Energy*Solutions*, Inc. Technical Support Document



RS-TD-313196-005 La Crosse Open Air Demolition Limits								
	Revision 0							
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• Rev. 0 –Initial issuance.

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# 1. PURPOSE

This Technical Support Document (TSD) provides the basis for the Open Air demolition Radiological Control Indicators that are applied to buildings and structures for open air demolition. These indicators are designations used to characterize the acceptable removable contamination and concrete contact deep dose equivalent radiation levels that are acceptable for open air demolition. Structural materials other than concrete, such as metals, do not tend to sorb radionuclides and are not evaluated for acceptable embedded total contamination dose rates. Activated materials are also not evaluated under this TSD and should be evaluated and modeled separately using the radiological mix of nuclides present. The radiological control indicators evaluated in this TSD will ensure that open air demolition can proceed without creating a Contaminated Area, requiring radiological PPE, or resulting in environmentally significant airborne radioactivity releases.

# 2. DISCUSSION OR BACKGROUND

### 2.1. Off-Site Dose Impact Method

Several decommissioning facilities established open air demolition criteria based upon the offsite dose impact from airborne radioactivity released during demolition. The facilities (1) (2) (3) used a conventional nuclear industry approach for safety related bounding calculations to establish limits for open demolition. This approach calculates the acceptable levels of fixed and removable contamination based upon re-suspension factors and site specific ground release dispersion models (X/Q). The limits at these facilities are based upon the calculated member of the public dose at the site boundary using Off Site Dose Calculation Manual (ODCM) (4) methodologies for a ground level airborne radioactivity release. As shown in Table 1 this approach results in relatively high levels of removable contamination being acceptable for open air demolition with minor off-site dose consequences.

Facility	Removable Contamination Level	Total Contamination Level	Offsite Dose (mrem)	Control Criteria Summary
SONGS Unit 1	N/A	1.5E+6 dpm/100 cm <sup>2</sup>	1.7E-3 instantaneous release	<ul> <li>≥ 25,000 dpm/100 cm<sup>2</sup> removable of 250,000 dpm/100 cm<sup>2</sup> total requires contamination control measure (e.g., fixative, local ventilation, enclosures)</li> <li>Air samples not to exceed 0.05 DAC beta/gamma or &gt;MDA alpha. Personnel contamination controls below 25,000 dpm/100 cm<sup>2</sup> required.</li> </ul>
Maine Yankee	5000 dpm/100 cm <sup>2</sup> beta/gamma 20 dpm/100 cm <sup>2</sup> alpha	500,000 dpm/100 cm <sup>2</sup> beta/gamma 100 dpm/100 cm <sup>2</sup> alpha	6.66E-2 entire decommissioning based upon estimated surface area of buildings and average contamination levels	Could result in up to 4600 dpm/100 cm <sup>2</sup> deposition within 50 feet of demolition with 10% plate out. May require layer of soil to be removed for FSS. Will have to be managed for equipment release.
Yankee Rowe		Average < 5000 dpm/100 cm <sup>2</sup>	2E-3 mrem/yr max organ	Maintain work zone air concentrations less than 0.25 DAC to maintain member of public dose below 0.2 mrem/yr. No other limits specified.

#### Table 1 - Summary of Offsite Dose Evaluations

Similar offsite dose evaluations of airborne radioactivity ground releases were performed at Connecticut Yankee (CY) as documented in reference (5). This TSD evaluated the offsite dose consequences of an instantaneous release of a 2000 DAC Am-241 source term due to a HEPA filter failure at CY. The calculated member of the public dose at the unrestricted area boundary was 1.77 mrem for a release of this magnitude. Similarly the LACBWR Post Shutdown Decommissioning Activity Report (PSDAR) Accident Analysis (6) evaluated a series of accidents with potential for source term releases to the environment. These calculations assumed that 30% of the remaining estimated approximately 1.175 Ci of radioactive material present on plant surfaces in 2014 was released (e.g., 0.35 Ci, 7.83E+11 dpm) through the plant stack as airborne radioactivity. Resulting doses at 50, 70 and 120 meters were calculated. The maximum dose was 65 mrem at 50 meters. (6) Thus, demolition and sizing of contaminated structures and materials can be performed at high contamination levels without significantly increasing the radiation exposure of members of the public at the site boundary.

### 2.2. Radiological Objectives for Open Air Demolition

Other objectives, in addition to the member of the public dose at the site boundary, should be considered when establishing Radiological Control Indicators for open air demolition of structures. The off-site dose based approach does not address additional considerations such as:

- Allowing open air demolition without instituting Contaminated Area controls such as, posting, clearance, and protective clothing controls in outside areas.
- Impact of the liberated source term on soil concentrations (Derived Concentration Guideline Levels DCGLs) required for License Termination.
- Ensuring radioactivity concentrations in high conductivity, high pH demolition water remain low enough to release without use of demineralizers. Groundwater intrusion during demolition at Connecticut Yankee required large quantities of water to be processed and released as part of the demolition process due to groundwater intrusion.

Given the above considerations, the objectives of the open air demolition limits are the following:

- Ensure ground level airborne radioactivity levels and off-site dose consequences remain ALARA and within regulatory limits.
- Ensure demolition liquid concentrations remain at levels which can be collected, processed and released using plant water treatment systems and discharge points.
- Minimize the spread on contamination within the site boundary such that there is not a significant effect on groundwater or the scope of soil remediation required for License Termination.
- Ensure open air demolition activities can be conducted using conventional demolition techniques with minimal radiological restrictions or controls (e.g., without area, equipment or personnel contamination controls).

#### 2.3. Radiological Control Indicator Method and Pre-Test Values

Initial pre-test Radiological Control Indicators (RCI) similar to those at other facilities were developed at Connecticut Yankee as part of the request for proposals and contract agreements with the Decommissioning Operation Contractor (DOC). The RCIs provided the contractual basis for radiologically acceptable levels for various phases and types of structure demolition. These indicators

were used to clearly specify contractual requirements for the demolition of buildings with regards to acceptable levels of fixed and removable contamination. The CY RCIs were defined as the following:

- **R1** was designated for structures where the radiological contamination is indistinguishable from background. This designation was only applied to structures outside a Radiologically Controlled Area (RCA) of the facility. Prior to Release of a structure for R1 demolition, an Unconditional Release Survey (URS) was completed. The URS provides data to demonstrate that secondary side structures are suitable for unconditional release from the Site, (i.e., free released as "clean" materials). This material is designated as Secondary Side Waste. For structures designated as R1, no radiological controls were required during demolition.
- **R2** was designated for structures that reside within the RCA where the radiological contamination is greater than the R1 levels, but less than the limits specified as being suitable for open air demolition (**R2**<sub>Open Air</sub>) or interior demolition (**R2**<sub>Interior</sub>). When the structure is scheduled for open air exterior demolition, R2<sub>Open Air</sub> controls are instituted mainly to protect the environment and public whereas R2<sub>Interior</sub> controls are instituted to protect the worker and to limit the potential for spread of contamination to other interior areas. Prior to structure turnover for R2 demolition contamination levels of primary side structures were below the limits established for open air or interior demolition. The resulting demolition debris was designated as Primary Side Waste. For structures designated as R2, limited radiological controls were required, including but not limited to intermittent health physics coverage, misting, air sampling, periodic surveys, personnel protective equipment and personnel contamination monitoring upon exiting the area.
- **R3** was designated for structures, or portions of structures, within the RCA where the radiological conditions exceed the R2<sub>Open Air</sub> or R2<sub>Interior</sub> criteria. This material was also designated as Primary Side Waste. For structures designated as R3, significant radiological controls were required. These included but were not limited to controls such as constant health physics coverage, application of surface fixatives, use of tents and HEPA ventilation, more intense air and surface sampling and personnel protective equipment such as respirators.

