CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

JUN - 6 2007

CY 07-092

Docket No. 50-213

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-001

Haddam Neck Plant
Radionuclide Concentration Data Related to the EPA/NRC
Memorandum of Understanding (MOU)

The purpose of this letter is to provide radionuclide concentration data that can be used to evaluate the conditions at the Haddam Neck Plant (HNP) in relation to the consultation trigger concentration values contained in the EPA/NRC MOU[1]

All remediation and Final Status Survey activities have been completed at the HNP and CYAPCO is in the process of requesting release of all areas outside of the Independent Spent Fuel Storage Installation (ISFSI) from the NRC license. One final round of groundwater monitoring well sampling will take place in early June of this year to complete the requirements of the HNP License Termination Plan (LTP). Beginning in June of 2007, at least four (4) years of groundwater monitoring will be conducted in compliance with CYAPCO's commitment to the State of Connecticut Department of Environmental Protection (CT DEP) Remediation Standards Regulations (RSRs). The compliance criteria under the CT DEP RSRs are:

- For groundwater to meet the EPA Maximum Contaminant Levels (MCLs); and
- For soil to meet the concentrations corresponding to a total effective whole body dose equivalent (TEDE) to a postulated future resident of 19 mrem/yr (adjusted downward to account for any TEDE dose due to groundwater contamination either existing or from future releases from subsurface concrete).

[1] Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, dated October 2, 2002

NMSS01

FSME

To correspond to the time for evaluation of radionuclide concentrations called for in the MOU which is the time of request of removal of site areas from the NRC license, the attached evaluation compares the radionuclide concentrations present in soil and groundwater to the consultation trigger concentrations contained in the EPA/NRC MOU.

In summary, for all survey units at the HNP, the actual average concentrations of soil and groundwater present in these areas at this time are below the trigger concentrations given in the EPA/NRC MOU. CYAPCO will be requesting release of the non-ISFSI areas of the Haddam Neck Plant site from the NRC license by separate correspondence.

If you should have any questions regarding this submittal, please contact me at (860) 267-3196.

Sincerely,

Gerard van Noordennen 6-6-07

Gerard van Noordennen Date
Director, Regulatory Affairs and Quality Assurance

Attachment: Evaluation of Soil and Groundwater Concentrations Concerning the NRC/EPA MOU

cc: S. J. Collins, NRC Region 1 Administrator
T. Smith, NRC Project Manager
L. Kauffman, NRC Region 1
E. L. Wilds, Jr., Director, Radiation Division, CT DEP
E. Waterman, EPA Region 1

CY-07-092

Attachment 1

Haddam Neck Plant

Evaluation of Soil and Groundwater Concentrations Concerning the NRC/EPA MOU

June 2007

Evaluation of Soil and Groundwater Concentrations Concerning the NRC/EPA MOU

## 1. Background:

The EPA/NRC MOU (Reference 3.1) contains certain radionuclide concentrations against which the average concentrations present at a NRC licensed site at the time of license termination are to be evaluated. These concentrations are for soil and groundwater. The following provides a summary of the actual concentrations for these media at the Haddam Neck Plant (HNP).

## 2. Evaluations

### 2.1 Soil:

Table 1 of the MOU (Reference 3.1) presents "Consultation Triggers for Residential and Commercial/Industrial Soil Contamination". As CYAPCO is seeking unrestricted release for the non-ISFSI areas of the HNP, the "Residential" values (Reference 3.1, Table 1, Column 2) are appropriate for comparison to the actual concentrations at the HNP. The MOU concentrations listed in Reference 3.1 for the radionuclides of concern at the HNP are shown in the second column of Table 1 of this attachment. The HNP License Termination Plan (LTP) (Reference 3.2) determined a conservative list of radionuclides known to be or potentially present at the HNP. The HNP final status survey activities have been performed to evaluate these radionuclides of concern. Therefore, only the radionuclides in the MOU that correspond to the HNP LTP list of radionuclides are shown in Table 1. Figure 1 shows the Monitoring Wells and Final Status Survey Areas in the Industrial Area and vicinity at the Haddam Neck Plant site.

