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## **Final Status Survey Planning Worksheet**

| GENERAL SECTION   |  |
|---|--|
| Survey Area #: OOL-01   | Survey Unit #: 01  |
| Survey Unit Name: OOL-01-01 (Seal Pit Discharg  | e Cove)  |
| FSSP Number: YNPS-FSSP-OOL01-01-02 (supp  | lement subdivision survey plan – modifications of the  |
| original FSSP Worksheet and implementation of   | of adjusted Type I errors are indicated by bold font.  |
| PREPARATION FOR FSS ACTIVITIES  |  |
| Check marks in the boxes below signify affirmativ   | e responses and completion of the action.  |
| 1.1 Files have been established for survey unit FS  | S records. $\square$   |
| 1.2 ALARA review has been completed for the su<br>The generic ALARA review applies to this sur<br>increase the Action Level.                              | rvey unit. I Refer to YA-REPT-00-003-05, Note:<br>vey unit because the costs involved in dredging would  |
| 1.3 The survey unit has been turned over for final  | status survey.   |
| 1.4 An initial DP-8854 walkdown has been perform<br>Evaluation is in the survey area file.  | med and a copy of the completed Survey Unit Walkdown ☑   |
| 1.5 Activities conducted within area since turnove  | r for FSS have been reviewed.  |
| Based on reviewed information, subsequent wa  | alkdown: 🗹 not warranted 🛛 warranted   |
| If warranted, subsequent walkdown has been p<br>Ol  | erformed and documented per DP-8854.<br>R  |
| The basis has been provided to and accepted by subsequent walkdown. $\Box$  | y the FSS Project Manager for not performing a   |
| 1.6 A final classification has been performed.  | 2  |
| Classification: CLASS 1 🗆 CLASS 2 🗹   | CLASS 3  |
| DATA QUALITY OBJECTIVES (DQO)   |  |
| 1.0 Statement of the problem:   |  |
| Survey Unit OOL-01-01 consists of sediment on the $m^2$ of surface area.  | ne bottom of Sherman Reservoir and contains about 204.7  |
| This FSS survey plan is designed as a result of t<br>of the investigation survey confirm the results o<br>elevated area of residual radioactivity. Conseq | he subdivision of survey unit OOL-01-01. The results<br>of the original FSS survey and bounded the extent of the<br>uently, the decision was made to partially re-classify |

elevated area of residual radioactivity. Consequently, the decision was made to partially re-classify and subdivide survey unit OOL-01-01 into two survey units. Survey unit OOL-01-06 was designed as a class 1 survey unit and was surveyed against the design criteria of that survey plan. The remainder of survey unit OOL-01-01 will remain a class 2 survey unit. The Type I errors were adjusted from 0.05 to 0.025 and 7 additional measurements will be made to satisfy sample statistics in accordance with section 5.5.1 of the License Termination Plan.

This newly subdivided OOL-01-01 survey unit is bound by the shoreline if seal pit cove. The shorelines of survey area OOL-03 form the West and East boundaries, and the re-classified OOL-01-06 creates the northern boundary.

DPF-8856.1 Rev. 6 Page 1 of 8 with a line because

The problem as defined by this survey plan is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

This plan is designed to determine the number of additional samples needed after adjusting the Type I error. This plan consists of collecting additional sediment samples as determined by DPF-8853.2 to satisfy the required number of samples in accordance with section 5.5.1 of the LTP.

## 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

## 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments (treated as soil)                  |
|--------------------------|--|
| Types of measurements:   | Sediment samples                                       |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137                          |
| Applicable DCGL:         | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL)   |
|                          | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL)  |
|                          | • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL  |
|                          | • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL) |

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect the characterization data; it's assumed that the discharge would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Twenty-five samples in all were used to provide the sample statistics. The samples were collected for the most recent FSS effort on August 23, 2005. The data provided is sufficient to support FSS planning for the sub-division of unit 01. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the data include:

| • C-14 (16 detects)  | C-14 is present in 100% of the 16 samples taken. Six samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.22 pCi/g.              |
|----------------------|--|
| • Co-60 (22 detects) | Co-60 is present in 88% of the 25 samples taken. Nine samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is $0.20 \text{ pCi/g}$ . |

| • Cs-137 (25 detects) | Cs-137 is present in 100% of the 25 samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g. |
|-----------------------|---|
| • Sr-90 (9 detects)   | Sr-90 is present in 56 % of the 16 samples taken. One samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.02 pCi/g.   |

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-01. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

| Survey Design / Release Criteria        |   |  |
|---|---|--|
| Average C-14 concentration:             | 0.22 pCi/g  |  |
| Standard deviation C-14 ( $\sigma$ ):   | 0.11 pCi/g  |  |
| Average C0-60 concentration:            | 0.20 pCi/g  |  |
| Standard deviation Co-60 ( $\sigma$ ):  | 0.30 pCi/g  |  |
| Average Sr-90 concentration:            | 0.02 pCi/g  |  |
| Standard deviation Sr-90 (σ):           | 0.03 pCi/g  |  |
| Average Cs-137 concentration:           | 0.38 pCi/g  |  |
| Standard deviation Cs-137 ( $\sigma$ ): | 0.34 pCi/g  |  |
| Surrogate DCGL:                         | N/A (a surrogate DCGL will not be used)   |  |
| Investigation Level for                 | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL <sub>w</sub> for C-14)  |  |
| sediment samples:                       | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL <sub>w</sub> for Co-60)  |  |
|   | • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL <sub>w</sub> for Sr-90)   |  |
|   | <ul> <li>3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for Cs-<br/>137)</li> </ul>  |  |
|   | • If the sum of the DCGL <sub>w</sub> fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted.   |  |
|   | • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y DCGL <sub>w</sub> an investigation will be conducted. |  |
| Investigation Level for scan            | N/A per section 5.6.3.2.5 of the LTP  |  |
| Radionuclides for analysis              | All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137   |  |

DPF-8856.1 Rev. 6 Page 3 of 8 n Maria - Alika Bara Bara a

| MDCs for gamma analysis of                                   | Nuclide   | <u>10% of the 10 mrem/y DCGL<sub>w</sub> (pCi/g)</u>   |
|--|---|--|
| sediment samples   | Co-60   | 0.16   |
|  | Nb-94   | 0.29   |
|  | Ag-108m   | 0.29   |
|  | Sb-125  | 1.3  |
|  | Cs-134  | 0.20   |
|  | Cs-137  | 0.34   |
|  | Eu-152  | 0.41   |
|  | Eu-154  | 0.38   |
|  | Eu-155  | 16   |
|  | The desired MDCs in<br>will be the 10% DCGI<br>50% DCGL values mu<br>FSS sediment samples | the laboratory analyses of FSS sediment samples<br>L values. If it is impractical to achieve those, the<br>1st be achieved in the laboratory analyses of the<br>s. |
| MDCs for HTD nuclide   | Nuclide   | 10% of the 10 mrem/y DCG[ $(nCi/a)$  |
| MDCs for 111D nuclide.                                       | H_3   | 15   |
|  | C-14  | 0.22   |
|  | Ee-55   | 1200   |
|  | Ni-63   | 33   |
| 1  | Sr-90   | 0.07   |
|  | Тс-99   | 0.57   |
|  | Pu-238  | 1.3  |
|  | Pu-239  | 1.2  |
|  | Pu-241  | 39   |
|  | Am-241  | 1.2  |
|  | Cm-243  | 1.3  |
|  | The MDC values for d<br>outside laboratory via<br>will accompany the se                   | lifficult to detect nuclides will be conveyed to the the sample chain-of-custody form DPF-8823.1 and diment samples.   |
| Scan Coverage :  | N/A per section 5.6.3.  | 2.5 of the LTP   |
| QC checks and measurements:                                  | • If applicable, QC cl<br>accordance with DI  | hecks for the Leica GPS will be performed in P-8859.   |
|  | <ul> <li><u>ONE</u> QC split sample</li> </ul>  | ple will be collected  |
|  | note: this is in acco<br>Quality Assurance  | ordance with DP-8852, "Final Status Survey<br>Project Plan (QAPP)" requirements.   |
|  | • <u>ONE</u> QC recount sa<br>Chemistry Lab   | ample will be performed and counted by the YNPS  |
|  | note: this is in accor<br>Quality Assurance   | rdance with DP-8852, "Final Status Survey<br>Project Plan (QAPP)" requirements.  |
| 4.0 <u>Define the boundaries of th</u>                       | <u>e survey</u> :   |  |
| • Physical boundaries of Survey                              | Unit OOL-01-01 are as   | shown on the attached map.   |
| • The survey will be performed equipment limitations and hum | under appropriate weathe<br>an tolerance).  | er conditions (as defined by instrumentation and   |

DPF-8856.1 Rev. 6 Page 4 of 8

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Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.

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• The Dive Operations Plan will address diver safety concerns.

• Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

# 5.0 <u>Develop a decision rule</u>:

Upon review of the FSS data collected under this survey plan:

- (a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-01 meets the release criteria).
- (b) If the activity concentration for any LTP nuclide exceeds its respective DCGL<sub>w</sub>, then perform an investigation survey.
- (c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-01 fails to meet the release criteria).
- (d) If the average concentration of identified LTP-listed nuclide is less than DCGL and the sum of their DCGL fractions are less than 1, but some individual measurements exceed the DCGL, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

| Null hypothesis:              | Residual plant-related radioactivity in Survey Unit OOL-01-01 exceeds the release criteria. |
|-------------------------------|---|
| Probability of type I error:  | 0.025   |
| Probability of type II error: | 0.05  |
| LBGR:                         | Unity Rule therefore the applicable DCGL = 1  |
|                               | LGBR = 0.5  |

## 6.0 Specify tolerable limits on decision errors:

## 7.0 Optimize Design:

Type of statistical test: WRS Test 🗹 Sign Test 🗅 (background will be applied to this survey unit)

Number and Location of Samples: 15 sediment samples are required in accordance with DP 8853, "Determination of the Number and Location of FSS Samples and Measurements." Eight of the original sixteen samples from the original FSS survey still reside in the new survey unit. Seven additional samples are necessary to provide sufficient power in accordance with the requirement in section 5.5.1 in the LTP. Seven sediment samples will be collected in random locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be fifteen.

*Reference Area Background*: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

### **Rev 01 Supplement**

*Discussion:* The collection of sediment samples for survey unit OOL-01-01 was started on September 23,2005. Sixteen systematic grid samples were collected. Two of the sixteen samples had results that exceed the 10 mrem per year soil DCGL. Survey Unit OOL-01-01 was re-classified in part sub-divided into two survey units. Survey Unit OOL-01-06 was bounded the extent of the elevated area and was classified as a class 1 survey unit. This FSS plan represents the remnant of survey unit OOL-01-01 and will remain a class 2 survey unit. 7 additional samples are needed to provide sufficient statistical power for the FSS. The location of the samples will be chosen randomly.

## **GENERAL INSTRUCTIONS**

- 1. Collect 7 sediment samples following the guidance of the Dive Operations Plan. One of the 7 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 7 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.
- 2. Sediment sample designation:

| ]  | FSS sediment<br>samples:                                       | OOL-01-01-038-F-SD through OOL-01-01-044-F-SD corresponding to FSS sample locations 001 through 007.  |
|----|--|---|
|    |  | OOL-01-01-038-F-SD-H through OOL-01-01-044-F-SD-H corresponding to the same 7 samples when analyzed off-site for C-14 and Sr-90.  |
| (  | QC split sample:   | OOL-01-01-041-F-SD-S is to be designated as QC split sample and<br>will be analyzed off-site. The results will be compared to the on-site<br>analysis results for sample OOL-01-01-004-F-SD in accordance with<br>DP-8864, "Split Sample Assessment for Final Status Survey." |
| ]  | Recount samples:   | OOL-04-01-038-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."                               |
| 3. | Determine the sam<br>location in accorda<br>Characterization." | ple locations using GPS, in accordance with DP-8859 and mark the sample ance with DP-8124 "Collection of Pond Sediment Samples For Site   |
| 4. | If a survey location   | n falls on riprap or an obstruction whereby the desired volume of sediment canr   |

- 4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
- 5. If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
- 6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
- 7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."

DPF-8856.1 Rev. 6 Page 6 of 8

- 8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
- 9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-01.
- 10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
- 11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

## **SPECIFIC INSTRUCTIONS**

 Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

- 2. Sediment Samples
  - YNPS Chemistry will analyze OOL-01-01-038-F-SD through OOL-01-01-044-F-SD for gammaemitting nuclides.
  - OOL-01-01-038-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-01-038-F-SD-RC.
  - Upon completion of on-site analysis for gamma emitting nuclides, OOL-01-01-038-F-SD through OOL-01-01-044-F-SD will be renamed (Excluding OOL-01-01-041-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-01-038-F-SD-H). The off-site laboratory will analyze these samples for C-14 and Sr-90 only.

Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

• OOL-01-01-041-F-SD will be renamed appending the letter S to the suffix and sent to the offsite laboratory. The off-site laboratory will analyze OOL-01-01-041-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides.

- 3. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.
- 4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.
- 5. Sample Preparation:
  - Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.
  - An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. Appending the letter H to the suffix and send to the off-site laboratory. The off-site laboratory will analyze these samples for C-14

DPF-8856.1 Rev. 6 Page 7 of 8

| drying oven in pans not the marinelli container. YNPS nma-emitting nuclides.                     |
|--|
| shall achieve the MDC values stated in the DQO<br>nmunicated to the off-site laboratory using an |
|  |
| cify:  |
|  |
|  |
|  |
| Field Supervisor Signature /Date:  |
|  |
|  |
| Date 7-31-06<br>Date 7-31-06   |
|  |

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DPF-8856.1 Rev. 6 Page 8 of 8

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# Final Status Survey Planning Worksheet

| GENERAL SECTION   |  |
|---|--|
| Survey Area #: OOL-01 Survey Unit #:  | 02   |
| Survey Unit Name: OOL-01-02 (Circulating Water System Intake)   |  |
| FSSP Number: YNPS-FSSP-OOL01-02-00  |  |
| PREPARATION FOR FSS ACTIVITIES  |  |
| Check marks in the boxes below signify affirmative responses and co   | ompletion of the action.   |
| 1.1 Files have been established for survey unit FSS records. $\square$  |  |
| 1.2 ALARA review has been completed for the survey unit.  | Refer to YA-REPT-00-003-05, Note:<br>the costs involved in dredging would  |
| 1.3 The survey unit has been turned over for final status survey. $\square$   |  |
| <ul> <li>1.4 An initial DP-8854 walkdown has been performed and a copy of<br/>Evaluation is in the survey area file.</li> </ul>   | f the completed Survey Unit Walkdown   |
| 1.5 Activities conducted within area since turnover for FSS have been   | en reviewed. 🗹   |
| Based on reviewed information, subsequent walkdown: I no  | t warranted 🗌 warranted  |
| If warranted, subsequent walkdown has been performed and docu   | umented per DP-8854.   |
| OR  |  |
| The basis has been provided to and accepted by the FSS Project subsequent walkdown.   | Manager for not performing a   |
| 1.6 A final classification has been performed.  |  |
| Classification: CLASS 1 🗆 CLASS 2 🗹 CLASS 3 🗆   |  |
| DATA QUALITY OBJECTIVES (DQO)   |  |
| 1.0 Statement of the problem:   |  |
| Survey Unit OOL-01-02 consists of sediment on the bottom of Sherr<br>of surface area.   | man Reservoir and contains about $401 \text{ m}^2$   |
| Unit 02 is located at the tip of the peninsula north of the Screenwell<br>the shoreline of survey area OOL-03 and GPS coordinates in the She<br>represent the location within which riprap will be positioned upon co<br>Recent sediment results from seal pit characterization data were used<br>Survey Unit OOL-01-02 was reclassified to a Class 2 from Class 3 b<br>characterization data. The data indicates that activity concentrations<br>their respective 25 mrem/year soil DCGLs. | Pump House and bound to the south by<br>erman Reservoir. The area of this unit<br>ompletion of FSS survey activities.<br>d for planning this FSS survey package.<br>based on the review of the<br>of Co-60 and Sr-90 exceeded 10% of |
| Upon completion of FSS survey activities; placement of riprap for fi  | inal grade can commence.   |
| The problem as defined by this survey plan is to demonstrate that the an accumulation of plant-related radioactivity that exceeds the release   | e years of plant operation did not result in se criteria.  |

DPF-8856.1 Rev. 2 Page 1 of 8 The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

## 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

# 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments                                    |
|--------------------------|--|
| Types of measurements:   | Sediment samples                                       |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137                          |
| Applicable DCGL:         | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL)   |
|                          | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL)  |
|                          | • 0.7 pCi Sr-90 per gram of sediment (10-mrem/y DCGL   |
|                          | • 3.5 pCi Cs-137 per gram of sediment (10-mrem/y DCGL) |

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect the characterization data; it's assumed that the discharge would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Twelve samples in all were used to provide the sample statistics. The samples were collected between June 29, 2005 and July 8, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-02. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

| • C-14 (9 detects)    | C-14 is present in 82% of the 11 characterization samples analyzed for HTD.<br>Six samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The<br>average activity concentration of C-14 for the samples is 0.28 pCi/g. |
|-----------------------|--|
| • Co-60 (11 detects)  | Co-60 is present in 92% of the characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is $0.18$ pCi/g.                |
| • Cs-137 (12 detects) | Cs-137 is present in 100% of the characterization samples taken. Two samples exceeded 10% of the 10-mrem/y DCGL (0.35 pCi/g). The average activity concentration of Cs-137 for the samples is 0.30 pCi/g.                |
| • Sr-90 (10 detects)  | Sr-90 is present in 91% of the 11 characterization samples analyzed for HTD. Three samples exceeded 10% of the 10-mrem/v DCGL (0.67 $pCi/g$ ).   |

DPF-8856.1 Rev. 2 Page 2 of 8

## The average activity concentration of Sr-90 for the samples is 0.08 pCi/g.

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-02. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. 100% of the samples collected will be analyzed C-14 and Sr-90.

| Survey Design / Release Criteria       |  |  |
|--|--|--|
| Average C-14 concentration:            | 0.28 pCi/g   |  |
| Standard deviation C-14 ( $\sigma$ ):  | 0.14 pCi/g   |  |
| Average Co-60 concentration:           | 0.18 pCi/g   |  |
| Standard deviation Co-60 ( $\sigma$ ): | 0.18 pCi/g   |  |
| Average Sr-90 concentration:           | 0.08 pCi/g   |  |
| Standard deviation Sr-90 ( $\sigma$ ): | 0.12 pCi/g   |  |
| Average Cs-137 concentration:          | 0.30 pCi/g   |  |
| Standard deviation Cs-137 (σ):         | 0.22 pCi/g   |  |
| Surrogate DCGL:                        | N/A (a surrogate DCGL v  | vill not be used)  |
| Investigation Level for                | <ul> <li>2.19 pCi C-14 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for C-14)</li> <li>1.60 pCi Co-60 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for Co-60)</li> </ul> |  |
| seaiment samples:                      |  |  |
|  | • 0.67 pCi Sr-90 per gra   | m of sediment (10-mrem/y DCGL <sub>w</sub> for Sr-90)          |
|  | • 3.46 pCi Cs-137 per gr<br>137)   | ram of sediment (10-mrem/y $DCGL_w$ for Cs-                    |
|  | • If the sum of the fraction 1, an investigation will  | ons for all detected LTP listed nuclides exceeds be conducted. |
|  | • Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y DCGL <sub>w</sub> an investigation will be conducted.      |  |
| Investigation Level for scan           | N/A per section 5.6.3.2.5  | of the LTP   |
| Radionuclides for analysis             | All LTP nuclides with the  | e focus on, C-14, Co-60, Sr-90 and Cs-137                      |
| MDCs for gamma analysis of             | Nuclide  | 10% of the 10 mrem/y DCGLw (pCi/g)                             |
| sediment samples                       | Co-60  | 0.16   |
|  | Nb-94  | 0.29   |
|  | Ag-108m  | 0.29   |
|  | Sb-125   | 1.26   |
|  | US-134<br>Co. 127  | 0.19   |
|  | (5-13/   | 0.33   |

| r   |   |   |  |
|---|---|---|--|
|   | Eu-152  | 0.40  |  |
|   | Eu-154  | 0.38  |  |
|   | Eu-155  | 16  |  |
|   | The desired MDCs in the laboratory analyses of FSS sediment samples<br>will be the 10% DCGL values. If it is impractical to achieve those, the<br>50% DCGL values must be achieved in the laboratory analyses of the<br>FSS sediment samples.   |   |  |
| MDCs for HTD nuclide:   | Nuclide<br>H-3<br>C-14<br>Fe-55<br>Ni-63<br>Sr-90<br>Tc-99<br>Pu-238<br>Pu-239<br>Pu-241  | 10% of the 10 mrem/y DCGL <sub>w</sub> (pCi/g)<br>14.7<br>0.22<br>1180<br>32.4<br>0.07<br>0.55<br>1.3<br>1.2<br>39                                      |  |
|   | Am-241  | 1.18  |  |
| Scan Coverage :   | The MDC values f<br>outside laboratory<br>and will accompan<br>N/A per section 5.   | For difficult to detect nuclides will be conveyed to the via the sample chain-of-custody form DPF-8823.1 by the sediment samples.<br>6.3.2.5 of the LTP |  |
| QC checks and measurements:   | • If applicable, Q accordance with  | C checks for the Leica GPS will be performed in h DP-8859.  |  |
|   | • <u>ONE</u> QC split s<br>note: this is in a<br>Quality Assuran  | sample will be collected<br>accordance with DP-8852, "Final Status Survey<br>nce Project Plan (QAPP)" requirements.                                     |  |
|   | <ul> <li>ONE QC recount sample will be performed and counted by the YNPS<br/>Chemistry Lab<br/>note: this is in accordance with DP-8852.</li> <li><u>TWO QC Blank samples will be collected from uncontaminated soil.</u><br/>The blank samples will be prepared and analyzed using routine<br/>methods.</li> </ul> |   |  |
|   |   |   |  |
|   | note: this is in a  | ccordance with DP-8852.   |  |
|   | • <u>ONE</u> QC Spike<br>in accordance v  | Sample will be analyzed by the YNPS Chemistry Lab vith DP-8852.   |  |
| <ul> <li>4.0 <u>Define the boundaries of the survey</u>:</li> <li>Physical boundaries of Survey Unit OOL-01-02 are as shown on the attached map.</li> </ul> |   |   |  |

- The survey will be performed under appropriate weather conditions (as defined by instrumentation and equipment limitations and human tolerance).
- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).
- The Dive Operations Plan will address diver safety concerns.

## 5.0 Develop a decision rule:

Upon review of the FSS data collected under this survey plan:

- (a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides for all samples are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-02 meets the release criteria).
- (b) If the activity concentration for any LTP nuclide exceeds its respective DCGL<sub>w</sub>, then perform an investigation survey.
- (c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-02 fails to meet the release criteria).
- (d) If the average concentration of identified LTP-listed nuclide is less than DCGL and the sum of their DCGL fractions are less than 1, but some individual measurements exceed the DCGL, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

## 6.0 Specify tolerable limits on decision errors:

| Null hypothesis:              | Residual plant-related radioactivity in Survey Unit OOL-01-02 exceeds the release criteria. |  |
|-------------------------------|---|--|
| Probability of type I error:  | 0.05  |  |
| Probability of type II error: | 0.05  |  |
| LBGR:                         | Unity Rule therefore the applicable DCGL = 1  |  |
|                               | LGBR = 0.5  |  |

# 7.0 Optimize Design:

Type of statistical test: WRS Test 🗹 Sign Test 🗔 (background will be applied to this survey unit)

Number and Location of Samples: 16 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file).

*Reference Area Background*: 20 sediment samples will be collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements."

