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LETTER REQUESTING APPROVAL OF MONITORING WELL INSTALLATION ZONE I AREAS OF CONCERN 678, 679, 680 AND 681 AND SOLID WASTE MANAGEMENT UNIT 177 CNC CHARLESTON SC
2/25/1998
ENSAFE INC.

2909-08920

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ENSAFE

ENVIRONMENTAL AND SAFETY DESIGNS, INC.

935 Houston Northcutt Blvd. • Suite 113 • Mt. Pleasant, SC 29464 • Telephone 803-884-0029 • Facsimile 803-856-0107

February 25, 1998

Mr. Paul Bergstrand
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

RE: Request for Approval of Permanent and Temporary Well Point Permits For Zone I Naval Base Charleston, Charleston, South Carolina

Dear Mr. Bergstrand:

This letter serves as a request to SCDHEC to issue well permits for additional permanent and temporary well points for Zone I at Naval Base Charleston. Additional information is also provided in this package to address concerns presented in the USEPA and SCDHEC comments of the Draft Zone I RFI Report. These concerns are addressed by site in the following sections. A copy of the Zone I monitoring well map from the RFI report is enclosed with this package; the locations of new permanent and temporary well points are noted on this map.

AOC 678/679

AOC 678/679 is the site of the former firefighting school and wash rack. EnSafe located one aerial photograph from 1954 for this area of the Naval Base. However, details are difficult to determine from this photograph, which is enclosed with this package. However, a base map from 1955 (also enclosed) shows the buildings associated with the firefighting school. Review of this map indicates that the firefighting school encompassed several buildings over a larger area than previously known, and that the previously installed wells do not adequately cover the southern portion of the former firefighting school area. Six additional temporary well points have therefore been proposed for this area. These well points are shown on the Zone I monitoring well location map. A transparent overlay of a portion of the 1955 base map is enclosed with this package; placing the transparency over the monitoring well drawing using older buildings (i.e., Buildings 200 and X33A) as tie-in points indicates that the additional well points will provide data for the previously unaddressed portion of the firefighting school area.

Groundwater samples will be collected from the six temporary wells using direct push technology (DPT). Two groundwater samples will be obtained from each of the six sampling points, at approximately 15 feet BGS and at the top of the Ashley Formation or the marsh clay, whichever is encountered first.

AOC 680

AOC 680 consists of Building NS-26. An oil water separator and a 6,000-gallon waste oil tank were formerly associated with this building. Three Naval Base figures are attached with this submittal; one shows the Building NS-26 association with the sanitary sewer system, the other two are internal piping diagrams of Building NS-26. The oil water separator was located inside the building, with the discharge piping exiting the river side of the building before entering the sanitary sewer system. The tank was also located on the river side of the building. Consequently, three permanent wells are proposed to further address this area; proposed well locations are shown on the Zone I monitoring well location map. Two well points are located on the river side of the building, one in the area where the oil/water separator piping exited the building, the second in the former tank area. An upgradient well point is located on the west side of the building. These shallow monitoring wells will be installed using hollow stem auger methods to an approximate depth of 15 feet below ground surface.

AOC 681

Various compounds of unknown origin have been detected on grid wells 13 and 13D. The sanitary sewer system map previously discussed (AOC 680) shows an oil/water separator located at Building 27, immediately adjacent to these two grid wells. Consequently, three temporary well points are proposed in the vicinity of the oil/water separator. These locations of these well points are shown on the attached Zone I monitoring well location map. Groundwater samples will be collected from the six temporary wells using direct push technology (DPT). Two groundwater samples will be obtained from each of the six sampling points, at approximately 15 feet BGS and at the top of the Ashley Formation or the marsh clay, whichever is encountered first.

SWMU 177

SWMU 177 consists of a former oil spill area at Building RTC-4. Two permanent well points are proposed for this area, one upgradient and one downgradient. The locations of these proposed well points are shown on the attached Zone I monitoring well location map. These shallow monitoring wells will be installed using hollow stem auger methods to an approximate depth of 15 feet below ground surface.