The values in the third column of Table 1 are the maximum average concentrations allowed in any survey unit at the HNP that has passed its Final Status Survey (FSS). As all areas for which CYAPCO is seeking release from the NRC license have passed their FSS, it is known that no survey unit has an average concentration above these values. In fact, the average concentrations in all the survey units at HNP have been shown to be well below the values in the third column of Table 1 (Highest Average Sum of the Fraction Dose is 6.91 mrem/yr or 36.4 percent of the design dose for Survey Unit 9527-0006). Therefore, if the values in column three of Table 1 are below those in column 2, no further evaluation regarding the consultation trigger values is required for these radionuclides. This is the case for all radionuclides except H-3, Cs-137, Eu-152 and Eu-154 (Values shown in bold in Table 1).

Concerning these four radionuclides, the maximum single sample tritium value detected in a FSS sample was 46.9 pCi/g (Discharge Canal Survey Unit 9106-0009), which is only 21% of the trigger concentration of 228 pCi/g. Similarly, Eu-152 and Eu-154 were positively detected at levels below 5% of the values in Column 3 of Table 1. Thus any Eu-152 and Eu-154 remaining in the site soils are no more then 10% of the NRC/EPA MOU trigger levels. Given that the maximum allowable concentration for Cs-137 in any survey unit is only 0.2% higher than the MOU, it can be seen that even if all the worst case values for H-3, Eu-152, Eu-154 and Cs-137 were present in the same survey unit, the sum of the fractions of the MOU trigger values would not exceed 1.

Table 1

Comparison of Maximum Allowable Average CY Soil Concentrations to MOU Trigger Concentrations

| Radionuclide | EPA/NRC MOU Consultation Triggers for Residential Soil Contamination (pCi/g) | Maximum Average Soil Concentration Allowed by Final Status Survey Design at CY (pCi/g) |
|---|---|---|
| | | |
| **H-3** | **228** | **313** |
| C-14 | 46 | 4.3 |
| Mn-54 | 69 | 13.2 |
| Fe-55 | 269,000 | 20,800 |
| Co-60 | 4 | 2.9 |
| Ni-63 | 9,480 | 549 |
| Sr-90 + Daughter Radionuclides | 23 | 1.18 |
| Nb-94 | 2 | 5.41 |
| Tc-99 | 25 | 9.58 |
| Cs-134 | 16 | 3.55 |
| **Cs-137 + Daughter Radionuclides** | **6** | **6.01** |
| **Eu-152** | **4** | **7.68** |
| **Eu-154** | **5** | **7.06** |
| Pu-238 | 297 | 22.5 |
| Pu-239 | 259 | 20.3 |
| Pu-241 | 40,600 | 661 |
| Am-241 | 187 | 19.6 |
| Cm-243 | 35 | 22 |

The average concentrations for all survey units at the HNP are below the trigger concentrations listed in Table 1, Column 2 of the EPA/NRC MOU. Based on actual measurement of average soil concentrations in individual survey units, the sum of the fractions for all the radionuclides in the survey units is below a value of one, indicating the MOU trigger for soil is not exceeded.

## 2.2 Groundwater

The EPA/NRC MOU also has consultation trigger values for radionuclides in groundwater. These trigger concentrations correspond to the EPA Maximum Contaminant Levels (MCLs) for drinking water. CYAPCO has reported (Reference 3.4) that three radionuclides of concern are being detected in groundwater at the HNP. These three radionuclides are H-3, Sr-90 and Cs-137.

As discussed above, the MOU calls for a comparison at the time of license termination of the actual measurement groundwater concentrations to the MCLs. As CYAPCO is, at this time, requesting release of the non-ISFSI area from the NRC license, comparing to the current concentrations is appropriate.

CYAPCO has determined (Reference 3.3) that the capture zone of influence for the water supply well of the potential future resident of the HNP is 100 meters. For this evaluation the most recent actual groundwater concentrations of detected substances of concern (i.e., H-3, Sr-90, Cs-137, as reported in Reference 3.4 in the wells exhibiting exceedance of the MCL sum-of-fractions were averaged with other wells within a 100-meter capture zone radius (see Reference 3.3).

