

**From:** Steven Orth *RTT*  
**To:** John Cassidy  
**Date:** Tue, Jan 17, 2006 6:35 AM  
**Subject:** Fwd: Braidwood Letter Report for Non-rush Water Samples 1-13-06

FYI.

E-71



January 13, 2006

Mr. John House  
U.S. Nuclear Regulatory Commission  
Region III  
2443 Warrenville Road  
Lisle, IL 60532-4351

**SUBJECT: ANALYTICAL RESULTS FOR NON-RUSH WATER SAMPLES NEAR  
THE BRAIDWOOD NUCLEAR GENERATING STATION IN  
BRAIDWOOD, ILLINOIS  
[INSPECTION REPORT 456/457/2005-010] (RFTA NO. 06-001)**

Dear Mr. House:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) received water samples from December 5, 2005 through December 12, 2005 that were collected near the Braidwood Nuclear Generating Station in Braidwood, Illinois. As directed, the residential and lake samples were first analyzed for tritium (H-3) to meet your request for rush processing. The tritium results of the residential and lake samples were reported to you in the letter report dated December 19, 2005. The 22 residential and lake samples were then gamma counted for activation/fission products to environmental levels based on a standard count time of 16 hours and the quantity available for each sample. The remaining samples were handled by the laboratory's routine process. We were instructed to analyze the samples that had a minimum of 500 mL by gamma spectroscopy (GS) (Procedure CP1, Revision 15). There were 12 water samples that met the GS criteria. All 37 of the routine water samples were analyzed for H-3. The analysis was performed by liquid scintillation (Procedure AP2, Revision 15; Procedure CP4, Revision 3). The sample identifications and collection data are presented in Table 1. The GS results are presented in Table 2. The H-3 results are presented in Table 3.

ESSAP's Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

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Mr. John House

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January 13, 2006

If you have any questions, please call me at (865) 241-3242 or Wade Ivey at (865) 576-9184.

Sincerely,

*Dale Condra*

Dale Condra  
Laboratory Manager  
Environmental Survey and  
Site Assessment Program

RDC:WPI:ar

Enclosure

cc: T. McLaughlin, NRC/NMSS/T-7E18 E. Abelquist, ORISE/ESSAP  
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File 1682

| Distribution approval and concurrence: | Initials    |
|----------------------------------------|-------------|
| Technical Management Team Member       | WCA for JSK |
| Quality Manager                        | TUB for ATP |