Zone I Dioxins

A memorandum has been prepared to address concerns expressed about the concentrations of dioxins and dioxin-like compounds detected in groundwater samples from Zone I. This issue was previously examined in 1995 for soil, sediment, and groundwater samples obtained from Zone H. The attached memorandum summarizes the activities conducted in Zone H to evaluate the significance of detected dioxin levels, then applies the same evaluation to the Zone I groundwater results. The USEPA and EnSafe Zone H documentation from 1995 is also enclosed.

This submittal fulfills the requirements for notification to SCDHEC as stated in the *South Carolina Well Standards and Regulations Document R.61-71*. All permanent and temporary wells will be installed by a state-licensed well driller. The subcontractor is scheduled to initiate activities on March 16, 1998.

If you have any questions, comments or need additional information, please do not hesitate to call me at (803) 884-0029. We look forward to hearing from you soon on this matter.

Sincerely,
EnSafe Inc.

By: Robert A. Maddux, Jr., P.E.
Project Engineer

cc: [redacted]
Tony Hunt, SOUTHDIV
Dann J. Spariosu, USEPA Region IV
CTO-2909, 2909-12210 file

EnSafe

Memorandum

SUBJECT: Dioxin Analyses for Groundwater in Zone I, Naval Base Charleston, SC

FROM: Robert Maddux, Environmental Engineer, EnSafe Inc.

TO: Naval Base Charleston Project Team

DATE: 2 February 1997

This memorandum has been prepared to address concerns expressed about the concentrations of dioxins and dioxin-like compounds detected in groundwater samples from Zone I, Naval Base Charleston, Charleston, South Carolina. This issue was previously examined in 1995 for soil, sediment, and groundwater samples obtained from Zone H. This memorandum summarizes the activities conducted in Zone H to evaluate the significance of detected dioxin levels, then applies the same evaluation to the Zone I groundwater results.

In a memorandum dated 2 March 1995 (Attachment A), Ted W. Simon of the Office of Health Assessment, Region IV, USEPA discussed risk and human health issues related to the results of chemical analyses for dioxin an dioxin-like compounds performed on surface soil samples collected by EnSafe/Allen & Hoshall in Zone H of Naval Base Charleston. He calculated dioxin levels by choosing the maximum detected concentration for each of the seventeen dioxin and furan analytes from 78 surface soil samples, then multiplying these concentrations by the appropriate toxic equivalency factors (TEFs) to obtain the toxic equivalents (TEQs) that express each congener's toxicity as an equivalent concentration of 2,3,7,8-TCDD. He then added the maximum TEQs to arrive at a value for total dioxin TEQs in the zone. He compared this figure (0.533 ppb) with the 1 ppb in soil that "EPA considers...to be a reasonable level to begin consideration of measures to limit exposure (Memo, p.3)." Based on his evaluation, he concluded that "the concentrations of dioxin in surface soil at Zone H are below the level at which human exposure should be limited." Since his method involves combining maximum values of different congeners from scattered locations as if they all came from a single theoretical "hot spot," it should be considered especially conservative in terms of protecting human health.

In a subsequent memorandum dated 18 April 1995 (Attachment B), Barry Doll of EnSafe Inc. applied the same methodology to calculations of total dioxin TEQs for Zone H subsurface soils, sediments, and groundwater as was applied to surface soils. The results of these calculations indicated total dioxin TEQs of 0.0657 ppb in subsurface soils, 0.0794 in sediments, and 14.459 pg/L (1.45×10^{-8} mg/L) in groundwater. The dioxin-based TEQs for subsurface soil and sediments were nearly an order of magnitude lower than those of surface soils. The groundwater TEQ of 1.45×10^{-8} mg/L was well below the EPA Maximum Contaminant Level (MCL) for drinking water, which for 2,3,7,8-TCDD is 3×10^{-8} mg/L. It was concluded that, utilizing this methodology, the maximum concentrations of seventeen dioxin and furan congeners seen in Zone

H soils and sediments, when combined as if they occurred at a single point, fall well below the level at which human exposure should be limited. It was also noted that corresponding maximum concentrations of dioxins in groundwater samples from Zone H are less than half of the EPA MCL for drinking water.