The results of the March 2007 sample round are shown in Table 2. Only two monitoring wells exhibit a sum of the MCL fractions greater than one. These wells are MW-125 and MW-137 with Total MCL Fractions of 2.33 and 1.02, respectively. Table 2 presents a comparison of the average groundwater concentrations and MCL fractions for the wells within the assumed 100 meter capture zone of MW-125 and MW-137. Figures 2 and 3 show the wells within the capture zones of MW-125 and MW-137. As all other wells at the HNP are below a total MCL fraction of 1, no analysis for wells other then MW-125 and MW-137 is needed.

As can be seen in Table 2, a number of well locations that are in the capture zone of the two wells analyzed are multi-zone or shallow and deep wells at the same location. For conservatism where this situation exists, only the highest concentrations from a zone of the multi-zone well or from one of the wells for a well pair were used. The values used in the calculation are in bold and italics in Table 2. The results of the calculation in Table 2 are that the Total Average MCL Fractions for MW-125 and MW-137 are 0.47 and 0.27, respectively. These total fractions are well below the MOU trigger of a Total MCL Fraction of 1 using the Sum of the Fraction methodology.

**Table 2 Comparison of Average Monitoring Well Concentrations to MCL (Page 1 of 4)**

| Well ID | Radio-nuclide | MCL Concentration (pCi/L) | March 2007 Concentration (pCi/L) | H-3 MCL Fraction for Wells in Capture Zone of MW-125 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-125 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-125 | H-3 MCL Fraction for Wells in Capture Zone of MW-137 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-137 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-137 |
|---|---|---|---|---|---|---|---|---|---|
| AT-1 | All | | <MDC | | | | | | |
| MW-100D | All | | <MDC | | | | | | |
| MW-100S | All | | <MDC | | | | | | |
| MW-101D | All | | <MDC | | | | ***0*** | ***0*** | ***0*** |
| MW-101S | All | | <MDC | | | | 0 | 0 | 0 |
| MW-102D | H-3 | 20000 | 1640 | | | | ***0.08*** | ***0*** | ***0*** |
| MW-102S | All | | <MDC | | | | 0 | 0 | 0 |
| MW-103A | All | | <MDC | | | | ***0*** | ***0*** | ***0*** |
| MW-103B | H-3 | 20000 | 1960 | | | | ***0.10*** | ***0*** | ***0*** |
| MW-103D | H-3 | 20000 | 443 | | | | ***0.02*** | ***0*** | ***0*** |
| MW-103S | All | | <MDC | | | | 0 | 0 | 0 |
| MW-105D | H-3 | 20000 | 1900 | ***0.10*** | ***0*** | ***0*** | ***0.10*** | ***0*** | ***0*** |
| MW-105S | H-3 | 20000 | 476 | 0.02 | 0 | 0 | 0.02 | 0 | 0 |
| MW-106D | H-3 | 20000 | 776 | 0.04 | 0 | 0 | 0.04 | 0 | 0 |
| MW-106S | H-3 | 20000 | 1800 | ***0.09*** | | ***0*** | ***0.09*** | | ***0*** |
| | Sr-90 | 8 | 4.77 | | ***0.60*** | | | ***0.60*** | |
| MW-107D | H-3 | 20000 | 2380 | ***0.12*** | ***0*** | ***0*** | ***0.12*** | ***0*** | ***0*** |
| MW-107S | H-3 | 20000 | 767 | 0.04 | 0 | 0 | 0.04 | 0 | 0 |
| MW-108 | All | | <MDC | | | | | | |
| MW-109D | H-3 | 20000 | 1790 | | | | | | |