Table 2 shows the original pre-test radiological criteria for fixed and removable contamination levels adopted for demolition at CY. These values were based upon regulatory requirements for R1 structures (e.g., no detectable licensed material for unrestricted release of materials) and estimates of the potential radiological consequences and controls for the demolition. Similar to other facilities, they allowed relatively high R2<sub>Open Air</sub> contamination levels on structures.

Demolition	Total Surface Contamination		Contamination
Category	β/γ	β/γ	α
R1	Non Detectable	Non Detectable	Non Detectable
R2 <sup>Open Air</sup>	500,000 dpm/100cm <sup>2</sup> Max 50,000 dpm/100cm <sup>2</sup> Avg	1000 dpm/100cm <sup>2</sup> Max	20 dpm/100cm <sup>2</sup> Max
R2 Interior	10 mR/h Contact	10,000 dpm/100cm <sup>2</sup> Max	200 dpm/100cm <sup>2</sup> Max
R3	>R2 and <100 mR/h Contact	>R2 and <100,000 dpm/100cm <sup>2</sup> Max	>R2 and <5000 dpm/100cm <sup>2</sup> Max

#### Table 2 – Original Connecticut Yankee Contractual Radiological Control Indicators

In 2004 Connecticut Yankee released the Decommissioning Operations Contractor (DOC) and resumed direct management of the decommissioning. Thus the contractual RCI criteria in Table 2 were no longer relevant. However, radiological criteria for building demolition still needed to be established. To ensure the criteria in Table 2 would meet the open air demolition objectives, testing was performed on concrete surfaces in the Primary Auxiliary Building (PAB) to determine empirically the proper  $R2_{Open Air}$  fixed contamination levels and the Table 2 removable contamination levels were reevaluated. The objective of the test was to determine the appropriate contact count rate or dose rate on concrete at which the concrete could be demolished or sized and meet the four objectives summarized at the end in Section 2.2 in this document. The results of the evaluation and tests are summarized in Section 3.3 of this TD. The supporting data and surveys from CY Technical Support Document (7) are provided as attachments to this TD.

# **3.** CALCULATIONS

### 3.1. Summary of Connecticut Yankee Removable Contamination Limit Evaluation

During plant operations and throughout the decommissioning all of the open air demolition objectives in Section 2.2 were routinely met by maintaining the loose surface contamination levels below 1000 dpm/100 cm<sup>2</sup> beta/gamma and 20 dpm/100 cm<sup>2</sup> alpha on items stored or transported in outside areas. Any materials released off-site were surveyed to less than detectable levels as defined by Nuclear Regulatory Commission guidance. The required sensitivity levels for unrestricted release are no detectable contamination with minimum detectable activities under 5000 dpm/100 cm<sup>2</sup> beta/gamma total, 1000 dpm/100 cm<sup>2</sup> beta/gamma removable and 20 dpm/100 cm<sup>2</sup> alpha removable.

In practice, containers, tools, equipment were decontaminated down to less than detectable contamination levels that range from 30 dpm/100 cm<sup>2</sup> to several hundred dpm/100 cm<sup>2</sup> depending on the survey method, instrumentation, and background before they are released from buildings. The impracticality of instituting Contaminated Area Controls in outside areas, in addition to the regulatory scrutiny that such controls would illicit, is simply outweighed by the relative ease with which removable contamination can be removed or fixed. Removable contamination is easily locked down by applying a fixative such as latex paint prior to demolition. It was determined that there was already sufficient precedent and experience to justify use of these practices as acceptable targets for R2<sub>Open Air</sub> removable contamination limits. To meet the above objectives removable beta gamma contamination limits for open air demolition should not exceed 1000 dpm/100 cm<sup>2</sup> and should on average be less than 300 dpm100 cm<sup>2</sup>. The removable alpha contamination should not exceed 20 dpm/100 cm<sup>2</sup>.

### 3.2. Connecticut Yankee Concrete Demolition Test Results

The remaining question was what levels of fixed contamination would be acceptable to maintain work area loose surface contamination levels below 300 dpm/100 cm<sup>2</sup> beta/gamma and 20 dpm/100 cm<sup>2</sup> alpha during demolition. Maintaining loose surface contamination levels within acceptable ranges depends upon the amount of loose radioactive material present on the structure at the time of demolition and the amount of radioactive material that is liberated during the demolition process as concrete dust. Conventional demolition uses large excavators with hydraulic rams to rubbelize concrete and mechanical or thermal methods to cut metallic materials. Embedded surficial fixed contamination becomes loose as part of the dust generated when concrete is fractured or cut by the demolition equipment. Typically, the vast majority of the contamination in the concrete surfaces of building interiors is embedded in the upper most portion, near the surface. Most of the concrete structure and rebar is not contaminated and therefore the fracture dust and metallic dust or cutting smoke is "clean". Dust generated fracturing the contaminated surface is diluted by uncontaminated dust from fracturing of

subsurface material. To develop an  $R2_{Open Air}$  fixed contamination limit for concrete, the relationship between fixed contamination levels as indicated by surface dose rates and the resulting loose surface contamination from the fracture dust liberated was evaluated. Tests were conducted at Connecticut Yankee to determine this correlation empirically, rather than by calculation.

In order to determine the appropriate R2<sub>Open Air</sub> fixed contamination criteria for concrete a series of insitu tests were conducted in the Primary Auxiliary Building (PAB) at CY. The PAB was chosen because it had a series of cubicles with concrete floors exhibiting a range of contact dose rates which varied from as low as no detectable radiation levels above background to as high as 20 to 30 mR/hr contact. The cubicles could be decontaminated to low pre-test loose surface activity levels then sealed off to contain dust and contamination generated during demolition of concrete test areas of various dose rates, then surveyed after the test to evaluate the resulting contamination levels. The objective of these tests was to rubbelize concrete surfaces with different contact dose rates in the absence of engineering controls or dust suppression methods and monitor the airborne radioactivity and removable contamination levels generated.

The tests were performed by pre-surveying the area to determine average contact dose rates in order to select a test location with the appropriate contact levels to be evaluated. The cubicle was then decontaminated or locked down to provide low levels of initial removable contamination and sealed off using clear poly with no negative pressure ventilation applied. This provided a static environment in which airborne radioactivity levels and removable contamination levels resulting directly from the demolition could be evaluated. A test location was then remediated using needle guns, or jack hammers while an air sample was running. After the remediation was completed, the test area and cubicle contamination levels were assessed by smear survey and large area swipes (LAS). The test area was also re-surveyed to determine the post remediation contact dose rates and evaluate the amount of source term removed.

