12 SAMPLES)
- △ LOCATION OF 7-DAYS, 10-DAYS AND 28 DAYS CONFIRMATORY SOIL SAMPLES (20 SITES)
- ⬠ LOCATION OF FINAL (60 DAYS) CONFIRMATORY SOIL SAMPLE (20 SITES)

CONFIRMATORY SOIL SAMPLE LOCATION
Solid Waste Management Unit 15
U.S. Naval Station, Mayport, Florida

Figure 6

Figure 7 - Application System Details



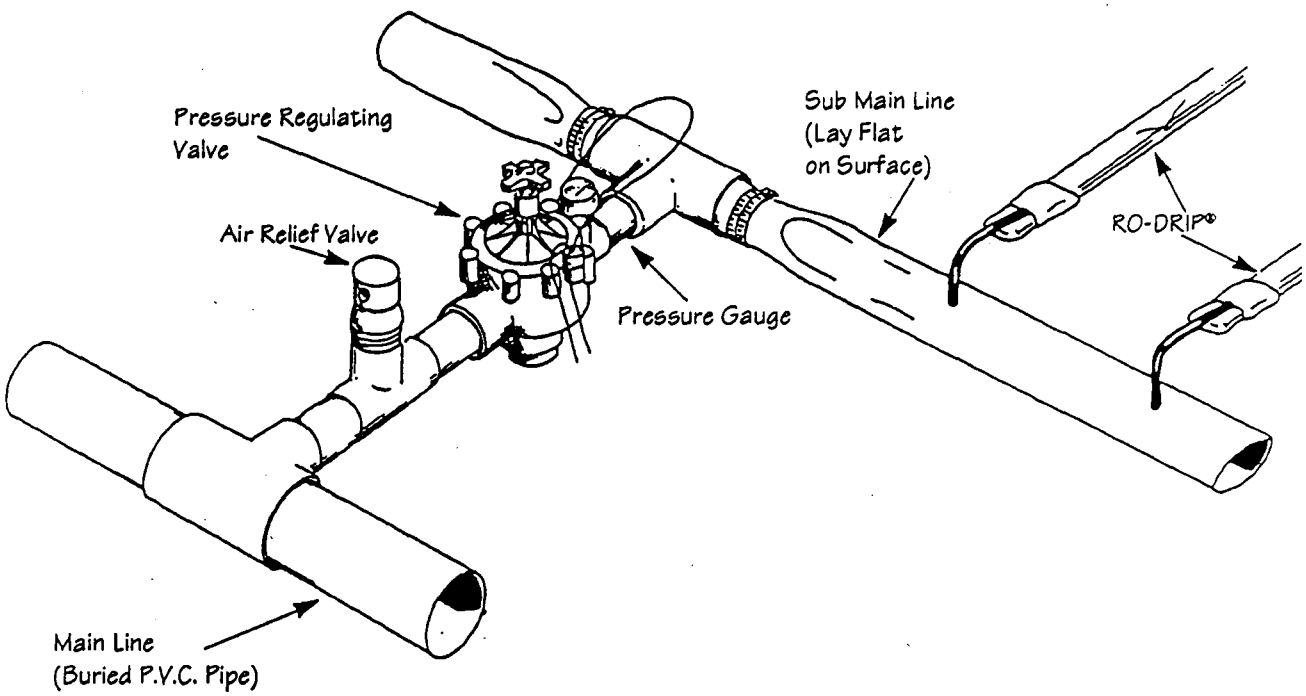
Equipment

All RO-DRIP® Irrigation System components:

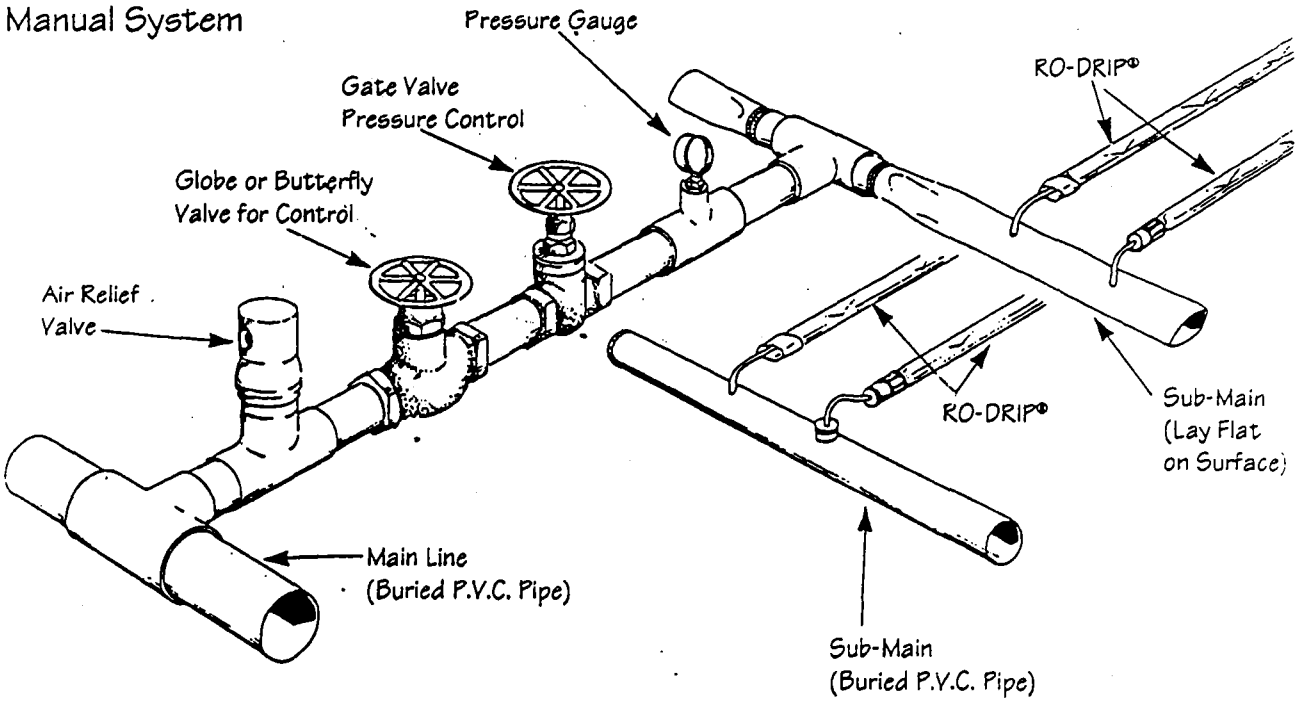
1. Pump
2. Back Flow Prevention Valve
3. Filter Tanks
4. Gate Valve
5. Pressure Gauges
6. Mainline Control Valve
7. Mainline
8. Flowmeter
9. Air Vents at all High Points
10. Pressure Relief Valve
11. Field Control Valve
12. Sub-Main Secondary Filters
13. Pre-set Pressure Regulator
14. Sub-Main
15. Lateral Hookups
16. RO-DRIP® Laterals

Connection of Control Valve to Sub-Main

Automatic System



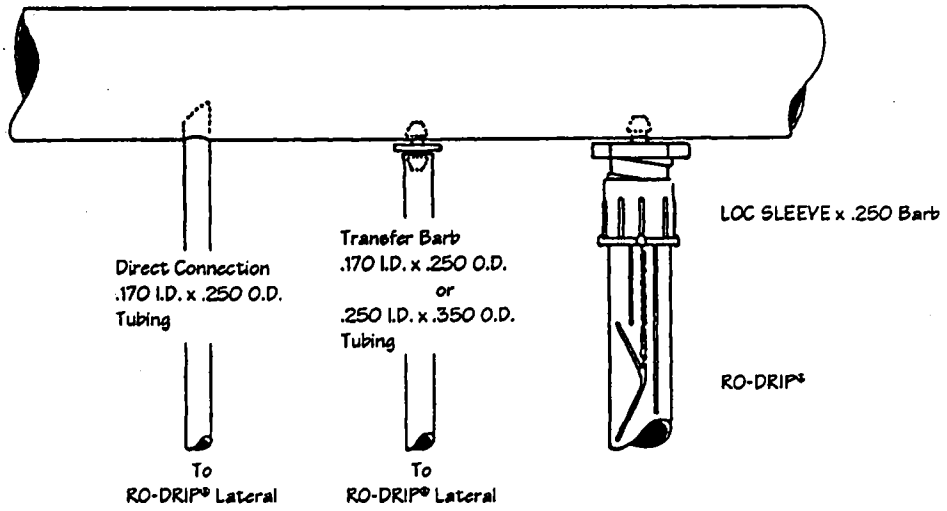
Manual System



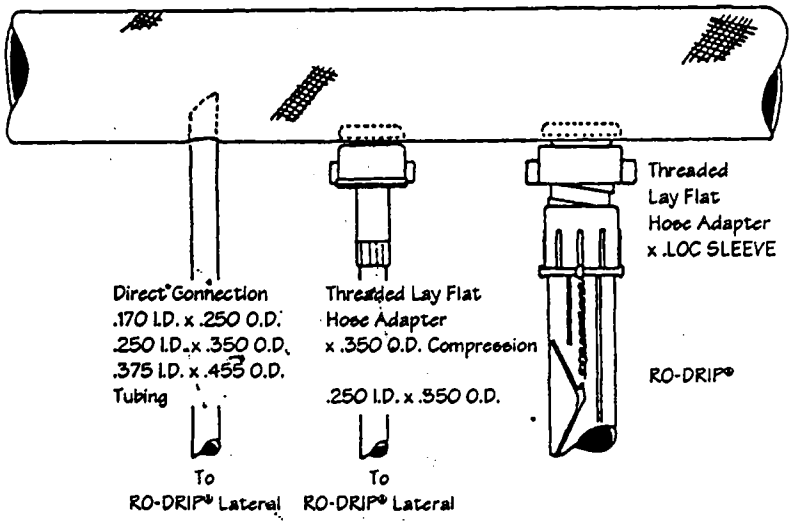
Connections

Connection of RO-DRIP® to Sub-Main

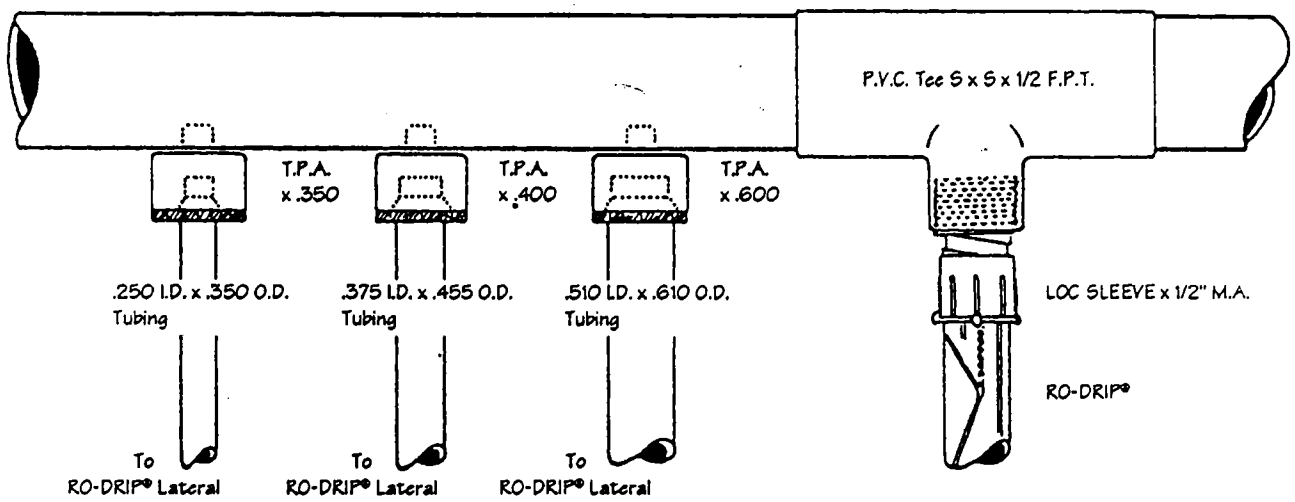
OVAL HOSE



LAY FLAT HOSE

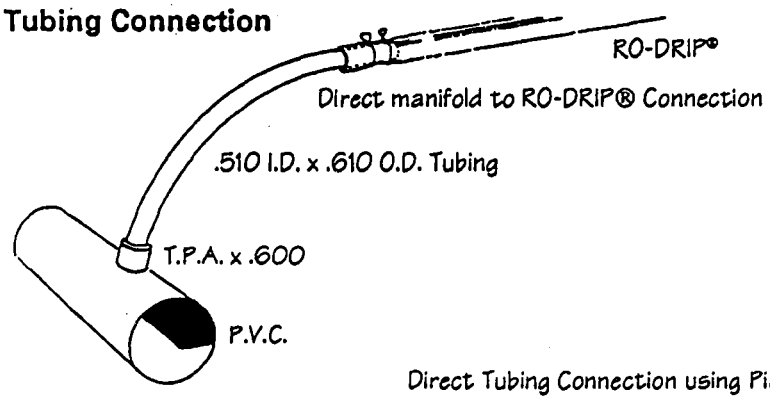


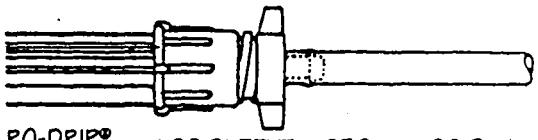
P.V.C.

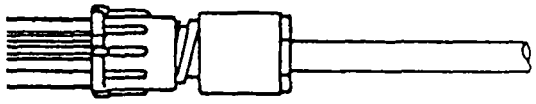


Connections

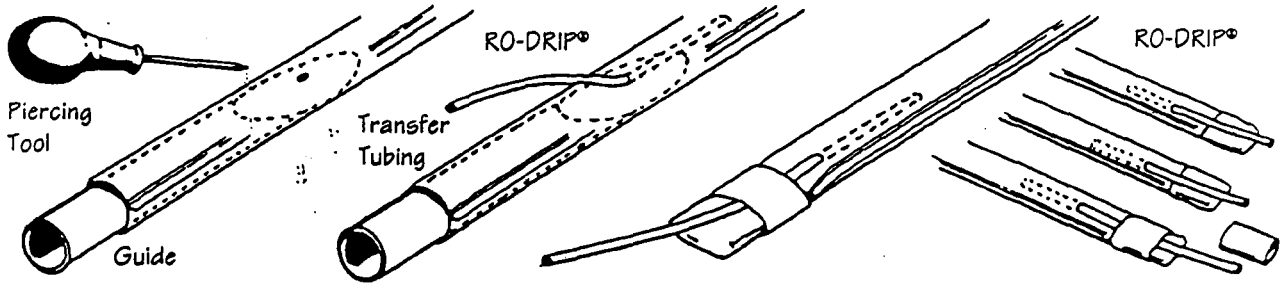
Tubing Connection



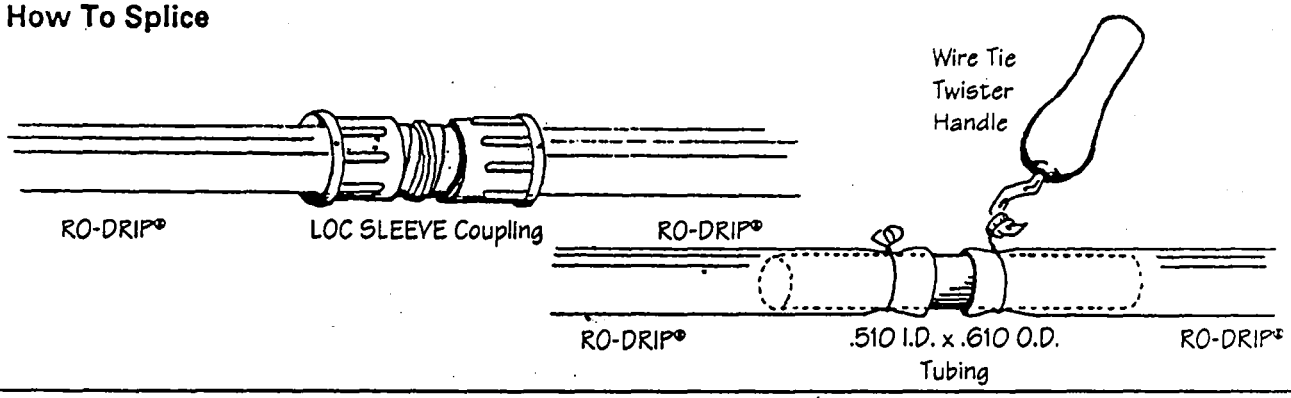




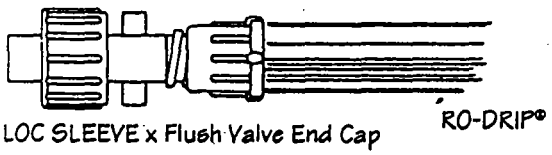
Direct Tubing Connection using Piercing Tool and Guide