**Table 2 Comparison of Average Monitoring Well Concentrations to MCL (Page 2 of 4)**

| Well ID | Radio-nuclide | MCL Concentration (pCi/L) | March 2007 Concentration (pCi/L) | H-3 MCL Fraction for Wells in Capture Zone of MW-125 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-125 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-125 | H-3 MCL Fraction for Wells in Capture Zone of MW-137 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-137 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-137 |
|---|---|---|---|---|---|---|---|---|---|
| MW-109S | H-3 | 20000 | 798 | | | | | | |
| | Sr-90 | 8 | 1.31 | | | | | | |
| MW-110D | H-3 | 20000 | 4440 | ***0.22*** | ***0*** | ***0*** | | | |
| MW-110S | H-3 | 20000 | 959 | 0.05 | 0 | 0 | | | |
| MW-112 | All | | <MDC | | | | | | |
| MW-113 | All | | <MDC | | | | | | |
| MW-117 | All | | <MDC | | | | | | |
| MW-118A-3 | H-3 | 20000 | 3640 | 0.18 | 0 | 0 | | | |
| MW-118A-4 | H-3 | 20000 | 2810 | 0.14 | 0 | 0 | | | |
| MW-118A-5 | H-3 | 20000 | 3500 | ***0.18*** | | ***0*** | | | |
| | Sr-90 | 8 | 3.36 | | ***0.42*** | | | | |
| MW-119-2 | H-3 | 20000 | 1500 | 0.08 | 0 | 0 | | | |
| MW-119-4 | H-3 | 20000 | 809 | 0.04 | 0 | 0 | | | |
| MW-119-5 | H-3 | 20000 | 10100 | 0.51 | 0 | 0 | | | |
| MW-119-6 | H-3 | 20000 | 15000 | ***0.75*** | ***0*** | ***0*** | | | |
| MW-120-1 | All | | <MDC | | | | | | |
| MW-120-2 | All | | <MDC | | | | | | |
| MW-120-3 | All | | <MDC | | | | | | |
| MW-120-4 | H-3 | 20000 | 2570 | | | | | | |
| MW-120-5 | H-3 | 20000 | 1290 | | | | | | |

## Table 2 Comparison of Average Monitoring Well Concentrations to MCL (Page 3 of 4)

| Well ID | Radio-nuclide | MCL Concentration (pCi/L) | March 2007 Concentration (pCi/L) | H-3 MCL Fraction for Wells in Capture Zone of MW-125 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-125 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-125 | H-3 MCL Fraction for Wells in Capture Zone of MW-137 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-137 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-137 |
|---|---|---|---|---|---|---|---|---|---|
| MW-121A-2 | All | | <MDC | 0 | 0 | 0 | | | |
| MW-121A-3 | H-3 | 20000 | 814 | 0.04 | 0 | 0 | | | |
| MW-121A-4 | H-3 | 20000 | 6000 | ***0.30*** | ***0*** | ***0*** | | | |
| MW-121A-5 | H-3 | 20000 | 844 | 0.04 | 0 | 0 | | | |
| MW-122D | All | | <MDC | ***0.00*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| MW-122S | H-3 | 20000 | 1110 | ***0.06*** | | ***0*** | ***0.06*** | | ***0*** |
| | Sr-90 | 8 | 1.72 | | **0.22** | | | ***0.22*** | |
| MW-123 | All | | <MDC | | | | | | |
| MW-124 | H-3 | 20000 | 620 | | | | | | |
| | Sr-90 | 8 | 4.93 | | | | | | |
| MW-125 | H-3 | 20000 | 13800 | ***0.69*** | | ***0*** | ***0.69*** | | ***0*** |
| | Sr-90 | 8 | 13.1 | | ***1.64*** | | | ***1.64*** | |
| MW-130 | All | | <MDC | | | | ***0*** | ***0*** | ***0*** |
| MW-131D | H-3 | 20,000 | 433 | | | | 0.02 | 0 | 0 |
| MW-131S | H-3 | 20,000 | 484 | | | | ***0.02*** | | ***0*** |
| | Sr-90 | 8 | 2.18 | | | | | ***0.27*** | |
| MW-132D | All | | <MDC | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** | ***0*** |
| MW-132S | All | | <MDC | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 2 Comparison of Average Monitoring Well Concentrations to MCL (Page 4 of 4)**

