Obtain Drywell Data Using Radionuclide Assessment System

Tank Farm Plant Operating Procedure

SURVEILLANCE

USQ # TF-16-1461-D Rev. 0

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
</tr>
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<tbody>
<tr>
<td>F-0</td>
<td>09/19/2016</td>
<td>Periodic Review</td>
<td>Move requirement for maximum speed in the farm while wearing Supplied air to Personnel Safety and delete Limits section. Update RadCon statement. Revise wording on Warning to meet standard. Add to supply list. Editorial changes for clarity.</td>
</tr>
<tr>
<td>E-2</td>
<td>08/18/2014</td>
<td>Inconsequential Change</td>
<td>Change Base Ops to Production Ops.</td>
</tr>
<tr>
<td>E-1</td>
<td>04/28/2014</td>
<td>Field crew request due to new laptop using thumb drives now.</td>
<td>Pages 6, 14, 16, 17, 20, 23, 32 &amp; 34: Modify steps to address new laptop and thumb drive use.</td>
</tr>
<tr>
<td>E-0</td>
<td>12/03/2013</td>
<td>Periodic Review and identified changes.</td>
<td>Added TFC-ESHQ-S-SAF-C-02 references. Reworded warnings. Added steps or special instructions to perform the actions instead of performing actions from notes.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for staging the Radionuclide Assessment System (RAS) vehicle at an assigned single-shell tank farm drywell, setting up the Logging System for drywell logging operations and obtaining drywell data.

1.2 Scope

This procedure applies to operation of the RAS vehicle, RAS Logging System and associated RAS components.

This procedure can be performed in multiple locations. A work area and/or location specific hazard analysis must be performed prior to starting the activity per TFC-ESHQ-S_SAF-C-02.

2.0 INFORMATION

2.1 Terms and Definitions

- RAS - Radionuclide Assessment System
- Sonde - Term for three assembled logging sub-sections
- RAS logging Sonde is composed of three basic pieces;
  - 1) NaI Detector Probe section
  - 2) Telemetry section
  - 3) Cablehead section.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - Removal of radioactive liquid could result in the spread of contamination.

**WARNING** - Placing fingers on or near mast assembly and/or adapter sheave wheels when winch is operating, could result in fingers getting caught in moving machinery causing injuries or amputations.

**WARNING** - Failure to place a set of wheel chocks in front of and behind one wheel after vehicle is positioned could result in personnel injury.

**WARNING** - Failure to use hand protection when setting up mast assembly and spooling cable could result in personnel injury.

3.1.1 All activities in this procedure fall within the scope of the GHA. All WARNINGS apply to General Hazards.

3.1.2 Maximum speed in the farms is 10 miles per hour, except when using supplied breathing air. The maximum speed shall then be 5 miles per hour.

3.2 Equipment Safety

**CAUTION** - Failure to carefully align detector sub-section and telemetry sub-section could cause shearing off of exposed connector pins protruding from detector head.

**CAUTION** - Failure to carefully align cablehead to telemetry sub-section before properly joining, could damage either cablehead and/or telemetry sub-section.

**CAUTION** - Sonde power must be off prior to connecting or disconnecting cablehead and/or assembling telemetry and detector sub-sections. Failure to do this could cause damage to internal electronics.

**CAUTION** - Sonde should not be allowed to strike bottom of drywell to prevent damage to detector.

**CAUTION** - Sonde must not be brought above zero mark on detector to prevent damage to cablehead or mast assembly.

**CAUTION** - If ProSine inverter is left on for an extended period of time with vehicle engine off, battery system for RAS could be drained.
3.3 Radiation and Contamination Control

3.3.1 When this procedure is worked in radiological areas, an approved radiological work permit (RWP) is required. If radiological conditions or work performed falls outside the scope of the RWP, all work activities must be discontinued until a new or revised RWP has been issued in accordance with TFC-ESHQ-RP_RWP-C-03.

3.3.2 Only liquid showing no detectable contamination during cleanliness check in Section 5.1, may be removed from vadose zone drywells.

3.3.3 Radiological monitoring shall be in accordance with the latest revision of HNF-5183, Tank Farms Radiological Control Manual.

3.4 Environmental Compliance

3.4.1 Environmental must be notified if a breach of the drywell is determined.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Swabbing Equipment
- Clean Rags
- Hand Protection
- Approved Cleaning Solution
- Thumb drive(s).
- Measuring tape with donut attached
- Bucket
- 4 in. Diameter Casing Adapter
- Mast Base with 6 in. Diameter Casing Adapter
- 8 in. Diameter Casing Adapter.

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- TO-100-052, Perform Waste Generation, Segregation, Accumulation, and Clean-up
- TFC-PLN-43 Tank Operations Contractor Health and Safety Plan
- Borehole Monitoring Request form
- Drywell Monitoring Schedule provided by S.M. Stoller.
- TFC-ESHQ-S-SAF-C-02, Job Hazard Analysis.