This same methodology has been applied to the groundwater sample results from Zone I. Data from all Zone I monitoring wells during the four rounds of sampling was utilized to determine the maximum value for each analyte. The results of the TEQ calculations is shown in the following table, as are the sample identifications corresponding to the maximum concentrations.

Dioxin/Furan Congener	Sample Identification	Maximum Detected Concentration (pg/L)	TEF	Maximum TEQ Present (pg/L)
2378-TCDD	N/A	ND	1	0.000
123789-HxCDD	N/A	ND	0.1	0.000
OCDD	012-G-W001-01	105.868	0.001	0.106
1234678-HpCDD	012-G-W001-01	14.857	0.01	0.149
OCDF	012-G-W001-01	359.642	0.001	0.360
123478-HxCDD	N/A	ND	0.1	0.000
12378-PeCDD	N/A	ND	0.5	0.000
2378-TCDF	N/A	ND	0.1	0.000
1234789-HpCDF	GDI-G-W01D-01	3.507	0.01	0.035
23478-PeCDF	N/A	ND	0.5	0.000
12378-PeCDF	012-G-W001-01	2.671	0.05	0.134
123678-HxCDF	GDI-G-W003-04	8.400	0.1	0.840
123678-HxCDD	GDI-G-W003-04	6.340	0.1	0.634
234678-HxCDF	GDI-G-W003-04	8.540	0.1	0.854
1234678-HpCDF	012-G-W001-01	111.889	0.01	1.119
123478-HxCDF	GDI-G-W003-03	13.100	0.1	1.310
123789-HxCDF	012-G-W001-01	6.766	0.1	0.677
Total Dioxin TEQs (pg/L)				6.216

For Zone I groundwater, the total dioxin TEQ total is 6.216 pg/L, which is equivalent to 6.22 x 10^{-9} mg/l. This is approximately 20% of the EPA MCL for drinking water of 3 x 10^{-8} mg/l for 2,3,7,8-TCDD. Since this result was determined by combining maximum values of different congeners from scattered locations as if they all came from a single theoretical "hot spot," the actual total dioxin TEQs for individual locations would considerably lower.

ATTACHMENT A

USEPA MEMORANDUM
2 MARCH 1995

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

March 2, 1995

4WD-OHA

MEMORANDUM

SUBJECT: Risk review comments, human health aspects, Dioxin Sampling in Zone H, Naval Base Charleston, Charleston, SC

FROM: Ted W. Simon, Ph.D. DABT, Toxicologist
Office of Health Assessment

THROUGH: Elmer W. Akin, Chief
Office of Health Assessment

TO: Doyle Brittain, Senior Remedial Project Manager
FFB/BRAC

Findings and Recommendations:

After review of the Dioxin Analysis data at Zone H provided me by EnSafe, I have concluded that the concentrations of dioxin in surface soil at Zone H are below the level at which human exposure should be limited. The additional dioxin exposure from surface soil at Zone H is not expected to raise a base resident's total dioxin exposure above levels considered protective.

There does not appear to be a need to restrict exposure to surface soil. However, the highest level of dioxin Toxic Equivalents (TEQs) occurred in two samples - 013-C-B022-01 and 121-C-B002-01. I was not provided a map and do not know these sampling locations. It might be prudent to consider why these locations had higher levels than others.

The total dioxin TEQ at zone H is 0.53 ppb and the level considered protective is 1 ppb. Using the maximum concentrations from geographically separate locations is unrealistic and would tend to overestimate the risk. In addition, protective or so-called conservative exposure assumptions were used to determine the level of concern for dioxin at 1 ppb in residential soils. Hence, this assessment would tend to be overprotective.

Level 1 only)

Maximum Dioxin Concentrations and TEQs in Surface Soil at Zone H

From all surface soil analyses, I chose the maximum detected concentration of the toxic congeners. The TEQs are multipliers that reflect the toxicity of the specific congener relative to 2,3,7,8-TCDD. The actual assessment is based on exposure to Toxic Equivalents (TEQs) of 2,3,7,8-TCDD. The maximum detected concentrations are presented in table I below.