| Well ID | Radio-nuclide | MCL Concentration (pCi/L) | March 2007 Concentration (pCi/L) | H-3 MCL Fraction for Wells in Capture Zone of MW-125 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-125 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-125 | H-3 MCL Fraction for Wells in Capture Zone of MW-137 | Sr-90 MCL Fraction for Wells in Capture Zone of MW-137 | Cs-137 MCL Fraction for Wells in Capture Zone of MW-137 |
|---|---|---|---|---|---|---|---|---|---|
| MW-133 | H-3 | 20,000 | 486 | *0.02* | | *0* | | | |
| | Sr-90 | 8 | 1.5 | | *0.19* | | | | |
| MW-134 | H-3 | 20,000 | 1040 | *0.05* | *0* | *0* | *0.05* | *0* | *0* |
| MW-135 | All | | <MDC | | | | | | |
| MW-136D | H-3 | 20,000 | 590 | | | | *0.03* | *0* | *0* |
| | Sr-90 | 8 | 2.81 | | | | | *0.35* | |
| MW-136S | H-3 | 20,000 | 359 | | | | *0.02* | *0* | *0* |
| MW-137 | H-3 | 20,000 | 2380 | *0.12* | | | *0.12* | | |
| | Sr-90 | 8 | 6.01 | | *0.75* | | | *0.75* | |
| | Cs-137 | 200 | 29.8 | | | *0.15* | | | *0.15* |
| MW-138 | All | | <MDC | | | | | | |
| MW-139 | All | | <MDC | | | | *0* | *0* | *0* |
| MW-140 | All | | <MDC | | | | *0* | *0* | *0* |
| MW-508D | All | | <MDC | | | | | | |
| MW-508S | All | | <MDC | | | | | | |
| | | Average MCL Fraction | | 0.19 | 0.27 | 0.01 | 0.07 | 0.19 | 0.01 |
| | | | | **Total Average MCL Fraction for MW-125** | | **0.47** | **Total Average MCL Fraction for MW-137** | | **0.27** |

**Notes:**
pCi/L - pico curries per liter
MDC - Minimum Detectable Concentration

### 2.3 Summary

CYAPCO is requesting release of the non-ISFSI areas of the Haddam Neck Plant site from the NRC license. The preceding analysis shows that the actual concentrations of soil (i.e., average within survey units) and groundwater (i.e., average concentration within a capture zone) present in these areas after completion of remediation and Final Status Surveys are below the trigger concentrations given in the EPA/NRC MOU.

## 3.0 References

3.1 Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, dated October 2, 2002.

3.2 Letter, CY-07-031, dated February 2, 2007, Haddam Neck Plant License Termination Plan, Revision 5.

3.3 Letter, CY-05-022, dated January 31, 2005, License Termination Plan Supplemental Information – Survey Areas Potentially Affected by Groundwater Contamination and Capture Zone Analysis.