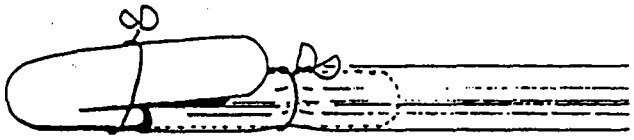


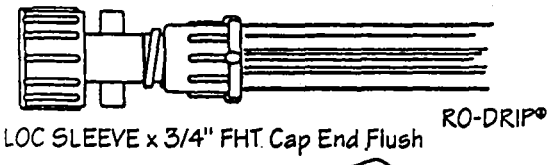
How To Splice

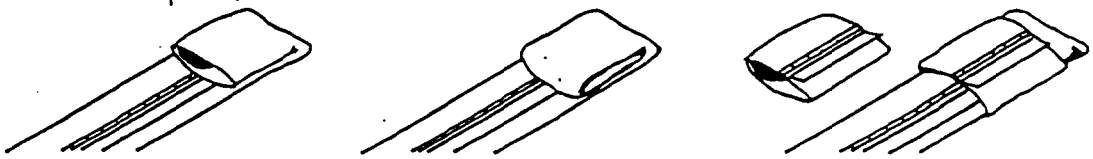


Closing Methods







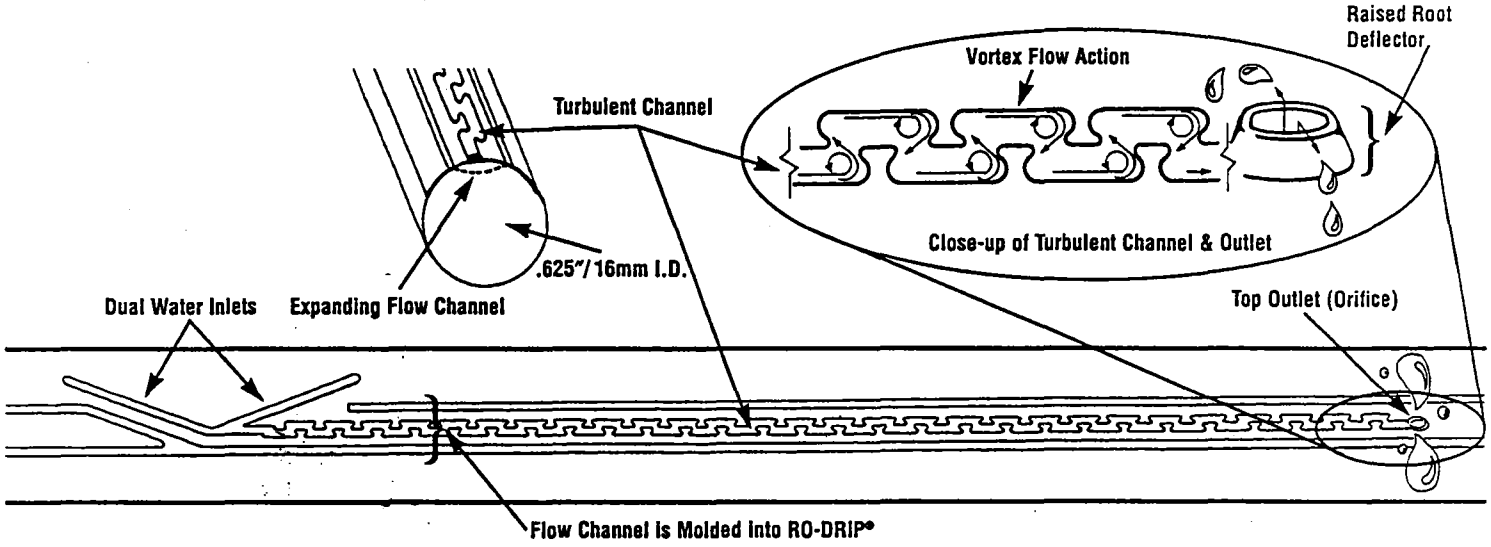


Closing RO-DRIP® by folding over twice and sliding cut piece over folded end of RO-DRIP®

Figure 8 - Application System Data

RO-DRIP®

.625″/16mm Inside Diameter



Features & Advantages

Large Turbulent Channel with Vortex Flow Action
Allows long uniform runs and resist plugging by keeping particles from settling in flow channel.

Expanding Flow Channel
Expands to allow purging of contaminants.

Heat Sealed Construction
Provides a highly reliable product.

Molded Flow Channel
Produces a consistently uniform product.

Raised Root Deflector
Raised top outlet deflects roots and resists root intrusion.

Dual Water Inlets
Two water inlets as large as the flow channel reduce the potential for inlet plugging.

Top Quality Plastic
Resists tearing and ensures a strong product. Participant in Union Carbide FINGERPRINT™ program.

SPACINGS - 4″/10cm, 8″/20cm, 12″/30cm, 16″/40cm, 24″/61cm

STANDARD FLOW RATES:

*60 G.P.H./100′ @ 8 P.S.I. 745 L.P.H./100m @ .55 Bars
40 G.P.H./100′ @ 8 P.S.I. 496 L.P.H./100m @ .55 Bars
[redacted]
*20 G.P.H./100′ @ 8 P.S.I. 248 L.P.H./100m @ .55 Bars
**17 G.P.H./100′ @ 8 P.S.I. 211 L.P.H./100m @ .55 Bars
15 G.P.H./100′ @ 8 P.S.I. 186 L.P.H./100m @ .55 Bars

*Available only in 8 mil/.127mm 4″/10cm spacing.
**Available only in 15 mil/.375mm 24″/61cm spacing.

THICKNESS AND LENGTH:

5 mil 12,500′ .127mm 3810m
8 mil 7,500′ .20mm 2286m
10 mil 6,000′ .254mm 1829m
[redacted]

12″ SPACING 24 G.P.H. PER 100 Feet @ 8 P.S.I.

0% SLOPE				
INLET PRESSURE (P.S.I.)				
*E.U.	6	8	10	12
90%	600 ft	600 ft	635 ft	635 ft
85%	765 ft	765 ft	800 ft	800 ft

1% DOWNHILL SLOPE				
INLET PRESSURE (P.S.I.)				
*E.U.	6	8	10	12
90%	800 ft	800 ft	800 ft	800 ft
85%	1000 ft	1000 ft	1000 ft	1000 ft

2% DOWNHILL SLOPE				
INLET PRESSURE (P.S.I.)				
*E.U.	6	8	10	12
90%	700 ft	800 ft	800 ft	850 ft
85%	1000 ft	1035 ft	1035 ft	1035 ft

*Emission Uniformity

RO-DRIP®
Length and Application Rates

United States Units of Measurement

Distance Between RO-DRIP® Laterals in.	Length of RO-DRIP® per Acre ft.	RO-DRIP® Flow Rate per 100 ft. @ 8 P.S.I.				
		40 GPH .67 GPM	24 GPH .40 GPM	20 GPH .33 GPM	17 GPH .28 GPM	15 GPH .25 GPM
		↓ Application Rate per Acre (acre inches per hr @ 8 PSI)				
30	17,424	0.258	0.155	0.131	0.108	.096
32	16,335	0.242	0.145	0.123	0.101	.090
34	15,374	0.228	0.136	0.115	0.095	.085
36	14,520	0.215	0.129	0.109	0.090	.080
38	13,756	0.204	0.122	0.103	0.085	.076
40	13,068	0.193	0.116	0.098	0.081	.072
42	12,446	0.184	0.110	0.093	0.077	.069
44	11,880	0.176	0.105	0.089	0.074	.066
46	11,363	0.168	0.101	0.085	0.070	.063
48	10,890	0.161	0.093	0.082	0.067	.060
54	9,680	0.143	0.086	0.073	0.060	.054
60	8,712	0.129	0.074	0.065	0.054	.048
66	7,920	0.117	0.070	0.059	0.049	.044
72	7,260	0.107	0.064	0.055	0.045	.040
84	6,223	0.092	0.055	0.047	0.039	.034
96	5,445	0.081	0.048	0.042	0.034	.030
120	4,356	0.064	0.039	0.033	0.027	.024

Appendix A - List of References

REFERENCES

1 Solicitation, Offer and Award, Issued by: Commanding Officer, Southern Division, Naval Facilities Engineering Command, 2155 Eagle Drive, P.O. Box 190010, North Charleston, SC 29419-9010.

2 U.S., NAVSTA, Mayport, Florida, Resource Conservation and Recovery Act (RCRA) Facility Investigation Workplan, Addendum 4, Job Number 06-94-0889, Figures 4-22, 4-23, 4-24 and 4-26.

REVISED SITE HEALTH AND SAFETY PLAN

Bioaugmentation Corrective Action

Naval Station, Mayport, Florida
Category #1, Area #1, Pesticide Area, SWMU 15

August 1995

For Submittal to:

DEPARTMENT OF THE NAVY

SOUTHNAVFACENGCOM
2155 Eagle Drive, PO Box 190010
North Charleston, SC 29419-9010
(803) 743-0974

Contract Number: N62467-94-D-0889

Prepared by:

FIFCO International, Inc.

1011 Camino Del Mar, Suite 240
Del Mar, California 92014
(619) 259-7710 / FAX (619) 259-9014

FIFCO International, Inc. Project Number: 94-1021-NSMFL-CA

Prepared for: FIFCO International, Inc.

For Submittal to: Department of the Navy, Southern Division Naval Facilities Engineering Command.

Project Location: Naval Station, Mayport, Florida, Category #1, Area #1, Pesticide Area, Solid Waste Management Unit (SWMU) 15.

All personnel participating in the field must be trained in the general and specific hazards unique to the job and, if applicable, meet recommended medical examination requirements. All **Environmental Consulting & Technology, Inc's. (ECT) /FIFCO International, Inc's. (FII)** personnel and visitors shall follow the guidelines, rules, and procedures contained in this Site Health and Safety Plan (SHSP). The project manager and the site health and safety officer may impose any other procedures or prohibitions that they believe are necessary for safe operations.

This plan is prepared to inform all field personnel, including **ECT** and **FII** contractors and subcontractors, of the potential hazards of the site. However, each contractor and/or subcontractor must assume direct responsibility for his/her own employees' site health and safety.

Plan Prepared By:

Mike Luster, SHSP
FL. C.I.H. 2132, Expires12/31/00

Date 9/5/95

Plan Approved By:

John R. Edwards, Project Engineer
FL. P.E. 46584 - Expires 02/28/97

Date 8/31/95

L. Duane Dungan, P.G., Project Geologist
FL. P.G.0000040 - Expires 07/31/96

Date 8/31/95

Local Health & Safety
Representative

Date 9/5/95

TABLE OF CONTENTS

Section Number and Title — Page

1.0 Introduction ---------- 1

2.0 Persons Responsible And Involved ---------- 1

3.0 Facility Background ---------- 2

4.0 Identified Chemical Contaminants ---------- 2

5.0 General Work Practices ---------- 6

6.0 Site Control/Work Zones ---------- 6

7.0 Site Resources ---------- 7

8.0 Hazard Analyses ---------- 8

9.0 Hazard Mitigation ---------- 9

10.0 Air Monitoring ---------- 12

11.0 Required Personal Protection And Related Safety Equipment ---------- 14

12.0 Decontamination Procedures ---------- 16

13.0 Documentation ---------- 18

14.0 Contingency/Emergency Information ---------- 21

FIGURES

Figure 1 - Vicinity Map
Figure 2 - Site Plan
Figure 3 - Treatment Staging Area Site Plan
Figure 4 - Wind Rose

1.0 Introduction

Site Location: Naval Station, Mayport, Jacksonville, Florida, Category #1, Area #1, Pesticide Area SWMU 15

The possible hazards on this job site are expected to be as follows:

Item	Description
Chemical:	See Section 4.0, *Identified Chemical Contaminants*
Mechanical:	Drilling Equipment, power and hand tools
Physical:	Vehicular traffic, noise, energized power tools

Required personal protective items and equipment for this project are:

Item	Description
Head Protection	Hard Hat
Boots	Steel toed
Pants	Long, Denim or equal
Respirator	Half-face negative pressure
Vapor Detection Device	Photoionization detector (PID)
Eye Protection	Safety Glasses
Ear Protection	Ear Plugs
Visual Recognition Device	Traffic Safety Vest

2.0 Persons Responsible and Involved

Project Manager: Kenneth Oftedal

Responsibilities: Plan, coordinate and participate in field operations, field scheduling and implementation of the bioaugmentation operations. Ensure all field personnel receive site specific assignments from the Project Manager (PM) and conduct production activities under his direction. Be on site at all time when field activities are being conducted.

Site Health and Safety Officer (SHSO): Mike Luster, C.I.H.

Responsibilities: Ensure a SHSP is prepared, written and reviewed, and that Health and Safety (H&S) equipment required by the SHSP is available, working and calibrated. Ensure that field team members received site-specific training as required by the SHSP. Prepare and distribute SHSP to project team members. Ensure implementation of the SHSP and that on-site personnel comply with the SHSP, and that tailgate safety meetings are conducted. Direct emergency response efforts during field emergencies. Ensure that general "Safe Work Practices" and "Site-Specific Safe Work Requirements" are followed. SHSO Will be present during application or have a designee present. Will be responsible for upgrading or downgrading requirements based upon conditions; responsible for shutting down operations.

3.0 Facility Background

A) FACILITY BACKGROUND AND DESCRIPTION:

The site is classified as a "Old Pesticide Handling Area".

B) IF A DESIGNATED HAZARDOUS WASTE SITE (NPL, STATE, LOCAL...) DESCRIBE:

This site is a Federally designated Solid Waste Management Unit (SWMU) currently managed under the Station's HSWA permit.

C) SITE HISTORY (USE OF SITE, ORIGIN OF CONTAMINATION):

SWMU 15, Old Pesticide Handling Area (see RAP, Section 1.0, *Site Description*, and 2.0, *Site History and Background*).

D) HAZARDOUS INCIDENCE HISTORY (HISTORY OF INJURIES, EXPOSURE, CHEMICAL SPILLS COMPLAINTS, ETC.):

There is no known record of injuries at this site. There is no known exposure to chemicals used at this site other than that which would be expected in normal handling and day to day operations. Spills, other than rinsing and dumping of containers, probably occurred at this site during routine operations. There is no record of complaints related to this site.

E) PURPOSE OF ACTIVITY/OBJECTIVE OF **FIFCO's** WORK (E.G., CHARACTERIZATION, REMEDIAL ACTIONS, EXCAVATION, TRENCHING - INCLUDE LOCATION WITH RESPECT TO AREAS OF KNOWN OR SUSPECTED CONTAMINATION):

Remedial Action utilizing **Bac-Terra™ Remedial Technology** .

F) SITE STATUS (ACTIVE, INACTIVE, UNKNOWN):

Inactive.

G) SURROUNDINGS (LOCATION WITH RESPECT TO RESIDENCES, SCHOOLS, COMMERCIAL SITES, NATURAL FEATURES, ROADS, GRADIENTS, TANKS, ETC.):

On base housing is located in the southeastern portion of the station. The small town of Mayport is located along the western boundary of the station.