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TABLE I
Maximum Concentrations and Corresponding TEQ Levels at Zone H

Dioxin Congener	Maximum Detected Concentration (ug/Kg or ppb)	TEQ	Maximum TEQ Present (ppb)
2,3,7,8-TCDD	0.421	1	0.421 ←
1,2,3,7,8,9-HxCDD	0.033	0.1	0.0033
OCDD	8.318	0.001	0.008
1,2,3,4,6,7,8-HpCDD	0.747	0.01	0.0075
OCDF	1.290	0.001	0.0013
1,2,3,4,7,8-HxCDD	0.0095	0.1	0.00095
.01146 1,2,3,7,8-PeCDD	.0095 ~~0.004~~	0.5	.0048 ~~0.002~~
2,3,7,8-TCDF	0.083	0.1	0.0083
1,2,3,4,7,8,9-HpCDF	0.029	0.01	0.003
2,3,4,7,8-PeCDF	0.055	0.5	0.028 ←
1,2,3,7,8-PeCDF	0.029	.05 ~~0.5~~	.00145 ~~0.015~~
1,2,3,6,7,8-HxCDF	0.045	0.1	0.0045
1,2,3,6,7,8-HxCDD	0.031	0.1	0.0031
2,3,4,6,7,8-HxCDF	0.067	0.1	0.0067
1,2,3,4,6,7,8-HpCDF	0.449	0.01	0.0045
1,2,3,4,7,8-HxCDF	0.147	0.1	0.015
1,2,3,7,8,9-HxCDF	0.012	0.1	0.0012
TOTAL DIOXIN TEQs			0.522 ~~0.533~~

Protective Exposure Level

EPA considers 1 ppb in surface soil to be a reasonable level to begin consideration of measures to limit exposure. At the Times Beach Superfund site, soil containing less than 1 ppb TEQ dioxin is not treated, soil containing between 1 ppb and 10 ppb is covered and soil containing greater than 10 ppb is removed and slated for incineration.

The level of 1 ppb is considered protective based on a peer-reviewed scientific paper, Kimbrough RD, Falk H, Stehr P, Fries G (1984) Health Implications of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soil. *J. Tox. Env. Health* 14:47-93. In the abstract, the paper states:

We have a copy of this

> *One ppb of 2,3,7,8-TCDD in soil is a reasonable level at which to behing consideration of action to limit human exposure to contaminated soil.*

and in the introduction

> *... because of the unlikelihood that all of the conservative exposure assessment assumptions will be realized on a continuous or lifetime basis, we have concluded that residential soil levels greater that 1 ppb TCDD pose a level of concern.*

Future Work

level 2)

Over the next few days, I will be reviewing the dioxin analyses from groundwater, subsurface soil and sediment and will let you know if I consider exposure to these media to pose a risk to human health.

Please let me know if I can be of any further help.

T.W. Simon/tws:4WD-OHA:1586/03/02/95/A:\DISK_5\MAR95\CNSY_DXN.RA

What cutoff will be use for groundwater?

For residential soils, EPA's RBC limit is 4.3 ppt; he used 1000 ppt.

EPA's RBC limit for Tapwater is 0.5 pg/L

groundwater

Target 1 hit for each dioxin & furan congener

	max PG/L	TEQ of max
2378 - TCDD	8.8008	8.8008
12378 - PeCDD	3.2491	1.6246
123478 - HxCDD	3.6705	0.3671
123678 - HxCDD	1.8357	0.1836
123789 - HxCDD	6.0165	0.6017
1234678 - HpCDD	7.1814	0.0718
OCDD	1548.8739	1.5489
2378 - TCDF	8.1057	0.4053
12378 - PeCDF	11.0236	5.5118
23478 - PeCDF	1.8948	0.1895
123478 - HxCDF	2.8708	0.2871
123678 - HxCDF	2.169	0.2169
123789 - HxCDF	2.0198	0.2020
234678 - HxCDF	—	
1234678 - HpCDF	15.1863	0.1519
1234789 - HpCDF	1.3615	0.0136
OCDF	31.5648	0.0316
		20.2082

ATTACHMENT B

ENSAFE MEMORANDUM
18 APRIL 1995

April 18, 1995

Memorandum

SUBJECT: Dioxin analyses for subsurface soil, sediments, and groundwater in Zone H, Naval Base Charleston, SC