The first test area was in B Charging Pump Cubicle. The Test 1 surveys, air samples, and demolition debris gamma spectroscopy results from reference (7) are provided in Attachment 1. The preremediation survey was conducted on 3/3/04 at 16:00. The maximum pre-remediation test area contact dose rate was 1.5 mR/hr and averaged 0.66 mR/hr. Table 3 summarizes the pre-test data from this survey.

	Test Area Re			Test	Area	Cubic	le Removable (	Outside Test Ar	ea
Smear Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	Cpm	Smear Location	beta/gamma dpm/100 cm <sup>2</sup>	Alpha dpm/100 cm <sup>2</sup>	LAS ccpm
31	< MDA	< MDA		1.5	8,000	2	62.17	< MDA	
32	< MDA	< MDA		0.7	14,000	4	122.84	< MDA	
33	< MDA	< MDA		0.6	13,000	23	62.17	< MDA	
34	79.5	< MDA		0.7	40,000	All Other	<mda< td=""><td>&lt; MDA</td><td></td></mda<>	< MDA	
35	< MDA	< MDA		0.9	28,000				
36	< MDA	< MDA		0.8	28,000				
37	105.51	< MDA		0.4					
38	< MDA	< MDA		0.3					
39	62.17	< MDA		0.3		А			NDA
40	62.17	< MDA		0.4		В			NDA
41	< MDA	< MDA				С			NDA
42	< MDA	< MDA							
43	< MDA	< MDA							
	Total Test Area Smears 13 23.8				Avg	Total	Outside Test	Area Smears	30
	beta/gamma Smear Average 0				21,833		beta/gamma S	mear Average	0.97
							Total Cu	ubicle Smears	43
							Total Cub	oicle Average	12.94
Nata Dia	l. Entrine have						Lloootions are		

Table 3 - Test 1 Pre-remedia	tion Survey Data
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Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

The test area was remediated by chipping concrete using a jack hammer and needle guns in the sealed cubicle. After the surface concrete was removed a post remediation survey was conducted to establish test area contact dose rates and contamination levels in the cubicle. The CY post remediation survey for Test 1 was conducted on 3/4/04 at 12:00 P.M. A copy is provided in Attachment 1. The post remediation survey data is summarized in Table 4 and shows a drop in the maximum contact dose rates from 1.5 mR/hr to 0.7 mR/hr with the average dose rate dropping from 0.66 mR/hr to 0.43 mR/hr. The smear survey data shows that removable contamination levels remained well below 1000 dpm/100 cm<sup>2</sup> in the cubicle with a maximum level of 253 dpm/100 cm<sup>2</sup>. LAS survey results increased from pre-remediation levels of No Detectable Activity (NDA) to up to 3000 ccpm in the cubicle. In addition, surveys of the remediation tooling, booties and gloves showed no detectable removable activity.

Table 5 provides the gamma spectroscopy results from samples of remediation dust and debris, the gross beta air sample result and the scaled Effluent Concentration. Air sample results are also provided in Attachment 1. They indicated very low levels of gross beta/gamma airborne radioactivity at 8.66E-12  $\mu$ Ci/cc or 0.043 DAC. Gamma spectroscopy of a sample of the fines and concrete chips generated during the remediation identified Co-60, Cs-134 and Cs-137 in the concrete as seen in Attachment 1. The gross beta/gamma activity on the air sample was scaled to the radionuclide fraction in the debris and compared to the 10 CFR 20 Appendix B Table 2 Effluent Concentrations for Air as shown in Table 5.

This demonstrated that even though the remediation was performed in a tented cubicle with no dust suppression, ventilation or engineering controls, the resulting airborne radioactivity was well below the 10 CFR 20 Appendix B, Table 2, Effluent Concentrations.

	Test Area Test Area Removable Contact Cubicle Removable									
	Test Area Re	movable		Col	ntact		Cubicle Re	movable		
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	Cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	
21	53.5	< MDA		0.2	5,000	10	62.17	< MDA		
22	< MDA	< MDA		0.3	1,000	11	235.53	< MDA		
23	< MDA	< MDA		0.6	5,000	All Other	<mda< td=""><td>&lt; MDA</td><td></td></mda<>	< MDA		
24	< MDA	< MDA		0.7	8,000					
25	< MDA	< MDA		0.5	10,000					
26	< MDA	< MDA		0.3	15,000	А			3000	
27	< MDA	< MDA			80,000	В			3000	
28	< MDA	< MDA			25,000	С			3000	
29	131.51	< MDA			10,000					
30	< MDA	< MDA								
	Total Test A	rea Smears	10	Avg	Avg	Total Outside Test Area Smears			20	
B	0.43	17,667	Be	ta/gamma Sme	ar Average	14.89				
							Total Cubi	cle Smears	30	
							<b>Total Cubic</b>	le Average	16.09	

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

Nuclide	µCi/gm	Fraction of Total	Scaled Air Sample µCi/cc	DAC μCi/cc	Weighted DAC Fraction (DACf)	Eff. Conc. μCi/cc	Weighted EC Fraction (ECf)
Co-60	2.77E-05	2.56E-02	2.21E-13	1.00E-08	2.21E-05	5.00E-11	4.43E-03
Cs-134	1.01E-05	9.35E-03	8.09E-14	4.00E-08	2.02E-06	2.00E-10	4.05E-04
Cs-137	1.04E-03	9.65E-01	8.36E-12	6.00E-08	1.39E-04	2.00E-10	4.18E-02
Total	1.08E-03	1.00E+00	8.66E-12	N/A	1.63E-04	N/A	4.66E-02
Air Sample Result		8.66E-12	µCi/cc				

A second area in Charging Pump Cubicle B with higher contact dose rates was selected for the next test. This area had contact dose rates in the 1 to 2 mR/hr range with an average contact dose rate of

approximately 1.4 mR/hr. The pre-remediation and post remediation surveys as well as the gross air sample results and debris gamma spectroscopy results are provided in Attachment 2.

The Test 2 pre-remediation survey was conducted on 3/8/04 at 11:00 A.M. The data for the survey area is shown in Table 6. There was no detectable removable contamination in the cubicle prior to Test 2.

		I able o	- 1 est 2			Survey Da	เล		
	Test Area Re	emovable			t Area ntact	Cubicle Removable			
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
1	< MDA	< MDA		1.5	50,000	10	< MDA	< MDA	•
2	< MDA	< MDA		1.2	16,000	11	< MDA	< MDA	
3	< MDA	< MDA		1.7	25,000	12	< MDA	< MDA	
4	< MDA	< MDA		1.9	15,000	13	< MDA	< MDA	
5	< MDA	< MDA		1.4	20,000	14	< MDA	< MDA	
6	< MDA	< MDA		1.2	75,000	15	< MDA	< MDA	
7	< MDA	< MDA		1.7	75,000	16	< MDA	< MDA	
8	< MDA	< MDA		2	30,000				
9	< MDA	< MDA		1.2	10,000	А			500
				1.2		В			500
				1.4		С			200
				1.5		D			200
				1.5		Е			200
				1.2		F			200
				1					
				1.4					
				1.5					
				1					
				1.5					
				1					
				1.7					
				1					
				2					
	Total Test A	rea Smears	9	Avg	Avg	Total O	ıtside Test Ar	ea Smears	10 <md< td=""></md<>
Beta/gamma Smear Average <mda< td=""><td>35,111</td><td>Ве</td><td>ta/gamma Sme</td><td>ar Average</td><td>А</td></mda<>					35,111	Ве	ta/gamma Sme	ar Average	А
							Total Cubi	cle Smears	19
									<md< td=""></md<>
							Total Cubic	le Average	Α

 Table 6 - Test 2 Pre-remediation Survey Data

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. The Test 2 Post Remediation Survey was conducted on 3/9/04 at 09:00. The post remediation surveys are provided in Attachment 2. The data is summarized in Table 7.