H) SITE MAP (ATTACH MAP AT END OF THIS PLAN SHOWING SALIENT FEATURES, INCLUDING LOCATION OF **FIFCO's** WORK AND LOCATION OF CONTAMINATED AREAS):

See Attached Figure 1 *Vicinity Map* , and Figure 2 *Site Plan*.

I) CLIMATE: AVERAGE WIND SPEED AND DIRECTION:

Please see attached wind rose figure 4.

4.0 Identified Chemical Contaminants

LIST CHEMICAL CONTAMINANTS THAT HAVE BEEN IDENTIFIED, THEIR CONCENTRATION, AND THE ENVIRONMENTAL MEDIA IN WHICH THEY ARE PRESENT.

Table-4.0a
CHEMICALS DETECTED IN SOIL (0-1) FEET

Chemicals Detected	Unit	MPT-15-SS11	MPT-15-SS21	MPT-15-SS31	MPT-15-SS41	MPT-15-SS51	MPT-15-SS61	MPT-15-SS71	MPT-15-SS81	MPT-15-SS81-DUP
Acetone	µg/kg	4.0 J			2.0 J	30.0 J	9.0 J			
Bis(2-ethylhexyl) phthalate	µg/kg							200.0 J		
Butylbenzylphthalate	µg/kg					18,000	640.0 J		180.0J	250.0 J
Dichlorophenyl dichloroethene (4,4-DDE)	µg/kg	24.0	28.0	160.0	49.0	100.0 J	72.0 J	2,800	260.0 J	230.0 J
Dichlorophenyl dichloroethane (4,4,-DDT)	µg/kg	9.2	22.0	34.0	18.0	100.0 J	84.0 J	1,500	110.0 J	140.0 J
Chlordane	µg/kg					5,600	1,100		1,000	710.0
Heptachlor	µg/kg					16.0 J				
Heptachlor epoxide	µg/kg					85.0 J				
Antimony	mg/kg	2.8								
Arsenic	mg/kg	1.3	1.2 J	1.2 J	1.4 J	2.9 J	5.0	3.0 J	2.9 J	2.9 J
Barium	mg/kg	7.1	5.1 J	4.3 J	5.5 J	7.5 J	4.5 J	30.6 J	27.7 J	21.8 J
Beryllium	mg/kg	0.16	0.12	0.14	0.17	0.09	0.10	0.07	0.09	0.09
Cadmium	mg/kg		0.62		0.59			0.5	0.8	0.84
Chromium	mg/kg	4.3	5.4	3.2	4.0	2.5	8.7	14.6	9.1	10.9
Cobalt	mg/kg	0.48	0.51	0.7	0.36	0.26	0.38	0.59	0.66	0.65
Copper	mg/kg	8.2	4.5	2.3	2.3	2.0	1.1 J	11.4	9.3	10.8
Lead	mg/kg	17.1	26.3	15.5	2.4	8.9	4.9	107.0 J	257.0 J	325.0 J
Mercury	mg/kg							0.07	0.53	0.62
Nickel	mg/kg		1.6					1.4		
Selenium	mg/kg	0.81	0.64	0.5 J	1.9	0.57 J	0.74 J	0.73 J	0.27 J	0.59 J
Tin	mg/kg			4.2	0.48 J				3.7	3.8
Vanadium	mg/kg	2.1	3.2	3.2	3.6	1.6 J	1.8	3.7	3.0	3.3
Zinc	mg/kg	22.8 J	53.6 J	72.6 J	28.5 J	39.6 J	9.1 J	165.0 J	169.0 J	174.0 J

Table-4.0b
CHEMICALS DETECTED IN SOIL (1-2) FEET

Chemicals Detected	Unit	MPT-15-SS12	MPT-15-SS22	MPT-15-SS32	MPT-15-SS42	MPT-15-SS52	MPT-15-SS62	MPT-15-SS72	MPT-15-SS82	MPT-15-SS82-DUP
Acetone	µg/kg	4.0 J	2.0 J	2.0 J	3.0 J	5.0 J	46.0 J			
Butylbenzylphthalate	µg/kg					380.0				
Dichlorophenyl dichloroethene (4,4-DDE)	µg/kg	28.0			2.1	1.9 J				
Dichlorophenyl dichloroethane (4,4,-DDT)	µg/kg	22.0			2.4					
Chlordane	µg/kg					180.0				
Arsenic	mg/kg	1.2 J	1.1 J	1.5 J	1.5 J	2.5 J	5.1	2.1	1.5 J	1.5 J
Barium	mg/kg	2.9 J	2.1 J	2.9 J	3.9 J	4.5 J	2.8 J	4.8 J	5.0 J	4.7 J
Beryllium	mg/kg	0.12	0.12	0.11	0.14	0.05	0.07	0.07	0.09	0.07
Chromium	mg/kg	2.0	1.8	2.0	2.5	0.86	2.9	1.9	1.3	0.93
Cobalt	mg/kg	0.24	0.31	0.49	0.35	0.41			0.37	
Copper	mg/kg	0.28 J	0.33 J	0.46 J	0.5 J	0.44 J	0.54 J	1.6 J	1.1 J	1.3 J
Lead	mg/kg	0.9	1.5	1.0	2.6	0.5	0.3	0.86	0.5	0.41
Selenium	mg/kg	0.52 J	0.54 J		0.37 J	0.44 J	0.62 J	0.64 J	0.46 J	0.46 J
Tin	mg/kg			4.2						
Vanadium	mg/kg	1.6	2.0	1.5	2.2	0.86	0.97	1.6	1.2	1.1
Zinc	mg/kg	1.3 J	1.5 J	3.6 J	3.1 J	3.5 J	2.6 J	7.8 J	5.0 J	2.4 J

Table 4.0c
CHEMICALS DETECTED IN SOIL AT MPT-15-MW1S (1-2) FEET, (5-6) FEET (Prior to installation of monitoring well MPT-15-MW1S)

Chemicals Detected	Unit	MPT-15-MSI-2	MPT-15-MS1-6
Acetone	µg/kg		150.0
Antimony	mg/kg		3.0
Arsenic	mg/kg	0.9	0.53
Barium	mg/kg	2.3 J	5.1 J
Chromium	mg/kg		1.5 J
Copper	mg/kg	1.7	2.4
Lead	mg/kg	0.63	0.56
Mercury	mg/kg		0.03 J
Thallium	mg/kg		0.22
Vanadium	mg/kg	0.96 J	1.8 J
Zinc	mg/kg	3.6 J	2.9 J

J = Estimated Value

Table 4.0d
CHEMICALS DETECTED IN GROUNDWATER AT MPT-15-MW1S

Chemicals Detected	Unit	MPT-15-MW1S
a -BHC	µg/kg	0.035
b-BHC	µg/kg	0.68
g-BHC (Lindane)	µg/kg	0.027
Arsenic	mg/kg	9.0
Barium	mg/kg	28.4
Beryllium	mg/kg	0.44
Chromium	mg/kg	17.1
Cobalt	mg/kg	3.3
Copper	mg/kg	8.8
Iron	mg/kg	8630.0 J
Lead	mg/kg	38.1
Manganese	mg/kg	65.3
Vanadium	mg/kg	14.5
Zinc	mg/kg	79.1 J

Chemical Contaminants Characterization:

HAS THE SITE BEEN ADEQUATELY CHARACTERIZED TO THE BEST OF YOUR KNOWLEDGE:

Yes____No X

IF YES, LIST APPLICABLE REFERENCES OR PREVIOUS REPORTS/STUDIES.

N/A

5.0 General Work Practices

In addition to the specific requirements of this SHSP, the following general work practices and safety rules will be in effect during the field operations:

- Smoking, eating, drinking, chewing gum or tobacco will not be permitted within the work zones.
- Personnel should keep track of weather conditions and wind direction to the extent they could affect potential exposure.
- Personnel should be alert to any abnormal behavior on the part of other coworkers that might indicate distress, disorientation, or other ill effects.
- Personnel should never ignore symptoms which could indicate potential exposure to chemical contaminants. These should be immediately reported to their Field Team Leader or the SHSO.
- Persons must secure long hair in a safe manner. Loose-fitting clothing that could become entangled in power equipment is not permitted in the work zones.
- Horseplay is prohibited in the work zone.
- Working while under the influence of intoxicants, narcotics or controlled substances is prohibited.
- Personnel will follow other ECT, Inc.'s./FIFCO Inc.'s Site Health and Safety Standards specific to tasks,(e.g.,installstion safety, drilling safety, site entry, etc.).
- No one will be permitted to engage in work operations alone (applicable to Hazardous Waste Operations as defined by 29 CFR Part 1910.120, Part A), or as is necessary for safe operations.
- Personal must wash face and hands thoroughly before leaving the site.

6.0 Site Control/Work Zones

DESCRIBE LOCATION OF THE EXCLUSION ZONE, HOT LINE, CONTAMINATION REDUCTION ZONE, AND DECONTAMINATION AREA AND SUPPORT ZONE; SHOW LOCATIONS ON SITE PLAN:

During drilling activities, a work zone will be established around the immediate area adjacent to the borings. The decontamination area will be established within the

fenced-in work area as depicted on Figure 3, *Treatment Staging Area Site Plan*. The SHSO will be responsible for controlling access to the site.

DEFINE THE SITE CONTROL/SECURITY MEASURES (E.G., FENCING, LOCKED GATES, KEYS, SECURITY GUARDS, FLAGGING, ETC.):

The work area will be confined within an isolated, fenced area of the Naval Station Mayport and access to the treatment area will be limited.

DESCRIBE SAFETY PLAN LOCATIONS (A COPY OF THE SITE HEALTH AND SAFETY PLAN CAN BE LOCATED):

A Site Health and Safety Plan will be with ECT and/or FIFCO personnel on site, and a copy will be in both the Tampa and Del Mar Offices.

7.0 Site Resources

LOCATIONS OF SITE RESOURCES:

Toilet facilities:	**On-site**
Drinking water supply:	**On-site**
Telephone:	**Mobile Phone will be carried, Public telephones are on site**
Radio:	**N/A**
Other:	

8.0 Hazard Analyses

List all activities in the Job Task column and assign a number to each activity. Identify how each category of hazard exists for each activity.

Activity Number	Job Task	Mechanical	Electrical	Chemical	Temperature	Acoustical	Radioactive	O_2 Deficiency Confined Space	Biohazard
1	Drilling	Heavy Equipment	Overhead and below grade utilities	NE	Heat Stress	Heavy Equipment	NE	NE	NE
2	Bioapplication	1 h.p. water pump. 5K & 10K gallon Water Storage Tank	Electric Shock	NE	Heat Stress	Heavy Equipment	NE	NE	NE
3	Lift & Carry	Light Lifting of product and nutrient barrels and bags.	NE	NE	Heat Stress	Heavy Equipment	NE	NE	NE
4	Sampling	Heavy Equipment	NE	Detergent See Section 4.0 for list of chemical contaminants	Heat Stress	Heavy Equipment	NE	NE	NE

Notes:
NE - Not Expected

9.0 Hazard Mitigation

Identify procedures to mitigate all hazards listed in Section 8, *Hazard Analyses,* by placing the task number next to the appropriate mitigating measure. If there is reason to believe that the Hazard will not be present on site, indicate by placing NE (Not Expected) next to that Hazard. This listing of standard procedures is not comprehensive. Consult LHSR if other known hazards exist. A specific procedure must be entered to mitigate each hazard identified in Section 8, *Hazard Analyses*.

The DON will be responsible for determining the location of underground utilities.

Activity	**Mechanical Hazards**
N/E	Do not stand near backhoe buckets and earthmoving equipment.
1/2/3	Verify that all equipment is in good condition.
NE	Do not stand or walk under elevated loads or ladders.
N/E	Do not stand near unguarded excavations and trenches.
N/E	Do not enter excavations or trenches over 5 feet deep that are not properly guarded, shored, or sloped.
N/E	Other:

Activity	**Electrical Hazards**
1	Locate and mark buried utilities before drilling.
1	Underground Service Alert contacted 48 hours prior to field work to locate and mark underground utilities. Dig Alert #_____ Expiration date _____.
1	Maintain at least 10-foot clearance from overhead power lines.
N/E	Contact utility company for minimum clearance from high voltage power lines.
N/E	If unavoidably close to buried or overhead power lines, have power turned off, with circuit breaker locked and tagged.
2	Properly ground all electrical equipment.
2	Avoid standing in water when operating electrical equipment.
N/E	If equipment must be connected by slicing wires, make sure all connections are properly taped.
2	Be familiar with specific operating instructions for each piece of equipment.
N/E	Do not attempt to work on energized system unless given specific instructions.
N/E	Other:

Activity	**Chemical Hazards**
1	Use personal protective equipment indicated in Section 11, *Required Personal Protection and Related Safety Equipment*.
1/4	Conduct direct reading air monitoring to evaluate respiratory and explosion hazards (list instrument, action level, monitoring location, and action to be taken in Section 10, *Air Monitoring*).
N/E	Consult LHSR for personal air monitoring.
N/E	Other:

Temperature Hazards

Activity	1. **Heat Stress**
1/3/4	When temperature exceeds 70° F, take frequent breaks in shaded area. Unzip or remove coveralls during breaks. Have cool water available. Drink small amounts frequently to avoid dehydration. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the work cycle should be shortened by 10 minutes (or 30 percent), while the length of the rest period stays the same. If the pulse rate is 110 beats/minute at the beginning of the subsequent period, the following work cycles should be shortened by 33 percent.

Activity	2. **Cold Stress**
1/2/3/4	Wear multilayer cold weather outfits. The outer layer should be of wind resistant fabric.
1/2/3/4	Drink warm fluid. Provide warm shelter for resting. Use buddy system. Avoid heavy sweating. For moderate to heavy work activity with no noticeable wind in 0° to -30°F (-18° to -34° C) total work time is 4 hours. Maximum work period is 55 minutes with three 10-minute breaks in a 4-hour period. Below -30° F, consult LHSR.

Activity	**Acoustic Hazards**
1/2	Use earplugs or earmuffs when noise level prevents conversation in normal voice at a distance of 3 feet.

Oxygen Deficiency: Confined Space Hazards

Confined spaces include trenches, pits, sumps, elevator shafts, tunnels, or any other area where circulation of fresh air is restricted or ability to readily escape from the area is restricted. Consult LHSR and Corporate Health and Safety Policy prior to entering a confined space.

Activity **Oxygen Deficiency: Confined Space Hazards (Continued)**

N/E Obtain permit for confined space entry.

N/E Monitor Oxygen and organic vapors before entering. If following values are exceeded, do not enter:

- Oxygen less than 19.5 percent or greater than 21 percent.
- Total hydrocarbons greater than 5 parts per million above background, if all air contaminants have not been identified.
- Concentrations of specific contaminants exceeding the action levels in Section 10, *Air Monitoring*, if all air contaminants are identified.

N/E Monitor Oxygen and organic vapors continuously while inside confined space. If values cited above are exceeded, evacuate immediately. Record instrument reading.

N/E At least one person must be on standby outside the confined space who is capable of pulling workers from confined space in an emergency.

N/E Use portable fans or blowers to introduce fresh air to confined spaces whenever use of respirator is required.

N/E Work involving the use of flame, arc. spark, or other source of ignition is prohibited within a confined space.

Activity **Radiation Hazards**

NE If radiation meter indicates 2 millirem per hour (mR/hr) or more, leave the area and consult LHSR.

Activity **Biohazards**

NE Poison oak, poison ivy.

NE Infectious waste.

NE Rabid animals.

NE Ticks, mosquitoes, and other insects (disease carriers or poisonous).

NE Avoid breathing dust in dry desert or central valley areas (valleyfever).

NE Biological or animal laboratories.

10.0 Air Monitoring

Air monitoring should be conducted with instruments selected to measure contaminants that employees may be exposed to. Measurements should be taken within the breathing zones of workers. If action levels are reached for a 1-minute reading, appropriate action must be taken.