FROM: Barry Doll, Geologist, EnSafe - Raleigh

TO: Tony Hunt, RPM, SOUTHNAVFACENGCOM

In a memorandum dated March 2, 1995, Ted W. Simon of the Office of Health Assessment, Region IV, USEPA discussed risk and human health issues related to the results of chemical analyses for dioxin and dioxin-like compounds performed on surface soil samples collected by EnSafe/Allen & Hoshall in Zone H of the Charleston Naval Base, Charleston, SC. He calculated dioxin levels by choosing the maximum detected concentration for each of the seventeen dioxin and furan analytes, then multiplying these concentrations by the appropriate toxic equivalency factors (TEFs) to obtain the toxic equivalents (TEQs) that express each congener's toxicity as an equivalent concentration of 2,3,7,8-TCDD. He then added the maximum TEQs to arrive at a value for total dioxin TEQs in the zone. He compared this figure (0.533 ppb) with the 1 ppb in soil that "EPA considers...to be a reasonable level to begin consideration of measures to limit exposure (Memo, p.3)." Based on his evaluation, he concluded that "the concentrations of dioxin in surface soil at Zone H are below the level at which human exposure should be limited." Since his method involves combining maximum values of different congeners from scattered locations as if they all came from a single theoretical "hot spot," it should be considered especially conservative in terms of protecting human health.

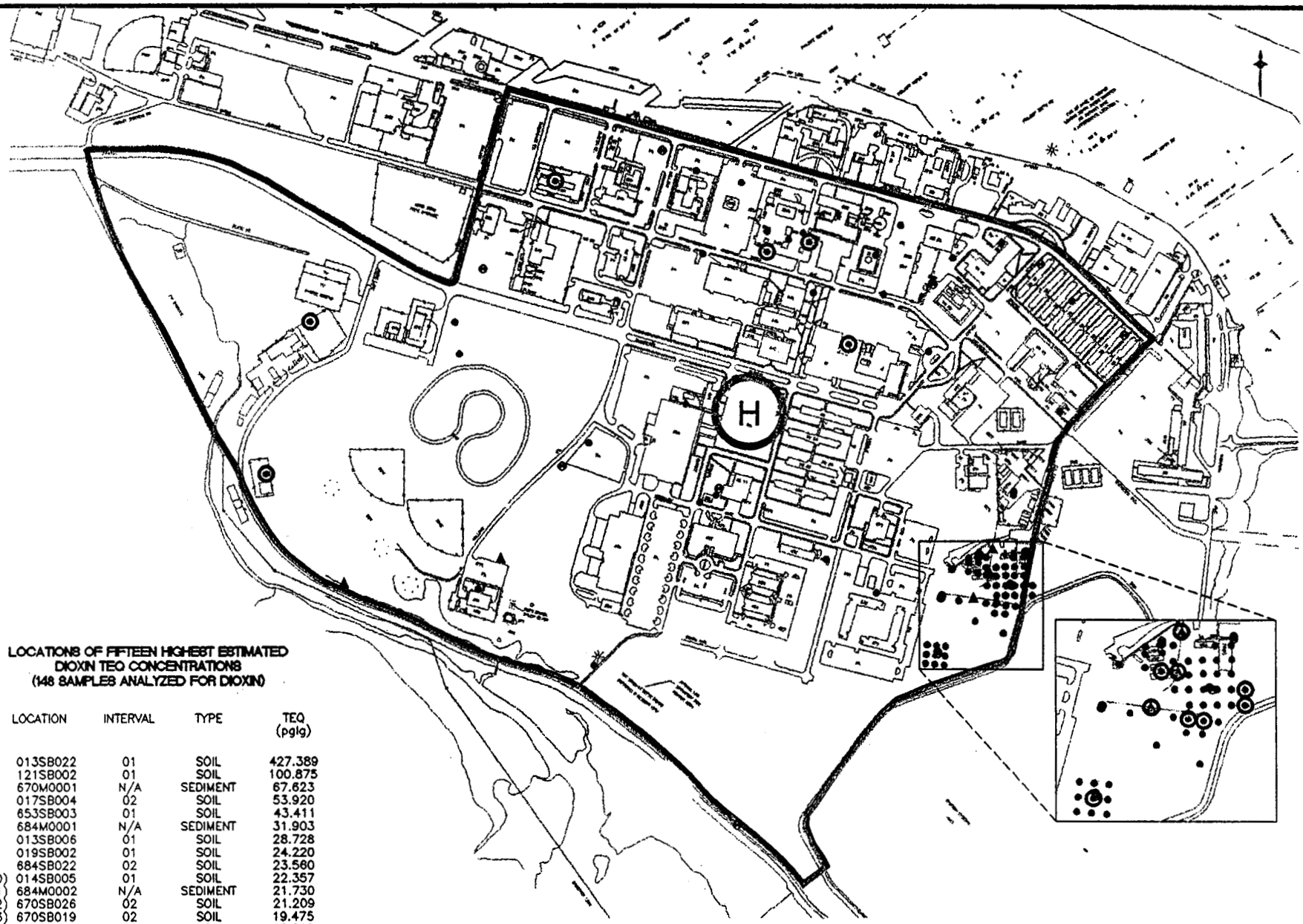
The original memorandum covered 78 surface soil samples taken in Zone H. This memo applies the same methodology to calculations of total dioxin TEQs for subsurface soils (45 samples), sediments (6 samples), and groundwater (19 samples) in Zone H as was applied to surface soils. Also included is a map showing the locations of the 15 highest calculated TEQs in individual samples.

