



U.S. Department of Energy



P.O. Box 450, MSIN H6-60  
Richland, Washington 99352

MAR 19 2007

06-ESQ-158

Mr. C. M. Albert, Project Manager  
Bechtel National, Inc.  
2435 Stevens Center Place  
Richland, Washington 99354

Dear Mr. Albert:

CONTRACT NO. DE-AC27-01RV14136 – AS LOW AS REASONABLY ACHIEVABLE  
(ALARA) ASSESSMENT - OFFSET PIPING/CONDUIT ASSEMBLIES (JOGGLE PIPES)  
ISSUE, A-06-ESQ-RPPWTP-010

This letter forwards the results of an assessment conducted by the U.S. Department of Energy (DOE), Office of River Protection from October 10 through 19, 2006. The purpose of the assessment was to evaluate the Bechtel National, Inc. (BNI) ALARA program with focus on analysis and subsequent corrective actions to the Joggle Pipes issue. BNI documented this problem in Corrective Action Report (CAR) 24590-WTP-CAR-QA-06-082 and subsequently reported the issue in the DOE Noncompliance Tracking System (NTS-ORP-BNRP-RRPWTP-2006-0001).

The Team reviewed procedures, documentation (CAR, Root Cause Analysis, etc.) and interviewed personnel involved in identifying and developing the Joggle Pipe corrective actions. The Team identified no Findings and made four Observations. The Observations are not contractually or regulatory based and are provided as opportunities for improvement. BNI is not required to provide responses to the Observations. Details of the assessment are provided in the Attachment.

The Joggle Pipes issue was one of the issues recently investigated by the Office of Price-Anderson Enforcement (OE). The results of this investigation will be provided to BNI in future DOE OE correspondence.

If you have any questions, please contact me, or your staff may call William J. Taylor, Director, Office of Environmental Safety and Quality, (509) 376-7851.

Sincerely,

John R. Eschenberg, Program Manager  
Waste Treatment and Immobilization Plant

ESQ:JLP

Attachment

cc: See page 2

Mr. C. M. Albert  
06-ESQ-158

-2-

MAR 19 2007

cc w/attach:

W. S. Elkins, BNI  
D. E. Gergely, BNI  
D. J. Jantosik, BNI  
D. E. Kammenzind, BNI  
S. C. Lynch, BNI  
M. F. Perks, BNI  
D. J. Pisarcik, BNI  
G. A. Simiele, BNI  
S. W. Sanders, PAC  
C. R. Ungerecht, PAC  
BNI Correspondence

Attachment  
06-ESQ-158  
A-06-ESQ-RPPWTP-010

U.S. DEPARTMENT OF ENERGY  
Office of River Protection  
Environmental Safety and Quality

ASSESSMENT: ALARA Assessment - Offset Piping/Conduit Assemblies (Joggle Pipes) Issue

REPORT: A-06-ESQ-RPPWTP-010

FACILITY: Bechtel National, Inc., Waste Treatment and Immobilization Plant

LOCATION: Hanford Site

DATES: October 10 through 19, 2006

ASSESSMENT TEAM: Jeanie L. Polehn, Lead Assessor  
Larry R. McKay, Assessor

APPROVED BY: Patrick P. Carrier, Team Lead  
Verification and Confirmation

## Executive Summary

The U.S. Department of Energy (DOE), Office of River Protection evaluated the Bechtel National, Inc. (BNI) As Low As Reasonably Achievable (ALARA) Program, specifically the analysis and subsequent corrective actions to the Offset Piping/Conduit Assemblies (Joggle Pipes) issue. BNI documented this problem in Corrective Action Report (CAR) 24590-WTP-CAR-QA-06-082 and subsequently reported the issue in the DOE Noncompliance Tracking System (NTS-ORP-BNRP-RRPWTP-2006-0001). This report provides the details of the evaluation.

The Team reviewed procedures, documentation (CAR, Root Cause Analysis, etc.) and interviewed personnel involved in identifying and developing the Joggle Pipe corrective actions. The Team identified no Findings and made four Observations. The Observations are not contractually or regulatory based and are provided as opportunities for improvement. No response is required to the Observations. A summary of the four Observations is provided below.