4.3 Field Preparation

4.3.1 ENSURE drywell surveillance logging has been requested by SME.

4.3.2 OBTAIN a drywell monitoring schedule provided by S.M. Stoller.

4.3.3 OBTAIN Borehole Monitoring Request form provided by S.M. Stoller.

4.3.4 ENSURE a work area and/or a location specific hazards analysis has been performed per TFC-ESHQ-S-SAF-C-02.
5.0  PROCEDURE

5.1  Drywell Cleanliness Check

**WARNING**
Removal of radioactive liquid could result in the spread of contamination.

5.1.1  **WITHIN** 30 days of scans, **PERFORM** the following steps for cleanliness check on assigned drywell:

5.1.1.1  **OBTAIN** measuring tape with donut attached.

5.1.1.2  **SECURE** rag to donut.

5.1.1.3  **REMOVE** drywell plug to gain access to drywell.

5.1.1.4  **LOWER** donut into riser to check for contamination.

5.1.1.5  **LEAVE** donut on bottom of well long enough to absorb any moisture.

5.1.1.6  **PERFORM** radiological survey as donut is reeled up **AND** **DOCUMENT** on a Radiological Survey Report.

**NOTE** - If background is greater than 150 counts per minute, tape may be wiped down as it is being removed and wipe checked in a low background area.

5.1.1.7  **IF** background is greater than 150 counts per minute, **EVALUATE** wiping down tape as it is being removed and checking the wipe in a low background area.

5.1.1.8  **CHECK** over drywell for cleanliness as donut is retrieved to top of drywell **AND**

**WHEN** donut and rag arrive at top of drywell, **PERFORM** radiological survey of donut and rag for contamination.

5.1.1.9  **IF** contamination greater than 5,000 dpm Beta/Gamma per probe area is detected, **STOP AND**

**GO TO** Step 5.1.3.6.
5.1 Drywell Cleanliness Check (Cont.)

5.1.2 IF meter response does not increase and swab is wet or dry (normal condition), **PERFORM** the following:

5.1.2.1 **PLACE** a bucket as close as possible to well opening.

5.1.2.2 **PLACE** swab in bucket.

**NOTE** - If background radiation levels are too high to perform a contamination survey, swab may be moved to an area of lower background radiation.

5.1.2.3 **IF** background radiation levels are too high to perform a contamination survey, **EVALUATE** moving swab to an area of lower background radiation.

5.1.2.4 **MONITOR** swab for contamination.

5.1.2.5 **IF** contamination is detected at greater than 5,000 dpm Beta/Gamma per probe area direct reading, **RE-INSTALL** drywell cap **AND**

**NOTIFY** the following Personnel:
- West Area Production Operations Field Crew Manager
- Work Release OE
- Rad Con FLM.

5.1.2.6 **IF** contamination is detected but is below 5,000 dpm Beta/Gamma per probe area direct reading, **NOTIFY** the following personnel of contamination readings obtained:
- West Area Production Operations Field Crew Manager
- OE
- Rad Con FLM.

5.1.2.7 **OBTAIN** permission from West Area Production Operations Field Crew Manager and Rad Con FLM to proceed with scanning this drywell **AND**

**DOCUMENT** approval in Work Release Operations Engineer’s Log.

5.1.2.8 **DISPOSE** of contaminated items per TO-100-052.

5.1.2.9 **IF** contamination is not detected, **PLACE** reel and donut into proper container.
5.1 Drywell Cleanliness Check (Cont.)

5.1.3 IF meter response increases while swab is still inside drywell and swab is wet, dry or unknown, **PERFORM** the following:

5.1.3.1 **LOWER** donut into drywell.
5.1.3.2 **SECURE** clean end of tape at surface to simplify future removal.
5.1.3.3 **REINSTALL** drywell cap, **SECURING** clean end of tape.
5.1.3.4 **SEAL** drywell cap in place with tape.
5.1.3.5 **NOTIFY** the following personnel:
   - Surveillance Manager
   - Shift Manager
   - Rad Con representative.

**Contamination Confirmed After Removing Swab From Drywell**

5.1.3.6 **REINSTALL** drywell cap.
5.1.3.7 **SEAL** drywell cap in-place with tape.
5.1.3.8 **NOTIFY** the following personnel:
   - Surveillance Manager
   - Shift Manager
   - Rad Con representative.

5.1.3.9 **DISPOSE** of contaminated swab in accordance with procedure TO-100-052.
5.2 Operate RAS Vehicle

5.2.1 **ENSURE** RAS vehicle is in safe operating condition before moving vehicle.

5.2.1.1 **PERFORM** the following motor vehicle inspections at least once per day before moving RAS vehicle for the first time:

- Engine fluids check
- Under hood inspection
- Walk-around vehicle inspection
- All lights.