TABLE 1
Maximum Concentrations and TEQ Levels for Subsurface Soils

Dioxin/furan Congener	Maximum Detected Concentration (ppb)	TEF	Maximum TEQ Present (ppb)
2378-TCDD	0.0063	1	0.0063
123789-HxCDD	0.0249	0.1	0.0025
OCDD	22.6950	0.001	0.0227
1234678-HpCDD	0.4505	0.01	0.0045
OCDF	0.3828	0.001	0.0004
123478-HxCDD	0.0088	0.1	0.0009
12378-PeCDD	0.0042	0.5	0.0021
2378-TCDF	0.0234	0.1	0.0023
1234789-HpCDF	0.0223	0.01	0.0002
23478-PeCDF	0.0238	0.5	0.0119
12378-PeCDF	0.0043	0.05	0.0002
123678-HxCDF	0.0086	0.1	0.0009
123678-HxCDD	0.0164	0.1	0.0016
234678-HxCDF	0.0165	0.1	0.0017
1234678-HpCDF	0.0910	0.01	0.0009
123478-HxCDF	0.0647	0.1	0.0065
123789-HxCDF	0.0009	0.1	0.0001
TOTAL DIOXIN TEQs (ppb)			0.0657

TABLE 2
Maximum Concentrations and TEQ Levels for Sediments

Dioxin/furan Congener	Maximum Detected Concentration (ppb)	TEF	Maximum TEQ Present (ppb)
2378-TCDD	0.0452	1	0.0452
123789-HxCDD	0.0281	0.1	0.0028
OCDD	7.3535	0.001	0.0074
1234678-HpCDD	0.8238	0.01	0.0082
OCDF	0.3011	0.001	0.0003
123478-HxCDD	0.0094	0.1	0.0009
12378-PeCDD	0.0115	0.5	0.0058
2378-TCDF	0.0050	0.1	0.0005
1234789-HpCDF	0.0085	0.01	0.0001
23478-PeCDF	0.0025	0.5	0.0013
12378-PeCDF	0.0086	0.05	0.0004
123678-HxCDF	0.0060	0.1	0.0006
123678-HxCDD	0.0285	0.1	0.0029
234678-HxCDF	0.0088	0.1	0.0009
1234678-HpCDF	0.1207	0.01	0.0012
123478-HxCDF	0.0065	0.1	0.0007
123789-HxCDF	0.0020	0.1	0.0002
TOTAL DIOXIN TEQs (ppb)			0.0794



LOCATIONS OF FIFTEEN HIGHEST ESTIMATED DIOXIN TEQ CONCENTRATIONS (148 SAMPLES ANALYZED FOR DIOXIN)