ORISE TABLE 1

SAMPLE IDENTIFICATIONS  
AND COLLECTION DATA  
BRAIDWOOD NUCLEAR GENERATING STATION  
BRAIDWOOD, ILLINOIS

| ESSAP Sample ID | NRC Region III Sample ID | Collection Date | Collection Time |
|-----------------|--------------------------|-----------------|-----------------|
| 1682W0001       | NRC-1-R3                 | 12/1/2005       | na <sup>a</sup> |
| 1682W0002       | NRC-2-R3                 | 12/1/2005       | na              |
| 1682W0003       | NRC-3-R3                 | 12/1/2005       | na              |
| 1682W0004       | NRC-4-R3                 | 12/1/2005       | na              |
| 1682W0005       | NRC-5-R3                 | 12/1/2005       | na              |
| 1682W0006       | NRC-6-R3                 | 12/1/2005       | na              |
| 1682W0007       | NRC-7-R3                 | 12/1/2005       | 15:45           |
| 1682W0008       | NRC-8-R3                 | 12/1/2005       | 16:40           |
| 1682W0009       | NRC-9-R3                 | 12/1/2005       | na              |
| 1682W0010       | NRC-10-R3                | 12/1/2005       | na              |
| 1682W0011       | NRC-11-R3                | 12/1/2005       | na              |
| 1682W0012       | NRC-12-R3                | 12/5/2005       | na              |
| 1682W0013       | NRC-13-R3                | 12/5/2005       | na              |
| 1682W0014       | NRC-14-R3                | 12/2/2005       | 14:35           |
| 1682W0015       | NRC-15-R3                | 12/2/2005       | 14:00           |
| 1682W0016       | NRC-16-R3                | 12/3/2005       | 13:28           |
| 1682W0017       | NRC-17-R3                | na              | na              |
| 1682W0018       | NRC-18-R3                | na              | na              |
| 1682W0019       | NRC-19-R3                | na              | na              |
| 1682W0020       | NRC-20-R3                | 12/2/2005       | na              |
| 1682W0021       | NRC-21-R3                | 12/2/2005       | na              |
| 1682W0022       | NRC-22-R3                | 12/2/2005       | na              |
| 1682W0023       | NRC-23-R3                | 12/2/2005       | na              |
| 1682W0024       | NRC-24-R3                | 11/30/2005      | na              |
| 1682W0025       | NRC-25-R3                | 11/30/2005      | na              |
| 1682W0026       | NRC-26-R3                | 11/30/2005      | na              |
| 1682W0027       | NRC-27-R3                | 12/6/2005       | na              |
| 1682W0028       | NRC-28-R3                | 11/30/2005      | na              |
| 1682W0029       | NRC-29-R3                | 11/30/2005      | na              |
| 1682W0030       | NRC-30-R3                | na              | na              |
| 1682W0031       | NRC-31-R3                | na              | na              |
| 1682W0032       | NRC-32-R3                | na              | na              |

## ORISE TABLE 1 (Continued)

SAMPLE IDENTIFICATIONS  
AND COLLECTION DATA  
BRAIDWOOD NUCLEAR GENERATING STATION  
BRAIDWOOD, ILLINOIS

| ESSAP Sample ID | NRC Region III Sample ID | Collection Date | Collection Time |
|-----------------|--------------------------|-----------------|-----------------|
| 1682W0033       | NRC-33-R3                | na              | na              |
| 1682W0034       | NRC-34-R3                | na              | na              |
| 1682W0035       | NRC-35-R3                | na              | na              |
| 1682W0036       | NRC-36-R3                | na              | na              |
| 1682W0037       | NRC-37-R3                | na              | na              |
| 1682W0038       | NRC-38-R3                | na              | na              |
| 1682W0039       | NRC-39-R3                | na              | na              |
| 1682W0040       | NRC-40-R3                | na              | na              |
| 1682W0041       | NRC-41-R3                | na              | na              |
| 1682W0042       | NRC-42-R3                | na              | na              |
| 1682W0043       | NRC-43-R3                | 12/6/2005       | 10:25           |
| 1682W0044       | NRC-44-R3                | 12/5/2005       | 13:25           |
| 1682W0045       | NRC-45-R3                | 12/6/2005       | 8:25            |
| 1682W0046       | NRC-46-R3                | 12/6/2005       | 9:00            |
| 1682W0047       | NRC-47-R3                | 12/5/2005       | 15:00           |
| 1682W0048       | NRC-48-R3                | 12/5/2005       | 14:25           |
| 1682W0049       | NRC-49-R3                | 12/5/2005       | 15:57           |
| 1682W0050       | NRC-50-R3                | 11/30/2005      | 15:00           |
| 1682W0051       | NRC-51-R3                | 12/2/2005       | na              |
| 1682W0052       | NRC-52-R3                | 12/7/2005       | 16:10           |
| 1682W0053       | NRC-53-R3                | 12/8/2005       | 8:30            |
| 1682W0054       | NRC-54-R3                | 12/8/2005       | 8:40            |
| 1682W0055       | NRC-55-R3                | 12/7/2005       | na              |
| 1682W0056       | NRC-56-R3                | 12/7/2005       | na              |
| 1682W0057       | NRC-57-R3                | 12/7/2005       | na              |
| 1682W0058       | NRC-58-R3                | 12/7/2005       | na              |
| 1682W0059       | NRC-59-R3                | 12/7/2005       | na              |

\*No data provided.