	Test Area									
	Test Area Re	movable			ntact		Cubicle Ren	novable		
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	
11	< MDA	< MDA	•	0.3	18,000	2	200.86	< MDA	•	
12	< MDA	< MDA		0.3	6,000	3	192.19	<mda< td=""><td></td></mda<>		
13	< MDA	< MDA		0.5	47,000	4	235.53	<mda< td=""><td></td></mda<>		
					16,000	5	261.53	<mda< td=""><td></td></mda<>		
						6	88.17	<mda< td=""><td></td></mda<>		
						8	103.51	<mda< td=""><td></td></mda<>		
						9	183.52	<mda< td=""><td></td></mda<>		
Е			200			10	96.89	<mda< td=""><td></td></mda<>		
						14	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>		
						15	88.17	<mda< td=""><td></td></mda<>		
						16	96.84	<mda< td=""><td></td></mda<>		
						17	131.51	<mda< td=""><td></td></mda<>		
						18	62.17	<mda< td=""><td></td></mda<>		
						All Other	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>		
						A			100	
						В			150	
						С			150	
						D			100	
						Е			200	
	Total Test A	rea Smears	3	Avg	Avg	Total O	utside Test Ar	ea Smears	28	
В	eta/gamma Sm	ear Average	<md A</md 	0.37	21,750	Be	ta/gamma Sme	ar Average	62.17	
	-						Total Cubi	cle Smears	31	
							<b>Total Cubic</b>	le Average	56.16	

Table 7 -	Test 2	<b>Post-remediation</b>	Survey	Data
I able /	I COL A	1 Ost 1 cm culation	Survey	Data

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

The maximum contact dose rate in the test area dropped from 2 mR/hr to 0.5 mR/hr. The average dose rate dropped from. 1.4 mR/hr to 0.37 mR/hr. It can be seen by the comparing post remediation removable contamination levels in Table 7 to the pre-remediation levels in Table 6, that there was an overall increase in the extent and levels of contamination in the cubicle. However, the contamination levels remained below the 1000 dpm/100 cm<sup>2</sup> loose surface beta/gamma objective with a maximum of

262 dpm/100 cm<sup>2</sup>. As seen in Attachment 2, the air sample during the remediation was 2.47E-11  $\mu$ Ci/cc or 0.124 DAC. A LAS was analyzed by gamma spectroscopy to provide the radionuclide profile of the concrete debris. Table 8 shows the anticipated effluent concentration for this air sample is 0.14 effluent concentrations. This is higher than the Test 1 air sample results but well below ground release concentrations that would result in any significant dose at the site boundary. There would be no significant off-site dose consequences from releases of this magnitude.

Nuclide	dpm per sample	Fraction of Total	Scaled Air Sample µCi/cc	DAC μCi/cc	Weighted DAC Fraction (DACf)	Eff. Conc μCi/cc	EC Weighted Fraction
Co-60	2.15E+02	3.91E-02	9.65E-13	1.00E-08	9.65E-05	5.00E-11	1.93E-02
Cs-134	5.89E+01	1.07E-02	2.64E-13	4.00E-08	6.60E-06	2.00E-10	1.32E-03
Cs-137	5.24E+03	9.50E-01	2.35E-11	6.00E-08	3.91E-04	2.00E-10	1.17E-01
Total	5.51E+03	1.00E+00	2.47E-11	N/A	4.94E-04	4.50E-10	1.38E-01
Air Sample Result		2.47E-11	µCi/cc				

Table 8 - Test 2 Debris Gamma Spectroscopy Results and Scaled Air Sample Results

Test 3 was conducted on an area with average contact dose rates of approximately 1.8 mR/hr with a maximum contact dose rate of 2.5 mR/hr. As shown in the Test 3 surveys provided in Attachment 3, the cubicle had low removable contamination levels on 3/9/04 at 15:30 prior to the test. The pre-remediation contact dose rates are the ones at the left hand side of the test area shown in survey 04-1758 conducted on 3/10/04 at 10:00. This data is summarized in Table 9.

Table 9 - 7	Test 3	<b>Pre-remediation</b>	Survey Data
-------------	--------	------------------------	-------------

	Test Area Re	emovable			Test Area Contact		Cubicle Removable			
Locatio n	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	beta/gammaalphadpm/100dpm/100Locationcm2cm2cm2			LAS ccpm	
12	62.4	<mda< td=""><td></td><td>1.2</td><td>10,000</td><td>3</td><td>69</td><td><mda< td=""><td></td></mda<></td></mda<>		1.2	10,000	3	69	<mda< td=""><td></td></mda<>		
13	52.9	<mda< td=""><td></td><td>2.5</td><td>15,000</td><td>10</td><td>52.9</td><td><mda< td=""><td></td></mda<></td></mda<>		2.5	15,000	10	52.9	<mda< td=""><td></td></mda<>		
14	55.3	<mda< td=""><td></td><td>1.4</td><td>&gt;50000</td><td>16</td><td>60</td><td><mda< td=""><td></td></mda<></td></mda<>		1.4	>50000	16	60	<mda< td=""><td></td></mda<>		
А			225	2.0	>50000	All Others	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>		
						В			155	
					-	С			225	
						D			175	
	Total Test Ar	ea Smears	3	Avg	Avg	Total O	utside Test Ar	ea Smears	27	
Be	Beta/gamma Smear Average 56.87				20,833	Be	ta/gamma Sme	ar Average	6.74	
						Total Cubicle Smears			30	
							<b>Total Cubic</b>	le Average	11.75	

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. The post remediation survey was conducted on 3/10/04 at 15:30. The post remediation survey results are also provided in Attachment 3 and summarized in Table 10. The maximum contact dose rate dropped from 2.5 mR/hr to 1.9 mR/hr and the average dropped from 1.8 mR/hr to 1.17 mR/hr. These results show similar removable contamination levels to those in Test 2 (Table 7) with a post remediation maximum of 200 dpm/100 cm<sup>2</sup>.