5.2.1.2 **REPORT** all vehicle defects and deficiencies immediately to S.M. Stoller point of contact using phone numbers listed in RAS vehicle cab.
5.3 Assembly Detector, Telemetry and Cablehead Sub-Sections

5.3.1 IF Sonde is already assembled, GO TO Step 5.3.14.

Detector and Telemetry Sub-Section Connection

5.3.2 REMOVE specified NaI detector sub-section (small, medium or large) from tool storage container at rear of RAS truck.

NOTE - Each detector section has 4 pins that extend out exposing them to possible damage.

5.3.3 REMOVE protective cap from detector sub-section AND

INSPECT threads and 4 pins for damage.

5.3.4 INSPECT telemetry sub-section for damage.

5.3.4.1 REMOVE telemetry sub-section from tool storage container.

5.3.4.2 REMOVE protective caps from ends of telemetry sub-section.

5.3.4.3 IF O-ring stays affixed to end cap, REMOVE O-ring from cap AND

PLACE in groove on telemetry sub-section.

NOTE - One large O-ring seal is located on end of telemetry sub-section that mates with detector sub-section.

5.3.4.4 INSPECT threads and O-ring for damage.

5.3.4.5 IDENTIFY slot on telemetry sub-section AND

INSPECT for damage.

5.3.4.6 IDENTIFY seven pins on telemetry sub-section AND

INSPECT for damage.
5.3 Assemble Detector, Telemetry and Cablehead Sub-Sections (Cont.)

**CAUTION**

Sonde power must be off prior to connecting or disconnecting cablehead and/or assembling telemetry and detector sub-sections. Failure to do this could cause damage to internal electronics.

5.3.5 **ENSURE** Sonde power is off.

**CAUTION**

Failure to carefully align detector sub-section and telemetry sub-section could cause shearing off of exposed connector pins protruding from detector head.

5.3.6 **ALIGN** selected detector sub-section to telemetry sub-section **AND**

**TURN** telemetry sub-section clockwise to attach to detector sub-section

5.3.7 **LAY** two connected sub-sections in V-shaped frame attached to bottom of RAS truck bed.

**Cablehead and Telemetry Sub-Section Connection**

5.3.8 **INSPECT** cablehead sub-section for damage.

5.3.8.1 **REMOVE** cablehead sub-section from storage container on RAS truck.

5.3.8.2 **REMOVE** protective cap.

**NOTE** - Two small O-ring seals are located on end of cablehead.

5.3.8.3 **INSPECT** threads and O-rings for damage.

5.3.8.4 **IDENTIFY** keyway on cablehead **AND**

**INSPECT** for damage.

5.3.9 **IDENTIFY** keyway on cablehead and slot in telemetry sub-section.
5.3 Assemble Detector, Telemetry and Cablehead Sub-Sections (Cont.)

CAUTION

Sonde power must be off prior to connecting or disconnecting cablehead and/or assembling telemetry and detector sub-sections. Failure to do this could cause damage to internal electronics.

5.3.10 ENSURE Sonde power is off.

CAUTION

Failure to carefully align cablehead to telemetry sub-section before properly joining, could damage either cablehead and/or telemetry sub-section.

5.3.11 ALIGN cablehead and telemetry sub-sections before joining.

5.3.12 AFTER cablehead and telemetry sub-sections are aligned, PUSH cablehead into telemetry sub-section until resistance is met.

NOTE - As quick-change nut is drawn down, O-rings will slip into telemetry sub-section creating a secure fit.

5.3.13 HAND TIGHTEN quick-change nut until secure.

5.3.14 PUSH assembled Sonde down V-shaped frame on RAS truck bed and into opening of KUTh Field Verifier until it stops.

5.3.15 REPORT all Sonde damage to S.M. Stoller contact per phone list in RAS truck cab.
5.4 **Power Up Supporting Systems**

NOTE - Sections 5.1 through 5.3 must be completed before proceeding with this section.

5.4.1 IF supporting systems are already powered up and on, GO TO Section 5.5.

5.4.2 ENSURE power distribution strip and winch control are both OFF prior to turning ProSine inverter on.

**ProSine Inverter**

5.4.3 POSITION two-way rocker POWER switch, located inside logging cab, to ON.

NOTE - With RAS vehicle motor idling and with no load on system, normal LCD readout is about 14.6 Volts and 00 amps, with load LCD readout at about 14.2 volts and 06 amps.

5.4.4 OBSERVE LCD illuminates showing condition of power output:
- Normal: LCD readout is about 14.6 Volts and 00 amps,
- Under load: LCD readout at about 14.2 volts and 06 amps.

**Power Distribution Strip**

NOTE - A 110 volt power distribution strip is attached to back of logging cab below Sonde power supply and supplies power to the following:
- Laptop
- Sonde
- Serial communications port
- Micro Wiz multifunction counter
- Winch.