	LOCATION	INTERVAL	TYPE	TEQ (pg/g)
1)	013SB022	01	SOIL	427.389
2)	121SB002	01	SOIL	100.875
3)	670M0001	N/A	SEDIMENT	67.623
4)	017SB004	02	SOIL	53.920
5)	653SB003	01	SOIL	43.411
6)	684M0001	N/A	SEDIMENT	31.903
7)	013SB006	01	SOIL	28.728
8)	019SB002	01	SOIL	24.220
9)	684SB022	02	SOIL	23.560
10)	014SB005	01	SOIL	22.357
11)	684M0002	N/A	SEDIMENT	21.730
12)	670SB026	02	SOIL	21.209
13)	670SB019	02	SOIL	19.475
14)	684SB031	01	SOIL	18.819
15)	684SB030	02	SOIL	17.499

ABOVE LOCATIONS IDENTIFIED ON MAP BY CIRCLED SOIL AND SEDIMENT SYMBOLS.

LEGEND

- ● - SOIL SAMPLE LOCATION
- ▲ - SEDIMENT SAMPLE LOCATION
- ⊕ - GROUNDWATER SAMPLE LOCATION

RFI
NAVY BASE CHARLESTON
CHARLESTON, SC

ZONE H
SAMPLE LOCATIONS WITH
DIOXIN ANALYSIS

DWG DATE: 03/02/95 | DWG NAME: 29CHRDA2

TABLE 3
Maximum Concentrations and TEQ Levels for Groundwater

Dioxin/furan Congener	Maximum Detected Concentration (pg/L)	TEF	Maximum TEQ Present (pg/L)
2378-TCDD	8.8008	1	8.8008
123789-HxCDD	6.0165	0.1	0.6017
OCDD	68.8541	0.001	0.0689
1234678-HpCDD	7.1814	0.01	0.0718
OCDF	5.8973	0.001	0.0059
123478-HxCDD	ND	0.1	0.0000
12378-PeCDD	3.2491	0.5	1.6246
2378-TCDF	8.1057	0.1	0.8106
1234789-HpCDF	1.3615	0.01	0.0136
23478-PeCDF	1.8945	0.5	0.9473
12378-PeCDF	11.0236	0.05	0.5512
123678-HxCDF	2.1690	0.1	0.2169
123678-HxCDD	1.8359	0.1	0.1836
234678-HxCDF	0.7699	0.1	0.0770
1234678-HpCDF	4.9722	0.01	0.0497
123478-HxCDF	2.3365	0.1	0.2337
123789-HxCDF	2.0198	0.1	0.2020
TOTAL DIOXIN TEQs (pg/L)			14.459

Results of TEQ calculations for the three groups of solid-media samples are as follows:

Surface soil (78 samples):	0.5330 ppb
Subsurface soil (45 samples):	0.0657 ppb
Sediment (6 samples):	0.0794 ppb

Subsurface soils and sediments exhibit levels of dioxin-based Toxic Equivalents (TEQs) that are nearly an order of magnitude lower than those of surface soils. Groundwater TEQ totals from Table 3 (above) are 14.459 pg/L, which is equivalent to 1.45×10^{-8} mg/L. This figure may be compared to the EPA's Maximum Contaminant Level (MCL) for drinking water, which for 2,3,7,8-TCDD is 3×10^{-8} mg/L.

After an extensive review of the dioxin literature, Paddock (1989, p.25) concluded that "dioxins and furans attached to particles can migrate considerable distances in the air, and to a lesser extent in water. But because these compounds are so insoluble in water, and because they bind so strongly to particles in the soil and water, they appear to migrate very little once they reach sediments and soil. Areas of severe contamination have typically remained local problems, and contamination appears to be limited to nearby areas."

In summary: According to the methods employed by Ted Simon of EPA in his memo of March 2nd, the maximum concentrations of seventeen dioxin and furan congeners seen in soil and sediment samples in Zone H, when combined as if they occurred at a single point, fall well below the level at which human exposure should be limited. The corresponding maximum concentrations of dioxins in groundwater samples from Zone H are less than half of EPA's Maximum Contaminant Level for drinking water.

Paddock, Todd (1989). *Dioxins and Furans: Questions and Answers*. Academy of Natural Sciences, Philadelphia, PA.