beta/gamma dpm/100 cm²         alpha dpm/100 cm²         alpha dpm/10 cm²		Toot Area Dam	avabla			Area	Cubicle Removable			
dpm/100         cm²         cpm         location         dpm/100         location         dpm/100         location         dpm/100         location         dpm/100         location         dpm/100         location         dpm/100         location         location <thlocation< th=""> <thlocation< th=""> <thl< th=""><th></th><th>Test Area Ren</th><th>lovable</th><th></th><th>Cor</th><th>itact</th><th></th><th></th><th>novable</th><th></th></thl<></thlocation<></thlocation<>		Test Area Ren	lovable		Cor	itact			novable	
No Smears taken in test area         1.2         9,000         5         86.2         < MDA	Location	dpm/100	dpm/100	-	mR/hr	cpm	Location	dpm/100	dpm/100	-
1       2,000       6       71.9       < MDA					1.3	10,000	4	200.2	< MDA	
1.9       4,000       8       90.9       < MDA	No Sm	No Smears taken in test area		1.2	9,000	5	86.2	< MDA		
Image: state of the state of the state st					1	2,000	6	71.9	< MDA	
Image: Normal system         Image: No					1.9	4,000		90.9	< MDA	
0.8       25,000       12       131.3       < MDA					1	2,500	9	171.7	< MDA	
1       7,000       13       163.6       < MDA					1	8,000	10	79.8	< MDA	
All OthersAll <br< td=""><td></td><td></td><td></td><td></td><td>0.8</td><td>25,000</td><td>12</td><td>131.3</td><td>&lt; MDA</td><td></td></br<>					0.8	25,000	12	131.3	< MDA	
Image: state of the state of						7,000		163.6	< MDA	
Image: constraint of the systemImage: constraint of the syst						ŕ		<mda< td=""><td>&lt; MDA</td><td></td></mda<>	< MDA	
Image: style="text-align: left;">Image: style="text-align: left;"/>Image: style="text-align: left;"/>Image						9,000				
Image: Constraint of the system of the sy							А			125
Total Test Area Smears0AvgAvgTotal Outside Test Area Smears34Beta/gamma Smear Average0.001.177,750Beta/gamma Smear Average29.28Total Cubicle Smears34							В			125
Total Test Area Smears0AvgAvgTotal Outside Test Area Smears34Beta/gamma Smear Average0.001.177,750Beta/gamma Smear Average29.28Total Cubicle Smears34							С			200
Beta/gamma Smear Average       0.00       1.17       7,750       Beta/gamma Smear Average       29.28         Total Cubicle Smears       34							D			175
Total Cubicle Smears 34	Τ	Total Test Area Smears 0			Avg	Avg	Total Ou	tside Test Are	a Smears	34
	Beta	Beta/gamma Smear Average $0.00$		1.17	7,750	Beta/gamma Smear Average		29.28		
							Total Cubicle Smears		34	
<b>Total Cubicle Average</b> 29.28								<b>Total Cubic</b>	le Average	29.28

Table 10 - Test	<b>3 Post Remediation Survey Data</b>

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. As shown in Table 11, a composite sample of the concrete chips from this area was obtained on 3/10/04 at 14:00. The sample was analyzed by gamma spectroscopy and showed Co-60, Cs-134, Cs-137 and Am-241. At CY Am-241 was approximately 50% of the alpha emitting transuranic (TRU) source term in all waste streams. Therefore a correction factor of 2 is applied to the Am-241 results when calculating the DAC and effluent concentration fractions. The airborne radioactivity was significantly higher than in Tests 1 and 2, but still less than 0.035 DAC. The air sample showed 1.114E-10  $\mu$ Ci/cc of Cs-137. The beta (Co-60, Cs-134, Cs-137) to alpha (2 X Am-241) ratio was 1,188 to 1. Well over the 50:1 beta/gamma to alpha ratio at which alpha monitoring is required for personnel and equipment exiting the area. When this Cs-137 level is scaled to the concrete chip sample results, the Effluent Concentration fraction (ECf) is 5.56, exceeding the 10 CFR 20 Appendix B Effluent Concentration Limit for Air but well below a value that would result in significant exposures at the site boundary when the ground release dispersion coefficient (*X/Q*) is considered.. Without the transuranic source term the ECf was 6.46E-01.

Nuclide	µCi/gm	Fraction of Total	Scaled Air Sample µCi/cc	DAC µCi/cc	Weighted DAC Fraction	Eff. Conc μCi/cc	EC Weighted Fraction		
Co-60	1.13E-04	3.72E-02	4.14E-12	1.00E-08	4.14E-04	5.00E-11	8.28E-02		
Cs-134	3.54E-05	1.16E-02	1.30E-12	4.00E-08	3.24E-05	2.00E-10	6.49E-03		
Cs-137	3.04E-03	1.00E+00	1.11E-10	6.00E-08	1.86E-03	2.00E-10	5.57E-01		
Am-241/TRU	1.34E-06	4.41E-04	4.92E-14	3.00E-12	3.28E-02	2.00E-14	4.92E+00		
Total	3.19E-03		1.17E-10		3.51E-02		5.56E+00		
Air S	ample Result	1.11E-10	μCi/cc Cs-137						
	2.04E-10	Total inclu	des radon dau	ighters					
Am-241/TRU	Correction								
Facto	or	2		Beta to A	Alpha Ratio		1,188		

Table 11 - Test 3 Debris Gamma Spectroscopy Results and Scaled Air Sample Results

Test 4 was also conducted in B Charging Pump Cubicle and was intended to test the contamination and airborne radioactivity levels resulting from demolition of concrete reading up to 5 mR/hr on contact. There were two attempts to perform this test, 4a and 4b, but neither test was valid because dose rates increased as each of test areas were remediated due to embedded piping in the floor under the test area. As seen in the surveys provided in Attachment 4 and the test 4a and 4b pre and post remediation survey summary tables below the maximum and average dose rates increased as concrete was removed. It was therefore not possible to quantify the dose rate change on the concrete removed.

	Test Area											
	Test Area Re	emovable			ntact		Cubicle Rem	ovable				
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm			
7	50.5	< MDA		4.5	50,000	1	205	< MDA				
8	< MDA	< MDA		5	25,000	2	269.1	< MDA				
9	< MDA	< MDA		3.5	4,000	3	285.7	< MDA				
10	55.3	< MDA		6	50,000	4	295.2	< MDA				
				3	45,000	5	52.9	< MDA				
				5	50,000	6	52.4	< MDA				
				3.2	45,000	11	71.9	< MDA				
				1.3	50,000	13	55.3	< MDA				
				3.5		15	62.4	< MDA				
				4.5		18	52.9	< MDA				
				2.4		25	55.3	< MDA				
				4.2		26	112.3	< MDA				
				2.7		All Others	< MDA	< MDA				
				1.5		others		- MD/T				
				3.8		A			200			
				3.2		B			75			
				3		C			225			
				2.7		D			125			
				3.2		E			25			
				2.9		F			675			
				2.8		G			275			
				2.2		Н			225			
	Total Test Area Smears 4				Avg	Total Outside Test Area Smears			26			
Beta/gamma Smear Average 10			105.80	3.37	39,875	Ве	ta/gamma Sme	ar Average	60.40			
Total Cubicle Smears						30						
							<b>Total Cubic</b>	e Average	55.87			
Nata Dian	k Entrios havo											

# Table 12 - Test 4a Pre-Remediation Survey

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. As seen in Table 13 the maximum dose rate increased from 5 to 8 mR/hr and the average test area dose rate increased from 3.37 to 4.67 mR/hr.