5.4.5 POSITION power distribution strip two way rocker switch to ON AND OBSERVE green light illuminates.
5.4 **Power Up Supporting Systems (Cont.)**

**Winch**

NOTE - Winch control panel is located in logging cab on console between driver and operator seats.

5.4.6 **ENSURE** the following switches are set as follows:

<table>
<thead>
<tr>
<th>Device</th>
<th>Parameter</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction Switch</td>
<td>Up, Down, or Neutral</td>
<td>Neutral *</td>
</tr>
<tr>
<td>Speed Adjustment Knob</td>
<td>Minimum or Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td>Mode Switch</td>
<td>Manual or Computer</td>
<td>Manual</td>
</tr>
</tbody>
</table>

* Direction Switch is in neutral when it is vertical and between UP and DOWN positions.

5.4.7 **DEPRESS** OFF/ON button on Winch Control Panel **AND**

**OBSERVE** LED tension display is ON and operating.

**Sonde Power Supply**

NOTE - When power to Sonde is switched on, a 30 min. warm-up period is necessary for electronic circuits to stabilize before data acquisition can begin.

- Sonde power switch is located on Sonde power supply unit, attached to back of logging cab above power distribution strip.

5.4.8 **PULL** stem out on two way toggle Sonde power switch **AND**

**POSITION** to ON.

5.4.8.1 **BEFORE** beginning data acquisition, **WAIT** 30 minutes for electronic circuits to stabilize (see Step 5.6.11).
5.4 Power Up Supporting Systems (Cont.)

Logging Computer

5.4.9 POWER-UP laptop AND

FOLLOW prompts.

5.4.10 AFTER laptop boots up, INSTALL thumb drive.
5.5 Invoke LVMON Program

NOTE - Section 5.4 must be completed before this section can be performed.

LVMon Program

5.5.1 CLICK on LVMon icon to invoke LVMon program AND

WAIT while program boots up.

5.5.2 OBSERVE LVMon logging program control panel window appears.
5.6 Perform Pre-survey Verification in KUTh

NOTE - A pre-survey verification spectrum must be collected prior to logging at the beginning of each day.

5.6.1 **IF** a detector switch is made during the day, **PERFORM** a new pre-survey verification spectrum prior to logging data.

5.6.2 **IF** pre-survey has already been completed for the day, **GO TO** Step 5.6.3.

NOTE - Verification source is mounted at rear of V-shaped frame in bed of RAS vehicle.

5.6.3 **GENTLY PUSH** Sonde until it bottoms out against back plate of verification source.

5.6.4 **INVOKE** Header screen for logging software.

5.6.5 **ENTER** the following information into Header screen fields:

<table>
<thead>
<tr>
<th>Screen Field</th>
<th>Data Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm I.D.</td>
<td>RAS10</td>
</tr>
<tr>
<td>Tank I.D.</td>
<td>VERIF</td>
</tr>
<tr>
<td>Hole No.</td>
<td>LARGE (if using large detector)</td>
</tr>
<tr>
<td></td>
<td>MEDIUM (if using medium detector)</td>
</tr>
<tr>
<td></td>
<td>SMALL (if using small detector)</td>
</tr>
<tr>
<td>Water Level</td>
<td>NA</td>
</tr>
<tr>
<td>Swabbed</td>
<td>No</td>
</tr>
<tr>
<td>Tool I.D.</td>
<td>Highlight appropriate tool</td>
</tr>
<tr>
<td>Operator</td>
<td>Enter name or initials</td>
</tr>
<tr>
<td>System No.</td>
<td>RAS1.0</td>
</tr>
<tr>
<td>Depth Based</td>
<td>Select button</td>
</tr>
<tr>
<td>Data Interval</td>
<td>0.5 ft.</td>
</tr>
<tr>
<td>File Root Name</td>
<td>Enter date as: YMMDD (where Y represents last digit of current year, MM represents month, and DD represents day).</td>
</tr>
<tr>
<td>Comments</td>
<td>Enter a description of where the vehicle is located.</td>
</tr>
</tbody>
</table>

5.6.6 **CLICK** Save & Close button.

5.6.7 **INVOKE** Pre/Post Verify screen from logging software.
5.6 Perform Pre-survey Verification in KUTh (Cont.)

5.6.8 CLICK PreVerify button.

5.6.9 ENTER one of the following in Acquire-Time-Preset field:
- 1000 (if using small detector)
- 600 (if using medium detector)
- 200 (if using large detector).

5.6.10 SET Gain to one of the following initial values, as a starting point to adjust gain:
- 10.000 (if using small detector)
- 10.000 (if using medium detector)
- 13.000 (if using large detector).

NOTE - A 30 min. warm-up period is necessary for electronic circuits to stabilize before data acquisition begins.