GASES AND VAPORS

Instrument & Date of Calibration	Calibration Gas Standard	Frequency/Duration of Air Monitoring	Action Level (a) (b) Above Background (Breathing Zone)	Action
				Introduce Engineering Controls (Level D)
PID Calibrated daily	Hexane	Continuous during drilling	≥ 5 ppm	Respirator Modified (Level C)
PID Calibrated daily	Hexane	Continuous during drilling	≥ 1,000 ppm	Leave Area (Level C)
				Upgrade to (Level B)
				Upgrade to (Level A)

Notes:

PID - Photoionization detector
PPM - parts per million
≥ - greater than or equal

(a) Action Levels for "Known Contaminants" should be based upon the contaminants' Permissible Exposure Levels (PELs) or Threshold Limit Values (TLVs).
(b) Action levels for unknown contaminants are based upon PID or FID Measurements in the Breathing Zone.

Reading for 1 minute

Background	Level D
≥0-5 ppm above background	Level C
5-500 ppm above background	Level B
500-1000 ppm above background	Level A

Background concentration (ambient air)_____ppm (a.m.)
_____ppm (p.m.)

(Establish background levels by taking the arithmetic average of six 1-minute readings at various locations on job site)

Comments:

_____

_____

_____

_____

_____

_____

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_____

_____

_____

_____

_____

Explosion Hazard

Instrument & Date of Calibration	Action Level (Ambient Air)	Frequency/Duration of Air Monitoring	Action

Instrument & Date of Calibration	Action Level (Ambient Air)	Frequency/Duration of Air Monitoring	Action

Instrument & Date of Calibration	Action Level (Ambient Air)	Frequency/Duration of Air Monitoring	Action
Date		Determined by SHSO based on observations of on-site conditions and work assignments.	Discontinue operations immediately leave area reevaluate controls by SHSO
Detection Pump/Tubes	Acetone > 25 ppm		
Radiation Monitor	N/A		
Heat Stress Meter	Continuous heavy work & > 1 hour WGBT > 79° F.		
Noise Meter	85 dBA continuous		
H_2S Meter	> 10 ppm		
pH Analyzer Others			
Filters	> PEL's		
Absorption Tube	> PEL's		

Note:
> - greater than
< - less than

11.0 Required Personal Protection and Related Safety Equipment

Place the activity number from Section 8, *Hazard Analyses,* next to each item of personal protection equipment required for that task. All personal safety equipment must meet American National Standard Institute (ANSI) standards or equivalent.

Level: NE___A NE___B NE___C 1-4___D

Comments:

Required Personal Protection and Related Safety Equipment (Continued)

Activity	Head
1,4	Hard-hat

Activity	Eye/Face
1,4	Safety Glasses
NE	Chemical
NE	Faceshield

Activity	Hand
NE	Neoprene
NE	Goggles Nitrile
NE	PVC
NE	Viton
4	Underglove

Body

Activity	
NE	Full Encapsulating Suit
NE	Two Piece Rainsuit, Material
NE	One Piece Splash Suite, Material
1,4	Tyvek Suit
NE	Hooded Tyvek/Saranax
NE	Hooded Tyvek/Polyethylene Suit
NE	Cloth Coveralls
1,4	High Visibility Vest
	Other

Lung

Activity	
NE	SCBA (open circuit, pressure demand)
NE	Full Face Respirator, cartridge
NE	Supplied Air, Airline
4	Half Mask Respirator, cartridge organic vapor
	Other

Ear

Activity	
1 - 4	Earplug, type - E.A.R.
NE	Earmuff, type

Foot

Activity	
1,4	Steel-toed Boots, type = Leather
	Disposable Overboots, type

Other Safety Equipment

Activity	
NE	Ventilation blower/fan
1 - 4	Traffic cones, delineators
1 - 4	Barrier tape
NE	Blast alarm
1 - 4	Ground fault circuit interrupter
NE	Lifeline harness
NE	Radiation Dosimeter

Comments:

Protection levels may be upgraded or downgraded for specific tasks or individual work assignments based on SHSO's on-site observations.

12.0 Decontamination Procedures

Equipment Decontamination: (solvents used, equipment used, method of disposal). Attach site decontamination map as necessary.

Equipment to be decontaminated during the project may include:

1) Drill Rig and Tools, 2) Monitoring Equipment, 3) Respirators, 4) Sample Containers, 5) Truck or Trailer, 6) Laboratory Equipment

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, determined by the Site Safety Officer. The decontamination work tasks will be split or rotated among support and work crews. Decontamination procedures within the trailer (if used) should take place only after other personnel have cleared the "hot area", moved to the clean area and the door between the two closed.

Miscellaneous tools and samplers will be dropped into a plastic pail, tub or other container. They will be brushed off and rinsed (outside, if possible) and transferred into a second pail to be carried to further decontamination stations. They will be washed with a non-phosphate detergent solution rinsed with deionized water, rinsed with pesticide grade organic free water if available. Decontaminated sampling equipment will then be wrapped in aluminum foil (shiny sideout) and stored in an uncontaminated area. The resultant waste water will be contained within 55 gallon DOT barrels and stored on-site for subsequent disposal under the direction of DON's SOUTHNAVFACENGCOM.

Drilling Rig/Backhoe and Tools.

In the event that a drilling Rig/Backhoe is needed or used, It is anticipated that the drill rigs/backhoes will be contaminated during test pit/borehole activities. They will be cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Other solvents may be used if necessary. Loose material will be removed by brush. The person performing this activity will usually be at Level D protection plus splash protection.

Sample Containers.

Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site, but it will be difficult to keep the sample containers completely clean. The samples will be taken to the decontamination area. Here they will be further cleaned as necessary and transferred to a clean carrier and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

Monitoring Equipment.

Monitoring equipment will be protected as much as possible from contamination by draping, masking or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNU meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any direct or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

Respirators.

Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be pre-coded, e.g.,#1 on all parts of mask #1.) After an appropriate time within the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be marked so as to indicate length of usage (if means to evaluate the cartridges' remaining utility are available) or will be discarded into the contaminated trash container for disposal. In the morning the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit.

Decontamination Trailer or Truck and Staging Area.

The decontamination trailer or truck, if used, will be cleaned daily. This will include vacuuming with a vacuum having a water filter to capture dust particles. The area will be wet mopped with cleanser and again with clean water. Work bench areas will be wiped down. Wash buckets and the cleaning area will be decontaminated and made ready for the next day's use.

Laboratory Equipment.

Sample handling areas and equipment will be cleaned/wiped down daily. Disposable wipes will be used and discarded into a plastic bag. These will subsequently be taken to and placed in the disposal drum for final disposition. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed of (e.g., glassware, covers for surfaces) as previously indicated.

Personnel Decontamination: (solvents used, method of solvent disposal; include decontamination and disposal methods of Personal Protection Equipment). Attach decontamination map a necessary.

will be contained within a 55 gallon DOT barrel, and stored on-site for the subsequent bioremediation.

Confirmatory Drilling-Derived Material Disposal:

1. **Drill Cuttings/well water: Soil to be placed in 55 gallon DOT drums and transported under signed test non-hazardous manifest to authorized storage facility.**
2. **Decontamination solutions: Decontamination solutions for sampling and application equipment will consist of distilled water and detergent to be stored in appropriate DOT containers and stored on-site for the subsequent bioremediation.**
3. **Other:**

   Not Applicable

13.0 Documentation

FIFCO International, Inc. personnel training and medical records are retained at the **FIFCO International, Inc.** Corporate office located in Del Mar, California/ ECT personnel training and medical records are retained at the ECT Corporate office in Gainesville, Florida. Records will be maintained on-site as necessary.

PROJECT PERSONNEL LIST AND SAFETY PLAN DISTRIBUTION RECORD

1. Employees

   All project staff must sign and indicating they have read and understand the HASP. A copy of this SHSP must be made available for their review and readily available at the job site.

Employee Name/Job Title	Date Distributed	Signature
John Bullington/President **FIFCO**		
Kenneth Oftedal (Project Manager)		
Duane Dungan (Project Geologist)		
Mike Luster (Industial Hygentist & SHSP)		
John R. Edwards (Project Engineer)		
Dave Bullington (Field Supervisor)		
William A. Edwards / Technician		
Pat Griffin/Technician		

2. **Contractors, Subcontractors:**

   Prior to the beginning of work, a copy of this **SHSP** shall be reviewed and provided to contractors and subcontractors who may be affected by activities covered under the scope of this **SHSP**. All contractors and subcontractors must comply with applicable **OSHA, EPA,** and local government rules and regulations.

SITE HEALTH AND SAFETY MEETING: All personnel working on site must receive initial **Site Health and Safety** orientation. Thereafter, a brief tailgate safety meeting is required and repeated as deemed necessary by the **SHSO** (or at least once every 10 working days).

Name of Attendee	Firm Name	Date	Signature

SITE HEALTH AND SAFETY MEETING (Continued)

VISITORS - It is the policy of **FIFCO International, Inc.** to ensure that all visitors are furnished their own personal protective equipment. All visitors are required to sign the visitor log and comply with the **SHSP** requirements. If the visitor represents a regulatory agency concerned with site health and safety issues, the **SHSO** SHALL IMMEDIATELY NOTIFY THE **LHSR**.

Name of Attendee	Firm Name	Date	Signature

VISITORS (Continued)

14.0 Contingency/Emergency Information

A. Required Emergency Equipment Location:

Required Emergency Equipment Location:	Contained in Health & Safety Field Kit. **Environmental Consulting & Technology, Inc./ FIFCO International, Inc.** personnel are supplied with all emergency equipment as standard field supplies. All vehicles carry Emergency Response and First Aid Equipment.
Fire Extinguisher:	Contained in field vehicles.

B. Emergency Telephone Numbers:

Emergency Department Facility	Phone Number
Ambulance	911
Police	911
Fire Department	911
Hospital	(904) 270-6776

C. **Standard Procedures for Reporting Emergencies**:
When calling for assistance in an emergency situation, the following information should be provided:

1. Name of person making call.
2. Telephone number at location on person making call.
3. Name of person(s) exposed or injured.
4. Nature of emergency.
5. Actions already taken.

Note: Receipt of call should hang up first "**not the caller**"

OTHER IMPORTANT PHONE NUMBERS AND FACILITIES

Emergency Department/Facility	Phone Number
Regional Poison Control Center	1-800-282-3171

CHEMTREC:	(**Emergency use** only) 800-424-9300
CHEMTREC:	(Non-Emergency use) 202-887-1255

OTHER IMPORTANT PHONE NUMBERS AND FACILITIES CONTINUED

Emergency Department/Facility	Phone Number
FIFCO, Inc. Project Manager	Office (800) 927-7310 / Pager (619) 432-3499
ECT, Inc. Project Geologist	Office (941) 277-0003 / Pager (941) 489-5930
ECT, Inc. Project SHSO	Office (813) 289-9338 / Pager (813) 980-4423

POST AT JOB SITE (AS APPROPRIATE)

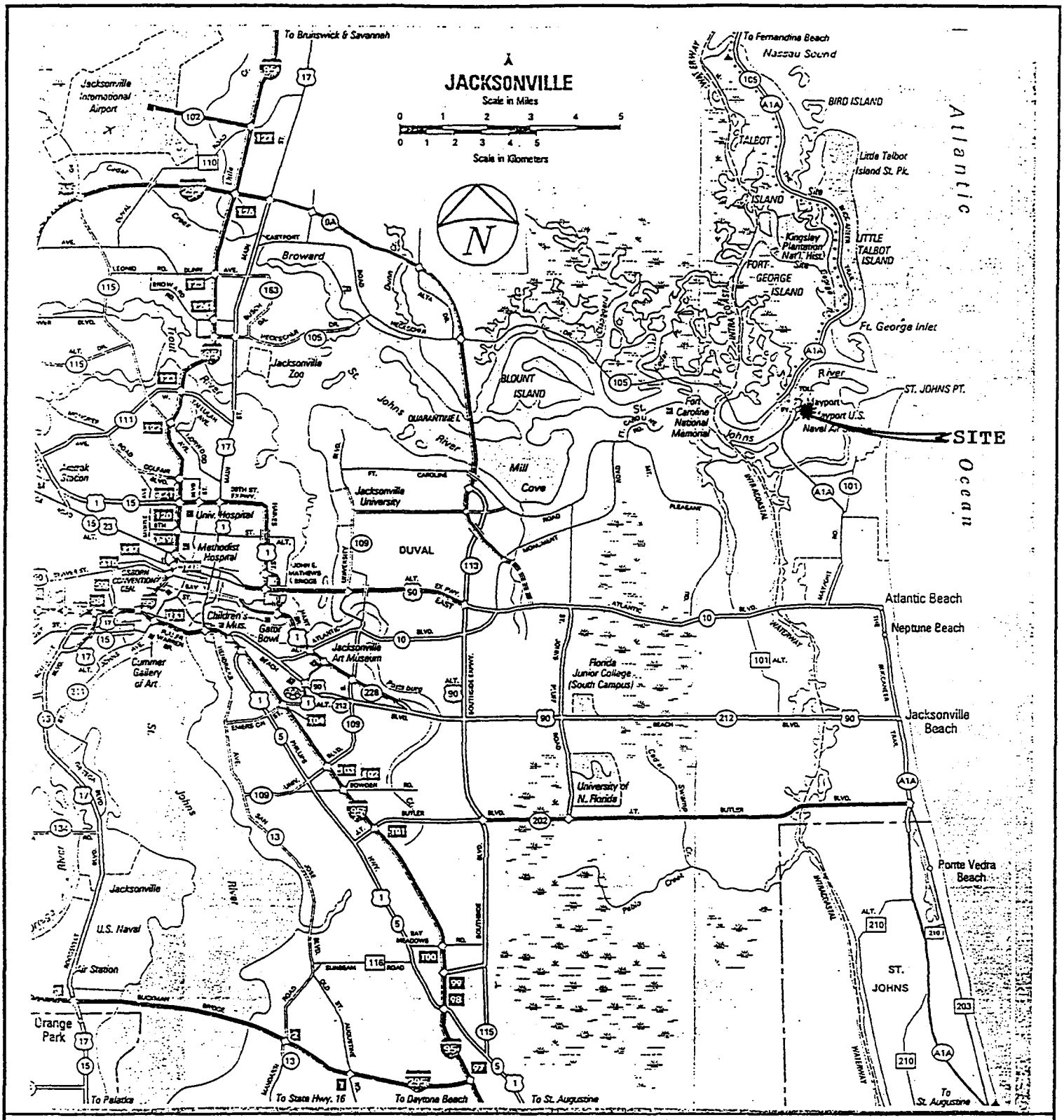
D. Emergency Routs: Branch Medical Clinic located at Naval Station Mayport, Florida. Has hospital been contacted to **determine** if they will handle a chemical exposure? Yes _X_ No ___

PRIMARY HOSPITAL/INFIRMARY:	**Naval Hospital**
Branch Medical Clinic	(904) 270-6776
Naval Station Mayport, Florida, 32228	
Located at Naval Station Mayport	

E. **Contingency Plans as Appropriate**: Describe contingency plans for emergencies such as earthquakes, fires, emergency care, injury **PPE** or other equipment failure. Include emergency signals and evacuation routes. If formal contingency plan document has been prepared, attach a copy.

If fire occurs or police or ambulance is needed, call 911. If hospital emergency room attention is needed, follow the above route.