		Table	15 - 1050		Area	uon Survey	Data		
	Test Area Re	emovable			ntact		Cubicle Ren	novable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
1	68.4	< MDA		4	32,000	3	66.8	<mda< td=""><td></td></mda<>	
7	< MDA	< MDA		7	22,000	4	77.9	<mda< td=""><td></td></mda<>	
5	< MDA	< MDA		8	8,000	11	63.6	<mda< td=""><td></td></mda<>	
6	< MDA	< MDA		3	18,000	13	66.8	<mda< td=""><td></td></mda<>	
9	73.1	< MDA		4	18,000	18	75.5	<mda< td=""><td></td></mda<>	
				5	6,000	19	132.5	<mda< td=""><td></td></mda<>	
				2	4,000	21	104.8	<mda< td=""><td></td></mda<>	
				5	10,000	22	58.8	<mda< td=""><td></td></mda<>	
				4	40,000	23	132.5	<mda< td=""><td></td></mda<>	
						26	94.5	<mda< td=""><td></td></mda<>	
						32	61.2	<mda< td=""><td></td></mda<>	
						33	49.3	<mda< td=""><td></td></mda<>	
						34	49.3	<mda< td=""><td></td></mda<>	
						37	104.8	<mda< td=""><td></td></mda<>	
						39	49.3	<mda< td=""><td></td></mda<>	
						All Others	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>	
						A			200
						В			100
						С			125
	Total Test A		5	Avg	Avg				35
B	eta/gamma Sm	ear Average	28.30	4.67	17,556	Ве	ta/gamma Sme	ar Average	33.93
							Total Cubi	cle Smears	40
							Total Cubic	le Average	33.23

<b>Table 13</b> -	Test 4a	Post	Reme	diation	Survey	Data
1 abic 15 -	тсэг та	I USU	numu	ulation	Survey	Data

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. A Masslin LAS and a sample of the concrete debris generated during test 4a were analyzed by gamma spectroscopy. The analysis results and the Test 4a air sample result of  $4.14E-11 \mu$ Ci/ml are provided in Attachment 4. The results of the gamma spectroscopy analysis for each sample and the scaled effluent concentration fractions (ECf) are summarized in Table 14 and Table 15.

Nuclide	3/15/04 15:40 Gamma Spec Dust dpm/smear	Fraction of Total	3/15/04 Gamma Spec Dust Scaled Air Sample μCi/cc	DAC μCi/cc	Weighted DAC Fraction (DACf)	Eff. Conc μCi/cc	3/16/04 Dust EC Weighted Fraction
Co-60	2.09E+02	1.39E-01	5.77E-12	1.00E-08	5.77E-04	5.00E-11	1.15E-01
Cs-134	2.07E+01	1.38E-02	5.70E-13	4.00E-08	1.43E-05	2.00E-10	2.85E-03
Cs-137	1.27E+03	8.47E-01	3.51E-11	6.00E-08	5.84E-04	2.00E-10	1.75E-01
Total	1.50E+03	1.00E+00		N/A	1.18E-03		2.94E-01
Air Sample R	esult Gross B	eta		4.14E-11	µCi/cc		

 Table 14 - Test 4a Masslin Debris Gamma Spectroscopy Results and Scaled Air Sample Results

#### Table 15 - Test 4a Debris Gamma Spectroscopy Results and Scaled Air Sample Results

Nuclide	3/15/04 15:40 Gamma Spec Dust μCi/gm	Fraction of Total	3/15/04 Gamma Spec Dust Scaled Air Sample μCi/cc	Eff. Conc μCi/cc	3/16/04 Dust EC Weighted Fraction
Co-60	2.90E-05	2.48E-02	1.03E-12	5.00E-11	2.06E-02
Cs-134	1.12E-05	9.61E-03	3.98E-13	2.00E-10	1.99E-03
Cs-137	1.13E-03	9.66E-01	4.00E-11	2.00E-10	2.00E-01
Total	1.17E-03	1.00E+00			2.22E-01
Air Sample Result Gross Beta	4.14E-11	µCi/cc			

A second test location was tried on test 4b at an area adjacent to the first location. The pre-remediation survey data is shown in Table 16.

	Test Area Removable					Test Area Contact Cubicle Removable			
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
1	< MDA	< MDA		8	25,000	5	68.4	< MDA	
2	< MDA	< MDA		7	32,000	9	99.2	< MDA	
3	< MDA	< MDA		4.5	10,000	10	49	< MDA	
				2	16,000	11	80	< MDA	

Table 16 - Test 4b Pre Remediation Survey Data

	Test Area Re	emovable			Area ntact	Cubicle Removable			
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
				6	47,000	16	54.1	< MDA	
						All			
				2.6	18,000	Others	< MDA	< MDA	
				1.6	13,000				
				9.5	9,000	А			125
				2.2	8,000	В			NDA
				2	18,000	С			295
				4.5	1,200	D			25
				1.2					
	Total Test A	rea Smears	3	Avg	Avg	Total O	utside Test Ar	ea Smears	13
B	eta/gamma Sm	ear Average	<mda< th=""><th>4.26</th><th>17,927</th><th>Be</th><th>ta/gamma Sme</th><th>ar Average</th><th>26.98</th></mda<>	4.26	17,927	Be	ta/gamma Sme	ar Average	26.98
							Total Cubi	cle Smears	16
							Total Cubic	le Average	21.92
Note: Blan	k Entries have	no correspoi	nding data	for that	column. A	Alphabetical	locations are L	AS locations	5.

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

As seen in Table 17, dose rates increased significantly up to 20 mR/hr as the concrete was removed.

Table 17- Test 4b Post Remediation Survey Data

	Test Area Re	emovable			Area ntact	Ĭ	Cubicle Rer	novable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
31	< MDA	< MDA		8	32,000	1	130.1	<mda< td=""><td></td></mda<>	
32	< MDA	< MDA		20	38,000	5	355.8	<mda< td=""><td></td></mda<>	
				2	12,000	6	348.9	<mda< td=""><td></td></mda<>	
				5	50,000	7	189.5	<mda< td=""><td></td></mda<>	
				18	50,000	8	170.5	<mda< td=""><td></td></mda<>	
				13	22,000	9	113.5	<mda< td=""><td></td></mda<>	
				8	8,000	14	49.3	<mda< td=""><td></td></mda<>	
				22	45,000	20	49.3	<mda< td=""><td></td></mda<>	
						All			
				8	18,000	Others	<mda< td=""><td><mda< td=""><td></td></mda<></td></mda<>	<mda< td=""><td></td></mda<>	
				5	50,000				
				13	22,000				
				2.8	18,000				
	Total Test A	rea Smears	2	Avg	Avg	Total O	utside Test Ar	ea Smears	38

Test Area Removable			Test Area Contact		Cubicle Removable				
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	beta/gammaalphadpm/100dpm/100nLocationcm²cm²cm²		LAS ccpm	
Beta	a/gamma Sme	ear Average	<mda< th=""><th>10.40</th><th>30,417</th><th>Be</th><th>ta/gamma Sme</th><th>ar Average</th><th>37.02</th></mda<>	10.40	30,417	Be	ta/gamma Sme	ar Average	37.02
							Total Cubi	cle Smears	40
							<b>Total Cubic</b>	e Average	35.17

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

A Masslin from the test area was analyzed by gamma spectroscopy, there was no corresponding air sample to accompany it since the test was abandoned due to the increasing dose rates. Am-241 was also detected on this sample but the beta to alpha ratio remained above 50:1.