5.6.11 ENSURE 30 minutes have elapsed in order for Sonde electronics to warm-up.

5.6.12 CLICK Start button to begin collecting spectrum.

5.6.13 ALLOW enough time for potassium peak to develop in potassium window.

5.6.14 MAKE necessary gain adjustments to center potassium peak in potassium window by using the following steps:

5.6.14.1 CLICK the Stop button to halt collection of spectrum data.

5.6.14.2 NOTE direction gain needs to be adjusted to center potassium peak in the potassium window.

5.6.14.3 CLICK Clear button to clear spectrum.

NOTE - Gain adjustments should be made in small increments to avoid moving spectral peak into wrong window.

5.6.14.4 USE slide bar AND ADJUST gain in required direction.

5.6.14.5 CLICK Start button to begin collecting spectrum.

5.6.14.6 REPEAT Steps 5.6.13 to 5.6.14.5 until potassium peak is centered in potassium window.
5.6 Perform Pre-survey Verification in KUTh (Cont.)

5.6.15 ALLOW spectrum to finish acquiring data until preset live-time interval is reached.

5.6.16 CLICK Stop button.

5.6.17 CLICK Save Cal File button.

5.6.18 CLICK Close button.

5.6.19 INVOKE Header screen from logging software.

5.6.20 CLICK Files field AND VERIFY files are present.

5.6.21 CLICK Copy to ZIP.

5.6.22 CLICK Cancel button to close Header screen.

5.6.23 POSITION RAS vehicle 10 to 50 feet from drywell assigned per Borehole Monitoring Request form.

5.6.24 AFTER RAS vehicle has been properly positioned near assigned drywell, PLACE RAS vehicle transmission in “P” (park) AND SET emergency brake.

5.6.25 ENSURE RAS vehicle is left running.

**WARNING**

Failure to place a set of wheel chocks in front of and behind one wheel after vehicle is positioned to prevent vehicle movement could result in personnel injury.

5.6.26 REMOVE wheel chocks from side storage compartment on RAS vehicle AND

PLACE one wheel chock in front of wheel and other chock behind same wheel.
5.6 Perform Pre-survey Verification in KUTh (Cont.)

Set up Mast Assembly

5.6.27 SELECT one of the following drywell casing adapters:
- 4 in. Diameter Casing Adapter
- Mast Base with 6 in. Diameter Casing Adapter
- 8 in. Diameter Casing Adapter.

5.6.28 ENSURE drywell cover is removed.

5.6.29 INSERT selected casing adapter into drywell.

5.6.30 INSERT mast base into casing adapter.

5.6.31 INSERT mast pole into mast base.

5.6.32 ROTATE mast assembly to align sheave wheels with winch.

Invoke Header Program

5.6.33 PRESS Header command button on LVMon control bar at top of screen AND

OBSERVE Header window appears.

5.6.34 ENTER appropriate information in accordance with Borehole Monitoring Request form.

5.6.35 SELECT “depth based”, or as directed per Borehole Request form, in logging mode section of Header screen.

5.6.36 INPUT Tank Farm, Tank Number, Drywell and File Root Name in accordance with Borehole Monitoring Request form

5.6.37 SELECT by using up and down arrows (in Logging System Information box), logging Tool ID AND

HIGHLIGHT with cursor.

5.6.38 ENTER Operator name or initials in Operator box.

5.6.39 ENTER logging system RAS1.0, or as directed per Borehole Monitoring Request form, in System No. box.
5.6 Perform Pre-survey Verification in KUTh (Cont.)

5.6.40 RECORD the following entries in Comments box:
- Depth Interval
- Log Run Number.

5.6.41 CLICK Save & Close button.

5.6.42 IF performing a second scan as follows:
- in same drywell
- using same Sonde,

GO TO Step 5.9.1.
5.7 Zeroing Sonde in Drywell

NOTE - Before this section can be performed Sections 5.1 through 5.6 must have been performed, i.e.:
- RAS set up at a drywell
- Correct Sonde attached and inserted in KUTh Field Verifier
- Supporting systems ON
- LVMon program booted
- HEADER data file completed and saved.

Set Up For Zero Depth

5.7.1 SET direction toggle switch on winch control panel to DOWN.
5.7.2 SET speed knob on winch control panel to MAX.
5.7.3 ENSURE PPE is donned.

WARNING
Placing fingers on or near mast assembly and/or adapter sheave wheels when winch is operating, could result in fingers getting caught in moving machinery causing injuries or amputations.

WARNING
Failure to use hand Protection when setting up mast assembly and spooling cable could result in personnel injury.

5.7.4 APPLY hand pressure to cable AND
SPOOL logging cable from winch.
5.7.5 WHEN sufficient amount of cable is spooled, POSITION speed knob on winch control panel to MIN.
5.7.6 THREAD logging cable under bottom sheave wheel on mast adaptor and over top sheave wheel on mast pole.
5.7.7 ENSURE Sonde is hanging freely into drywell.
5.7.8 MOVE Sonde up or down drywell using direction and speed controls on winch control panel until scribe around detector is even with top surface of mast base plate.
5.7 Zeroing Sonde in Drywell (Cont.)