- Some BNI personnel did not clearly understand the Environmental and Nuclear Safety (ENS) Organization's roles and responsibilities for design verification;
- BNI did not maintain ALARA Design Review mandatory and administrative review comments made during the review cycle as records;
- The ALARA refresher training corrective action for CAR 24590-WTP-CAR-QA-06-082 was untimely and the closure criteria were inappropriate; and
- ENS Radiological Safety Engineer experience equivalency was poorly defined.

Additional details on the above Observations are provided in the Attachment.

## Table of Contents

<b>Executive Summary .....</b>	<b>ii</b>
<b>List of Acronyms .....</b>	<b>iv</b>
<b>Scope.....</b>	<b>5</b>
<b>Details.....</b>	<b>5</b>
<b>Results .....</b>	<b>5</b>
<b>Open Items.....</b>	<b>8</b>
<b>Closed Items .....</b>	<b>8</b>
<b>Discussed Items .....</b>	<b>8</b>

## List of Acronyms

ALARA	As Low As Reasonably Achievable
ADR	ALARA Design Review
BNI	Bechtel National, Inc.
CAR	Corrective Action Report
DOE	U.S. Department of Energy
ENS	Environmental and Nuclear Safety
NTS	Noncompliance Tracking System
ORP	Office of River Protection
RCA	Root Cause Analysis

## **As Low As Reasonably Achievable (ALARA) Assessment - Offset Piping/Conduit Assemblies (Joggle Pipes)**

### **Scope**

Two Radiological Controls Subject Matter Experts from the U.S. Department of Energy (DOE), Office of River Protection (ORP) evaluated the Bechtel National, Inc. (BNI) ALARA Program with focus on the analysis and subsequent corrective actions to the Offset Piping/Conduit Assemblies (Joggle Pipes) issue. BNI documented this problem in Corrective Action Report (CAR) 24590-WTP-CAR-QA-06-082 and subsequently reported the issue in the DOE Noncompliance Tracking System (NTS) (NTS-ORP-BNRP-RRPWTP-2006-0001).

The Team reviewed procedures, examined records, and interviewed staff members who were involved in identifying and developing corrective actions for the Joggle Pipe issue. Assessment Note A-06-ESQ-RPPWTP-010-01 contains records and interview details. Document sources are referenced to support report discussions.

### **Details**

As described in BNI's Root Cause Analysis (RCA)<sup>1</sup> and through discussions with BNI staff, the joggle issue began with BNI's decision in 2002 to move away from joggle wall boxes to individual joggle pipe designs. Joggle wall boxes were packages of pipes with specific components designed to minimize worker dose when pipes penetrated shield walls. Environmental and Nuclear Safety (ENS) ALARA Engineers performed a calculation which documented some shield plates could be removed from the joggle design without compromising dose rate criteria. In 2005, Design Engineering changed, or removed, joggle components but the inexperienced Design Engineer, Mechanical Equipment Supervisor, and Discipline Engineering Manager, did not recognize the complexity of the change. None of these individuals understood changes to the joggle components impacted the design so design dose rate criteria were potentially not met. ENS identified the issue in 2006 and BNI placed a hold on joggle design activities, issued CARs that identified corrective actions to prevent recurrence, performed a RCA, and reported the issue in the DOE NTS.

### **Results**

The Team identified no Findings and made four Observations. The Observations are not contractually or regulatory based and are provided as opportunities for improvement. ORP requires no response to the Observations. The Joggle Pipes issue was one of the issues recently investigated by the Office of Price-Anderson Enforcement. The results of

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<sup>1</sup> 24590-WTP-RCA-ENG-06-0001, Revision 0, "Root Cause Analysis of ALARA/Supplier Submittal Issues, May 31, 2006.

this investigation should provide DOE's conclusion on the adequacy of BNI's corrective actions to resolve this issue.

The Team's Observations were categorized as follows: Management Expectations, ALARA Training, Qualifications, and Adequacy of Corrective Actions. Details of the Observations are provided below.

### Management Expectations

#### **1. Observation: Some BNI personnel did not clearly understand the ENS Organization's roles and responsibilities for design verification.**

The Team interviewed 11 BNI staff and management personnel. The interviews revealed 3 of the 11 BNI personnel interviewed were not clear on the design verification roles and responsibilities of the ENS organization. The three interviewers were not sure whether ENS approved, checked, co-checked, or verified ALARA design documents in the same sense those terms were used in BNI drawing and design procedures.<sup>2</sup> BNI had not documented, defined, or explained the ENS role in verification of ALARA design documents. The Team concluded this lack of clarity contributed to the Joggle Pipe issue. Clear roles and responsibilities are a key principle of a good Integrated Safety Management System.