# **GENERAL INSTRUCTIONS**

| 1. | Collect 16 sediment samples following the guidance of the Dive Operations Plan. One of the 16     |
|----|---|
|    | sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852   |
|    | "Final Status Survey Quality Assurance Project Plan (QAPP)." All 16 sediment samples will also be |
|    | analyzed for the C-14 and Sr-90 nuclides.   |

- 2. The collection of sediment samples will be performed in accordance with the Dive Operations Plan.
- 3. Sediment sample designation:

| FSS Sediment<br>Samples: | OOL-01-02-001-F-SD through OOL-01-02-019-F-SD corresponding to FSS sample locations 001 through 019. One spike and two field blanks were added to the seventeen sediments samples for a total of nineteen samples.   |
|--------------------------|--|
|                          | OOL-01-02-001-F-SD-H through OOL-01-02-019-F-SD-H (Except OOL-01-02-005-F-SD, OOL-01-02-009-F-S and OOL-01-02-012-F-SD-S) will be analyzed off-site for C-14 and Sr-90.  |
| QC Split Sample:         | OOL-01-02-012-F-SD-S is to be designated as the QC split sample. The results will be compared to the on-site analysis results for sample OOL-01-02-012-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey."   |
| Recount Samples:         | OOL-01-02-002-F-SD is to be counted twice on site, the letters RC will be<br>appended to the suffix (i.e. OOL-01-02-002-F-SD-RC) representing the<br>recounted result. The results will be compared in accordance with DP-<br>8864, "Split Sample Assessment for Final Status Survey." |
| Spike Sample:            | Sample 009 will be labeled OOL-01-02-009-F-SD and will represent the spiked sample, the results of which will be compared to the expected activity to determine precision and accuracy in accordance with DP-8852, "Final Status Survey Quality Assurance Project Plan (QAPP)."        |
| Field Blanks:            | OOL-01-02-005-F-SD and OOL-01-02-017-F-SD will represent two blank<br>samples. The samples will be collected prepared and analyzed in<br>accordance with DP-8852, "Final Status Survey Quality Assurance Project<br>Plan (QAPP)."  |

- 4. The measurement locations have been identified using GPS, in accordance with DP-8859, "Operation of the Leica Geosystems GPS 1200 Global Positioning System for Identification of Final Status Survey Measurements" and the sample location marked in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
- 5. If random survey location may fall on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
- 6. If a random survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
- 7. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in

plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.

- 8. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation".
- 9. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
- 10. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-02.
- 11. Diver Safety will be addressed in the accompanying Dive Operations Plan.
- 12. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program."

# SPECIFIC INSTRUCTIONS

- All designated measurement locations have already been identified by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
- 2. Sediment Samples
  - YNPS Chemistry will analyze OOL-01-02-001-F-SD through OOL-01-02-019-F-SD for gammaemitting nuclides.
  - OOL-01-02-002-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-02-002-F-SD-RC.
  - OOL-01-02-012-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-02-012-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides (except H-3). Cm 9-95-05
  - Upon completion of on-site analysis for gamma emitting nuclides, OOL-01-02-001-F-SD through OOL-01-02-019-F-SD will be renamed (Excluding OOL-01-02-005-F-SD, OOL-01-02-009-F-SD and OOL-01-02-012-F-SD) appending the letter H to the suffix (i.e. OOL-01-02-001-F-SD-H and sent to the off-site laboratory. The off-site laboratory will analyze these samples for C-14 and Sr-90 only.

Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

- 3. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.
- 4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

| NOTIFICATION POINTS  |  |
|--|--|
| QA notification point(s) (y/n) * S   | Specify:   |
| 1. Date/time of initial pre-survey briefing  | QA Signature:  |
| 2. Date/time of commencement of sediment sampling  | QA Signature:  |
| *Email notification to <u>trudeau@yankee.com</u> v   | vith a copy to <u>calsyn@yankee.com</u> satisfies this step.       |
| FSI point(s) (y/n)<br>Specify:   | Field Supervisor Signature /Date:                                  |
| 1.   |  |
| 2.   |  |
| Prepared by FSS Radiological Engine<br>Reviewed by FSS Radiological Engine<br>Approved by Sump / Su | Date $8 - 18 - 05$<br>er<br>Date $8/18/05$<br>er<br>Date $8/25/05$ |

DPF-8856.1 Rev. 2 Page 8 of 8

# Final Status Survey Planning Worksheet

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| GENERAL SECTION   |  |
|---|--|
| Survey Area #: OOL-01   | Survey Unit #: 03  |
| Survey Unit Name: OOL-01-03   |  |
| FSSP Number: YNPS-FSSP-OOL01-03-00  | E0   |
| PREPARATION FOR FSS ACTIVITI  | E.S  |
| Check marks in the boxes below signify affirr   | native responses and completion of the action.   |
| 1.1 Files have been established for survey uni  | it FSS records. $\square$  |
| 1.2 ALARA review has been completed for the generic ALARA review applies to the increase the Action Level.  | he survey unit. If Refer to YA-REPT-00-003-05, Note: is survey unit because the costs involved in dredging would   |
| 1.3 The survey unit has been turned over for  | final status survey.   |
| 1.4 An initial DP-8854 walkdown has been performed by Evaluation is in the survey area file.  | erformed and a copy of the completed Survey Unit Walkdown  |
| 1.5 Activities conducted within area since tur  | nover for FSS have been reviewed.  |
| Based on reviewed information, subseque   | nt walkdown: 🗹 not warranted 🛛 warranted   |
| If warranted, subsequent walkdown has be  | een performed and documented per DP-8854.  |
|   | OR   |
| The basis has been provided to and accept subsequent walkdown. $\Box$   | ted by the FSS Project Manager for not performing a  |
| 1.6 A final classification has been performed.  | . 🗹  |
| Classification: CLASS 1 M CLASS 7   |  |
|   |  |
| DATA QUALITY OBJECTIVES (DQC  | J)   |
| 1.0 Statement of the problem:   |  |
| Survey Unit OOL-01-03 consists of sediment of surface area.   | on the bottom of Sherman Reservoir and contains about 751  |
| Unit 03 is bound to the south by the seal pit c<br>and western boundaries, and survey unit OOL<br>seal pit characterization and recent FSS effort<br>OOL-01-03 was reclassified to a Class 1 from<br>from the discharge cove indicate activity cond                             | ove. The shorelines of survey area OOL-03 form the eastern<br>L-01-04 forms the northern boundary. Sediment results from t<br>t were used for planning this FSS survey package. Survey Uni-<br>n a Class 3 based on the review of this data. The sediment resu<br>centrations of Cs-137, Sr-90, Co-60 and C-14 that together |
| exceed unity. It is possible that deposition of survey unit OOL-01-03.  | the radionuclides discovered in the discharge cove extend into   |
| exceed unity. It is possible that deposition of<br>survey unit OOL-01-03.<br>The problem as defined by this survey plan is<br>an accumulation of plant-related radioactivity  | the radionuclides discovered in the discharge cove extend into<br>to demonstrate that the years of plant operation did not result<br>that exceeds the release criteria.  |
| exceed unity. It is possible that deposition of<br>survey unit OOL-01-03.<br>The problem as defined by this survey plan is<br>an accumulation of plant-related radioactivity<br>The planning team for this effort consists of the<br>Supervisor, and FSS Technicians. The FSS F | the radionuclides discovered in the discharge cove extend into<br>to demonstrate that the years of plant operation did not result<br>that exceeds the release criteria.<br>he FSS Project Manager, FSS Radiological Engineer, FSS Fie<br>Radiological Engineer will make primary decisions with the                          |

| Rev. 6 | 5      |
|--------|--------|
| Page 1 | l of 7 |

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concurrence of the FSS Project Manager.

## 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

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## 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments (treated as soil)                  |
|--------------------------|--|
| Types of measurements:   | Sediment samples                                       |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137                          |
| Applicable DCGLs:        | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL)   |
|                          | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL)  |
|                          | • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL  |
|                          | • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL) |

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to collect new samples from the reservoir. The Seal Pit Discharge Cove was selected as the location to collect data for its characterization. It's assumed that the cove bottom sediments would yield a conservative representation of the LTP radionuclides currently present in the Sherman Reservoir. Recent sediment samples collected from the Cove survey unit (OOL-01-01) was added to the original characterization data. Thirty samples in all were used to provide the statistics for characterization of survey unit OOL-01-03. The original characterization samples were collected between June 29, 2005 and July 8, 2005 and the FSS samples were collected on August 23, 2005. The data set provided is sufficient to support FSS planning of Survey Unit OOL-01-03. Based on this data, C-14, Co-60, Sr-90 and Cs-137 continue to be the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

| • C-14 (26 detects)   | C-14 is present in 96% of the 27 characterization samples taken. Twelve samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.23 pCi/g.     |
|-----------------------|--|
| • Co-60 (26 detects)  | Co-60 is present in 87% of the 30 characterization samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.17 pCi/g.      |
| • Cs-137 (30 detects) | Cs-137 is present in 100% of the 30 characterization samples taken. Eight samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.31 pCi/g. |
| • Sr-90 (18 detects)  | Sr-90 is present in 67% of the 27 characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.     |

DPF-8856.1 Rev. 6 Page 2 of 7

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-03. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90. Survey Design / Release Criteria Average C-14 concentration: 0.23 pCi/g Standard deviation C-14 ( $\sigma$ ): 0.13 pCi/g Average C0-60 concentration: 0.17 pCi/g *Standard deviation Co-60 (\sigma):* 0.25 pCi/g 0.04 pCi/g Average Sr-90 concentration: Standard deviation Sr-90 ( $\sigma$ ): 0.08 pCi/g Average Cs-137 concentration: 0.31 pCi/g Standard deviation Cs-137 ( $\sigma$ ): 0.31 pCi/g N/A (a surrogate DCGL will not be used) Surrogate DCGL: aboloc DCGL<sub>EMC</sub> based on grid space of 21.6 ft of area of 37.6 m² (use 50 m² values) = 814 pCilg (AF= 370) 'alsolar • 1.7E3 (Area Factor = 860) C-14 • 2.5E0 (Area Factor = 1.4) = 2.4 pcilg (AF= 1.5) *Co-60* - ( AF = 18-4 pcily (AF= 2) Sr-90 • 3.3E1 (Area Factor = 54) - 13 = 27-06:4 Cs-137 • 1.1E1 (Area Factor = 3.7)- 12" = 10.5 pcily (AF= 3.1) • If any LTP listed nuclide is greater than its  $DCGL_{EMC}$ , an Investigation Level for sediment samples: investigation will be conducted. • If the sum of the DCGL<sub>EMC</sub> fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted. • If any LTP listed nuclide is greater than its respective DCGLw and the value is a statistical outlier as defined in the LTP, an investigation will be conducted. Investigation Level for scan N/A per section 5.6.3.2.5 of the LTP All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137 Radionuclides for analysis MDCs for gamma analysis of Nuclide 10% of the 10 mrem/y DCGL<sub>w</sub> (pCi/g) sediment samples Co-60 0.16 Nb-94 0.29 Ag-108m 0.29 Sb-125 1.3 Cs-134 0.20

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DPF-8856.1 Rev. 6 Page 3 of 7

|   | Eu-155   | 16   |
|---|--|--|
|   | The desired MI<br>will be the 10%<br>50% DCGL va<br>FSS sediment s   | DCs in the laboratory analyses of FSS sediment samples<br>6 DCGL values. If it is impractical to achieve those, the<br>lues must be achieved in the laboratory analyses of the<br>samples.   |
| MDCs for HTD nuclide:   | Nuclide  | 10% of the 10 mrem/y DCGL <sub>w</sub> (pCi/g)   |
|   | H-3  | 15   |
|   | C-14   | 0.22   |
|   | Fe-55  | 1200   |
|   | Ni-63  | 33   |
|   | Sr-90  | 0.07   |
|   | Tc-99  | 0.57   |
|   | Pu-238   | 1.3  |
|   | Pu-239   | 1.2  |
|   | Pu-241   | 39   |
|   | Am-241   | 1.2  |
|   | Cm-243   | 1.3  |
|   | The MDC valu<br>outside laborate<br>will accompan  | tes for difficult to detect nuclides will be conveyed to the ory via the sample chain-of-custody form DPF-8823.1 and y the sediment samples.   |
| Scan Coverage :   | N/A per section  | n 5.6.3.2.5 of the LTP   |
| QC checks and measurements:   | • If applicable accordance   | e, QC checks for the Leica GPS will be performed in with DP-8859.  |
|   | • TWO OC st  | plit sample will be collected  |
|   | note: this is<br>Ouality Ass   | in accordance with DP-8852, "Final Status Survey<br>urance Project Plan (OAPP)" requirements.  |
|   | • <u>ONE</u> QC re<br>Chemistry I  | count sample will be performed and counted by the YNPS   |
|   | note: this is<br>Quality Ass   | in accordance with DP-8852, "Final Status Survey urance Project Plan (QAPP)" requirements.   |
| 4.0 Define the boundaries of t  | he survey:   |  |
| <ul> <li>Physical boundaries of Survey</li> </ul>   | / Unit OOL-01-03   | are as shown on the attached map.  |
| • Visual observation of the c<br>equipment on July 5, 2006 b<br>bottom with camera equipmen<br>because of diver safety cons<br>was deemed incapable of yi<br>Sherman Dam was omitted from | ondition of the by<br>y the Normindo of<br>nt instead of placi-<br>iderations. Coord<br>elding enough se<br>om the survey area | bottom sediments was performed via underwater camera<br>dive team and an FSS Engineer. The decision to scan the<br>ng divers in the water in the vicinity of the intake was made<br>dinates identifying an area surrounding the intake where it<br>diment. The area surrounding the intake structure to the<br>a; the remaining area is shown in the attached map. |
| • The survey will be performe equipment limitations and hu  | d under appropria<br>nan tolerance).   | ate weather conditions (as defined by instrumentation and  |
| • Divers will perform the surve   | y in daylight hour   | s allowing adequate daylight time for ingress and egress.  |
| • The Dive Operations Plan wil  | l address diver sa   | fety concerns.   |

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• Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.