Zero Depth On Logging Computer

5.7.9 CLICK Preset button in LVMon control panel window on Laptop computer.

5.7.10 CLICK Set Zero button in Preset window.

NOTE - It may take a couple of times to zero multifunction counter.

5.7.11 OBSERVE Depth box on control panel and Micro Wiz multifunction counter both match and display a zero value.

5.7.12 IF casing adapter does not sit flush on bore hole, MEASURE distance between top of casing adapter and top of drywell.

5.7.12.1 LOWER Sonde to same distance and re-zero.

5.7.12.2 NOTE measurement for post-zeroing.

5.7.13 CLICK CLOSE button in Preset window.
5.8 Pre-Survey Gain Adjustment Spectrum in Drywell

5.8.1 POSITION Sonde to depth prescribed on Borehole Monitoring Request under gain adjust.

5.8.2 INVOKE Pre/Post Verify screen from logging software.

5.8.3 CLICK PreVerify button.

5.8.4 ENTER one of the following in Acquire Time Presets field:
- 1000 (if using small detector)
- 600 (if using medium detector)
- 200 (if using large detector).

5.8.5 AFTER the Sonde has been in drywell 5 minutes to acclimate, CLICK Start button to begin collecting spectrum.

5.8.6 ALLOW enough time for peak prescribed in Borehole Monitoring Request form to develop in appropriate window.

5.8.7 MAKE necessary gain adjustments to center peak prescribed in Borehole Monitoring Request form in appropriate window by using the following steps:

5.8.7.1 CLICK Stop button to halt collection of spectrum data.

5.8.7.2 NOTE which direction gain needs to be adjusted to center peak prescribed in Borehole Monitoring Request form in appropriate window.

5.8.7.3 CLICK Clear button to clear spectrum.

NOTE - Gain adjustments should be made in small increments to avoid moving spectral peak into wrong window.

5.8.7.4 USE slide bar AND ADJUST gain in required direction.

5.8.7.5 CLICK Start button to begin collecting spectrum.

5.8.7.6 REPEAT Steps 5.8.7.1 through 5.8.7.5 until peak prescribed in Borehole Monitoring Request form is centered in appropriate window.
5.8 Pre-Survey Gain Adjustment Spectrum in Drywell (Cont.)

5.8.8 ALLOW spectrum to finish acquiring data until preset live time interval is reached.

5.8.9 CLICK Stop button.

5.8.10 CLICK Save Cal File button.

5.8.11 CLICK Close button.
5.9  Position Sonde in Drywell and Obtain Data

NOTE - During data acquisition, Logging System operator should monitor several systems, including Sonde depth, logging speed, cable tension, power, and gain drift.

- The drywell may be logged using one of two methods:
  - 1) Descending top to bottom (preferred)
  - 2) Ascending bottom to top

5.9.1  DURING data acquisition, MONITOR the following:
  - Sonde depth
  - logging speed
  - cable tension
  - power
  - gain drift.

5.9.2  IF at any time a single log in a borehole must be broken into two runs (due to data loss, logging over two days, etc.), INCLUDE a 2.0 foot overlap between the log runs to ensure data continuity and comparability.

5.9.3  OBTAIN weekly schedule provided by S.M. Stoller engineer AND DETERMINE logging intervals for monitoring from Borehole Monitoring Request form supplied by S.M. Stoller engineer.

5.9.4  CONFIRM depth of drywell to be surveyed is noted on Borehole Monitoring Request form.

5.9.5  IF using descending data acquisition (preferred) method, GO TO Step 5.9.7.

5.9.6  IF using ascending data acquisition method, GO TO Step 5.9.16.

Descending Data Acquisition (preferred)

5.9.7  ENSURE Manual/Computer toggle switch is in Manual mode.

5.9.8  CLICK Begin Logging command from LVMon control Menu to begin data acquisition.

5.9.9  SET depth direction switch on winch control panel to Down position.

NOTE - Logging speed will normally be 1.0 ft/min.

5.9.10 ADJUST speed to logging speed ascribed in Borehole Monitoring Request form.
5.9 Position Sonde in Drywell and Obtain Data (Cont.)

**WARNING**
Placing fingers on or near mast assembly and/or adapter sheave wheels when winch is operating, could result in fingers getting caught in moving machinery causing injuries or amputations.

5.9.11 **MONITOR** depth displayed on Micro Wiz counter as probe is descending down drywell.