Nuclide	3/16/04 Gamma Spec Masslin dpm/smear	Fraction of Total			
Co-60	2.18E+02	1.18E-01			
Cs-134	2.12E+01	1.15E-02			
Cs-137	1.59E+03	8.63E-01			
Am-241	1.32E+01	7.18E-03			
Total	1.84E+03	1.00E+00			
Am-241/TRU	Am-241/TRU Correction Factor				
B	eta to Alpha Ratio	69.15			

# Table 18 - Test 4b Maslin Gamma Spectroscopy Results

Test 5 was conducted in the PAB Metering Pump Cubicle. The Pre-remediation contact dose rate survey was performed on 3/18/04. The pre-remediation smear survey was performed on 3/23/04. The surveys are provided in Attachment 5 and the data is summarized in Table 19. It can be seen that the initial removable contamination levels were higher than in the previous tests.

	Test Area Re	movable			Area ntact	•	Cubicle Rer	novable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
2	227.5	< MDA	•	1.5	•	1	73.1	< MDA	•
D			400	2.5		3	118.2	< MDA	
				2		4	132.5	< MDA	
				2.5	50,000	5	130.1	< MDA	
				3.2		6	156.3	< MDA	
				2.8		7	172.9	< MDA	
				2		8	80.2	< MDA	
				10		9	144.4	< MDA	
				17		10	106.4	< MDA	
				3.8		11	244.2	< MDA	
				7		12	184.8	< MDA	
				10		13	142	< MDA	
				4.5		14	70.7	< MDA	
				8		15	427.1	< MDA	
				7.2		16	182.4	< MDA	
				3.5		17	172.9	< MDA	
				5.2		18	187.1	< MDA	
				2.5		19	123	< MDA	
				3.5		20	85	< MDA	
						All Others	< MDA	< MDA	
						А			250
						В			300
						С			200
	Total Test A	rea Smears	1	Avg	Avg	Total O	utside Test Ar	ea Smears	20
В	eta/gamma Sm	ear Average	227.50	5.19	50,000	000 Beta/gamma Smear Average 146			146.67
							Total Cubi	cle Smears	21
							<b>Total Cubic</b>	le Average	150.51
Note: Blan	k Entries have	no correspor	ndina dat	a for that	column	Alphabetical	locations are I	AS location	•

Table 19 - Te	st 5 Pre-reme	diation S	urvey Data
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Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area. The post remediation smear survey was performed on 3/24/04 14:30. The results are summarized in Table 20. Initially test area post remediation dose rates ranged from 1.5 to 4.5 mR/hr. The test area was resurveyed on 3/25/04 at 10:30 after the chips and fines had been cleared and the dose rates in the test area with the debris removed were significantly lower at less than 1 mR/hr.

	Test Area Rei	movable		Test	Area Itact		Cubicle Rer	movable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
1	< MDA	< MDA		0.4	450	1	244.2	< MDA	
2	56.5	< MDA		0.4	600	3	146.8	< MDA	
20	< MDA	< MDA		0.1	800	4	158.6	< MDA	
21	< MDA	< MDA		0.4	600	5	144.4	< MDA	
				0.3	700	6	80.2	< MDA	
				0.6	600	7	146.8	< MDA	
				0.6	800	8	151.5	< MDA	
				0.6	600	9	66	< MDA	
				0.7	700	10	104	< MDA	
						11	75.5	< MDA	
						12	146.8	< MDA	
						13	104	< MDA	
						15	115.9	< MDA	
						18	87.4	< MDA	
						19	681.3	< MDA	
						23	87.4	< MDA	
						24	89.7	< MDA	
						26	56.5	< MDA	
						27	94.5	< MDA	
						28	49.3	< MDA	
						29	73.1	< MDA	
						30	54.1	< MDA	
						32	61.3	< MDA	
						34	96.9	< MDA	
						36	82.6	< MDA	
						38	73.1	< MDA	
						39	51.7	< MDA	
						40	96.9	< MDA	
						41	94.5	< MDA	
						42	87.4	< MDA	
						43	113.5	< MDA	
						44	284.6	< MDA	

## Table 20 - Test 5 Post Remediation Survey

	Test Area Re	movable			Area ntact		Cubicle Rer	novable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
						45	137.5	< MDA	
						46	77.9	< MDA	
						47	35.1	< MDA	
						48	77.9	< MDA	
						49	260.8	< MDA	
						50	186	< MDA	
						All Others	< MDA	< MDA	
						A			120
						В			220
						С			120
						D			220
						E			170
						F			70
						G			270
	Total Test A	rea Smears	4	Avg	Avg	Total O	utside Test Ar	ea Smears	46
B	eta/gamma Sm	ear Average	14.13	0.46	650	Ве	ta/gamma Sme	ar Average	103.82
							Total Cubi	cle Smears	50
							Total Cubic	le Average	96.64
Note: Blan	ote: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations.								

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

The dose rates were reduced significantly from a maximum of 17 to 0.7 mR/hr and from a pre-test average of 5.19 to a post-test average of 0.46 mR/hr. The pre-remediation and post remediation removable contamination results are similar because a thorough pre-remediation decontamination of the area was not performed. However, they were not detectably elevated by the demolition activity on concrete with an average dose rate 5 mR/hr. The highest smear read 681 dpm/100 cm<sup>2</sup> which is close to the 1000 dpm/100 cm<sup>2</sup> threshold at which posting as a Contaminated Area would be required, and is a level that would be detectable as contamination on personnel and equipment exiting the area.

A composite sample of the concrete chips from Test 5 was analyzed by gamma spectroscopy. The results identified Co-60 and Cs-137 at the concentrations shown in Table 21. The air sample had 1.85 E-10  $\mu$ Ci/cc of Cs-137 and 6.00E-11  $\mu$ Ci/cc of Co-60. This equaled 2.13 ECf which is minimal when the ground release *X/Q* is considered.

Nuclide	μC/ml	Fraction of Total	Air Sample µCi/cc	DAC μCi/cc	Weighted DAC Fraction (DACf)	Eff. Conc μCi/cc	EC Weighted Fraction
Co-60	1.29E-05	1.83E-03	6.00E-11	1.00E-08	6.00E-03	5.00E-11	1.20E+00
Cs-134	<mda< td=""><td>0.00E+00</td><td>0.00E+00</td><td>4.00E-08</td><td>0.00E+00</td><td>2.00E-10</td><td>0.00E+00</td></mda<>	0.00E+00	0.00E+00	4.00E-08	0.00E+00	2.00E-10	0.00E+00
Cs-137	7.02E-03	1.00E+00	1.85E-10	6.00E-08	3.08E-03	2.00E-10	9.25E-01
Total	7.03E-03	1.00E+00	2.45E-10	N/A	9.08E-03	N/A	2.13E+00
Air Sample l	Results	Cs-137	1.85E-10	µCi/cc			
		Co-60	6.00E-11	µCi/cc			
		Gross Beta	1.42E-10	uCi/cc			

Table 21 - Test 5 Air Sam	ple Data and Debris Gamma	Spectroscopy Results
	pie Dutu und Debris Gumme	specific beopy freshires

Test 6 was performed on an area adjacent to Test 5. This was an additional test to verify that remediation of concrete in the 2 mR/hr range would meet the contamination control objectives of for open air demolition. The pre-test smear survey was performed on 3/25/04 at 10:30 and is provided along with the other data in Attachment 6. The pre-demolition contact dose rate survey was performed on 3/25/04 at 14:30. The pre-demolition survey data is summarized in Table 22.