ORISE TABLE 2

**CONCENTRATIONS OF SELECTED  
GAMMA EMITTING RADIONUCLIDES  
IN WATER SAMPLES  
BY GAMMA SPECTROSCOPY CP1, REVISION 15  
BRAIDWOOD NUCLEAR GENERATING STATION  
BRAIDWOOD, ILLINOIS**

| ESSAP Sample ID | NRC Region III Sample ID | Radionuclide Concentrations <sup>a</sup> (pCi/L) |            |            |                        |
|-----------------|--------------------------|--------------------------------------------------|------------|------------|------------------------|
|                 |                          | Co-58                                            | Co-60      | Cs-134     | Cs-137                 |
| 1682W0001       | NRC-1-R3                 | -2.3 ± 2.7 <sup>b</sup>                          | 5.2 ± 4.5  | -0.7 ± 3.0 | 2.7 ± 5.6              |
| 1682W0003       | NRC-3-R3                 | 0.9 ± 3.2                                        | -0.2 ± 3.0 | 2.2 ± 3.3  | 2.7 ± 2.9              |
| 1682W0005       | NRC-5-R3                 | -0.4 ± 2.3                                       | 2.6 ± 2.5  | 0.6 ± 2.4  | 2.1 ± 2.2              |
| 1682W0009       | NRC-9-R3                 | -1.4 ± 3.5                                       | 2.7 ± 3.1  | -1.0 ± 3.1 | 0.8 ± 2.9              |
| 1682W0010       | NRC-10-R3                | -1.9 ± 2.3                                       | 2.6 ± 2.4  | 2.1 ± 2.4  | 0.8 ± 2.3              |
| 1682W0011       | NRC-11-R3                | -0.6 ± 3.1                                       | 0.2 ± 3.5  | 0.1 ± 3.3  | 0.1 ± 3.0              |
| 1682W0012       | NRC-12-R3                | -1.2 ± 2.6                                       | 1.3 ± 3.0  | 1.3 ± 5.0  | -3.4 ± 5.4             |
| 1682W0013       | NRC-13-R3                | 1.4 ± 4.6                                        | 0.7 ± 5.4  | 4.7 ± 5.4  | 0.7 ± 5.0              |
| 1682W0014       | NRC-14-R3                | 0.4 ± 2.2                                        | 1.6 ± 2.9  | -0.2 ± 2.5 | 1.3 ± 2.2              |
| 1682W0015       | NRC-15-R3                | 1.2 ± 5.3                                        | 0.6 ± 5.8  | 2.6 ± 6.5  | 1.4 ± 6.1              |
| 1682W0016       | NRC-16-R3                | -0.1 ± 4.8                                       | 3.5 ± 4.8  | 2.1 ± 5.7  | 0.0 <sup>c</sup> ± 4.5 |
| 1682W0017       | NRC-17-R3                | -2.1 ± 2.8                                       | 1.1 ± 2.9  | 0.0 ± 3.0  | -1.2 ± 5.4             |
| 1682W0019       | NRC-19-R3                | 2.0 ± 2.8                                        | 1.2 ± 3.0  | 3.8 ± 2.9  | 4.3 ± 3.2              |
| 1682W0021       | NRC-21-R3                | -2.8 ± 2.7                                       | 2.7 ± 2.9  | 1.4 ± 2.7  | -0.1 ± 4.4             |
| 1682W0024       | NRC-24-R3                | -6.7 ± 8.2                                       | 4.1 ± 7.2  | -0.5 ± 7.2 | -3 ± 13                |