#### **2. Observation: BNI did not maintain ALARA Design Review (ADR) mandatory and administrative review comments made during the review cycle as records.**

The Team reviewed ADR records associated with the Joggle Pipe issue and discussed ADR comments with BNI staff. The records reviewed did not contain a copy of the mandatory, or administrative, comments made by BNI reviewers. The records provided the signed ADR form which indicated comments were resolved to the reviewer's satisfaction. Details of the comments were not retained as part of the official record. This practice could hinder resolving problems should an individual commenter question how their input to the review process was resolved. BNI staff stated such records were not kept for any part of the project so this Observation has potential generic project implications.

### ALARA Training:

#### **3. Observation: The ALARA refresher training corrective action for CAR 24590-WTP-CAR-QA-06-082 was untimely and the closure criteria were inappropriate.**

As part of its corrective actions for CAR-06-082, BNI performed an RCA, 24590-WTP-RCA-ENG-06-0001, Revision 0, dated May 31, 2006. In the RCA, BNI identified the lack of ALARA refresher training as a corrective action. BNI added

<sup>2</sup> 24590-HLW-DC-ENG-06-001, Revision 0, "Design Criteria for HLW Offset (Joggle) & Straight Through Penetrations," Section 5.5 "Checking of Design Drawings," October 5, 2006.



Corrective Action 10 to CAR-06-082<sup>3</sup> to perform ALARA refresher training but the CAR documented this corrective action was not assigned until two months after completion of the RCA. The Team concluded two months was not timely considering the seriousness of the issue and the fact CAR-06-082 was a Level 4 CAR, Price Anderson-significant CAR. The Team believe ALARA refresher training is a good practice which ensures ALARA design engineers are formally instructed on the latest changes affecting their discipline.

The Team also concluded the completion of the corrective action was not timely. BNI had completed a draft of the computer-based ALARA refresher training. The Team reviewed the revised training module and agreed with BNI that it was an improvement over the initial ALARA training. As of the date of the assessment, not a single individual had been trained using this new training module. That is four months following the completion of the RCA. Meanwhile, ALARA design on non-joggle components continued without the benefits of this additional training.

Lastly, the Team concluded the corrective action closure criterion did not ensure ALARA refresher training was complete for the targeted individuals. The closure criteria for Corrective Action 10 read as follows:

“As recommended in CC-AL-1-1, provide annual ALARA refresher training to engineering personnel, including management, assigned to tasks related to ALARA. Refresher training will include a specific focus on creation and revision of ADRs. **Credit for completion of this action will be taken when training is ready for presentation and has been added to the training profiles for affected staff.**” (Emphasis added.)

Placing a training requirement in the affected staff training profiles does not complete training. Completion of this corrective action should be closed when all affected personnel have formally completed the training module. BNI stated entry of training requirements in staff training profiles was the usual approach for closure of training corrective actions. BNI should reconsider this practice for closing training corrective actions.

#### Qualification

#### **4. Observation: ENS Radiological Safety Engineer experience equivalency was poorly defined.**

ENS Engineering Position Descriptions for Radiological Safety Engineer, Radiological Engineer II, and Radiological Safety Assessment Engineer required a degree or “equivalent experience.” The term “equivalent experience” was not documented or defined. The Team believe a defined and documented set of qualification requirements would ensure a consistent level of knowledge for

<sup>3</sup> 24590-WTP-CAR-QA-06-082, Revision 0, “Deficiencies in Offset Piping/Conduit Assemblies (“Joggles”) to Support Shielding/ALARA,” March 3, 2006.

Radiological Safety Engineers and any other personnel requiring an equivalency determination to perform design work at the WTP.

Note: Subsequent to the assessment BNI issued a training procedure which addressed this issue.

**Conclusions:**

The Team identified no Findings and documented four Observations. The Observations are not contractually or regulatory based and are provided as opportunities for improvement. BNI is not required to respond to the Observations. The Joggle Pipes issue was one of the issues recently investigated by the Office of Price-Anderson Enforcement. The results of this investigation should provide DOE's conclusion on the adequacy of BNI's corrective actions to resolve this issue.