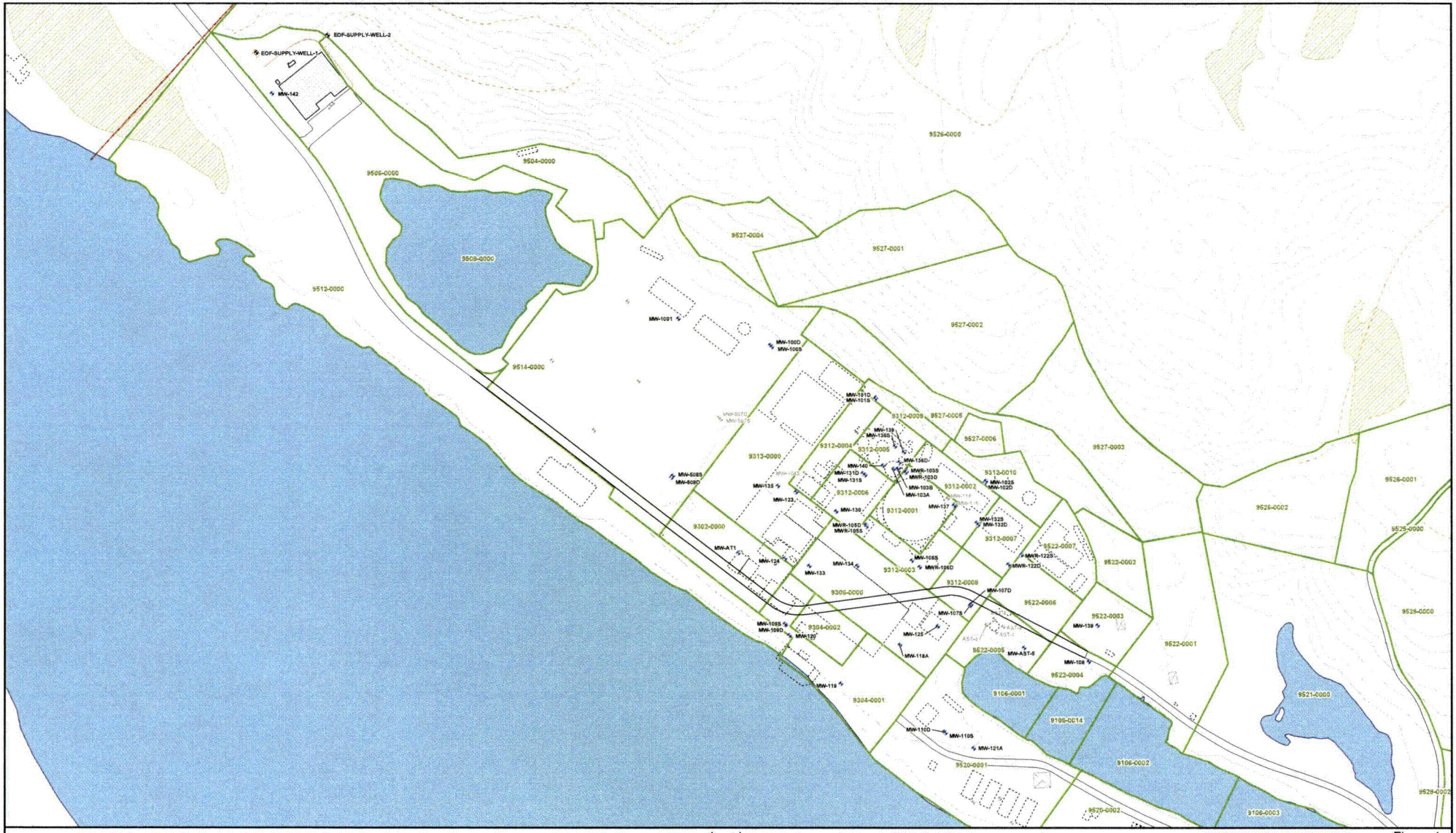
3.4 Letter, CY-07-081, dated May 21, 2007, Groundwater Monitoring to Support License Termination Quarterly Summary Report (Spring 2007).

## 4.0 Attachments

Figure 1 – Monitoring Wells and Final Status Survey Areas

Figure 2 – Capture Zone Around MW-125

Figure 3 – Capture Zone Around MW-137




Plant North

N

0 50 100 Feet

Note: Site Conditions Circa December 2006.