5.9.12 Continue to **LOG** data AND **MONITOR** logging Sonde depth, logging speed, cable tension, power and gain drift.

**CAUTION**
Sonde should not be allowed to strike bottom of drywell to prevent damage to detector.

5.9.13 WHEN specified logging interval is reached, **TURN** Speed dial to absolute Minimum to stop Sonde travel.

5.9.14 **CLICK** Stop button on bottom of Borehole Monitoring Logging window.

5.9.15 IF multiple scans on same drywell are required, **REPEAT** Steps 5.6.33 through 5.9.24.

**Ascending Data Acquisition**

5.9.16 **AS** stated on Borehole Monitoring Request form, **SEND** Sonde down to prescribed depth of drywell.

5.9.17 **ENSURE** Manual/Computer toggle switch is in Manual mode.

5.9.18 **CLICK** Begin Logging command from LVMon control Menu to begin data acquisition.

5.9.19 **SET** depth direction switch on winch control panel to Up position.
5.9 Position Sonde in Drywell and Obtain Data (Cont.)

NOTE - Logging speed will normally be 1.0 ft/min.

5.9.20 ADJUST speed to logging speed prescribed in Borehole Monitoring Request form.

5.9.21 MONITOR depth displayed on Micro Wiz counter as probe is ascending up drywell.

5.9.22 Continue to LOG data AND MONITOR logging Sonde depth, logging speed, cable tension, power and gain drift.

CAUTION
Sonde must not be brought above zero mark on detector to prevent damage to cablehead or mast assembly.

5.9.23 WHEN specified logging interval is reached, TURN Speed dial to absolute Minimum.

5.9.24 CLICK Stop button on bottom of Drywell Monitoring Logging five count rates display.

5.9.25 IF multiple scans on same drywell are required, REPEAT Steps 5.6.33 through 5.9.24.

Probe failure during scan

5.9.26 NOTE depth at which Sonde data was lost.

5.9.27 STOP scan.

5.9.28 TURN probe power OFF.

5.9.29 RETURN to header screen.

5.9.30 CREATE new file AND ENSURE adequate overlap with previous scan.
5.9 Position Sonde in Drywell and Obtain Data (Cont.)

5.9.31 SAVE and CLOSE header screen.

5.9.32 MAKE necessary corrections to Borehole Monitoring Request form.

5.9.33 LOWER probe to appropriate start depth.

5.9.34 RESTORE power to probe.

5.9.35 RESUME scan.
5.10 Post Logging Routines

Post-Survey Gain Check Spectrum

NOTE - A post-survey gain check spectrum must be collected after logging each drywell with Sonde. This check will be performed inside drywell at the depth and using spectral peak as prescribed on Borehole Monitoring Request form.

5.10.1 POSITION Sonde to depth prescribed on Borehole Monitoring Request form under gain adjust.

5.10.2 INVOKE Pre/Post Verify screen from logging software.

5.10.3 CLICK Post Verify button.

5.10.4 ENTER one of the following in Acquire Time Presets field:
- 1000 (if using small detector)
- 600 (if using medium detector)
- 200 (if using large detector).

5.10.5 CLICK Start button to begin collecting spectrum.

5.10.6 ALLOW spectra to acquire for entire preset time.

NOTE - Gain adjustments are not made during post-survey verification. This spectrum will be used to check for gain drift that may have occurred during log run.

5.10.7 CLICK Stop button.

5.10.8 CLICK Save Cal File button.

5.10.9 CLICK Close.
5.10 Post Logging Routines (Cont.)

Determining Depth Return Error

5.10.10 MOVE Sonde to zero position.

5.10.11 MEASURE distance between scribe mark on Sonde and mast base AND RECORD on Borehole Monitoring Request form.

5.10.12 IF the adapter DID NOT sit flush on bore-hole, USE measurement taken in Step 5.7.12, RAISE Sonde that distance AND CHECK for return error.

Copy Files to Thumb Drive

5.10.13 OPEN “Header” window.

5.10.14 CLICK File field AND VERIFY files are present.

5.10.15 CLICK on Copy to Zip to copy newly created files from the current working directory to the thumb drive AND OBSERVE progress bar displays percent completion.

5.10.16 WHEN files have finished being copied, CLICK on Cancel to exit Header screen.

End Drywell Logging Data Acquisition

NOTE - The following step is performed when logging is complete, or at end of day, or while stopping for lunch with RAS vehicle motor OFF.

5.10.17 IF drywell logging data acquisition is complete, GO TO Section 5.11.
5.10 Post Logging Routines (Cont.)

NOTE - The following steps are performed when continuous logging will be done between drywells.

- A 110 volt electrical power supplied by ProSine inverter should remain ON as well as all other support systems. This includes the winch as long as winch was safely configured to do so prior to vehicle movement.

Resume Logging At Another Drywell

5.10.18 IF vehicle will be moved, REMOVE wheel chocks AND STOW in RAS vehicle storage compartment.

5.10.19 Safely STORE assembled Sonde in V-shaped frame on RAS truck bed before moving RAS truck.

5.10.20 IF logging will resume at another drywell, MOVE RAS vehicle to next assigned drywell AND

GO TO Step 5.6.24 to resume drywell logging.
5.11 Power Down RAS Equipment When Logging Complete

NOTE - This section is performed when logging is completed or at end of day.