**Open Items**

None

**Closed Items**

None

**Discussed Items**

None

<b>Task# ORP-ESQ-2006-0165</b>
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E-STARS™ Report  
Task Detail Report  
03/20/2007 0945

TASK INFORMATION			
<b>Task#</b>	ORP-ESQ-2006-0165		
<b>Subject</b>	CONCUR:06-ESQ-158; ALARA DESIGN IMPLEMENTATION AND OVERSIGHT ASSESSMENT, A-06-ESQ-RPPWTP-010		
<b>Parent Task#</b>		<b>Status</b>	CLOSED
<b>Reference</b>	06-ESQ-158	<b>Due</b>	
<b>Originator</b>	Gano, Becky	<b>Priority</b>	High
<b>Originator Phone</b>	(509) 376-6004	<b>Category</b>	None
<b>Origination Date</b>	10/30/2006 0843	<b>Generic1</b>	
<b>Remote Task#</b>		<b>Generic2</b>	
<b>Deliverable</b>	None	<b>Generic3</b>	
<b>Class</b>	Long Term	<b>View Permissions</b>	Normal
<b>Instructions</b>	<p>Correspondence is being routed for concurrence via hard copy instead of electronically. Once you receive the correspondence, please approve or disapprove electronically via E-STARS and route to next person on the routing/concurrence list.</p> <p>BCC: ESQ OFF FILE ESQ RDG FILE MGR RDG FILE R.C.BARR, ESQ P.P.CARRIER, ESQ L.R.MCKAY, ESQ J.L.POLEHN, ESQ J.R.ESCHENBERG, WTP</p> <p>RECORD NOTE:</p>		
<b>ROUTING LISTS</b>			
1	Route List	Inactive	
	<ul style="list-style-type: none"> <li>● Polehn, Jeanie L - Review - Concur with comments - 10/30/2006 0948 <i>Instructions:</i></li> <li>● Carier, Patrick P - Review - Concur - 01/08/2007 1110 <i>Instructions:</i></li> <li>● Barr, Robert C - Review - Cancelled - 03/20/2007 0945 <i>Instructions:</i></li> <li>● Schepens, Roy J - Review - Cancelled - 03/20/2007 0945 <i>Instructions:</i></li> <li>● Eschenberg, John R - Approve - Approved - 03/20/2007 0831 <i>Instructions:</i></li> </ul>		
<b>ATTACHMENTS</b>			
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. 06-ESQ-158 att ALARA Assessment A-06-ESQ-RPPWTP-010.doc</li> <li>2. 06-ESQ-158 BNI LTR ALARA DIO Assessment A-06-ESQ-RPPWTP-010.doc</li> </ol>		
<b>COLLABORATION</b>			
<div style="border: 2px solid black; padding: 5px; display: inline-block;"> <b>RECEIVED</b> MAR 20 2007         </div>			

<b>Task# ORP-ESQ-2006-0165</b>	
<b>COMMENTS</b>	
<b>Poster</b>	Polehn, Jeanie L (Polehn, Jeanie L) - 10/30/2006 0910
	Concur
	Concur but with comments (marked on hard copy). JLAPo 10/30/06
<b>Poster</b>	Gano, Becky (Gano, Becky) - 03/20/2007 0903
	CLOSED
	Bill Taylor concurred on 3/5/07; Shirley Olinger concurred on 3/14/07.
<b>TASK DUE DATE HISTORY</b>	
<i>No Due Date History</i>	
<b>SUB TASK HISTORY</b>	
<i>No Subtasks</i>	

-- end of report --

**Task# ORP-ESQ-2006-0165**

E-STARS™ Report  
 Task Detail Report  
 10/30/2006 0848

**TASK INFORMATION**

<b>Task#</b>	ORP-ESQ-2006-0165		
<b>Subject</b>	CONCUR:06-ESQ-158; ALARA DESIGN IMPLEMENTATION AND OVERSIGHT ASSESSMENT, A-06-ESQ-RPPWTP-010		
<b>Parent Task#</b>		<b>Status</b>	Open
<b>Reference</b>	06-ESQ-158	<b>Due</b>	
<b>Originator</b>	Gano, Becky	<b>Priority</b>	High
<b>Originator Phone</b>	(509) 376-6004	<b>Category</b>	None
<b>Origination Date</b>	10/30/2006 0843	<b>Generic1</b>	
<b>Remote Task#</b>		<b>Generic2</b>	
<b>Deliverable</b>	None	<b>Generic3</b>	
<b>Class</b>	Long Term	<b>View Permissions</b>	Normal