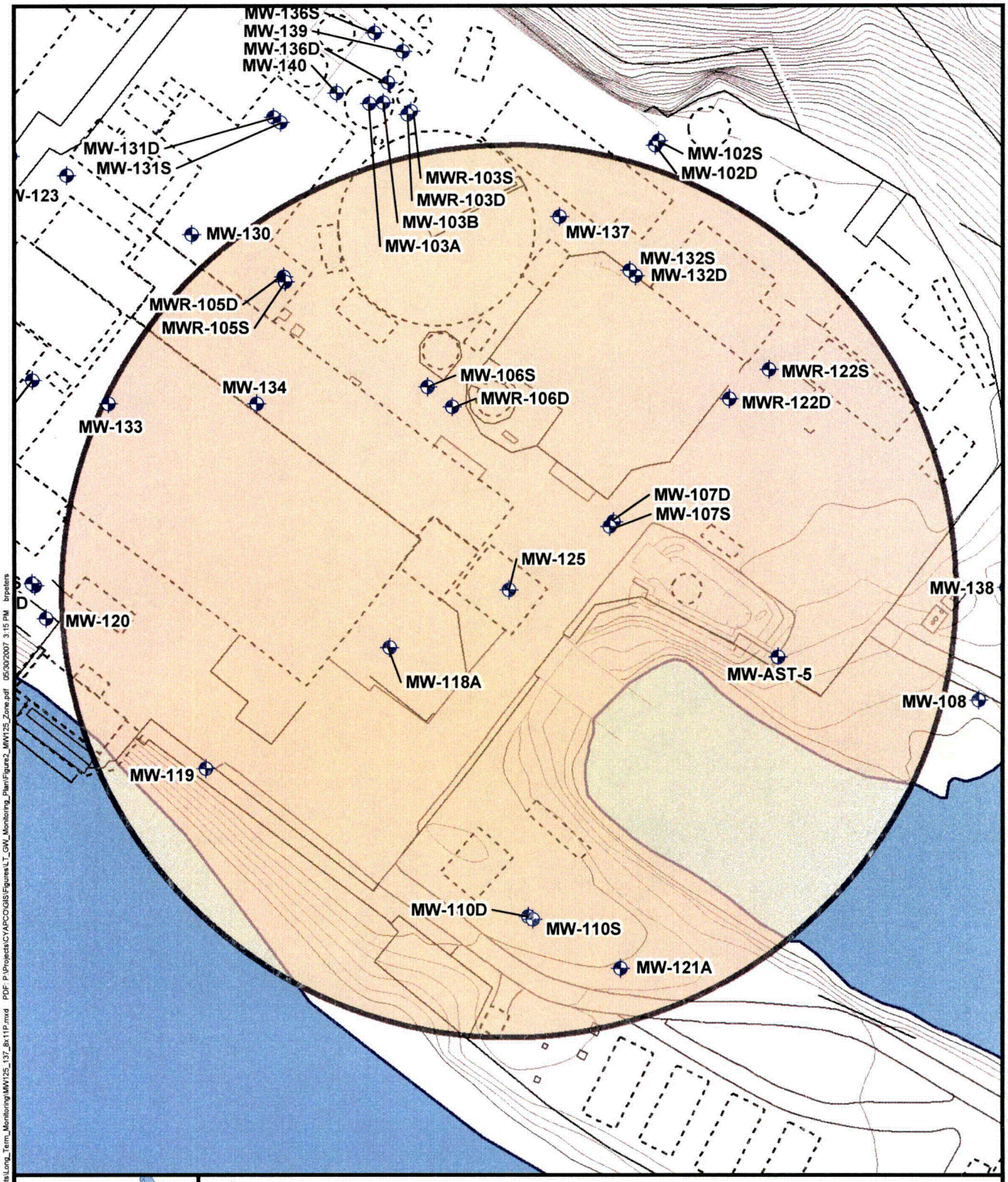
Prepared By: BRP | Checked By: NSG

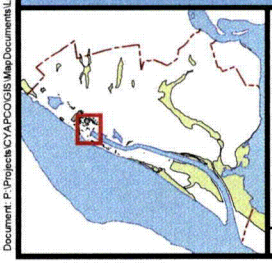
**Legend**

- Existing Monitoring Well Location
- Extraction or Supply Well
- Abandoned Well
- Survey Areas
- Existing Structures
- Former Structures
- Property Boundary
- 10 Foot Contour
- Road to ISFSI

Figure 1
Monitoring Wells and
Final Status Survey Areas

CYAPCO, Haddam Neck Plant
Haddam, Connecticut
MACTEC, Inc.



Plant North

N

0 50 100 Feet

**Legend**

- Existing Monitoring Well Location
- Capture Zone Around MW-125 (100 Meters)
- Existing Structures
- Former Structures