Figure 1 - Vicinity Map



REFERENCE:

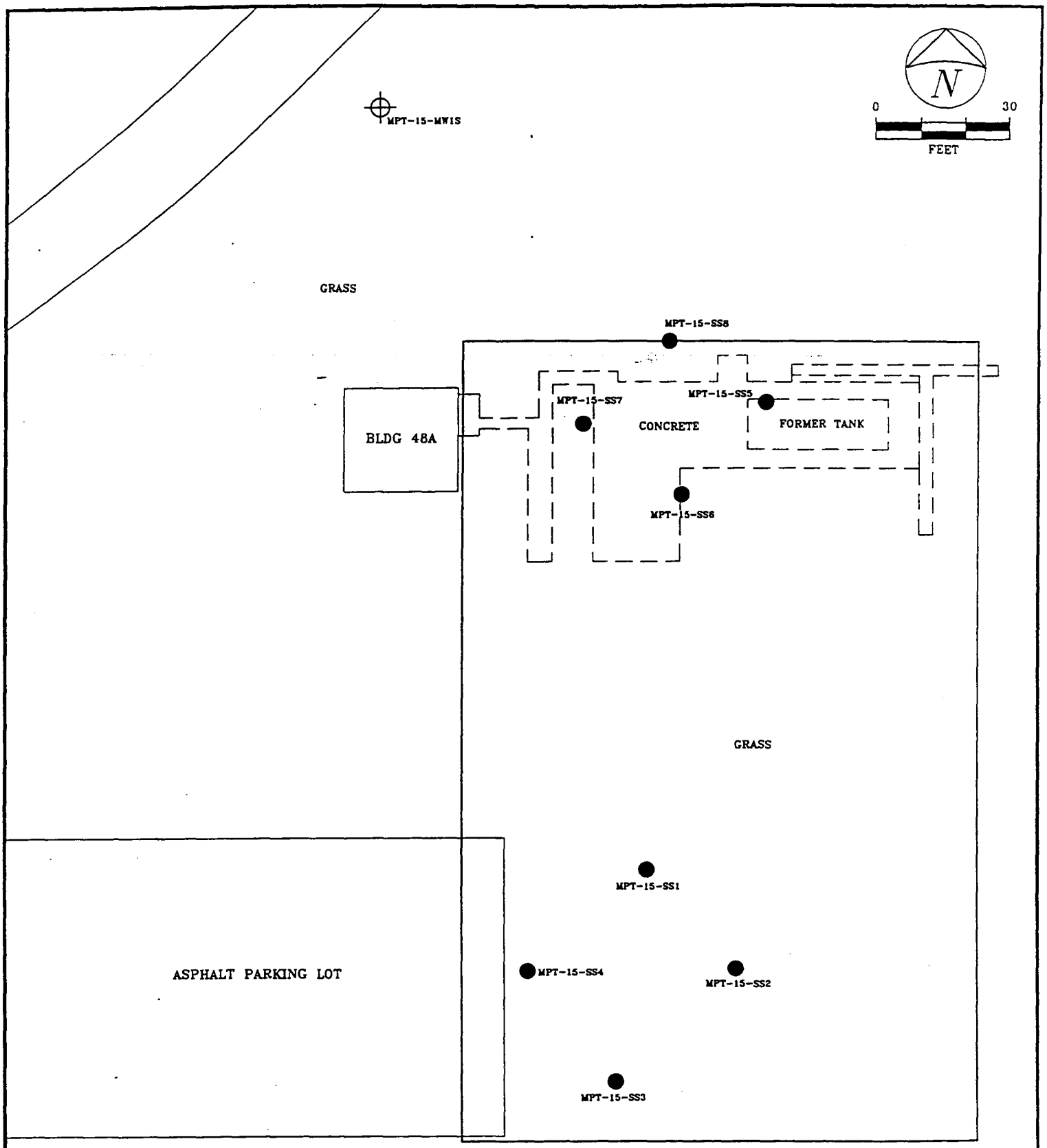
MAP OF FLORIDA, JACKSONVILLE AREA

PUBLISHED BY AAA, 1993, C-54

VICINITY MAP
U.S. NAVAL STATION
MAYPORT, FLORIDA

Figure 1

Figure 2 - Site Plan



LEGEND

MPT-15-SS1 LOCATION OF SURFACE SOIL SAMPLE PERFORMED IN 1991

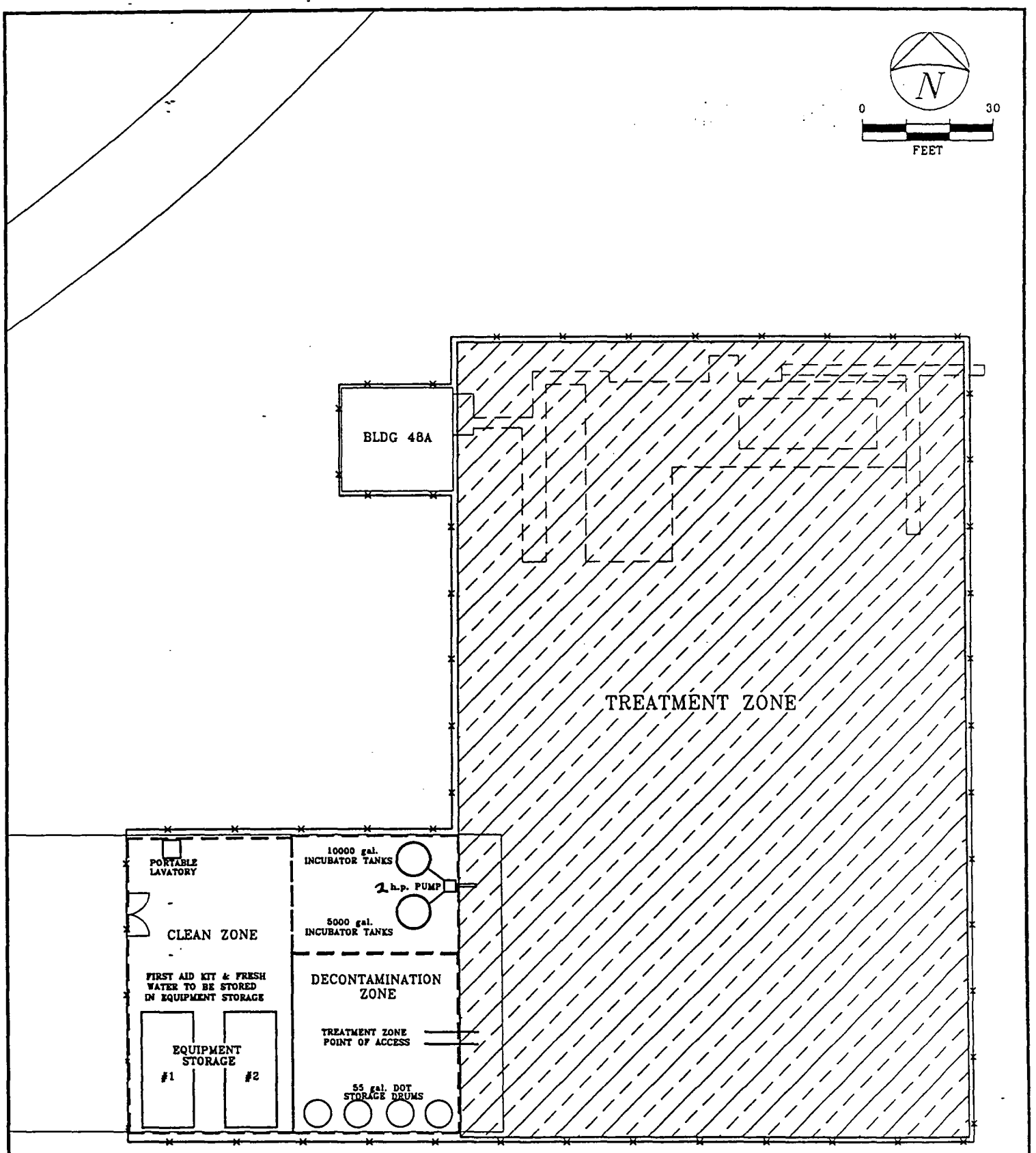
MPT-15-MW1S LOCATION OF EXISTING MONITORING WELL

— — — OUTLINE OF FORMER SIDEWALKS AND SURFACE STRUCTURE

SITE PLAN
SWMU 15, Old Pesticide Handling Area
U.S. Naval Station, Mayport, Florida

Figure 2

Figure 3 - Treatment Staging Area Site Plan



LEGEND

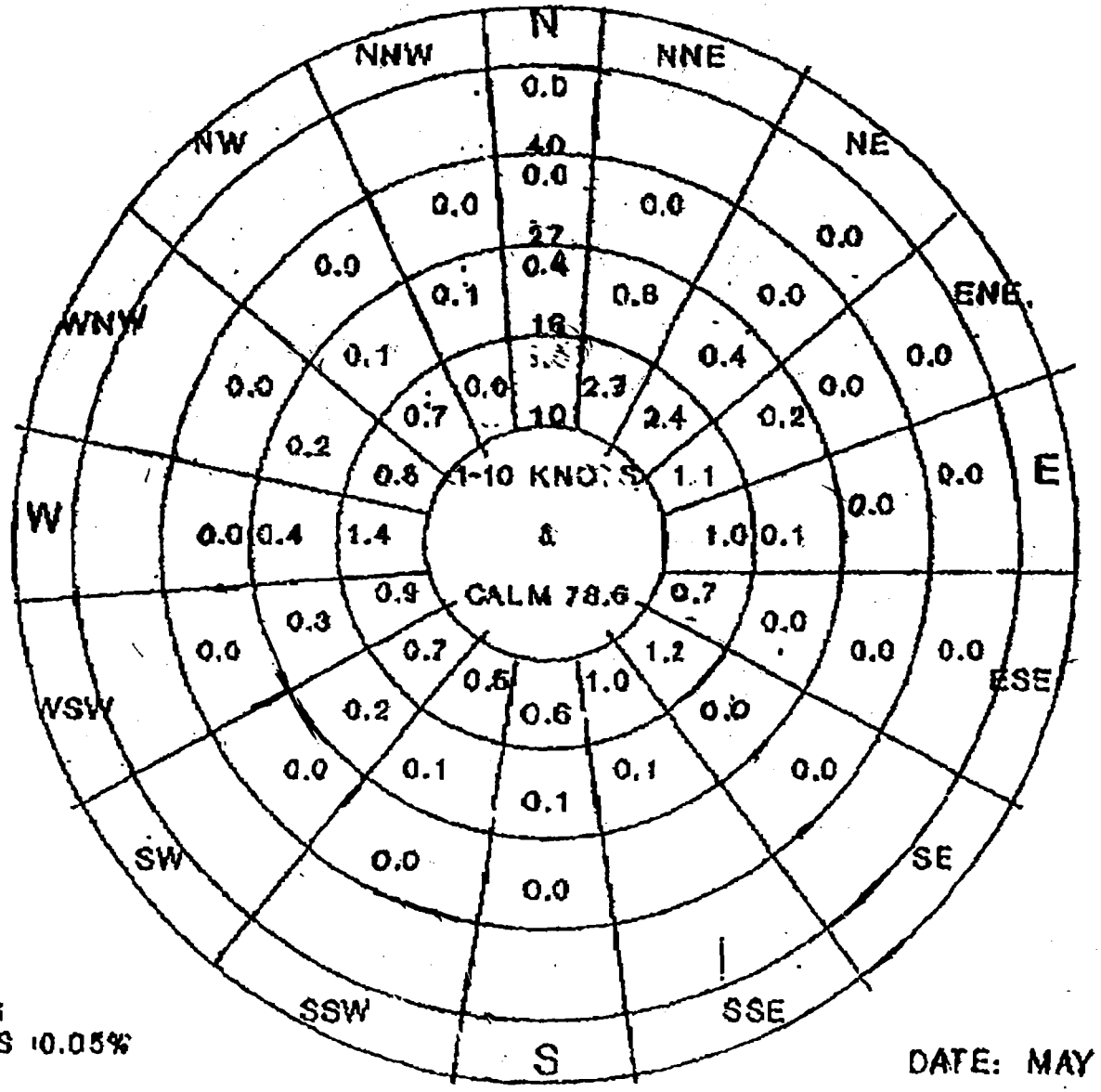
4' SAFETY ORANGE SNOW FENCE

TREATMENT STAGING AREA SITE PLAN
SMWU 15, Old Pesticide Handling Area
U.S. Naval Station, Mayport, Florida

Figure 3

Figure 4 - Wind Rose

SURFACE WIND ROSE



0.0 INDICATES
OCCURRENCES <0.05%

DATE: MAY 1989

REVISED QUALITY ASSURANCE PROJECT PLAN

Bioaugmentation Corrective Action

Naval Station, Mayport, Florida
Category #1, Area #1, Pesticide Area, SWMU 15

August 1995

For Submittal to:

DEPARTMENT OF THE NAVY

SOUTHNAVFACENGCOM
2155 Eagle Drive, PO Box 190010
North Charleston, SC 29419-9010
(803) 743-0974

Contract Number: N62467-94-D-0889

Prepared by:

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FIFCO International, Inc. Project Number: 94-1021-NSMFL-CA

TABLE OF CONTENTS

Section Number and Title — Page

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION 2

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 2

3.1 PROJECT ORGANIZATION 2
3.2 PERSONNEL AND RESPONSIBILITIES 3

4.0 DATA QUALITY OBJECTIVES 4

4.1 DATA QUALITY OBJECTIVES 4
4.2 DATA QUALITY ASSURANCE GOALS 5
4.2.1 ACCURACY 5

5.0 FIELD PROCEDURES 5

5.1 INTRODUCTION 5
5.2 OBJECTIVES OF FIELD WORK 6
5.3 QUALITY CONTROL SAMPLES 6

6.0 SAMPLE PRESERVATION, LABELING AND CUSTODY 6

6.1 SAMPLE PRESERVATION 16
6.2 SAMPLE LABELING, CHAIN-OF-CUSTODY, AND TRAFFIC REPORTS 17
6.3 SAMPLE HANDLING, PACKAGING, SHIPPING 18
6.3.1 ENVIRONMENTAL SAMPLES 19
6.3.2 HAZARDOUS SAMPLES 20
6.4 LABORATORY ACCEPTANCE OF SAMPLES AND HANDLING 21
6.5 FIELD NOTEBOOKS 21

7.0 FIELD EQUIPMENT CALIBRATION PROCEDURES 22

7.1 pH, CONDUCTIVITY AND TEMPERATURE MEASURING EQUIPMENT 22

8.0 ANALYTICAL PROCEDURES 22

8.1 GENERAL 22
8.2 CHEMICAL ANALYSIS PROCEDURES 22

9.0 DATA ASSESSMENT 22

10.0 DATA MANAGEMENT 24

10.1 SCOPE 24

FIGURES:

FIGURE 1 - PROJECT MANAGEMENT STRUCTURE
FIGURE 2 - CHAIN-OF-CUSTODY

1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) presented herein is designed to implement the procedures necessary to maintain a consistent quality of technical products for evaluation by the Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). Consistent technical quality will be ensured through the formal standardization and documentation of field techniques and activities. In addition, project deliverables will be distributed to the SOUTHNAVFACENGCOM for review and approval. Field and laboratory activities will be performed by properly trained and qualified personnel (including subcontractors) and will conform to specific procedures outlined in the subsequent sections of the QAPP and Remedial Action Plan (RAP) for this project. Project deliverables resulting from these activities will be submitted and reviewed by senior technical staff for completeness, precision, accuracy, representativeness, and comparability with specified procedures.

The QAPP for this project covers each of the following activities:

- Data Quality Objectives
- Project Organization and Responsibilities
- Field Measurements
- Sample collection, preservation, handling, chain-of-custody, request for analysis, and laboratory analysis
- Field and quality assurance and quality control procedures
- Data Management

The quality of project deliverables is controlled through technical review by peers and senior staff, and through periodic audits.

As discussed in Section 5.0, *Field Procedures*, field remedial activities will be performed in accordance with **FIFCO's** Application Procedures (APs) presented in the RAP. Samples will be collected in the field in accordance with the RAP and sent to laboratories certified by the State of Florida and approved by the U.S. Navy to perform the required analyses. The quality and validity of the analytical data will be measured by laboratory audits, performance evaluation samples, and quality control measures specified by the SOUTHNAVFACENGCOM.

For sample analysis, the analytical parameters and levels of detection are determined on a case-by-case basis as outlined in this QAPP. Field samples obtained during site investigation may be analyzed for compounds that are used to confirm the presence of contamination and/or monitor reduction in concentration levels over the work period. In either case, the quality requirements as presented are specified by the Project Manager with the concurrence of the Naval Remedial Project Manager. Local Health Agency requirements will be used as guidelines for obtaining Required Action Limits.