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BCC:  
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 R.C.BARR, ESQ  
 P.P.CARRIER, ESQ  
 L.R.MCKAY, ESQ  
 J.L.POLEHN, ESQ

RECORD NOTE:

**ROUTING LISTS**

1	Route List	Active
	<ul style="list-style-type: none"> <li>Polehn, Jeanie L - Review - Awaiting Response  <i>Instructions:</i> <i>WPT 10/30/06</i></li> </ul>	
	<ul style="list-style-type: none"> <li>Carrier, Patrick P - Review - Awaiting Response  <i>Instructions:</i> <i>WPT 11/8/06</i></li> </ul>	
	<ul style="list-style-type: none"> <li><del>Barr, Robert C</del> - Review - Awaiting Response  <i>Instructions:</i> <i>WPT 3/5/07</i></li> </ul>	
	<ul style="list-style-type: none"> <li><del>Schepens, Roy J</del> - Review - Awaiting Response  <i>Instructions:</i> <i>WPT 3/11/07</i></li> </ul>	
	<ul style="list-style-type: none"> <li>Eschenberg, John R - <del>Approve</del> - Awaiting Response  <i>Instructions:</i> <i>WPT 3/14</i></li> </ul>	

*Rec'd 11/1/07*

**ATTACHMENTS**

Attachments	<ol style="list-style-type: none"> <li>06-ESQ-158 att ALARA Assessment A-06-ESQ-RPPWTP-010.doc</li> <li>06-ESQ-158 BNI LTR ALARA Design Implementation and Oversight Assessment A-06-ESQ-RPPWTP-010.doc</li> </ol>
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**COLLABORATION**

BACKGROUND

(PLEASE SCAN)

LETTER # 06-ESQ-158

**Assessment Note A-06-ESQ-RPPWTP-010-01**

**Assessment Team:** Jeanie L. Polehn and Larry R. McKay

**Dates of Assessment:** October 10 through 19, 2006

**Areas/Items Assessed:** Bechtel National, Inc. (BNI) As Low As Reasonably Achievable (ALARA) Design Implementation and Oversight

The U.S. Department of Energy (DOE), Office of River Protection assessment team members evaluated the adequacy of BNI's ALARA design implementation and oversight of the Waste Treatment Plant against established requirements and guidance.

Assessment Report A-06-ESQ-RPPWTP-010 contains the assessment results. This assessment note captures details of personnel interviews and documents reviewed.

**Personnel Interviewed:****BNI Environmental & Nuclear Safety (ENS)**

M. F. Perks, Radiological & Fire Safety Manager

G. A. Simiele, Radiological Safety Lead

R. A. Dunn, Radiological Safety Engineer – High-Level Waste (HLW)

R. G. Lauber, Radiological Safety Engineer – Low-Activity Waste (LAW) & Balance of Facility (BOF)

J. L. Rathbun, Radiological Safety Engineer – Pre-Treatment

W. G. Gripentog, Radiological Safety Assessment Engineer (part-time)

**BNI Engineering**

S. C. Lynch, Deputy Manager of Engineering

K. X. Walvekar, Assistant to Deputy Manager of Engineering

D. J. Pisarcik, Engineering Processes Manager

J. L. Clinton, HLW Engineering Group Supervisor

J. K. Schutte, Deputy Manager, Jumper Group

**Documents Reviewed:**

10 CFR 835, "Occupational Radiation Protection," Section 1001, Design and Control and Section 1002, Facility Design and Modifications, January 1, 1999

24590-WTP-RPP-ESH-01-001, Radiation Protection Program for Design and Construction, Revision 0, December 11, 2001

24590-WTP-MN-ESH-01-001, Waste Treatment Plant Radiological Control Manual, Revision 4, October 24, 2005

**Assessment Note A-06-ESQ-RPPWTP-010-01**

24590-WTP-RCA-ENG-06-0001, Revision 0, "Root Cause Analysis of ALARA/Supplied Supplier Submittal Issues," May 31, 2006

NTS-ORP-BNRP-RRPWTP-2006-0001, "Offset Piping/Conduit Assemblies (Joggle Pipes)," August 2, 2006 (Noncompliance Report)

"ALARA Design Review – Annual Refresher Training," course materials (draft), undated.