| 1682W0025       | NRC-25-R3                | -0.7 ± 8.8                                       | -0.5 ± 7.4 | 4.5 ± 8.1  | 3.8 ± 6.9              |
| 1682W0026       | NRC-26-R3                | 0.1 ± 8.0                                        | 5.5 ± 6.7  | 1.2 ± 6.9  | 5.9 ± 5.7              |
| 1682W0027       | NRC-27-R3                | 1.8 ± 9.0                                        | -2.0 ± 6.7 | 6 ± 13     | 1.7 ± 6.2              |
| 1682W0028       | NRC-28-R3                | -0.1 ± 7.3                                       | 1.6 ± 7.4  | -2.0 ± 7.1 | 1.9 ± 6.8              |
| 1682W0029       | NRC-29-R3                | -4.9 ± 5.9                                       | -7.4 ± 6.7 | -0.5 ± 6.1 | -0.7 ± 5.0             |
| 1682W0030       | NRC-30-R3                | -1.3 ± 2.9                                       | -0.7 ± 3.1 | 0.8 ± 3.1  | 0.8 ± 2.9              |
| 1682W0031       | NRC-31-R3                | -1.5 ± 2.6                                       | -0.9 ± 2.5 | -1.3 ± 2.9 | -0.4 ± 2.3             |
| 1682W0032       | NRC-32-R3                | 0.2 ± 3.2                                        | 3.3 ± 3.1  | 0.6 ± 3.7  | -0.9 ± 2.9             |
| 1682W0043       | NRC-43-R3                | -1.4 ± 2.9                                       | 1.3 ± 3.1  | -1.8 ± 3.1 | 0.8 ± 2.9              |
| 1682W0050       | NRC-50-R3                | -0.9 ± 2.7                                       | 4.2 ± 3.7  | 0.3 ± 3.2  | 1.1 ± 4.8              |
| 1682W0051       | NRC-51-R3                | -0.5 ± 2.4                                       | -1.5 ± 2.5 | 1.9 ± 2.5  | 0.6 ± 2.4              |
| 1682W0052       | NRC-52-R3                | -2.8 ± 4.8                                       | 3.9 ± 5.9  | 0.9 ± 5.3  | 1.0 ± 8.0              |
| 1682W0053       | NRC-53-R3                | -3.4 ± 5.3                                       | 5.4 ± 5.7  | -1.5 ± 6.2 | 6.4 ± 5.0              |
| 1682W0054       | NRC-54-R3                | -2.6 ± 6.4                                       | 1.4 ± 6.9  | 5.2 ± 6.9  | 2.8 ± 6.2              |
| 1682W0055       | NRC-55-R3                | -3.9 ± 7.6                                       | 2.0 ± 7.9  | 0.9 ± 8.2  | -1.9 ± 7.1             |
| 1682W0056       | NRC-56-R3                | 2.1 ± 8.9                                        | 11.0 ± 7.1 | -1.1 ± 9.1 | -4 ± 18                |
| 1682W0057       | NRC-57-R3                | 4.5 ± 7.3                                        | 0.4 ± 6.9  | 5.0 ± 7.8  | -4.8 ± 6.6             |
| 1682W0058       | NRC-58-R3                | -4.2 ± 5.7                                       | -1.0 ± 5.9 | 6.1 ± 6.4  | 3.4 ± 5.1              |
| 1682W0059       | NRC-59-R3                | -4.1 ± 7.7                                       | -2.9 ± 9.5 | 2.2 ± 7.9  | 4.9 ± 7.0              |