Field equipment used for measurements and monitoring is maintained and calibrated in accordance with procedures outline in the RAP. Records of calibration and maintenance will be kept by assigned personnel. Field procedures and monitoring are performed following strict procedural guidelines as outlined in the project RAP and the Site Health and Safety Plan (SHSP).

2.0 PROJECT DESCRIPTION

The subject site, Solid Waste Management Unite (SWMU) 15, consists of approximately 0.48 acres and is located in the western portion of the Naval Station, Mayport, Jacksonville, Florida.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 Project Organization

This project is administered under the Southern Division Naval Facilities Engineering Command, (NELP) contract. Under this contract, the **FIFCO** Remedial Team consists of **FIFCO**, as the prime contractor responsible for all work conducted under the contract, and one major subcontractor, **Environmental Consulting & Technology, Inc. (ECT)**. Within each firm, a Project Manager serves as the overall manager of resources for remedial work done and helps to assure that quality work is produced by all personnel. The **FIFCO** Project Manager (Kenneth Oftedal) ensures that all application operations conform to project specifications and the RAP. The **ECT** Project Geologist, Duane Dungan, ensures that all documentation and necessary protocol, as outlined in the RAP, SHSP and this QAPP, is followed.

3.2 Personnel and Responsibilities

Personnel: Identified in Section 3.1, *Project Organization*, are the Project Manager, Project Geologist, Project Engineer, Project Field Personnel, Quality Assurance officer, and Health and Safety officer. Figure 1, *Project Management Structure*, illustrates the project organization. **FIFCO's** Project Manager will report directly to the SOUTHNAVFACENGCOM site specific Project Manager. Field duties will be performed by experienced personnel who are trained for each task required of them.

Manufacturer: The **FIFCO** Company Principal (FCP), John Bullington, is the primary point of contact for the Navy's Project Manager and Contracting Officer. The Project Company Principal is responsible for coordinating project execution. Mr. Oftedal will be responsible for monitoring the quality of work, controlling the project schedule and cost, reviewing deliverables, identifying and resolving problems, and for all other application aspects of the project.

Project Geologist: **ECT's** Project Geologist, Duane Dungan, is responsible for the geologic work done on the project and provides direct interaction with the FCP. The Project Geologist is responsible for staffing, day-to-day management, project execution, and performance quality on this project, as well as direct communication and interface with the **FIFCO** Project Manager.

Site Health and Safety Officer: ECT's Industrial Hygienist, Mike Luster, is responsible to ensure a SHSP is prepared, written and reviewed, and that Health and Safety (H&S) equipment required by the SHSP is available, working and calibrated. Ensure that field team members received site-specific training as required by the SHSP. Prepare and distribute SHSP to project team members. Ensure implementation of the SHSP and that on-site personnel comply with the SHSP, and that tailgate safety meetings are conducted. Direct emergency response efforts during field emergencies. Ensure that general "Safe Work Practices" and "Site-Specific Safe Work Requirements" are followed. SHSO Will be present during application or have a designee present. Will be responsible for upgrading or downgrading requirements based upon conditions; responsible for shutting down operations.

4.0 DATA QUALITY OBJECTIVES

4.1 Data Quality Objectives

Data Quality Objectives (DQOs) for the SWMU 15 was designed to ensure that data of known and appropriate quality will be obtained during the project implementation operations.

To ensure that data generated is adequate to evaluate results of the remedial technology DQOs have been specified for each data collection activity associated with the project.

Data Quality Objectives, uses and needs, as summarized in Table 4.1, comprise potential and un-verified contaminants at site SWMU-15

Table 4.1

Data Quality Objective for Bioremediation utilizing BRT, Site SWMU 15

Data Quality and Use/Objective	Prioritized Data Uses	Appropriate Analytical Levels	Critical Samples
SWMU 15 Determine product concentrated levels necessary to achieve action limits	Provide data for system design necessary full scale implementation operations	NEESA Level C	Representative surface soil with SWMU 15
SWMU 15 Obtain confirmatory samples for determination of satisfactory degradation of contaminants	Provide date to develop the risk assessment Assess remedial alternatives Support site characterization Support engineering design	NEESA Level C	Clean samples at boundary of contaminated areas

The criteria for the risk assessment are based on the action levels mandated by the regulatory agencies.

The State and Federal standards for the presence of these contaminants in soil, drinking water, and marine water have been established.

4.2 Data Quality Assurance Goals

Quality assurance goals for the BRT operations are intended to provide reliable data for evaluation of the technology. In addition to documentation of field application techniques, evaluation of collected sample data accuracy, representativeness, completeness and comparability (PARCC) limits. PARCC standards are provided within the EPA report "Data Quality Objectives for Remedial Response Activities (reference: dated 1987, EPA/540/-6-87/003). Analytical precision will be the responsibility of the approved laboratory and the quality assurance protocol dictated to them by the SOUTHNAVFACENGCOM.

4.2.1 Accuracy

Accuracy of collected data is hard to measure since it can be affected by field contamination, sampling procedures and preparation, as well as analysis techniques. However, in order to ensure accuracy in test results and evaluation of BRT, **FIFCO International, Inc./ECT, Inc.** will maintain a complete daily record of field application activities and the SOUTHNAVFACENGCOM will ensure that the designated laboratory complies with established procedures.

5.0 FIELD PROCEDURES

5.1 Introduction

The field procedures to be conducted at SWMU 15:

- Mobilization
- Sampling of untreated earth materials (Control)
- Installation of Application Systems
- Setup of Equipment and Holding Tanks
- Application of Product
- Soil Sampling
- Additional Application (if necessary)
- Spray application of surface materials
- Field Screening Samples
- Confirmatory sampling
- Demobilization of Equipment and Supplies

The field procedures are designed so that:

- Application, sampling procedures, techniques, mixture ratios and product reliability remain consistent and are conducted correctly and in accordance with established methodology.
- Samples are collected in a manner such that data is representative of the actual site conditions.

This data will be used to evaluate the effectiveness and reliability of BRT to reduce known contaminates to background (Action Limits) levels.

5.2 Objectives of Field Work

The objective of the field work to be conducted will be to degrade the organic and inorganic contaminants. Specific procedures that will be implemented to accomplish the various described tasks, including decontamination, are discussed in Section 4.4, *Decontamination of Sampling Equipment,* of the accompanying RAP.

5.3 Quality Control Samples

Quality control procedures have been established for the field activities. Field Quality Control (QC) activities include the calculation and measurements for pH, specific conductance, temperature, and photoionization measurements. Any special quality control measures beyond that described in the RAP will be established by SOUTHNAVFACENGCOM.

6.0 SAMPLE PLAN, PRESERVATION, LABELING AND CUSTODY

6.1 General

It is understood that the SOUTHNAVFACENGCOM, will make arrangements for confirmatory sampling for the treatment operations. However, **FIFCO International, Inc's/ECT's** personnel will be present during application operations and are prepared and qualified to obtain samples for analytical testing upon request.

Soil sampling at hazardous waste sites will typically be approached in a totally different manner than sampling of other media. Sampling locations and rationale for other media are usually easily defined. For example, ground water samples may be collected at existing monitoring wells; surface water and sediment samples are usually collected from well defined surface drainage patterns at easily rationalized locations with respect

to the suspected problem; and waste sources, such as drums, tanks and piles, are easily identified sampling targets. Occsionally,surface soils may be stained or show evidence of vegetative stress, indicating that a contaminant may be present, but in many cases there may not be any direct evidence to suggest that a particular location is a candidate for soil sampling. The sampler may, in fact, be faced with investigating a virtually invisible contaminant distribution pattern, both in the surficial material, as well as in the subsurface region.

6.1.1 Sampling Location/Site Selection

Areas selected for soil sampling shall be strategically located in order to collect a representative fraction of the soils with the minimum number of samples. Although it is not always feasible to conduct a site reconnaissance prior to an investigation, a site reconnaissance can eliminate many uncertainties with respect to site characteristics and result in more complete and successful soil sampling studies. A surface inspection of the subject area should be made to locate pertinent features (e.g., rock outcrops, drainage patterns, surface run-off, ponds, lakes, wet areas, seeps, springs, permanent structures, fill areas, erosioal areas, depositional areas, etc.) ad to evaluate the relationship between these features and potential sources of pollution. A knowledge of these relationships and conditions, particularly soil conditions (type and thickness of soil overburden) and water table conditions are extremely important in developing sampling plans.

In addition to what is normally considered soil, i.e., in situ weathered rock overburden, soil samples may also consist of what is more correctly considered sediment, which has been deposited by both overland sheet runoff, as well as flow in normally dry wet-weather swales. The location of sediment sampling locations in those types of depositional areas is a useful screening tool, providing an indication of the presence of contaminants from the larger area contributing the sediment.

Initial investigations at most sites will consist of "screening-type" studies. Sampling for these investigations will generally be confined to a small number of surface or shallow subsurface samples. Typically, samples would be collected from depositional areas within and around the periphery of the site, as well as from obviously contaminated

areas. Based on the results of the initial site-screening studies, more detailed studies, involving considerably more samples and with a greater emphasis on subsurface sampling, are usually required to fully characterize soil contamination at a site.

Study plans or work plans for soil sampling investigations must be carefully conceived with respect to the study objectives. This, in turn, requires a careful consideration of the types of samples to be collected, as well as the sampling methods to be employed. These areas are discussed below.

6.2 Basic Considerations for Soil Sampling

Three basic considerations, with respect to sample type, should be evaluated when developing a soil sampling plan and establishing investigation objectives. Should the samples be random, biased, or grid-based? Will they be collected from the surface or subsurface? Will a particular sample be a grab sample or a composite sample?: When all of these questions are answered, it will be found that many investigations will involve the collection of most combinations of the above types of samples. A discussion of these considerations is found in the following sections.

6.2.1 Sampling Procedure

An in-situ soil sample will be obtained utilizing equipment approved by the Department of the Navy's SOUTHNAVFACENGCOM. Clear plastic, brass, stainless steel and/or Teflon sampling tubes or rings are considered acceptable provided the sampling protocol is followed. Once the sample insert is retrieved, the ends will be cleaned off with a knife, flush with the tube ends to prevent voids from forming. The tube ends will then be covered with aluminum foil, and plastic caps secured. Next, duct tape will be applied around the tube ends between the tube surface and the plastic caps. The samples will then be marked and immediately placed inside an ice chest with cube ice for transportation to the designated analytical laboratory. Relative density, moisture content, and sediment type should be described and logged for each sample prior to preparing them for shipment to the analytical laboratory. Head space should be measured in each sample by use of a Photo Ionization Detector (PID).

6.2.2 Random, Biased and Grid-Based Sampling

Generally, unless there is a strong indication of contamination, such as staining, or there are distinct depositional areas which provide excellent screening samples, soil samples collected for small investigations with limited areal extent, such as screening site investigations, must be randomly selected from several areas within the suspected area of contamination. Random in this sense is synonymous with casual, i.e., locations are often subjectively selected based purely on personal judgment.

If any areas show evidence of contamination, such as staining or vegetative stress, biased samples should be collected from each of the areas to characterize the contamination present in each area. If surface drainage patterns such as dry washes or swales are discernible, soil/sediment samples may be collected from the deposits in these features to characterize the immediate areas. Background and control samples are also biased, since they are collected in locations dictated by expected clean conditions or by anticipated impact from adjacent off-site areas.

When soil sampling investigations involve large areas, measured in acres for example, a systematic approach must be taken, not necessarily to the exclusion of other approaches, to characterize the presence and distribution of contaminants. In these situations, a grid-based soil sampling program is employed. There is no single grid size that is appropriate for all sites; however, in most cases, the smaller the site, the smaller the grid size. Please refer to figure 6 - Confirmatory Soil Sample location Plan (RAP) to be followed at the subject site.

When the site is extremely large, over several acres for example, it may be impossible to consider sampling every grid and it will be necessary to statistically select a sub-set of the total number of grids in order to reduce the number of samples collected for the study. On the other hand, it may sometimes be appropriate to sample every grid and use relatively inexpensive and quick screening-level analytical techniques used to define the areas which must be sampled and analyzed for a higher level of data quality. Because the screening level analysis is relatively quick the second phase sampling can sometimes be conducted during the same investigation. In all cases, however, the grid

centers should be located using a site survey and semi-permanently marked to facilities relocating the sample locations for subsequent sampling.

6.2.3 SURFACE AND/OR SUBSURFACE SOIL SAMPLES

In most initial investigations, particularly site screening-type studies, surface soil samples may comprise the great majority of soil samples collected. These are collected to look for the possible presence and distribution of contaminants in surficial materials. Subsurface soil sampling may be limited during initial investigations, but it may comprise the major portion of the soil sampling effort during subsequent phases of the investigation where the vertical extent of contamination in identified areas of surface contamination is the major objective.

6.2.4 Grab versus Composite Samples

When a sample is needed to identify and quantify compounds at a specific location or interval, a grab sample is collected. Grab samples are limited in areal extent (for surface samples) or vertical extent (for subsurface samples). The sample should be comprised of no more than the minimum amount of soil necessary to make up the volume of sample dictated by the required sample containers. Composite samples are a mixture of a; given number of subsamples and are collected to characterize the average composition of a given surface area or vertical surface within the selected area. The number of subsamples forming a composite should remain consistent within the context of the study, i.e., a number and pattern for collection of subsamples within a grid should be selected and, for a given grid size, should not be changed. Likewise, if one of the objectives of the study is to determine if any contamination is present within a particular vertical interval, a vertical composite sample, comprised of vertically discrete samples collected over the selected interval may be collected. As with the areal composites, the number of subsamples is dependent on the objectives of the study. With the low analytical detection limits available today, compositing can usually be used to determine the presence or absence of compounds in the area or interval sampled.

There are two potential problems associated with compositing for which the sampler must be aware. Even though modern analytical detection limits allow for qualitative screening in many cases using compositing techniques, the risk still remains that low concentrations, present in individual composite aliquots, may be diluted to the extent that the total composite concentration is below the minimum quantification limit. Also, if the subsamples are predominantly moist and clayey, it will be very difficult to produce a homogenous mixture. The resulting sample, as represented by the portion selected by the analytical chemist, may not be representative, either qualitatively or quantitatively, of an average of all of the subsamples.

6.3 MANUAL (HAND OPERATED) COLLECTION TECHNIQUES AND EQUIPMENT

These methods are used primarily to collect surface and shallow subsurface soil samples. Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface to a site-specific depth at which sample collection be 12 a depth at which sample collection using, i.e., hand-powered, methods becomes impractical.

6.3.1 SURFACE SOILS

Surface soils may be collected with a wide variety of equipment. spoons, shovels, hand-augers, push tubes, and post-hole diggers, made of the appropriate material, may be used to collect surface soil samples. As discussed in the section on powered equipment, surface soil samples may also be collected in conjunction with the use of heavy equipment.

Surface samples are removed from the ground and placed in pans, where mixing, as appropriate and occurs prior to filling of sample containers. Section 6.5 contains specific procedures for handling samples for purgeable organic compounds analyses. If a thick, matted root zone is encountered at the surface, it should be removed before the sample is collected.

6.3.2 SUBSURFACE SOILS

Hand-augering is the most common manual method used to collect subsurface samples. Typically, 4-inch auger-buckets with cutting heads are pushed and twisted into the ground and removed as the buckets are filled. The auger holes are advanced one bucket at a tie. The practical depth of investigation using a hand-auger is related to the material being sampled. In sands, auguring is usually easily accomplished, but the depth of investigation is controlled by the depth at which sands begin to cave. At this point, auger holes usually begin to collapse and cannot practically be advanced to lower depths, and further samples, if required, must be collected using some type of pushed or driven device. hand-augering may also become difficult in tight clays or cemented sands. At depths approaching 20 feet, torquing of hand-auger extensions becomes so severe that in resistant materials, powered methods must be used if deeper samples are required. Some powered methods, discussed later, are not acceptable for actual sample collection, but are used solely to gain easier access to the required sample depth, where hand-augers or push tubes are generally used to collect the sample.