24590-HLW-DC-ENG-06-001, Revision 0, "Design Criteria for HLW Offset (Joggle) & Straight Through Penetrations," October 5, 2006

24590-WTP-GPG-ENG-0106, Revision 1, "Augmented Monitoring of New Employees/Employees with New Assignments," August 15, 2006

Memorandum from D. A. Klein to Distribution, "Augmented Monitoring of New Employees/Employees with New Assignments," CCN: 139932, September 7, 2006

24590-WTP-MAR-ENS-06-0030, Revision 0, "August 2006 Assessment of the WTP Radiation Protection Program," August 30, 2006

24590-WTP-PL-ENS-04-0001, Revision 0, "Radiological Safety Management Assessment Plan Fiscal Year 2005 through Fiscal Year 2007, pages 3 through 6, April 15, 2004

24590-WTP-MAR-ENS-05-0036, Revision 0, "Assessment of Engineering System Descriptions for ALARA Documentation, November 28, 2005

24590-WTP-SV-PA-05-0006, Revision 0, "Engineering Drawing ALARA Documentation," February 16, 2005

24590-WTP-SV-PA-05-010, Revision 0, "Engineering Specification ALARA Documentation," May 13, 2005

24590-HLW-ZOC-30-00021, Revision C, "MCNP Analysis of HLW Wallboxes," September 29, 2006

24590-WTP-ISMSD-ESH-01-001, Revision 3, "WTP Project Integrated Safety management System Description," September 20, 2005

ASME NQA-1a-2005, "Quality Assurance Requirements for Nuclear Facility Applications, May 3, 2006

DOE P 450.4, "Safety Management System Policy," October 15, 1996

WTP Corrective Action Reports (CARs):

- 24590-WTP-CAR-QA-05-066, Revision 1, "Inadequate QL Assignment for HLW Penetrations," April 14, 2005



**Assessment Note A-06-ESQ-RPPWTP-010-01**

- 24590-WTP-CAR-QA-05-209, Revision 0, "System Description for LAW Plant Service Air ALARA Applicability," September 6, 2005
- 24590-WTP-CAR-QA-05-097, Revision 0, "ALARA Applicable Components Not Specified Correctly," June 2, 2005
- 24590-WTP-CAR-QA-06-008, Revision 0, "Isometric Indicates Valves That Differ From Original Design Intent," January 6, 2006
- 24590-WTP-CAR-QA-06-082, Revision 0, "Deficiencies in Offset Piping/Conduit Assemblies ("Joggles") to Support Shielding/ALARA," March 3, 2006
- 24590-WTP-CAR-QA-05-262, Revision 0, "Deviations from Drawings, October 16, 2005
- 24590-WTP-CAR-QA-06-033, Revision 0, "SRAD-002 requirements are contrary to Engineered Pipe Support Drawings," January 24, 2006.

"Engineering Quality Presentation" for April 2005, November 2005, March 2006, June 2006, and February 2006

**BNI Job Descriptions:**

- Radiological Safety Engineer, December 6, 2004
- Radiological Engineer II, December 3, 2004
- Radiological Safety Assessment Engineer, October 11, 2006
- Designer, October 19, 2006
- Senior Piping Designer, October 19, 2006

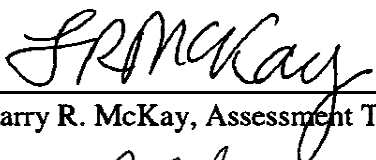
"WTP Engineering Organization," May 18, 2006


"Environmental & Nuclear Safety" organization chart, April 4, 2006

"Radiological Safety Support of Joggled Penetration Design," BNI Radiological Safety Lead presentation to Assessment Team, October 10, 2006

"Principles for a Strong Nuclear Safety Culture," INPO, Principles 1, 2, 3, 4, 6, 7, <http://apweb200.rl.gov/rapidweb/chg/chgism/docs/30/docs/INPOPrinciplesForStrongNuclearSafetyCulture.pdf?CFID=375085&CFTOKEN=99362960&jsessionid=463069d4b779534d7652TR4630>, November 2004

"Characteristics of an Effective Nuclear Safety Culture," J. Wert and J. Fuoto, <http://nuclearsafetyculture.freeyellow.com/MDI-characteristics.htm>

Submitted By:  Date: 11/15/06  
 Larry R. McKay, Assessment Team Member

Approved By:  Date: 10/30/06  
 Jeanie L. Polehn, Assessment Team Lead