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- The Dive Operations Plan will address diver safety concerns.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

## 5.0 <u>Develop a decision rule</u>:

Upon review of the FSS data collected under this survey plan:

- (a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-03 meets the release criteria).
- (b) If the investigation level is exceeded, then perform an investigation survey.
- (c) If the average concentration of the radionuclide-of-concern is below the DCGL, or if the sum of the fractions for identified radionuclides-of-concern <1, but some measurements exceed the DCGL, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.</p>
- (d) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-03 fails to meet the release criteria).

| Null hypothesis:              | Residual plant-related radioactivity in Survey Unit OOL-01-01 exceeds the release criteria. |  |
|-------------------------------|---|--|
| Probability of type I error:  | 0.05  |  |
| Probability of type II error: | 0.05  |  |
| LBGR:                         | Unity Rule therefore the applicable DCGL = 1  |  |
|                               | LGBR = 0.5  |  |

### 6.0 Specify tolerable limits on decision errors:

## 7.0 Optimize Design:

Type of statistical test: WRS Test 🗹 Sign Test 🗆 (background will be applied to this survey unit)

*Number and Location of Samples*: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

*Reference Area Background*: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

## **GENERAL INSTRUCTIONS**

1. Collect 20 sediment samples following the guidance of the Dive Operations Plan. Two of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852

DPF-8856.1 Rev. 6 Page 5 of 7 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.

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2. Sediment sample designation:

| FSS sediment samples:  | FSS sedimentOOL-01-03-001-F-SD through OOL-01-03-020-F-SD corresponding to<br>FSS sample locations 001 through 020.  |  |  |
|--|--|--|--|
|  | OOL-01-03-001-F-SD-H through OOL-01-03-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90. Excluding 003 and 013.   |  |  |
| QC split sample:   | OOL-01-03-003-F-SD-S and OOL-01-03-013-F-SD-S is to be designated<br>as QC split sample and will be analyzed off-site. The results will be<br>compared to the on-site analysis results for sample OOL-01-01-003-F-SD<br>and OOL-01-03-013-F-SD in accordance with DP-8864, "Split Sample<br>Assessment for Final Status Survey." |  |  |
| Recount samples:   | OOL-01-03-002-F-SD is to be counted twice on site, the letters RC will<br>be appended to the suffix representing the recounted result. Its<br>designation will be OOL-01-03-002-F-SD-RC. The results will be<br>compared in accordance with DP-8864, "Split Sample Assessment for<br>Final Status Survey."                       |  |  |
| <ol> <li>Determine the sample location in accorda Characterization."</li> </ol>  | ole locations using GPS, in accordance with DP-8859 and mark the sample nce with DP-8124 "Collection of Pond Sediment Samples For Site   |  |  |
| <ol> <li>If a survey location<br/>be achieved anothe<br/>Survey Plans."</li> </ol>   | 4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."  |  |  |
| 5. If a survey location accordance with D  | 5. If a survey location falls in depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".   |  |  |
| 6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool. |  |  |  |
| 7. All sediment samp and Preparation."   | 7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."  |  |  |
| 8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.                          |  |  |  |
| 9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-03.   |  |  |  |
| 10. Diver Safety will b  | 10. Diver Safety will be addressed in the accompanying Dive Operations Plan.   |  |  |
| 11. All personnel (excl<br>8868, "Final Status   | <ol> <li>All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-<br/>8868, "Final Status Survey Training Program."</li> </ol>  |  |  |
| SPECIFIC INSTRUCT  | IONS   |  |  |
| 1 Determine the sample lo  | ocation by GPS per DP-8859 Operation of The Leica Geosystems GPS 1200  |  |  |

1.

Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

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- 2. Sediment Samples:
  - Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.
  - An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. OOL-01-03-001-F-SD through OOL-01-03-020-F-SD will be renamed (Excluding OOL-01-03-003-F-SD and OOL-01-03-013-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-03-001-F-SD-H). The off-site laboratory will analyze these samples for C-14 and Sr-90 only.

Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.

- OOL-01-03-<del>002</del>-F-SD and OOL-01-03-013-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-03-003-F-SD-S and OOL-01-03-013-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides.
- The remaining sediment is to be dried in the drying oven in pans not the marinelli container. YNPS Chemistry will analyze OOL-01-03-001-F-SD through OOL-01-03-020-F-SD for gamma-emitting nuclides.
- OOL-01-03-002-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-03-002-F-SD-RC.
- 3. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.
- 4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

| NOTIFICATION POINTS        |                           |                                |
|----------------------------|---------------------------|--------------------------------|
| n/a                        | •                         |                                |
| Prepared by<br>Reviewed by | FSS Radiological Engineer | Date 7-20-2006<br>Date 7/20/06 |
| Approved by                | FSS Radiologícal Engineer | Date 7/20/04                   |

DPF-8856.1 Rev. 6 Page 7 of 7

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# Final Status Survey Planning Worksheet

| Survey Area #: OOL-01   | Survey Unit #: 04  |
|---|--|
| Survey Unit Name: OOL-01-04   |  |
| FSSP Number: YNPS-FSSP-O  | OL01-04-99 01  |
| PREPARATION FOR FSS   | ACTIVITIES   |
| Check marks in the boxes below  | w signify affirmative responses and completion of the action.  |
| 1.1 Files have been established   | for survey unit FSS records. $\square$   |
| 1.2 ALARA review has been co<br>The generic ALARA review<br>increase the Action Level.  | ompleted for the survey unit. If Refer to YA-REPT-00-003-05, Note:<br>w applies to this survey unit because the costs involved in dredging would   |
| 1.3 The survey unit has been tu   | rned over for final status survey.   |
| 1.4 An initial DP-8854 walkdow<br>Evaluation is in the survey a   | wn has been performed and a copy of the completed Survey Unit Walkdown area file.  |
| 1.5 Activities conducted within   | area since turnover for FSS have been reviewed.  |
| Based on reviewed informat  | tion, subsequent walkdown: 🗹 not warranted 🛛 warranted   |
| If warranted, subsequent wa   | alkdown has been performed and documented per DP-8854.  OR OR  |
| The basis has been provided subsequent walkdown.  | t to and accepted by the FSS Project Manager for not performing a  |
| 1.6 A final classification has be   | en performed.  |
| Classification: CLASS 1   | CLASS 2 17 CLASS 3 18  |
| DATA OUALITY ODIECT   |  |
| DATA QUALITT OBJEC  |  |
| 1.0 Statement of the problem:   | :  |
| Survey Unit OOL-01-04 consist<br>67,120m <sup>2</sup> of surface area.  | ts of sediment on the bottom of Sherman Reservoir and contains about   |
| Unit 04 is bound on the south by<br>shorelines of survey area OOL-<br>western boundaries. The shorel<br>TransCanada form the eastern b<br>by TransCanada. Characterizat<br>discharge cove (OOL-01-01, wh<br>Survey Unit OOL-01-04 was re-<br>activity concentrations for three<br>soil DCGLs. | y the northern boundary of survey unit OOL-01-05 (west reservoir cove). The<br>03 and non-impacted property owned by TransCanada form the southern and<br>line of survey area OOL-15 and non-impacted property owned by<br>boundary. The northern boundary is defined by non-impacted property owned<br>ion and FSS results from sediment samples collected within the seal pit<br>hich is not directly adjacent) were used for planning this FSS survey package.<br>classified to a Class 2 based on the review of the data. The data indicates that<br>of the twenty-four samples would have exceed unity based on 10-mrem/y |
| The problem as defined by this an accumulation of plant-related   | survey plan is to demonstrate that the years of plant operation did not result in d radioactivity that exceeds the release criteria.   |
| 1856.1 * Based upon   | re-review of data and the size of<br>Unit, Survey Unit OOL-01-04 was re-   |

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The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

#### 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

#### 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments (treated as soil but at 10-mrem/y DCGLs) |
|--------------------------|--|
| Types of measurements:   | Sediment samples   |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137                                |
| Applicable DCGL:         | • 2.2E+00 pCi C-14 per gram of sediment (10-mrem/y DCGL)     |
|                          | • 1.6E+00 pCi Co-60 per gram of sediment (10-mrem/y DCGL)    |
|                          | • 6.9E-01 pCi Sr-90 per gram of sediment (10-mrem/y DCGL     |
|                          | • 3.4E+00 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)   |

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to use additional sample data from the reservoir. The Seal Pit Discharge Cove (O characterization and FSS data were used to provide ample sample statistics; it's assumed that the samples collected in the discharge would yield a conservative representation of the LTP radionuclides present in OOL-01-04. Twenty-four samples were used to provide the sample statistics for C-14 and Sr-90 and twentynine samples for Co-60 and Cs-137. The samples were collected between July 8, 2005 and August 23, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-04. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results include:

| • C-14 (23 detects*)  | C-14 is present in 96% of the 24 characterization samples. None of the samples exceeded 10% of the 25-mrem/y DCGL (5.3 pCi/g). The average activity concentration of C-14 for the samples is $0.22 \text{ pCi/g}$ . |
|-----------------------|---|
| • Co-60 (22 detects*) | Co-60 is present in 92% of the 24 characterization samples. Five samples exceeded 10% of the 25-mrem/y DCGL (3.8 pCi/g). The average activity concentration of Co-60 for the samples is 0.22 pCi/g.                 |
| • Sr-90 (18 detects*) | Sr-90 is present in 75% of the 24 characterization samples. Three samples exceeded 10% of the 25-mrem/y DCGL (1.6 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.                |

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DPF-8856.1 Rev. 2 Page 2 of 7 a de

• Cs-137 (24 detects\*) Cs-137 is present in 100% of the 24 characterization samples. Two samples exceeded 10% of the 25-mrem/y DCGL (8.1 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g.

Note \*: Detects as used in this section refer the number of results in pCi/g where the reported activity concentration exceeded the critical level (2.33 sigma).

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-04. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

| Survey Design / Release Criteria         |  |  |
|--|--|--|
| Average C-14 concentration:              | 0.22 pCi/g   |  |
| Standard deviation C-14 (o):             | 0.12 pCi/g   |  |
|  | · · ·  |  |
| Average C0-60 concentration:             | 0.22 pCi/g   |  |
| Standard deviation Co-60 (σ):            | 0.27 pCi/g   |  |
|  |  |  |
| Average Sr-90 concentration:             | 0.04 pCi/g   |  |
| Standard deviation Sr-90 (σ):            | 0.09 pCi/g   |  |
| Average Cs-137 concentration             | $0.38 \text{ nCi/}\sigma$  |  |
| Standard deviation $C_{s-137}(\sigma)$ : | 0.33  pCi/g  |  |
| signadra deviation Cs-157 (b).           | 0.55 peng  |  |
| Surrogate DCGL:                          | N/A (a surrogate DCGL w  | vill not be used)  |
| Investigation Level for                  | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL <sub>w</sub> for C-14)   |  |
| sediment samples:                        | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL <sub>w</sub> for Co-60)   |  |
|  | • 0.69 pCi Sr-90 per grar  | n of sediment (10-mrem/y DCGL <sub>w</sub> for Sr-90)                                      |
|  | • 3.4 pCi Cs-137 per gran<br>137)  | m of sediment (10-mrem/y DCGL <sub>w</sub> for Cs-   |
|  | • If the sum of the DCGI exceeds 1, an investiga   | $L_w$ fractions for all detected LTP listed nuclides tion will be conducted.               |
|  | • Additionally if any othe concentration greater the investigation will be content of the conten | er LTP listed nuclide is identified at a nan its respective 10-mrem/y $DCGL_w$ an nducted. |
| Investigation Level for scan             | N/A per section 5.6.3.2.5  | of the LTP   |
| Radionuclides for analysis               | All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137  |  |
| MDCs for gamma analysis of               | Nuclide  | 10% of the 10 mrem/y DCGL <sub>w</sub> (pCi/g)   |
| sediment samples                         | Co-60  | 1.6E-01  |
|  | Nb-94  | 2.9E-01  |
|  | Ag-108m  | 2.9E-01  |