Prepared by BRP | Checked by NSG

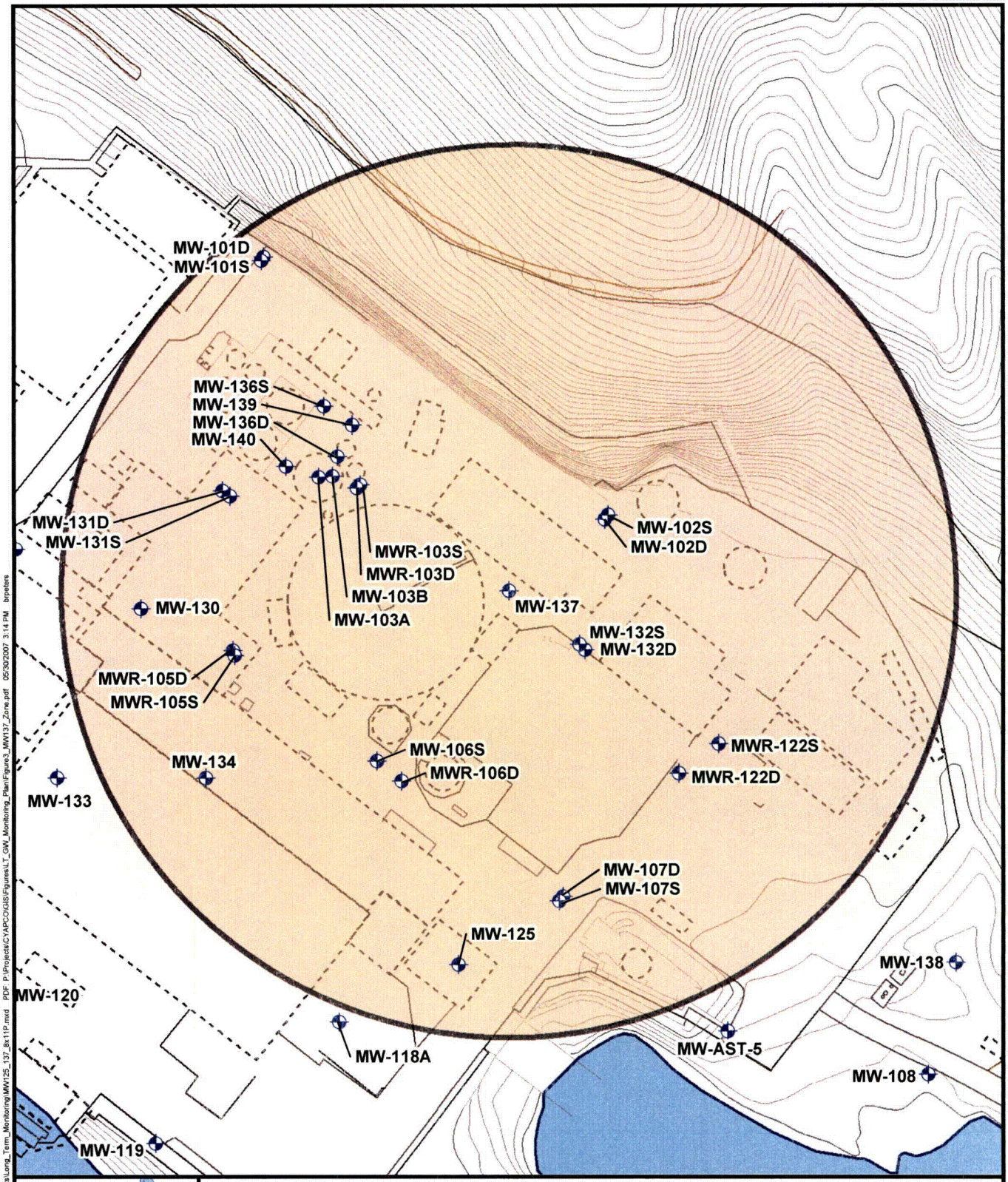
Note: Site Conditions Circa December 2006

Figure 2
Capture Zone Around MW-125
(100 Meters)

CYAPCO, Haddam Neck Plant
Haddam, Connecticut

MACTEC, Inc.

Document: P:\Projects\CYAPCO\GIS\Map Documents\Long_Term_Monitoring\MW125_137_8x11P.mxd PDF: P:\Projects\CYAPCO\GIS\Figures\LT_GW_Monitoring_Plan\Figure2_MW125_Zone.pdf 05/30/2007 3:15 PM brpeters



Plant North

**Legend**

- Existing Monitoring Well Location
- Capture Zone Around MW-137 (100 Meters)
- Existing Structures
- Former Structures

N

0 50 100 Feet

Prepared by BRP | Checked by NSG

Note: Site Conditions Circa December 2006

Figure 3
Capture Zone Around MW-137
(100 Meters)

CYAPCO, Haddam Neck Plant
Haddam, Connecticut
MACTEC, Inc.

Document: P:\Projects\CYAPCO\GIS\MapDocuments\Long_Term_Monitoring\MW125_137_8x11P.mxd PDF P:\Projects\CYAPCO\GIS\Figures\LT_GW_Monitoring_Plan\Figure3_MW137_Zone.pdf 05/30/2007 3:14 PM brpeters