When a vertical sampling interval has been established, one auger-bucket is used to advance the auger hole to the first desired sampling depth. If the sample at this location is to be a vertical composite of all intervals, the same bucket may be used to advance the hole, as well as collect subsequent samples in the same hole. However, if discrete grab samples are to be collected to characterize each depth, a new bucket must be placed on the end of the auger extension immediately prior to collecting the next sample. The top several inches of soil should be removed from the bucket to minimize the chances of cross-contamination of the sample from fall-in of material from the upper portions of the hole. Section 6.5 contains additional sample handling procedures.

Another hand-operated piece of soil sampling equipment commonly used to collect shallow subsurface soil samples is the Shelby or "push tube". This is simply a thin-walled tube, generally of stainless steel construction and having a beveled leading edge, which is twisted and pushed directly into the soil. This type of sampling device is

particularly useful if a relatively undisturbed sample is required. The sampling device is removed from the push-head, then the sample is extruded from the tube into the pan with a spoon or special extruder. Even though the push-head is equipped with a check valve to help retain samples, the Shelby tube will generally not retain loose and watery soils, particularly if collected at lower depths.

6.4 POWERED SAMPLING DEVICES

Powered sampling devices and sampling aids may be used to acquire samples from any depth but they are generally limited to depths of 20 feet or less. Among the common types of powered equipment used to collect or aid in the collection of subsurface soil samples are Little Beaver'-type two-man power augers; split-spoon samplers; specialized hydraulic cone penetrometer rigs; and back-hoes. The use of each of these is described below.

6.4.1 POWER AUGERS

Two-man power augers of the Little Beaver' variety, are commonly used to aid in the collection of subsurface soil samples at depths where hand augering is impractical. This type of equipment is technically a sampling aid and not a sampling device, and 20 to 25 feet is the typical lower depth range for this equipment. It is used to advance a hole to the required sampling depth, at which point a hand auger is usually used to collect the sample.

6.4.2 DRILL RIGS

Drill rigs offer the capability of collecting soil samples from greater depths. For all practical purposes, the depth of investigation achievable by this method is controlled only by the depth of soil overlying bedrock, which may be in excess of 100 feet.

When used in conjunction with drilling, split-spoon samplers are usually driven either inside a hollow-stem auger or inside an open ;borehole after rotary drilling equipment has been temporarily removed. The spoon is driven with a 140-pound hammer through a distance of up to 24 inches and removed. If geotechnical data are also required, the number of blows with the hammer for each six-inch interval is also recorded.

Continuous split-spoon samplers may be used to obtain five-foot-long, continuous samples approximately 3 to 5 inches in diameter. These devices are located inside a five-foot section of hollow-stem auger and advanced with the auger during drilling. As the auger advances, the central core of soil moves into the sampler and is retained until retrieval.

6.4.3 CONE PENETROMETER RIGS

A recent innovation is now available, which involves the modification of a standard split-spoon. The spoon has been modified with a releasable tip which keeps the spoon closed during the sampling push. Upon arrival at the desired depth, the tip can be remotely released and the push continued. During the subsequent push, the released tip floats freely up the inside of the spoon as the soil core displaces it. Split-spoon soil samples, therefore, can be collected without drilling, as has historically been required, by simply pushing the device to the desired depth. This technique is particularly beneficial at highly contaminated sites, because cuttings are not produced as with drill rigs. The push rods are generally retrieved with very little residue. This results in minimal exposure to sampling personnel and very little contaminated residue is produced as a result of equipment cleaning.

6.4.4 BACK-HOES

Back-hoes are often utilized shallow subsurface soil sampling programs. Samples may either be collected directly from the back-hoe bucket or they may be collected from the trench wall if proper safety protocols are followed. Trenches offer the ability to collect samples from very specific intervals and allow visual correlation with vertically and horizontally adjacent material. Prior to collecting samples from trench walls, the wall surface must be dressed with a stainless steel shovel, spatula, knife, or spoon to remove the surface layer of soil which was smeared across the trench wall as the bucket passed. If back-hoe buckets are not cleaned, samples must be collected from material which has not been in contact with the bucket surface.

6.5 SPECIAL TECHNIQUES AND CONSIDERATIONS

6.5.1 COLLECTION OF SOIL SAMPLES FOR PURGEABLE O. C. (VOA) ANALYSES

These samples should be collected in a manner that minimizes disturbance of the sample. For example, when sampling with a hand auger, the VOA sample may be collected directly from the auger bucket or immediately after an auger bucket is emptied into the pan. The sample should be placed in the appropriate container with no head-space, if possible, as the practice with water samples.

6.5.2 DRESSING SOIL SURFACES

Any time a vertical or near vertical surface, such as is achieved when shovels or back-hoes are used for subsurface sampling, is sampled, the surface should be dressed to remove smeared soil. This is necessary to minimize the effects of cross-contamination due to smearing of material from other levels.

6.5.3 SAMPLE MIXING

It is extremely important that soil samples be mixed as thoroughly as possible to ensure that the sample is representative of the interval sampled. Soil samples should be mixed as specified in Section 4.2.10.

6.5.4 SPECIAL PRECAUTIONS FOR TRACE CONTAMINANT SOIL SAMPLING

All soil sampling equipment used for sampling for trace contaminants should be constructed of stainless steel where possible. Pans used for mixing shall be made of Pyrex', or equivalent, glass. In no case with chromium, cadmium, or galvanized plated or coated equipment be used for soil sampling operations. Similarly, no painted or plastic equipment shall be used. All paint and primer must be removed from soil sampling equipment by sandblasting or other means before such equipment can be used for collecting soil samples.

6.5.5 SPECIFIC SAMPLING EQUIPMENT QUALITY ASSURANCE TECHNIQUES

Drilling rigs and other major equipment used to collect soil samples shall be identified so that this equipment can be traced through field records. A log book shall be

established for this equipment so that all cleaning, maintenance and repair procedures can be traced to the person performing these procedures and to the specific repairs made. Sampling spoons, hand augers, Shelby tubes, and other minor disposable type equipment are exempted from this equipment identification requirement.

- FIFCO International, Inc. will utilize hand held sampling equipment: A "split spoon' sampler will be used for shallow sampling operations (upper 2 feet of surface). The hand held sampler equipment utilized by **FIFCO International, Inc.** consists of a 2.5" O.D. stainless steel split spoon sampler with three inch (3") brass sampling tubes
- All equipment used to collect soil samples shall be cleaned as outlined in SHSP section 12.0, if necessary, before being stored at the conclusion of field studies.
- Any cleaning conducted in the field or field repairs should be thoroughly documented in field records.

6.5.6 AUXILIARY DATA COLLECTION

In addition to information pertaining to an area or specific site/location that may be available in EPA files from previous investigations (:i.e., site screenings, water quality, well monitoring studies, etc.), information and data may be obtained from various city, county, state, and other federal agencies.

Samples should be accurately tagged and labeled with all pertinent site information at the time of sampling. See Section 6 of the QAPP for sample labeling and field recording procedures. The attitude and longitude shall be obtained for each site for future STORET date entry.

6.6 Sample Preservation

Preservatives will be added to the appropriate sample containers by the participating laboratory prior to field sampling. These sample containers will be made available to the sampling team at least one day before the scheduled sampling event. Samples that require cooling will be immediately placed on ice and maintained at 4°C. Documentation of all sampling events will be the responsibility of the Project Geologist.

6.7 Sample Labeling, Chain-of-Custody, and Traffic Reports

The sample label and the chain-of-custody form will contain information which will be recorded for final reporting purposes and filed at ECT's Fort Myers, Florida office for future reference.

Sample Labels

The sample label is used to identify each individual sample. The label will correspond to information contained in the chain-of-custody forms. At the minimum, the sample label will include the complete sample identification (ID) number, the date and time the sample was taken, the analyses required, and the initials of the sampler.

Chain-of-Custody Record

The Chain-of-Custody Record (Figure 2) is initiated by the field technician who collects the field sample. Whenever samples are transferred to another responsible party, the chain-of-custody is signed by the receiving party. The laboratory will sign the chain-of-custody upon receipt of sample(s). One chain-of-custody record will accompany the samples in each cooler. Each Chain-of-custody will be maintained while the sample is in the field, during shipping, and in the laboratory. All internal sample handling will be documented by the Project Geologist.

The chain-of-custody record will be used to document the following.

- Project Name and Number
- Laboratory Name and Address
- Sample Identification Number
- Date (The date the sample was taken)
- Time (The time the sample was taken)
- Sampler's Initials
- Number of Container (The number of sample containers taken)
- Preservative used
- Matrix Code (GW for groundwater, SW for surface water, So for soil, etc.)
- Analyses Required
- QC Code (To indicate which samples are to have QC analysis performed (i.e., MS/MSD) to be determined by SOUTHNAVFACENGCOM)
- Comments (Notes indicating which samples are notably contaminated, and special handling requirements, etc.)
- Collected and Released by (Must be signed when relinquishing custody of samples on chain-of-custody form)
- Turnaround Time (Record the requested turnaround time if it is anything other than 30 days)

- Date/Time (The date and time the sample was relinquished and/or received)
- Received by (Individual receiving sample)

Five copies of each chain-of-custody form will be created. The top two copies (white and yellow) will be sent with the samples to the laboratory. The laboratory will send the yellow copy back with acknowledgment of receipt of the samples and will be filed with the pink copy. The green copy will be provided to the SOUTHNAVFACENGCOM. The Blue copy will be sent to **FII's**. Project Manager

Traffic Reports

A traffic report is completed to complement the chain-of-custody form in tracking hazardous samples, defined in Section 6.3.2, *Hazardous Samples* . Targeted samples will be classified as "hazardous" or "environmental" prior to sample collection. An individual traffic report will be completed for each hazardous sample. The information provided will include the sample ID, date, matrix, volume, and contact person and telephone number. All shipping information will be maintained by project personnel in a separate file.

Table 6.2

Analysis	Preservative	Analytical Holding Time From Sampling	Containers
Volatiles	Protect from light Store at 4° C	10 days from sample receipt	8 oz glass jar
Semivolatiles	Protect from light Store at 4° C	Extraction: 10 days from receipt Analysis: 40 days from extraction	8 oz glass jar
Target Inorganics (1)	Store at 4° C	180 days from sample receipt	8 oz glass jar
Pesticides/PCBs/PCTs	Protect from light Store at 4° C	Extraction: 10 days form receipt Analysis: 40 days from receipt	4 oz glass jar

6.8 Sample Handling, Packaging, Shipping

Outlined in this section are the sample handling, packaging, and shipping procedures.

Specific procedures for sample handling are determined by the assigned sample classification. Samples are classified as either environmental samples or hazardous samples.

Assessment of each sample needs to be made by the field geologist to determine whether the sample is potentially hazardous. This assessment must be made in order for proper handling and labeling for shipment.

There are no concentration limits that specifically define a sample as hazardous by Department of Transportation (DOT) regulations. Rather, good judgment on the part of the Project Geologist must be used to assess this. Samples collected which are stained or otherwise obviously contaminated soil, free product from a well, leachates, sludge's, and samples with very high photoionization detector (PID) or flame ionization detector (FID) readings are all hazardous samples. Samples determined to be non-hazardous by the Project Geologist are environmental samples. These samples will be labeled, packaged, documented, and shipped as described below.

6.8.1 Environmental Samples

Environmental samples are normally low concentration. The procedures for packing and shipping environmental samples are as follows:

1. Determine the maximum of allowable weight of each cooler (Federal Express limit is 70 lbs.).
2. Tape completely around the signed sample container label with wide, clear tape. (Custody seals should already have been secured to the containers)
3. Mark the volume level on liquid containers with a grease pencil.
4. Place each container in a zip-lock bag and seal, squeezing as much air as possible from the bag before closing.
5. Tape the drain plug shut on the inside and the outside.
6. Place approximately 1 inch of approved packing material in the bottom of the cooler or wrap all bottles in bubble wrap.
7. Place the bottles upright in the cooler, not touching, with enough room for ice bags to be placed among the containers.
8. Place a minimum of three bags of ice among the containers in a manner to ensure uniform cooling. Do not use blue ice as its heat capacity is lower than regular ice. Do not use dry ice.
9. Fill cooler with approved inert cushioning material.
10. **a)** If shipping via commercial carrier (i.e., Federal Express), write the air bill number on the chain-of-custody form inside a zip-lock bag and seal the bag with a signed, dated custody seal.

    b) If a courier is delivering the samples to the laboratory, have the courier assess that all samples listed are present and then sign the chain-of-custody form. Place the chain-of-custody form inside a zip-lock bag. Sealing the bag with a custody

seal signed by the courier is not necessary, as the samples and form shall remain in his/her possession until they are signed over to the laboratory.

11. Place chain-of-custody form inside cooler, close and latch.
12. Wrap strapping tape completely around the cooler on both sides of the latch.
13. Affix "This Side Up" labels on all four sides of the cooler and "Fragile: labels on at least two sides.
14. Affix the shipping label with the address and telephone number of the laboratory and the field office.
15. Affix signed custody seals on front right and back left of the cooler (if being sent by Federal Express or equivalent with an air bill). Cover the seals with wide, clear tape.
16. Alert the laboratory if the samples are being delivered via courier that they should be prepared to receive the samples and sign the chain-of-custody form in the presence of the courier. The courier shall also sign the form to give the samples to the laboratory.

It is assumed that the designated laboratory will provide all necessary labeling and packing material.

6.8.2 Hazardous Samples

Hazardous samples are those suspected or known to contain high concentrations of substances requiring specific handling, packaging, and shipping procedures.

Sample in this classification are suspected to contain individual chemical contaminants (organic or inorganic) in the concentration range from 15% to 100%. All high concentration samples are shipped to a laboratory that has the appropriate facilities for extraction and preparation of these hazardous samples. If any analysis indicates that an environmental sample from a given sampling station contains at least 15% of a single contaminant, samples from this station will be treated as hazardous samples in subsequent sampling periods.

Procedures for high concentration hazardous samples are the following:

<u>Organic and Inorganic Soil Analysis:</u>

High concentration soil/sediment samples will be collected in 4-ounce quantities. The laboratory will prepare a portion of each high concentration sample for base/neutral extractable analysis, pesticides analysis, and volatile organics analysis.

Samples will be packed and shipped according to DOT regulations specified for hazardous samples.

6.9 Laboratory Acceptance of Samples and Handling

The final sign-off on the chain-of-custody will be done by the analytical laboratory receiving the samples. The receiving agent for the laboratory is responsible for inspecting all transport coolers, verifying the integrity of their contents and confirming that each sample received is as described on the attached chain-of-custody record and is properly preserved and at the correct temperature. Any discrepancies or problems in the transportation or condition of samples will be reported immediately to the Project QA/QC officer and the Project Geologist and noted on the chain-of-custody form.

6.10 Field Notebooks

A field log will be maintained on a daily basis by the Project Geologist. The log is an accounting of the accomplishment of scheduled activities. Any problems or deviations from scheduled activities will be duly noted in the Field Geologist's log. Any observations relating to the test procedures will be recorded in this log. The field logbook will be completed in ink and will include the following information:

<u>Application System</u>

- Application System Utilized
- Person responsible for logging
- Ground elevation and coordinates
- Date started and completed
- Detailed soil description including
    - major soil or rock component
    - secondary component and estimated percentage
    - unified soil classification
    - color
    - consistency or density
    - texture
- Depth/elevation interval
- Depth/elevation of lithologic changes
- Water table information and method of determination
- Equipment details
- Drilling sequence
- Results of volatile organic screening

Samples will be checked in the field for the presence of volatile organics using a volatile organic analyzer.

The Project Geologist will keep a logbook to document interactions with SOUTHNAVFACENGCOM and project personnel, subcontractors, suppliers, and progress on the project; the arrival and departure of personnel and visitors to the site; daily tailgate meeting; any health and safety issues that may arise; and any other items that may impact field operations.