DPF-8856.1 Rev. 2 Page 3 of 7

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|  | 01 105  | 1.00 + 0.0   |
|--|---|--|
|  | Sb-125  | 1.3E+00  |
|  | Cs-134  | 2.0E-01  |
|  | Cs-137  | 3.4E-01  |
|  | Eu-152  | 4.1E-01  |
|  | Eu-154  | 3.8E-01  |
|  | Eu-155  | 1.6E+01  |
|  | The desired MDCs<br>will be the 10% DC<br>50% DCGL values   | in the laboratory analyses of FSS sediment samples<br>CGL values. If it is impractical to achieve those, the<br>must be achieved in the laboratory analyses of the |
|  | FSS sediment samp   | bles.  |
| MDCs for HTD nuclide:  | Nuclide   | 10% of the 10 mrem/y DCGL <sub>w</sub> (pCi/g)   |
|  | H-3   | 1.5E+01  |
|  | C-14  | 2.2E-01  |
|  | Fe-55   | 1.2E+03  |
|  | Ni-63   | 3.3E+01  |
|  | Sr-90   | 6.9E-02  |
|  | Тс-99   | 5.7E-01  |
|  | Pu-238  | 1.3E+00  |
|  | Pu-239  | 1.2E+00  |
|  | Pu-241  | 3.9E+01  |
|  | Am-241  | 1.2E+00  |
|  | Cm-243  | 1.3E+00  |
|  | The MDC values for<br>outside laboratory will accompany the | or difficult to detect nuclides will be conveyed to the via the sample chain-of-custody form DPF-8823.1 and e sediment samples.                                    |
| Scan Coverage :  | N/A per section 5.6   | 5.3.2.5 of the LTP   |
| QC checks and measurements:  | • If applicable, Q0 accordance with                         | C checks for the Leica GPS will be performed in DP-8859.   |
|  | ONE OC split s  | ample will be collected  |
|  | note: this is in a  | coordings with DD 8852 "Einst Status Survey  |
|  | Quality Assuran   | ce Project Plan (QAPP)" requirements.  |
|  | ONE QC recour<br>Chemistry Lab                              | at sample will be performed and counted by the YNPS  |
|  | note: this is in ac<br>Quality Assuran                      | cordance with DP-8852, "Final Status Survey ce Project Plan (QAPP)" requirements.  |
| 4.0 Define the boundaries of the   | e survey:   |  |
| Divisional hours device of Surrow  |   | as shown on the ottoched men   |
| <sup>1</sup> Physical boundaries of Survey   | Unit OOL-01-04 are  | as shown on the attached map.  |
| <ul> <li>The survey will be performed u<br/>equipment limitations and hum</li> </ul> | ander appropriate wea<br>an tolerance).                     | ather conditions (as defined by instrumentation and  |
|  |   |  |
| Divers will perform the survey   | in daylight hours allo                                      | owing adequate daylight time for ingress and egress.   |

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Rev. 2 Page 4 of 7 Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

#### 5.0 Develop a decision rule:

Upon review of the FSS data collected under this survey plan:

- (a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-04 meets the release criteria).
- (b) If the activity concentration for any LTP nuclide exceeds its respective DCGL<sub>w</sub>, then perform an investigation survey.
- (c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL<sub>w</sub> or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-04 fails to meet the release criteria).

X+(d) If the average concentration of identified LTP-listed nuclide is less than DCGL<sub>w</sub> and the sum of their DCGL<sub>w</sub> fractions are less than 1, but some individual measurements exceed the DCGL<sub>w</sub>, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

#### 6.0 Specify tolerable limits on decision errors:

| Residual plant-related radioactivity in Survey Unit OOL-01-04 exceeds the release criteria. |
|---|
| 0.05  |
| 0.05  |
| Unity Rule therefore the applicable DCGL = 1  |
| LGBR = 0.5  |
|   |

#### 7.0 Optimize Design:

Type of statistical test: WRS Test 🗹 👘 Sign Test 🗔 (background will be applied to this survey unit)

Number and Location of Samples: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 15, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

*Reference Area Background*: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

#### GENERAL INSTRUCTIONS

 Collect 20 sediment samples following the guidance of the Dive Operations Plan. One of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will be

DPF-8856.1 X Unneccessary with reclassification Rev. 2 Page 5 of 7 to a class 3 area Page 5 of 7



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|                              | analyzed for the Co  | o-60, Cs-137, C-14 and Sr-90 nuclides.  |
|------------------------------|--|---|
| 2.                           | Sediment sample de   | esignation:   |
| ]                            | FSS sediment<br>samples:   | OOL-01-04-001-F-SD through OOL-01-04-020-F-SD corresponding to FSS sample locations 001 through 020.  |
|                              |  | OOL-01-04-001-F-SD-H through OOL-01-04-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90.   |
|                              | QC split sample:   | OOL-01-04-010-F-SD-S is to be designated as QC split sample and will<br>be analyzed off-site. The results will be compared to the on-site analysis<br>results for sample OOL-01-04-010-F-SD in accordance with DP-8864,<br>"Split Sample Assessment for Final Status Survey."                                       |
| ]                            | Recount samples:   | OOL-01-04-003-F-SD is to be counted twice on site, the letters RC will<br>be appended to the suffix representing the recounted result. The results<br>will be compared in accordance with DP-8864, "Split Sample Assessment<br>for Final Status Survey."  |
| 3.                           | Determine the samp<br>location in accorda<br>Characterization."  | ole locations using GPS, in accordance with DP-8859 and mark the sample nce with DP-8124 "Collection of Pond Sediment Samples For Site  |
| 4.                           | If a survey location<br>be achieved anothe<br>Survey Plans."   | falls on riprap or an obstruction whereby the desired volume of sediment cannot<br>r survey location will be chosen in accordance with DP-8856, "Preparation of   |
| 5.                           | If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".                                   |   |
| 6.                           | 5. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool. |   |
| 7.                           | 7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."  |   |
| 8.                           | <ol> <li>Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of<br/>Custody" for all sediment samples sent to an off-site laboratory.</li> </ol>     |   |
| 9.                           | The job hazards ass accompanying Job   | ociated with the Survey described in this package are addressed in the Hazard Assessment for OOL-01-04.   |
| 10                           | . Diver Safety will be   | e addressed in the accompanying Dive Operations Plan.   |
| 11                           | . All personnel (exclu<br>8868, "Final Status  | uding divers) participating in this survey shall be trained in accordance with DP-<br>Survey Training Program."   |
| SPEC                         | IFIC INSTRUCT  | IONS  |
| 1. Det<br>Glo<br>desi<br>Rad | ermine the sample lo<br>bal Positioning Syste<br>ignated sample locati<br>liological Engineer o  | cation by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200<br>em For Identification Of Final Status Survey Measurement Locations". If a<br>ion is obstructed or deemed incapable of yielding enough sediment, the FSS<br>r the FSS Field Supervisor will select an alternate location in accordance with |

1.48-1.00 F 88-14-1-1

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DPF-8856.1 Rev. 2 Page 6 of 7 يمأن ال

DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

- 2. Sediment Samples
  - YNPS Chemistry will analyze OOL-01-04-001-F-SD through OOL-01-04-020-F-SD for gammaemitting nuclides.
  - OOL-01-04-003-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-04-003-F-SD-RC.
  - The off-site laboratory will analyze OOL-01-04-001-F-SD-H through OOL-01-04-020-F-SD-H for C-14 and Sr-90. Each sample will be comprised of approximately 500 ml homogenous aliquot of wet sediment and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
  - OOL-01-04-010-F-SD-S will be sent to the off-site laboratory and analyzed as a QC split sample. This sample will be analyzed for all LTP listed nuclides including Total Chemical Uranium (TCU).
- 3. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.
- 4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

| NOTIFICATION POINTS  |
|--|
|  |
| Prepared by Date   |
| Reviewed by <u>Reviewed by Reviewed by Revie</u> |
| Approved by FSS Project Manager Date 7-7-06  |
| Fortimating Erichson (3/5/2007   |
| Rev.1 Preparea Chie 5/5/2007   |

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DPF-8856.1 Rev. 2 Page 7 of 7

# Final Status Survey Planning Worksheet

| GENERAL SECTION   |   |  |  |
|---|---|--|--|
| Survey Area #: OOL-01   | Survey Unit #: 05   |  |  |
| Survey Unit Name: OOL-01-05   |   |  |  |
| FSSP Number: YNPS-FSSP-OOL01-05-00  |   |  |  |
| PREPARATION FOR FSS ACTIVITIES  |   |  |  |
| Check marks in the boxes below signify affirmative  | responses and completion of the action.   |  |  |
| 1.1 Files have been established for survey unit FSS   | records.  |  |  |
| 1.2 ALARA review has been completed for the surv<br>The generic ALARA review applies to this surv<br>increase the Action Level.   | ey unit. If Refer to YA-REPT-00-003-05, Note:<br>ey unit because the costs involved in dredging would |  |  |
| 1.3 The survey unit has been turned over for final s  | atus survey. 🗹  |  |  |
| 1.4 An initial DP-8854 walkdown has been perform<br>Evaluation is in the survey area file.  | ed and a copy of the completed Survey Unit Walkdown   |  |  |
| 1.5 Activities conducted within area since turnover   | for FSS have been reviewed. 🗹   |  |  |
| Based on reviewed information, subsequent wall  | kdown: 🗹 not warranted 🛛 warranted  |  |  |
| If warranted, subsequent walkdown has been per<br>OR  | If warranted, subsequent walkdown has been performed and documented per DP-8854. $\Box$ OR            |  |  |
| The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. $\Box$   |   |  |  |
| 1.6 A final classification has been performed.  |   |  |  |
| Classification: CLASS 1 🗆 CLASS 2 🗹 CLASS 3 🗆   |   |  |  |
| DATA QUALITY OBJECTIVES (DQO)   |   |  |  |
| 1.0 Statement of the problem:   |   |  |  |
| Survey Unit OOL-01-05 consists of sediment on the $m^2$ of surface area.  | bottom of Sherman Reservoir and contains about 4,540  |  |  |
| Unit 05 is bound on the south by the northern boundary of survey unit OOL-03-03 (Sherman Reservoir Shoreline). The shorelines of survey area OOL-03 and OOL-13 form the southern and western boundaries. The shoreline of survey area OOL-15 forms the eastern boundary. The northern boundary is defined by the southern boundary of survey unit OOL-01-04. Characterization and FSS results from sediment samples collected within the seal pit discharge cove (OOL-01-01, which is not directly adjacent) were used for planning this FSS survey package. Survey Unit OOL-01-05 was reclassified to a Class 2 based on the review of the data. The data indicates that activity concentrations for three of the twenty-four samples would have exceed unity based on 10-mrem/y soil DCGLs. |   |  |  |
| The problem as defined by this survey plan is to den<br>an accumulation of plant-related radioactivity that e   | nonstrate that the years of plant operation did not result in xceeds the release criteria.            |  |  |

YNPS-FSS-OOL01-94-00 Cm

The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.