5.11.1 ENSURE spectral data have been transferred to a thumb drive.

5.11.2 AFTER logging is complete or at end of day, SHUT OFF laptop computer as follows:

5.11.2.1 AFTER spectral data have been transferred to a thumb drive, PRESS Quit command button on the LVMon control menu AND OBSERVE that LVMon program closes.

5.11.2.2 REMOVE thumb drive.

5.11.2.3 POWER DOWN computer.

5.11.3 AFTER laptop has been shut down, MOVE two-way toggle switch to OFF position on Sonde power supply.

5.11.4 PLACE Sonde in V-shaped frame on RAS truck bed.

5.11.5 SET direction toggle switch to UP.

5.11.6 SET speed to MAX.
5.11 Power Down RAS Equipment When Logging Complete (Cont.)

WARNING
Placing fingers on or near mast assembly and/or adapter sheave wheels when winch is operating, could result in fingers getting caught in moving machinery causing injuries or amputations.

WARNING
Failure to use hand Protection when setting up mast assembly and spooling cable could result in personnel injury.

5.11.7 ENSURE PPE is donned.
5.11.8 APPLY hand pressure to cable to begin spooling.
5.11.9 WHEN sufficient amount of cable is spooled up, LET GO of cable.
5.11.10 SET winch speed to minimum.
5.11.11 DEPRESS Pwr On/Off switch to OFF position located at bottom right side on winch control panel AND
OBSERVE Tension display is not illuminated.
5.11.12 MOVE two-way rocker switch on power distribution strip to OFF AND
OBSERVE green light is off.

CAUTION
If ProSine inverter is left on for an extended period of time with vehicle engine off, battery system for RAS could be drained.

5.11.13 MOVE power switch on ProSine control panel to OFF AND
OBSERVE LCD showing power usage is not illuminated.
5.11.14 IF monitoring will not be done within a couple of days with the same Sonde, GO TO Section 5.12.
5.11 Power Down RAS Equipment When Logging Complete (Cont.)

5.11.15 IF monitoring will be done within a couple of days with the same Sonde, PERFORM the following:

5.11.15.1 PLACE Sonde into V-shaped frame attached to RAS truck bed.

5.11.15.2 GO TO Step 5.12.3.

Power Down Equipment For Lunch

5.11.16 DEPRESS Pwr On/Off switch to OFF position located at bottom right side on winch control panel AND

OBSERVE Tension display is not illuminated.

NOTE - It is better from a data quality assurance standpoint to avoid having to perform a complete gain check by figuring out a way to leave the truck and inverter running, with the tool power on, during lunch or any other break in data acquisition.

5.11.17 LEAVE truck and equipment in a safe configuration.

OR

IF truck and ProSine inverter cannot be left running during lunch and prior to continuation of monitoring in any incompletely monitored borehole, PERFORM a complete gain check after starting the vehicle engine and turning on the inverter.
5.12 Store Equipment

**CAUTION**
Sonde power must be off prior to connecting or disconnecting cablehead and/or assembling telemetry and detector sub-sections. Failure to do this could cause damage to internal electronics.

5.12.1 ENSURE Sonde power is OFF.

5.12.2 DISASSEMBLE logging Sonde AND STOW in RAS vehicle.

5.12.2.1 TURN quick-change nut on cablehead counterclockwise AND HAND LOOSEN nut until unsecured.

5.12.2.2 REMOVE cablehead from telemetry sub-section.

5.12.2.3 STOW cablehead in tube located near base of winch.

5.12.2.4 TURN detector sub-section counterclockwise AND CAREFULLY REMOVE from telemetry sub.

5.12.2.5 PLACE protective cap on end of detector sub-section.

5.12.2.6 PLACE protective caps on ends of telemetry sub-section.

5.12.2.7 STOW telemetry sub in proper carrying tube AND SECURE.

5.12.2.8 STOW detector sub-section in proper carrying tube AND SECURE.

5.12.2.9 POSITION all carrying tubes in vertical position AND SECURE.

5.12.3 CLOSE AND LOCK tailgate on RAS vehicle.
5.12 Store Equipment (Cont.)

5.12.4 DISASSEMBLE Mast pole from Mast Adapter AND STOW in RAS vehicle storage compartment.

5.12.5 REMOVE Mast Adapter from drywell AND STOW in RAS vehicle storage compartment.

5.12.6 PLACE drywell cover on drywell casing.

5.12.7 IF vehicle will be moved, REMOVE wheel chocks AND STOW in RAS vehicle storage compartment.

5.13 Records

NOTE - No records are generated during the performance of this procedure.