<sup>a</sup>The range of MDCs for the selected radionuclides is 3.6 pCi/L to 17 pCi/L.

<sup>b</sup>Uncertainties represent the 95% confidence level, based on total propagated uncertainties.

<sup>c</sup>Zero values are due to rounding.

ORISE TABLE 3

CONCENTRATIONS OF TRITIUM  
IN WATER SAMPLES  
BY LIQUID SCINTILLATION ANALYSIS  
AP2, REVISION 15; CP4, REVISION 3  
BRAIDWOOD NUCLEAR GENERATING STATION  
BRAIDWOOD, ILLINOIS

| ESSAP Sample ID | NRC Region III Sample ID | Tritium Concentrations, TPUs, and MDCs <sup>a</sup> (pCi/L) |                    |       |
|-----------------|--------------------------|-------------------------------------------------------------|--------------------|-------|
| 1682W0001       | NRC-1-R3                 | 2,930                                                       | ± 330 <sup>b</sup> | (450) |
| 1682W0002       | NRC-2-R3                 | 33,630                                                      | ± 810              | (450) |
| 1682W0003       | NRC-3-R3                 | 6,820                                                       | ± 410              | (450) |
| 1682W0004       | NRC-4-R3                 | 190                                                         | ± 270              | (450) |
| 1682W0005       | NRC-5-R3                 | 1,200                                                       | ± 290              | (450) |
| 1682W0006       | NRC-6-R3                 | 2,720                                                       | ± 330              | (450) |
| 1682W0007       | NRC-7-R3                 | 2,650                                                       | ± 330              | (450) |
| 1682W0008       | NRC-8-R3                 | 34,760                                                      | ± 820              | (450) |
| 1682W0017       | NRC-17-R3                | -60                                                         | ± 270              | (470) |
| 1682W0018       | NRC-18-R3                | 140                                                         | ± 280              | (470) |
| 1682W0019       | NRC-19-R3                | 420                                                         | ± 270              | (450) |
| 1682W0020       | NRC-20-R3                | 2,750                                                       | ± 340              | (470) |
| 1682W0021       | NRC-21-R3                | 2,470                                                       | ± 320              | (450) |
| 1682W0022       | NRC-22-R3                | -90                                                         | ± 270              | (470) |
| 1682W0023       | NRC-23-R3                | 110                                                         | ± 280              | (470) |
| 1682W0030       | NRC-30-R3                | 290                                                         | ± 270              | (450) |
| 1682W0031       | NRC-31-R3                | 230                                                         | ± 270              | (450) |
| 1682W0032       | NRC-32-R3                | 140                                                         | ± 270              | (450) |
| 1682W0033       | NRC-33-R3                | -40                                                         | ± 270              | (470) |
| 1682W0034       | NRC-34-R3                | 2,120                                                       | ± 330              | (470) |
| 1682W0035       | NRC-35-R3                | 1,770                                                       | ± 320              | (470) |
| 1682W0036       | NRC-36-R3                | 1,400                                                       | ± 310              | (470) |
| 1682W0037       | NRC-37-R3                | -70                                                         | ± 270              | (470) |
| 1682W0038       | NRC-38-R3                | 110                                                         | ± 280              | (470) |
| 1682W0039       | NRC-39-R3                | 140                                                         | ± 280              | (470) |
| 1682W0040       | NRC-40-R3                | 1,230                                                       | ± 300              | (470) |
| 1682W0041       | NRC-41-R3                | 2,190                                                       | ± 330              | (470) |
| 1682W0042       | NRC-42-R3                | 490                                                         | ± 290              | (470) |
| 1682W0043       | NRC-43-R3                | -30                                                         | ± 260              | (450) |
| 1682W0044       | NRC-44-R3                | -40                                                         | ± 270              | (460) |
| 1682W0045       | NRC-45-R3                | 30,020                                                      | ± 770              | (480) |
| 1682W0046       | NRC-46-R3                | 2,500                                                       | ± 340              | (480) |
| 1682W0047       | NRC-47-R3                | 1,640                                                       | ± 320              | (480) |
| 1682W0048       | NRC-48-R3                | 42,580                                                      | ± 920              | (480) |
| 1682W0049       | NRC-49-R3                | 3,840                                                       | ± 370              | (480) |
| 1682W0050       | NRC-50-R3                | 39,400                                                      | ± 880              | (450) |
| 1682W0051       | NRC-51-R3                | 280                                                         | ± 270              | (450) |

<sup>a</sup>MDCs are in parenthesis.<sup>b</sup>Uncertainties represent the 95% confidence level, based on total propagated uncertainties.