# 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

## 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments (treated as soil but at 10-mrem/y DCGLs)                   |
|--------------------------|--|
| Types of measurements:   | Sediment samples   |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137  |
| Applicable DCGL:         | • 2.2E+00 pCi C-14 per gram of sediment (10-mrem/y DCGL)                       |
|                          | • 1.6E+00 pCi Co-60 per gram of sediment (10-mrem/y DCGL)                      |
|                          | <ul> <li>6.9E-01 pCi Sr-90 per gram of sediment (10-mrem/y<br/>DCGL</li> </ul> |
|                          | • 3.4E+00 pCi Cs-137 per gram of sediment (10-mrem/y DCGL)                     |

Since the characterization data set present in the HSA did not account for C-14 and Sr-90 nuclides sufficiently, it was necessary to use additional sample data from the reservoir. The Seal Pit Discharge Cove characterization and FSS data were used to provide ample sample statistics; it's assumed that the samples collected in the discharge would yield a conservative representation of the LTP radionuclides present in OOL-01-05. Twenty-four samples were used to provide the sample statistics for C-14, Sr-90, Co-60 and Cs-137. The samples were collected between July 8, 2005 and August 23, 2005. The characterization data provided is sufficient to support FSS planning of Survey Unit OOL-01-05. Based on the current data, C-14, Co-60, Sr-90 and Cs-137 are the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results include:

| • C-14 (23 detects*)  | C-14 is present in 96% of the 24 characterization samples. None of the samples exceeded 10% of the 25-mrem/y DCGL (5.3 pCi/g). The average activity concentration of C-14 for the samples is $0.22 \text{ pCi/g}$ . |
|-----------------------|---|
| • Co-60 (22 detects*) | Co-60 is present in 92% of the 24 characterization samples. Five samples exceeded 10% of the 25-mrem/y DCGL (3.8 pCi/g). The average activity concentration of Co-60 for the samples is $0.22 \text{ pCi/g}$ .      |
| • Sr-90 (18 detects*) | Sr-90 is present in 75% of the 24 characterization samples. Three samples exceeded 10% of the 25-mrem/y DCGL (1.6 pCi/g). The average activity  |

|   | concentration of Sr-90 for the samples is 0.04 pCi/g.   |
|---|---|
| • Cs-137 (24 detects*)                                  | Cs-137 is present in 100% of the 24 characterization samples. Two samples exceeded 10% of the 25-mrem/y DCGL (8.1 pCi/g). The average activity concentration of Cs-137 for the samples is 0.38 pCi/g. |
| Note *: Detects as used in th<br>concentration excee    | his section refer the number of results in $pCi/g$ where the reported activity edd the critical level (2.33 sigma).   |
| The gamma analysis perforr suggests that TRUs are not p | ned did not detect Am-241 in any of the characterization sediment samples. This present in Survey Unit OOL-01-05. HTD nuclides and TRUs will be included in   |

suggests that TRUs are not present in Survey Unit OOL-01-05. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

|  | Survey Design / Release Criteria  |
|--|---|
| Average C-14 concentration:                  | 0.22 pCi/g  |
| Standard deviation C-14 ( $\sigma$ ):        | 0.12 pCi/g  |
| Average C0-60 concentration:                 | 0.22 pCi/g  |
| Standard deviation Co-60 ( $\sigma$ ):       | 0.27 pCi/g  |
| Average Sr-90 concentration:                 | 0.04 pCi/g  |
| Standard deviation Sr-90 (σ):                | 0.09 pCi/g  |
| Average Cs-137 concentration:                | 0.38 pCi/g  |
| Standard deviation Cs-137 (σ):               | 0.33 pCi/g  |
| Surrogate DCGL:                              | N/A (a surrogate DCGL will not be used)   |
| Investigation Level for<br>sediment samples: | <ul> <li>2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for C-14)</li> <li>1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for Co-60)</li> <li>0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for Sr-90)</li> <li>3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL<sub>w</sub> for Cs-137)</li> <li>If the sum of the DCGL<sub>w</sub> fractions for all detected LTP listed nuclides exceeds 1, an investigation will be conducted.</li> <li>Additionally if any other LTP listed nuclide is identified at a concentration greater than its respective 10-mrem/y DCGL<sub>w</sub> an investigation will be conducted.</li> </ul> |
| Investigation Level for scan                 | N/A per section 5.6.3.2.5 of the LTP  |
| Radionuclides for analysis                   | All LTP nuclides with the focus on, C-14, Co-60, Sr-90 and Cs-137   |

YNPS-FSS-OOL01-04-00

| MDCs for gamma analysis of       | Nuclide  | 10% of the 10 mrem/y DCGL <sub>w</sub> (pCi/g)  |
|----------------------------------|--|---|
| sediment samples                 | Co-60  | 1.6E-01   |
|                                  | Nb-94  | 2.9E-01   |
|                                  | Ag-108m  | 2.9E-01   |
|                                  | Sb-125   | 1.3E+00   |
|                                  | Cs-134   | 2.0E-01   |
|                                  | Cs-137   | 3.4E-01   |
|                                  | Eu-152   | 4.1E-01   |
|                                  | Eu-154   | 3.8E-01   |
|                                  | Eu-155   | 1.6E+01   |
|                                  | The desired MDCs in the laboratory analyses of FSS sediment samples will be the 10% DCGL values. If it is impractical to achieve those, the 50% DCGL values must be achieved in the laboratory analyses of the FSS sediment samples. |   |
| MDCs for HTD nuclide:            | Nuclide  | 10% of the 10 mrem/y DCGL <sub>m</sub> (pCi/g)  |
|                                  | H-3  | 1.5E+01   |
|                                  | C-14   | 2.2E-01   |
|                                  | Fe-55  | 1.2E+03   |
|                                  | Ni-63  | 3.3E+01   |
|                                  | Sr-90  | 6.9E-02   |
|                                  | Tc-99  | 5.7E-01   |
|                                  | Pu-238   | 1.3E+00   |
|                                  | Pu-239   | 1.2E+00<br>2.0E+01  |
|                                  | $\Delta m_{-}241$  | 1.2E+00   |
|                                  | Cm-243   | 1.3E+00   |
|                                  | The MDC values for diff<br>outside laboratory via the<br>will accompany the sedin  | ficult to detect nuclides will be conveyed to the e sample chain-of-custody form DPF-8823.1 and ment samples. |
| Scan Coverage :                  | N/A per section 5.6.3.2.5 of the LTP   |   |
| QC checks and measurements:      | • If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.   |   |
|                                  | ONE QC split sample  | will be collected   |
|                                  | note: this is in accordance with DP-8852, "Final Status Survey<br>Quality Assurance Project Plan (QAPP)" requirements.   |   |
|                                  | • <u>ONE</u> QC recount sam<br>Chemistry Lab   | ple will be performed and counted by the YNPS   |
|                                  | note: this is in accorda   | ance with DP-8852, "Final Status Survey   |
|                                  | Quality Assurance Pro  | oject Plan (QAPP)" requirements.  |
| 4.0 Define the boundaries of the | <u>e survey</u> :  |   |
| • Physical boundaries of Survey  | Unit OOL-01-05 are as she  | own on the attached map.  |
| • The survey will be performed u | inder appropriate weather  | conditions (as defined by instrumentation and   |
|                                  |  | YNPS-FSS-OOL01-Q  |

equipment limitations and human tolerance).

- Divers will perform the survey in daylight hours allowing adequate daylight time for ingress and egress.
- The Dive Operations Plan will address diver safety concerns.
- Water Depth (Alternate sample locations will be chosen for samples with dive depths greater than 80 ft).

## 5.0 <u>Develop a decision rule</u>:

Upon review of the FSS data collected under this survey plan:

- (a) If all the data show that the sediment concentrations of plant related nuclides and the sum of fractions of nuclides are below the 10-mrem/y DCGLs, accept the FSS data as valid and reject the null hypothesis (i.e., Survey Unit OOL-01-05 meets the release criteria).
- (b) If the activity concentration for any LTP nuclide exceeds its respective DCGL<sub>w</sub>, then perform an investigation survey.
- (c) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL<sub>w</sub> or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-05 fails to meet the release criteria).
- (d) If the average concentration of identified LTP-listed nuclide is less than DCGL<sub>w</sub> and the sum of their DCGL<sub>w</sub> fractions are less than 1, but some individual measurements exceed the DCGL<sub>w</sub>, then apply the statistical test as the basis for accepting or rejecting the null hypothesis.

Note: Alternate actions beyond investigations are not expected to be necessary within this survey unit.

## 6.0 Specify tolerable limits on decision errors:

| Null hypothesis:              | Residual plant-related radioactivity in Survey Unit OOL-01-05 exceeds the release criteria. |  |
|-------------------------------|---|--|
| Probability of type I error:  | 0.05  |  |
| Probability of type II error: | 0.05  |  |
| LBGR:                         | Unity Rule therefore the applicable DCGL = 1  |  |
|                               | LGBR = 0.5  |  |

# 7.0 Optimize Design:

Type of statistical test: WRS Test 🗹 Sign Test 🗆 (background will be applied to this survey unit)

*Number and Location of Samples*: 20 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 20 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

*Reference Area Background*: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination of the Number and Location of FSS Samples and Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background

Study" will be used.

## GENERAL INSTRUCTIONS

- Collect 20 sediment samples following the guidance of the Dive Operations Plan. One of the 20 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 20 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.
- 2. Sediment sample designation:

| FSS sediment samples: | OOL-01-05-001-F-SD through OOL-01-05-020-F-SD corresponding to FSS sample locations 001 through 020.  |  |
|-----------------------|---|--|
|                       | OOL-01-05-001-F-SD-H through OOL-01-05-020-F-SD-H corresponding to the same 20 samples when analyzed off-site for C-14 and Sr-90.   |  |
| QC split sample:      | OOL-01-05-003-F-SD-S is to be designated as QC split sample and will<br>be analyzed off-site. The results will be compared to the on-site analysis<br>results for sample OOL-01-05-003-F-SD in accordance with DP-8864,<br>"Split Sample Assessment for Final Status Survey." |  |
| Recount samples:      | OOL-01-05-013-F-SD is to be counted twice on site, the letters RC will<br>be appended to the suffix representing the recounted result. The results<br>will be compared in accordance with DP-8864, "Split Sample Assessment<br>for Final Status Survey."                      |  |

- 3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization."
- 4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans."
- 5. If a survey location falls depths greater than 80 feet another survey location will be chosen in accordance with DP-8856, "Preparation of Survey Plans".
- 6. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool.
- 7. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
- 8. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory.
- 9. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-05.
- 10. Diver Safety will be addressed in the accompanying Dive Operations Plan.
- 11. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-

8868, "Final Status Survey Training Program."

## **SPECIFIC INSTRUCTIONS**

- Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.
- 2. Sediment Samples
  - YNPS Chemistry will analyze OOL-01-05-001-F-SD through OOL-01-05-020-F-SD for gammaemitting nuclides.
  - OOL-01-05-013-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted sample will be OOL-01-05-013-F-SD-RC.
  - The off-site laboratory will analyze OOL-01-05-001-F-SD-H through OOL-01-05-020-F-SD-H for C-14 and Sr-90. Each sample will be comprised of approximately 500 ml homogenous aliquot of wet sediment and prepared in accordance with DP-8813, "Sample Receipt and Preparation."
  - OOL-01-05-003-F-SD-S will be sent to the off-site laboratory and analyzed as a QC split sample. This sample will be analyzed for all LTP listed nuclides including Total Chemical Uranium (TCU).
- 3. On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.
- 4. If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.

| NOTIFICATION POINTS            |                 |
|--------------------------------|-----------------|
|                                |                 |
|                                |                 |
| Prepared by the not of the man | Date 6. 29 - 26 |
| FSS Radiological Engineer      | _               |
| Reviewed by M Ripskyck         | Date 7-5-06     |
| FSS Radiologidal Engineer      |                 |
| Approved by migloh Marine      | Date 7-5-06     |
| / FSS Rroject Manager          |                 |
| FOR MARTY ERICKSON             |                 |

YNPS-FSS-OOL01-04-00

# Final Status Survey Planning Worksheet

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| GENERAL SECTION  |
|--|
| Survey Area #: OOL-01 Survey Unit #: 06  |
| Survey Unit Name: OUL-01-06 (Subdivision of the Seal Pit Discharge Cove Northern Boundary)   |
| PREPARATION FOR FSS ACTIVITIES   |
| Check marks in the bayes below signify offirmative responses and completion of the action  |
| Check marks in the boxes below signify affirmative responses and completion of the action.   |
| 1.1 Files have been established for survey unit FSS records.   |
| 1.2 ALARA review has been completed for the survey unit.<br>The generic ALARA review applies to this survey unit because the costs involved in dredging would increase the Action Level.   |
| 1.3 The survey unit has been turned over for final status survey. $\square$  |
| <ul> <li>1.4 An initial DP-8854 walkdown has been performed and a copy of the completed Survey Unit Walkdown</li> <li>Evaluation is in the survey area file.</li> </ul>  |
| 1.5 Activities conducted within area since turnover for FSS have been reviewed.  |
| Based on reviewed information, subsequent walkdown: 🗹 not warranted 🛛 warranted  |
| If warranted, subsequent walkdown has been performed and documented per DP-8854. $\Box$<br>OR  |
| The basis has been provided to and accepted by the FSS Project Manager for not performing a subsequent walkdown. $\Box$  |
| 1.6 A final classification has been performed.   |
| Classification: CLASS 1 🗹 CLASS 2 🗆 CLASS 3 🗆  |
| DATA QUALITY OBJECTIVES (DQO)  |
| 1.0 <u>Statement of the problem</u> :  |
| Survey Unit OOL-01-06 consists of sediment on the bottom of Sherman Reservoir and contains about 185.8 m <sup>2</sup> of surface area.   |
| This FSS survey plan is designed as a result of the re-classification in part of survey unit OOL-01-01. The partial re-classification was necessary following the investigation survey performed in unit 01. The results of the investigation survey confirm the result of the original FSS survey and bound the extent of the elevated area of residual radioactivity. The decision was made to partially re-classify and sub-divide OOL-01-01 into two survey units. The newly sub-divided survey unit will be classified as a class 1 unit and will be surveyed against the design criteria established in this plan. |
| The problem as defined by this survey plan is to demonstrate that the years of plant operation did not result in an accumulation of plant-related radioactivity that exceeds the release criteria.   |
| The planning team for this effort consists of the FSS Project Manager, FSS Radiological Engineer, FSS Field Supervisor, and FSS Technicians. The FSS Radiological Engineer will make primary decisions with the concurrence of the FSS Project Manager.  |

DPF-8856.1 Rev. 6 Page 1 of 7

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## 2.0 Identify the decision:

Does residual plant-related radioactivity, if present in the survey unit, exceed the release criteria? Alternative actions that may be implemented in this effort are investigations.