7.0 FIELD EQUIPMENT CALIBRATION PROCEDURES

Calibration of field equipment will provide daily quality assurance checks on all equipment used. Equipment that consistently falls out of calibration or exceeds manufacturer's critical limits will be appropriately cleaned or serviced or replaced immediately.

7.1 pH, Conductivity and Temperature Measuring Equipment

All meters will be in good working condition. Each meter will have an individual identification number affixed. This number will be transcribed on field data records when using a particular meter for a sampling event.

Buffer solutions used for wet calibration will be changed daily from standard stock solutions. Stock solutions will be changed on a quarterly basis.

8.0 ANALYTICAL PROCEDURES

8.1 General

The laboratory selected to conduct test sample analyses will be approved by the U.S. Navy (NEESA) and certified by the State of Florida to conduct the required analyses.

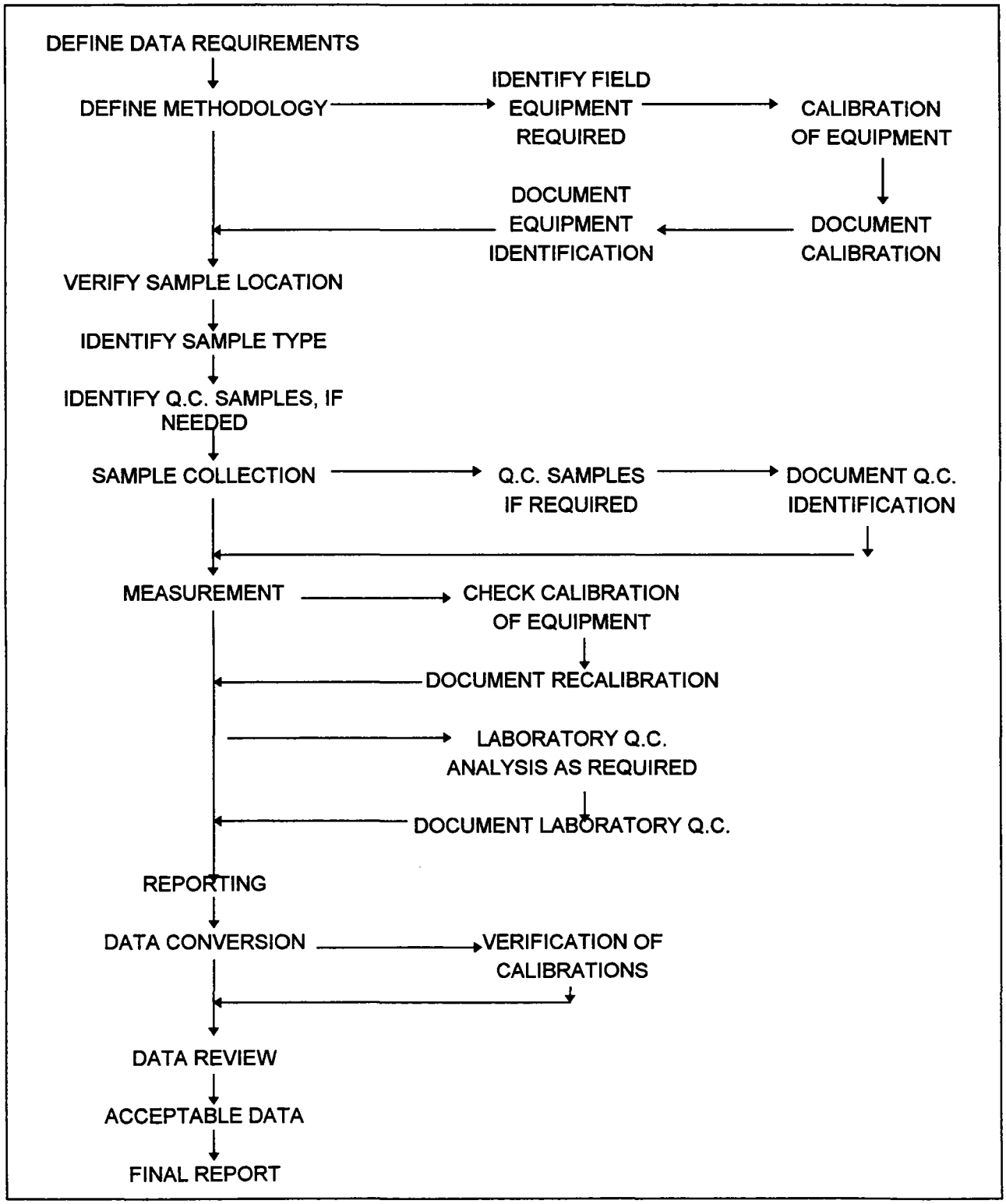
8.2 Chemical Analysis Procedures

Analysis of samples collected during the field investigation will be performed in accordance with the data quality objectives established for this project. Samples from selected sites will be analyzed for pesticides, based on the known historical information regarding material used or disposed of at SWMU 15.

9.0 DATA ASSESSMENT

The data assessment process will be established by the SDNEFC. It is recommended that the field data collection and interpretation follow a general process illustrated on Table 9.1, below.

Table 9.1


DEFINE DATA REQUIREMENTS
DEFINE METHODOLOGY
IDENTIFY FIELD EQUIPMENT REQUIRED
CALIBRATION OF EQUIPMENT
DOCUMENT EQUIPMENT IDENTIFICATION
DOCUMENT CALIBRATION
VERIFY SAMPLE LOCATION
IDENTIFY SAMPLE TYPE
IDENTIFY Q.C. SAMPLES, IF NEEDED
SAMPLE COLLECTION
Q.C. SAMPLES IF REQUIRED
DOCUMENT Q.C. IDENTIFICATION
MEASUREMENT
CHECK CALIBRATION OF EQUIPMENT
DOCUMENT RECALIBRATION
LABORATORY Q.C. ANALYSIS AS REQUIRED
DOCUMENT LABORATORY Q.C.
REPORTING
DATA CONVERSION
VERIFICATION OF CALIBRATIONS
DATA REVIEW
ACCEPTABLE DATA
FINAL REPORT

10.0 DATA MANAGEMENT

10.1 Scope

The data management aspect will be conducted under the direction and supervision of the SOUTHNAVFACENGCOM. Should details of the data management aspects of this investigation be required, it will be described in a later revision of this document.

If you have any further questions regarding the Quality Assurance Project Plan, please contact John Bullington or Kenneth Oftedal at **FIFCO International, Inc.** at (619) 259-7710 or the Project Engineer/Geologist at the **ECT's** office in Fort Myers, Florida, (941) 277-0002 / FAX (941) 277-1211.

Respectfully submitted,

ECT, Inc.

Reviewed By:

Mike Luster C.I.H.
Industrial Hygienist
CIH 2132 - Expires 12/31/00

Reviewed By:

L. Duane Dungan, P.G.
Project Geologist
PG 0000040 - Expires 07/31/96

KRO/JB:st

Quality Assurance Project Plan reviewed by FIFCO International, Inc.

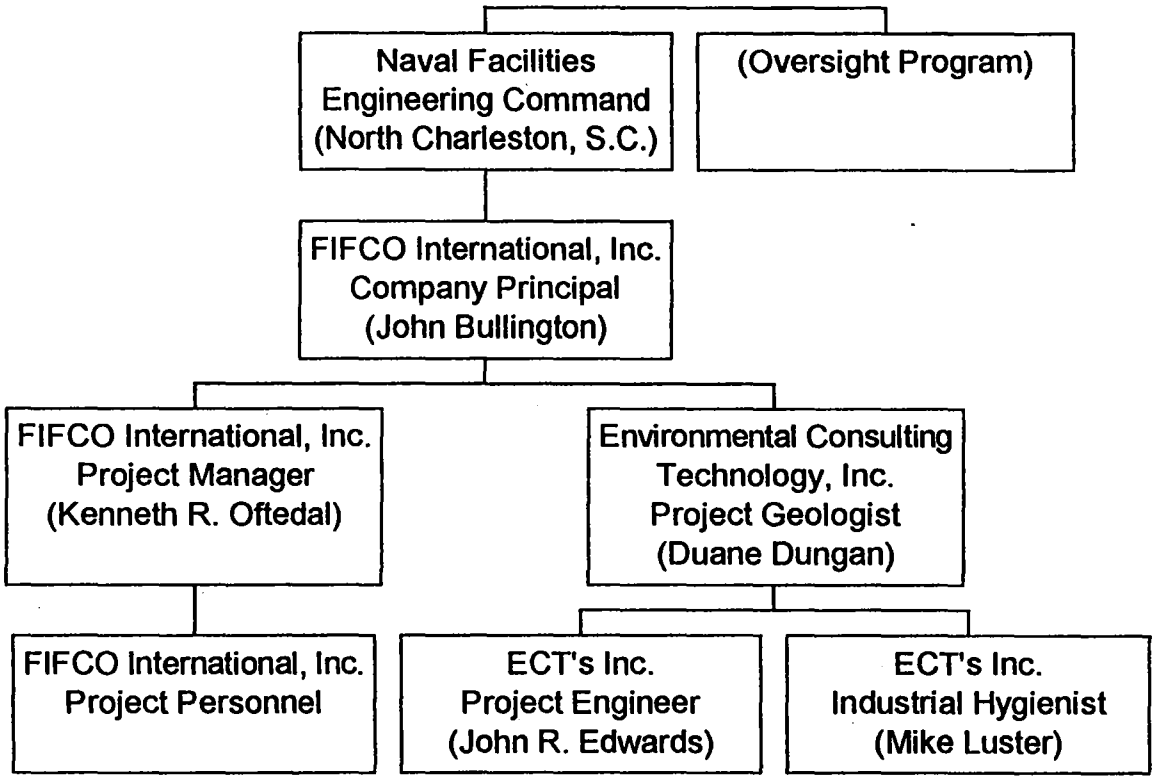
Kenneth Oftedal
FIFCO International, Inc.
Project Manager
Hazardous Materials Contractor
CA LIC #495632 - Expires 07/31/96

HAZARDOUS MATERIALS CONTRACTOR
KENNETH R. OFTEDAL
No. 495632
Expires 7/31/96
STATE OF CALIFORNIA

John Bullington
FIFCO International, Inc.
President

Figure 1 - Project Management Structure

PROJECT CONTACT ORGANIZATIONAL CHART



Project Geologist: L. Daune Dungan	NAVAL AIR STATION - MAYPORT Jacksonville, Florida
Project Engineer: Donald R. Ehlenbeck	
Drawn By: KRO	SWMU 15 Project Contact Organizational Chart
Project Number: 94-1021-NSMFL-CA	
Date: 08/16/96	BIOAUGMENTATION CORRECTIVE ACTION

GREEN ENVIRONMENTAL, INC.

The Forty Hour Refresher Course
"Procedures and Practices
for Hazardous Waste Supervisor"

CERTIFICATE OF COMPLETION

It is hereby decreed that *Kenneth R. Ofledal* has attended and successfully completed all the requirements of 29 C.F.R. 1910.120 for Proceedures and Practices for a Hazardous Waste Supervisor, conducted by the Training and Education Division of Green Environmental, Inc., Whittier, California. The instruction provided in this course has given *Kenneth R. Ofledal* the ability to conduct work safely at a hazardous waste site.

Date January 28, 1995

Certificate Number: 8RF012895-21

548-94-4998
Social Security Number

Keith E. Green
Director of Training

GREEN ENVIRONMENTAL, INC.

The Forty Hour Refresher Course
"Procedures and Practices
for Hazardous Waste Supervisor"

CERTIFICATE OF COMPLETION

It is hereby decreed that *William A. Edwards* has attended and successfully completed all the requirements of 29 C.F.R. 1910.120 for Proceedures and Practices for a Hazardous Waste Supervisor, conducted by the Training and Education Division of Green Environmental, Inc., Whittier, California. The instruction provided in this course has given *William A. Edwards* the ability to conduct work safely at a hazardous waste site.

Date January 28, 1995

Certificate Number: 8RF012895-30

554-86-8849
Social Security Number

Keith E. Green
Director of Training

GREEN ENVIRONMENTAL, INC.

The Forty Hour Refresher Course
"Procedures and Practices
for Hazardous Waste Supervisor"

CERTIFICATE OF COMPLETION

It is hereby decreed that *David Ballington* has attended and successfully completed all the requirements of 29 C.F.R. 1910.120 for Procedures and Practices for a Hazardous Waste Supervisor, conducted by the Training and Education Division of Green Environmental, Inc., Whittier, California. The instruction provided in this course has given *David Ballington* the ability to conduct work safely at a hazardous waste site.

Date January 28, 1995

Certificate Number: 8RF012895-29

553-76-4807
Social Security Number

Keith E. Green
Director of Training

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

This certifies that

Duane Dungan

has completed the 8-hour Annual Refresher seminar in

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

ECT

IN FULL COMPLIANCE WITH TRAINING REQUIREMENTS OF 29 CFR 1910.120

conducted by

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

February 17, 1995
Tampa, Florida

Douglas A. Dean, Health and Safety Officer

Jack D. Doolittle, President

This is to certify that

L. Duane Durgan

has satisfactorily completed the

RCRA Personnel Protection and Safety Training Course for Hazardous Waste Site Inspectors (40 Hour)

conducted by the

Center for Biomedical & Toxicological Research
Solid & Hazardous Waste Management
Florida State University

Christopher M. Teaf	June 8, 1990	
CBTR Associate Director FSU Training Course Coordinator	Date of Completion	FDER Training Course Coordinator

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

This certifies that

Michael T. Luster

has completed the 8-hour Annual Refresher seminar in

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

ECT

IN FULL COMPLIANCE WITH TRAINING REQUIREMENTS OF 29 CFR 1910.120

conducted by

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

February 17, 1995
Tampa, Florida

Douglas A. Dean, Health and Safety Officer

Gary P. Uebelhoer, Vice President

WESTINGHOUSE ELECTRIC CORPORATION

Name: ***Michael T. Luster***

Course: ***Hazardous Wastes Operations***

Date: ***September 11 - 15, 1990***

This is to certify the attendee's participation in the specified Westinghouse training during calendar year 1990. This training has been conducted by fully qualified instructors and fulfills the attendee's training requirements under Corporate Environmental Affairs standards.

Samuel R. Pitts
Vice President
Environmental Affairs

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

Certifies That

John Edwards

has successfully completed training in

HAZARDOUS MATERIALS & SITE INVESTIGATIONS

Basic 40-Hour Course

Instructor

October 7, 1988

Awarded This Date

Director of Safety

Director of Human Resources

A HUNTER Company

Environmental Technology Center

certifies that

John R. Edwards

has successfully completed the

8 Hour Safety and Health Annual Refresher Training

in compliance with 29 CFR 1910.120 and is awarded this Certificate

Issued on this eighteenth day of February, 1994 in Tampa, Florida

Richard Chinn, Director of Training

Environmental Technology Center
9225 Bay Plaza Blvd., Suite 407, Tampa FL 33619-4448
Ph: 813-621-8848 Fax: 813-621-0153

Figure 2 - Chain-of-Custody

Environmental Consulting & Technology, Inc.
4100 Center Pointe Drive • Suite #112 • Fort Myers, Florida 33916
Telephone: (941) 277-003 • FAX: (941) 277-1211

Chain of Custody

Please Print In Pen
Page ____ of ____

Client Name:	Contact:	Telephone:	Fax:
Address:	City:	State:	Zip Code:
Bill To:			
Project Name/Code:	Job #:	P.O.#:	
Project Address			
Due Date: ☐ Regular ☐ Rush (24 hrs), ☐ , 5 days	Sampled By:		

SAMPLE NUMBER	LOCATION DESCRIPTION	DATE	TIME	WATER	AIR	SOLID	NO. OF CONTAINERS	REQUIRED TEST

Relinquished by: (Signature)	Relinquished by: (Signature)	Date/Time	I hearby authorize the performance of the above indicated Work.
Relinquished by: (Signature)	Relinquished by: (Signature)	Date/Time	
Special Instructions/Remarks			DISTRIBUTION: White with report; Yellow to Lab.; Pink to Courier; Green to Client