## 3.0 Identify the inputs to the decision:

| Sample media:            | Reservoir Sediments (treated as soil)                  |
|--------------------------|--|
| Types of measurements:   | Sediment samples                                       |
| Radionuclide-of-concern: | C-14, Co-60, Sr-90 and Cs-137                          |
| Applicable DCGL:         | • 2.2 pCi C-14 per gram of sediment (10-mrem/y DCGL)   |
|                          | • 1.6 pCi Co-60 per gram of sediment (10-mrem/y DCGL)  |
|                          | • 0.69 pCi Sr-90 per gram of sediment (10-mrem/y DCGL  |
|                          | • 3.4 pCi Cs-137 per gram of sediment (10-mrem/y DCGL) |

Recent sediment samples collected from the Cove survey unit (OOL-01-01) were added to the original characterization data. Thirty samples in all were used to provide the statistics for characterization of survey unit OOL-01-06. The original characterization samples were collected between June 29, 2005 and July 8, 2005 and the FSS samples were collected on August 23, 2005. The data set provided is sufficient to support FSS planning of Survey Unit OOL-01-06. Based on this data, C-14, Co-60, Sr-90 and Cs-137 continue to be the radionuclides of concern; consequently the focus will be on the sediment concentrations of these radionuclides. The sample results from the characterization data include:

| • C-14 (26 detects)    | C-14 is present in 96% of the 27 characterization samples taken. Twelve samples exceeded 10% of the 10-mrem/y DCGL (0.22 pCi/g). The average activity concentration of C-14 for the samples is 0.23 pCi/g.     |
|------------------------|--|
| • Co-60 (26 detects)   | Co-60 is present in 87% of the 30 characterization samples taken. Ten samples exceeded 10% of the 10-mrem/y DCGL (0.16 pCi/g). The average activity concentration of Co-60 for the samples is 0.17 pCi/g.      |
| • Cs-137 (30 detects)  | Cs-137 is present in 100% of the 30 characterization samples taken. Eight samples exceeded 10% of the 10-mrem/y DCGL (0.34 pCi/g). The average activity concentration of Cs-137 for the samples is 0.31 pCi/g. |
| • Sr-90 (17 detects)   | Sr-90 is present in 63% of the 27 characterization samples taken. Four samples exceeded 10% of the 10-mrem/y DCGL (0.07 pCi/g). The average activity concentration of Sr-90 for the samples is 0.04 pCi/g.     |
| e gamma analysis perfo | rmed did not detect Am-241 in any of the characterization sediment samples. Th<br>t present in Survey Unit OOL-01-06. HTD nuclides and TRUs will be included in  |

The gamma analysis performed did not detect Am-241 in any of the characterization sediment samples. This suggests that TRUs are not present in Survey Unit OOL-01-06. HTD nuclides and TRUs will be included in the assessment related to this survey plan. At least 5% of the FSS sediment samples will be sent to an independent laboratory for complete analyses of HTD nuclides and TRUs. In addition to sampling for HTD and TRU nuclides, 100% of the samples collected will be analyzed C-14 and for Sr-90.

DPF-8856.1 Rev. 6 Page 2 of 7

|   | Survev Design / Re                                     | lease Criteria   |
|---|--|--|
| Average C-14 concentration:               | 0.23 pCi/g   |  |
| Standard deviation C-14 (o):              | 0.13 pCi/g   |  |
| 1   | 0.17   |  |
| Average C0-60 concentration:              | 0.1 / pCi/g  |  |
| Standard deviation $Co-60$ ( $\sigma$ ):  | 0.25 pC1/g   |  |
| Average Sr-90 concentration:              | 0.04 pCi/g   |  |
| Standard deviation Sr-90 ( $\sigma$ ):    | 0.08 pCi/g   |  |
| Average Cs-137 concentration:             | 0.31 pCi/g   |  |
| Standard deviation $Cs-137 (\sigma)$      | 0.31  pCi/g  |  |
|   | 0.01 Pong  |  |
| Surrogate DCGL:                           | N/A (a surrogate DCG                                   | L will not be used)                                      |
| $DCGL_{EMC}$ based on grid space          | a set last   |  |
| of 21.6 ft of arca of 12.39 m             | (Use as a values)                                      | 1200 12000 -> 1862 -Cila                                 |
| $C_{-14}$ , where $C_{-14}$               | -1.7E3 (Area Factor =                                  |  |
| C0-00<br>Sr-00                            | = 2.5EU (Area Factor =                                 | $= \frac{1.4}{1.8} = 72.88 pci(9)$                       |
| $C_{s-137}$                               | -1 = 3.3EF (Area Factor =                              | = 54) = 37.26 pci/q                                      |
|   | $\{ \bullet \mathbf{H} \in \mathbf{H} \in \mathbf{H} $ | = 3.7) => 12.58 plily                                    |
| Investigation Level for sediment samples: | • If any LTP listed nu investigation will be           | sclide is greater than its $DCGL_{EMC}$ , an econducted. |
|   | • If the sum of the D(                                 | CGL <sub>EMC</sub> fractions for all detected LTP listed |
|   | • If any I TP listed r                                 | welide is greater than its respective DCGL wand          |
|   | the value is a statist will be conducted.              | ical outlier as defined in the LTP, an investigation     |
|   |  |  |
|   |  |  |
| Investigation Level for scan              | N/A per section 5.6.3.                                 | 2.5 of the LTP   |
| Radionuclides for analysis                | All LTP nuclides with                                  | the focus on, C-14, Co-60, Sr-90 and Cs-137              |
| MDCs for gamma analysis of                | Nuclide  | <u>10% of the 10 mrem/y DCGL<sub>w</sub> (pCi/g)</u>     |
| sediment samples                          | Co-60  | 0.16   |
|   | Nb-94  | 0.29   |
|   | Ag-108m  | 0.29   |
|   | Sb-125   | 1.3  |
|   | Cs-134   | 0.20   |
|   | Cs-137   | 0.34   |
|   | Eu-152   | 0.41   |
|   | Eu-154   | 0.38   |
|   |  |  |
|   | Eu-155   | 16   |

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DPF-8856.1 Rev. 6 Page 3 of 7

| MDCs for HTD nuclide:       Nuclide<br>H-3<br>C-14<br>Fe-55<br>Ni-63<br>Sr-90<br>Tc-99<br>Pu-238<br>Pu-239<br>Pu-241<br>Am-241<br>Cm-243<br>The MDC values for di<br>outside laboratory via ti<br>will accompany the sed         Scan Coverage :       N/A per section 5.6.3.2         QC checks and measurements:       If applicable, QC ch<br>accordance with DP<br>ONE QC split samp<br>note: this is in accor<br>Quality Assurance P         4.0 Define the boundaries of the survey:       ONE QC recount sa<br>Chemistry Lab<br>note: this is in accor<br>Quality Assurance F         4.0 Define the boundaries of Survey Unit OOL-01-06 are as s         The survey will be performed under appropriate weather<br>equipment limitations and human tolerance).         Divers will perform the survey in daylight hours allowir         The Dive Operations Plan will address diver safety concerts  | st be achieved in the laboratory analyses of the   |  |
|--|--|--|
| <ul> <li>C-14<br/>Fe-55<br/>Ni-63<br/>Sr-90<br/>Tc-99<br/>Pu-238<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via t<br/>will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch<br/>accordance with DP<br/>• <u>TWO</u> QC split samp<br/>note: this is in accor<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this and human tolerance).</li> <li>Divers will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir<br/>The Dive Operations Plan will address diver safety cond<br/>5.0 Develop a decision rule:</li> </ul>  | <u>10% of the 10 mrem/y DCGL<sub>w</sub> (pCi/g)</u>   |  |
| <ul> <li>C-14<br/>Fe-55<br/>Ni-63<br/>Sr-90<br/>Tc-99<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via ti<br/>will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch<br/>accordance with DP.</li> <li>TWO QC split samp<br/>note: this is in accor<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accor<br/>Quality Assurance F</li> <li>4.0 Define the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 Develop a decision rule:</li> </ul>  | 15   |  |
| <ul> <li>Fe-55<br/>Nii-63<br/>Sr-90<br/>Tc-99<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via ti<br/>will accompany the sed</li> <li><i>Scan Coverage :</i> N/A per section 5.6.3.2</li> <li><i>QC checks and measurements:</i> If applicable, QC ch<br/>accordance with DP.</li> <li>Two QC split samp<br/>note: this is in accord<br/>Quality Assurance F</li> <li><u>ONE</u> QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li><b>4.0 Define the boundaries of the survey:</b></li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> </ul>  | 0.22   |  |
| <ul> <li>Ni-63<br/>Sr-90<br/>Tc-99<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via t<br/>will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch<br/>accordance with DP.</li> <li>TWO QC split samp<br/>note: this is in accor<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>One perform the survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>Develop a decision rule:</li> </ul>   | 1200   |  |
| <ul> <li>Sr-90<br/>Tc-99<br/>Pu-238<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via t<br/>will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch<br/>accordance with DP.</li> <li>TWO QC split samp<br/>note: this is in accor<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance P</li> <li>One perform the survey unit OOL-01-06 are as s</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 Develop a decision rule:</li> </ul>   | 33   |  |
| <ul> <li>Tc-99<br/>Pu-238<br/>Pu-239<br/>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for di<br/>outside laboratory via t<br/>will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch<br/>accordance with DP.</li> <li>Two QC split samp<br/>note: this is in accor<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance P</li> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance P</li> <li>One: this</li></ul> | 0.07   |  |
| <ul> <li>Pu-238 Pu-239 Pu-241 Am-241 Cm-243 The MDC values for di outside laboratory via t will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch accordance with DP.</li> <li>TWO QC split samp note: this is in accor Quality Assurance P</li> <li>ONE QC recount sa Chemistry Lab note: this is in accor Quality Assurance P</li> <li>4.0 Define the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety conditioned.</li> </ul>  | 0.57   |  |
| <ul> <li>Pu-239 Pu-241 Am-241 Cm-243 The MDC values for di outside laboratory via t will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC ch accordance with DP <ul> <li>TWO QC split samp note: this is in accord Quality Assurance P</li> <li>ONE QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> </ul> </li> <li>4.0 Define the boundaries of the survey: <ul> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir <ul> <li>The Dive Operations Plan will address diver safety cond</li> </ul> </li> </ul></li></ul>  | 1.3  |  |
| <ul> <li>Pu-241<br/>Am-241<br/>Cm-243<br/>The MDC values for dioutside laboratory via twill accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC chacks and measurements:</li> <li>If applicable, QC chacks and measurements:</li> <li><u>ONE</u> QC recounts a Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li><u>ONE</u> QC performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing the Dive Operations Plan will address diver safety conditions</li> <li><u>Develop a decision rule</u>:</li> </ul>   | 1.2  |  |
| Am-241<br>Cm-243<br>The MDC values for di<br>outside laboratory via t<br>will accompany the sed<br>Scan Coverage : N/A per section 5.6.3.2<br>QC checks and measurements: If applicable, QC ch<br>accordance with DP<br>• TWO QC split samp<br>note: this is in accor<br>Quality Assurance P<br>• <u>ONE</u> QC recount sa<br>Chemistry Lab<br>note: this is in accord<br>Quality Assurance P<br>• <u>ONE</u> QC recount sa<br>Chemistry Lab<br>note: this is in accord<br>Quality Assurance P<br>• Physical boundaries of the survey:<br>• Physical boundaries of Survey Unit OOL-01-06 are as s<br>• The survey will be performed under appropriate weather<br>equipment limitations and human tolerance).<br>• Divers will perform the survey in daylight hours allowin<br>• The Dive Operations Plan will address diver safety cond<br>5.0 <u>Develop a decision rule</u> :  | 39   |  |
| <ul> <li>Cm-243 <ul> <li>The MDC values for dioutside laboratory via twill accompany the sed</li> </ul> </li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: <ul> <li>If applicable, QC chacks and measurements:</li> <li>Physical boundaries of the survey unit OOL-01-06 are as s</li> </ul> </li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing:</li> <li>The Dive Operations Plan will address diver safety conditions:</li> </ul> <li>5.0 Develop a decision rule:</li>   | 1.2  |  |
| <ul> <li>The MDC values for di outside laboratory via t will accompany the sed</li> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC chacks and measurements:</li> <li>If applicable, QC chacks and measurements:</li> <li><u>The Dive Operations Plan will address diver safety conditions and human tolerance</u></li> </ul>   | 1.3  |  |
| <ul> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC character with DP</li> <li>TWO QC split samp note: this is in accord Quality Assurance P</li> <li>ONE QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li>ODEfine the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing The Dive Operations Plan will address diver safety conditions.</li> </ul>   | fficult to detect nuclides will be conveyed to the   |  |
| <ul> <li>Scan Coverage : N/A per section 5.6.3.2</li> <li>QC checks and measurements: If applicable, QC chacks and measurements: If applicable, QC chacks and measurements: Two QC split samp note: this is in accord Quality Assurance P</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li><u>ONE</u> QC recount sa Chemistry Lab note: this is in accord Quality Assurance P</li> <li><u>Divers</u> Will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing</li> <li>The Dive Operations Plan will address diver safety conditions</li> <li><u>Develop a decision rule</u>:</li> </ul>   | he sample chain-of-custody form DPF-8823.1 and liment samples.   |  |
| <ul> <li>QC checks and measurements:</li> <li>If applicable, QC chacks and measurements:</li> <li>If applicable, QC chacked accordance with DP</li> <li>If applicable, QC split samp note: this is in accord Quality Assurance F</li> <li>ONE QC recount satchemistry Lab</li> <li>note: this is in accord Quality Assurance F</li> </ul> 4.0 Define the boundaries of the survey: <ul> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing</li> <li>The Dive Operations Plan will address diver safety conditions</li> </ul>   | 2.5 of the LTP   |  |
| <ul> <li>TWO QC split samp note: this is in accord Quality Assurance F</li> <li>ONE QC recount sa Chemistry Lab note: this is in accord Quality Assurance F</li> <li>4.0 Define the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety conditions</li> <li>5.0 Develop a decision rule:</li> </ul>   | <ul> <li>If applicable, QC checks for the Leica GPS will be performed in accordance with DP-8859.</li> </ul>                   |  |
| <ul> <li>note: this is in accorr<br/>Quality Assurance F</li> <li><u>ONE</u> QC recount sa<br/>Chemistry Lab<br/>note: this is in accorr<br/>Quality Assurance F</li> <li>4.0 <u>Define the boundaries of the survey</u>:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 <u>Develop a decision rule</u>:</li> </ul>  | • $\frac{1}{100}$ QC split sample will be collected $\sqrt{1.20-06}$   |  |
| <ul> <li>ONE QC recount sa<br/>Chemistry Lab<br/>note: this is in accord<br/>Quality Assurance F</li> <li>4.0 Define the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 Develop a decision rule:</li> </ul>  | dance with DP-8852, "Final Status Survey<br>Project Plan (QAPP)" requirements.   |  |
| note: this is in accord<br>Quality Assurance F<br>4.0 <u>Define the boundaries of the survey</u> :<br>• Physical boundaries of Survey Unit OOL-01-06 are as s<br>• The survey will be performed under appropriate weather<br>equipment limitations and human tolerance).<br>• Divers will perform the survey in daylight hours allowir<br>• The Dive Operations Plan will address diver safety cond<br>5.0 <u>Develop a decision rule</u> :  | mple will be performed and counted by the YNPS   |  |
| <ul> <li>4.0 Define the boundaries of the survey:</li> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowir</li> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 Develop a decision rule:</li> </ul>   | dance with DP-8852, "Final Status Survey<br>Project Plan (QAPP)" requirements.   |  |
| <ul> <li>Physical boundaries of Survey Unit OOL-01-06 are as s</li> <li>The survey will be performed under appropriate weather<br/>equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowin</li> <li>The Dive Operations Plan will address diver safety cond</li> </ul> 5.0 <u>Develop a decision rule</u> :  |  |  |
| <ul> <li>The survey will be performed under appropriate weather equipment limitations and human tolerance).</li> <li>Divers will perform the survey in daylight hours allowing.</li> <li>The Dive Operations Plan will address diver safety conditions.</li> <li>5.0 Develop a decision rule:</li> </ul>   | hown on the attached map.  |  |
| <ul> <li>Divers will perform the survey in daylight hours allowin</li> <li>The Dive Operations Plan will address diver safety cond</li> </ul> 5.0 <u>Develop a decision rule</u> :   | r conditions (as defined by instrumentation and  |  |
| <ul> <li>The Dive Operations Plan will address diver safety cond</li> <li>5.0 <u>Develop a decision rule</u>:</li> </ul>   | ng adequate daylight time for ingress and egress.  |  |
| 5.0 <u>Develop a decision rule</u> :   | cerns.   |  |
|  |  |  |
| Upon review of the FSS data collected under this survey p  | lan:   |  |
| (a) If all the data show that the sediment concentration<br>of nuclides are below the 10-mrem/y DCGLs, acc<br>hypothesis (i.e., Survey Unit OOL-01-06 meets th   | ns of plant related nuclides and the sum of fraction<br>ept the FSS data as valid and reject the null<br>re release criteria). |  |
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(c) If the average concentration of the radionuclide-of-concern is below the DCGL, or if the sum of the fractions for identified radionuclides-of-concern <1, but some measurements exceed the DCGL, then apply a statistical test as the basis for accepting or rejecting the null hypothesis.

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(d) If the average concentration of any LTP-listed nuclide exceeds its respective DCGL or the average sum of fractions exceed one, then accept the null hypothesis (i.e., Survey Unit OOL-01-06 fails to meet the release criteria).

### 6.0 Specify tolerable limits on decision errors:

| Null hypothesis:              | Residual plant-related radioactivity in Survey Unit OOL-01-06 exceeds the release criteria. |
|-------------------------------|---|
| Probability of type I error:  | 0.05  |
| Probability of type II error: | 0.05  |
| LBGR:                         | Unity Rule therefore the applicable DCGL = 1  |
|                               | LGBR = 0.5  |

### 7.0 Optimize Design:

Type of statistical test: WRS Test ☑ Sign Test □ (background will be applied to this survey unit)

*Number and Location of Samples*: 15 sediment samples will be collected in systematic grid locations with a random start (refer to the completed DPF-8853.2 in the survey package file). The number of sediment samples required was determined to be 13, but 15 samples will be collected in a conservative effort to account for the inability to perform surface scans of the bottom sediments.

*Reference Area Background*: Twenty sediment samples were collected from Harriman Reservoir in random locations in accordance with DP-8865, "Computer Determination Of The Number And Location Of FSS Samples And Measurements." If a background is applied the data contained in the reference area background technical report, YA-REPT-00-019-05, "Harriman Reservoir Reference Area Background Study" will be used.

## **GENERAL INSTRUCTIONS**

- Collect 15 sediment samples following the guidance of the Dive Operations Plan. One of the 15 sediment samples will be analyzed as a QC split sample to fulfill the QC requirement of DP-8852 "Final Status Survey Quality Assurance Project Plan (QAPP)." All 15 sediment samples will also be analyzed for the C-14 and Sr-90 nuclides.
- 2. Sediment sample designation:

| FSS sediment samples: | OOL-01-06-001-F-SD through OOL-01-06-015-F-SD corresponding to FSS sample locations 001 through 015.                              |
|-----------------------|---|
|                       | OOL-01-06-001-F-SD-H through OOL-01-06-015-F-SD-H corresponding to the same 15 samples when analyzed off-site for C-14 and Sr-90. |
| QC split sample:      | OOL-01-06-013-F-SD-S is to be designated as QC split sample and will  |

DPF-8856.1 Rev. 6 Page 5 of 7

Adde - Alexander - Alexander be analyzed off-site. The results will be compared to the on-site analysis results for sample OOL-01-06-013-F-SD in accordance with DP-8864, "Split Sample Assessment for Final Status Survey." Recount samples: OOL-01-06-005-F-SD is to be counted twice on site, the letters RC will be appended to the suffix representing the recounted result. The results will be compared in accordance with DP-8864, "Split Sample Assessment for Final Status Survey." 3. Determine the sample locations using GPS, in accordance with DP-8859 and mark the sample location in accordance with DP-8124 "Collection of Pond Sediment Samples For Site Characterization." 4. If a survey location falls on riprap or an obstruction whereby the desired volume of sediment cannot be achieved another survey location will be chosen in accordance with DP-8856. "Preparation of Survey Plans." 5. Divers will collect the sediment samples. Approximately 2 liters of sediment shall be collected in plastic Ziploc bags or in hard plastic containers using a trowel or equivalent tool. 6. All sediment samples will be received and prepared in accordance with DP-8813, "Sample Receipt and Preparation." 7. Chain of Custody form will be used in accordance with DP-8123, "Sample Security and Chain of Custody" for all sediment samples sent to an off-site laboratory. 8. The job hazards associated with the Survey described in this package are addressed in the accompanying Job Hazard Assessment for OOL-01-06. 9. Diver Safety will be addressed in the accompanying Dive Operations Plan. 10. All personnel (excluding divers) participating in this survey shall be trained in accordance with DP-8868, "Final Status Survey Training Program." SPECIFIC INSTRUCTIONS 1. Determine the sample location by GPS per DP-8859, Operation of The Leica Geosystems GPS 1200 Global Positioning System For Identification Of Final Status Survey Measurement Locations". If a designated sample location is obstructed or deemed incapable of yielding enough sediment, the FSS Radiological Engineer or the FSS Field Supervisor will select an alternate location in accordance with DP-8856, "Preparation of Survey Plans". A detailed description of the alternate location will be recorded on form DPF-8856.2. The coordinates for the alternate location will be recorded with GPS in accordance

- 2. Sediment Samples
  - Decant any standing water and then homogenize the wet sediment in a container large enough for the entire sample. Prepare an aliquot of at least 500 ml for wet samples sent to the off-site laboratory for analysis. The 500 ml sample will be sufficient to perform either a split sample analysis or a HTD analysis commensurate with this plan.

with DP-8859, and the survey unit map will be annotated appropriately to reflect the alternate location.

• An aliquot of 500 ml or greater volume of wet sediment is to be placed in screw top plastic containers for shipment to the off-site laboratory for analysis. OOL-01-06-001-F-SD through OOL-01-06-015-F-SD will be renamed (Excluding OOL-01-06-013-F-SD) appending the letter H to the suffix and sent to the off-site laboratory (i.e. OOL-01-06-001-F-SD-H). The off-site laboratory will analyze these

DPF-8856.1 Rev. 6 Page 6 of 7 9.0

|  | samples for C-14 and Sr-90 only.   |  |
|--|--|--|
|  | Note: renaming the off-site samples is necessary to ensure unique naming convention for the C-14 and Sr-90 results.  |  |
| •  | OOL-01-06-013-F-SD will be renamed appending the letter S to the suffix and sent to the off-site laboratory. The off-site laboratory will analyze OOL-01-06-013-F-SD-S as a QC split sample. This sample will be analyzed for all LTP listed nuclides. |  |
|  | • The remaining sediment is to be dried in the drying oven in pans not the marinelli container. YNPS Chemistry will analyze OOL-01-06-001-F-SD through OOL-01-06-015-F-SD for gamma-emitting nuclides.   |  |
|  | <ul> <li>OOL-01-06-005-F-SD will be counted twice by YNPS Chemistry. The designation for the recounted<br/>sample will be OOL-01-06-005-F-SD-RC.</li> </ul>  |  |
| 3.   | On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.                              |  |
| 4.   | If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.   |  |
| 5.   | On-site gamma analysis of the FSS samples shall achieve the MDC values stated in the DQO section of this plan. The MDCs will be communicated to the off-site laboratory using an attachment to the Chain-of Custody form.                              |  |
| 6.   | If any LTP-listed nuclides exceed the investigation levels outlined in the DQO section the FSS Radiological Engineer will determine the appropriate investigation.   |  |
| NC   | DTIFICATION POINTS   |  |
|  |  |  |
| n/a  |  |  |
| Prepared by FSS Radiological Engineer Date 7-20-2006<br>FSS Radiological Engineer Date 7/20/06 |  |  |
| A  | pproved by / At. C. End Date 7/20/86<br>FSS Project Manager  |  |

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DPF-8856.1 Rev. 6 Page 7 of 7

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