	Test Area								
	Test Area Rei	movable			Area ntact		Cubicle Rem	ovablo	
				00	llaci				
	beta/gamma dpm/100	alpha dpm/100	LAS				beta/gamma dpm/100	alpha dpm/100	LAS
Location	cm <sup>2</sup>	cm <sup>2</sup>	ccpm	mR/hr	Cpm	Location	cm <sup>2</sup>	cm <sup>2</sup>	ccpm
2	104	< MDA		2.3	20,000	4	99.2	< MDA	
3	87.4	< MDA		1.5	25,000	5	118.2	< MDA	
19	< MDA	< MDA		1.8	15,000	6	111.1	< MDA	
				1.9	16,000	7	125.4	< MDA	
				0.8	10,000	8	70.7	< MDA	
				1.2	2,000	9	111.1	< MDA	
				1.5	12,000	11	99.2	< MDA	
				1.2	49,000	12	61.2	< MDA	
				1.2	35,000	13	87.4	< MDA	
				0.8	42,000	14	73.1	< MDA	
				0.8		15	54.1	< MDA	
				1		16	80.2	< MDA	
				1.4		17	182.4	< MDA	
				1.1		18	94.5	< MDA	
				1		19	127.7	< MDA	
				1		22	125.4	< MDA	
				1		23	80.2	< MDA	
				0.8		24	70.7	< MDA	
				0.6		26	379	< MDA	
				0.1		27	109	< MDA	

#### Table 22 - Test 6 Pre-remediation Survey Data

	Test Area Removable				Area ntact		Cubicle Rem	ovable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	Cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
				1		All Others	< MDA	< MDA	
				0.8					
				0.8					
				0.6					
						А			120
						В			220
						С			120
						D			220
						Е			170
						F			70
						G			270
	Total Test A	rea Smears	3	Avg	Avg	Total O	utside Test Ar	ea Smears	27
B	eta/gamma Sm	ear Average	63.80	1.09	22,600	Be	ta/gamma Sme	ar Average	83.70
							Total Cubi	cle Smears	30
							Total Cubic	le Average	81.71
	k Entries have								IS.

NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

The post remediation smear survey was conducted on 3/29/04 at 10:30. After the debris was removed the post remediation dose rate survey was conducted on 3/29/04 at 14:20. This survey is mislabeled as a pre-chip survey in Attachment 6. This post demolition data is summarized in Table 23.

Test Area Removable					Area Itact	Cubicle Removable			
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
4	< MDA	< MDA		0.6	1,000	6	56.13	< MDA	
5	< MDA	< MDA		0.5	1,000	8	64.79	< MDA	
				0.4	10,000	10	73.46	< MDA	
				0.3	1,500	11	125.47	< MDA	
				0.4	500	12	73.46	< MDA	
				0.3	1,000	17	56.13	< MDA	
				0.4	1,000	23	64.79	< MDA	

 Table 23 - Test 6 Post Remediation Survey Data

	Test Area Re	emovable			Area ntact		Cubicle Rer	novable	
Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm	mR/hr	cpm	Location	beta/gamma dpm/100 cm <sup>2</sup>	alpha dpm/100 cm <sup>2</sup>	LAS ccpm
				0.3	600	25	108.13	< MDA	
				0.4	1,000	27	64.79	< MDA	
						34	125.47	< MDA	
						35	220.82	< MDA	
						36	99.47	< MDA	
						38	212.15	< MDA	
						45	83.13	< MDA	
						51	64.79	< MDA	
						All Others	< MDA	< MDA	
						A B			260 240
						C B			300
						D			125
						Е			280
	Total Test A	rea Smears	2	Avg	Avg	Total O	utside Test Ar	ea Smears	27
B	eta/gamma Sm	ear Average	<mda< td=""><td>0.40</td><td>1,956</td><td>Ве</td><td>ta/gamma Sme</td><td>ar Average</td><td>55.30</td></mda<>	0.40	1,956	Ве	ta/gamma Sme	ar Average	55.30
							Total Cubi	cle Smears	29
							Total Cubic	le Average	51.48
Note: Blan	lote: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations.								

Note: Blank Entries have no corresponding data for that column. Alphabetical locations are LAS locations. NDA = No Detectable Activity, MDA = Minimum Detectable Activity Contact Dose Rate and Smear are not at same locations or at the smear locations in the test area.

The Test 6 data showed no significant change in area contamination levels and a slight increase in Large Area Smear results. Maximum dose rates dropped from 2.3 mR/hr to 0.6 mR/hr and average dose rates were reduced from 1.09 mR/hr to 0.4 mR/hr. The maximum removable surface contamination was 221 dpm/100 cm<sup>2</sup>. This is below the personnel contamination threshold and well below the Contaminated Area posting requirement.

An LAS sample of the concrete dust generated during the remediation was analyzed by gamma spectroscopy. The results are shown in Table 24. The air sample obtained during the remediation was 2.41E-11  $\mu$ Ci/cc. When scaled to the gamma spectroscopy results, it is well below the effluent concentrations.

Nuclide	µCi/gm	Fraction of Total	Scaled Air Sample µCi/cc	DAC µCi/cc	Weighted DAC Fraction (DACf)	Eff. Conc µCi/cc	EC Weighted Fraction
Co-60	7.13E-05	1.72E-02	4.14E-13	1.00E-08	4.14E-05	5.00E-11	8.29E-03
Cs-134	4.11E-06	9.91E-04	2.39E-14	4.00E-08	5.97E-07	2.00E-10	1.19E-04
Cs-137	4.07E-03	9.82E-01	2.37E-11	6.00E-08	3.94E-04	2.00E-10	1.18E-01
Total	4.15E-03	1.00E+00	2.41E-11	N/A	4.36E-04	N/A	1.27E-01
Air Sam	ple Result	2.41E-11	µCi/cc				

 Table 24 - Test 6 Air Sample Data and Debris Gamma Spectroscopy Results

Test 6 confirmed that of concrete with contact dose rates in the 2 mR/hr range could be demolished while maintaining maximum beta/gamma removable contamination levels below 1000 dpm/100 cm<sup>2</sup> and average levels below 300 dpm/100 cm<sup>2</sup>. It also confirmed that airborne radioactivity levels will remain low.

#### 3.3. Summary and Conclusions from Connecticut Yankee Concrete Demolition Test Results

As stated in the section 2.2 of this TSD, the objectives of the R2 open air demolition limits were the following:

- Ensure ground level airborne radioactivity concentrations remain ALARA and within regulatory limits.
- Ensure demolition liquid concentrations remain at levels which can be collected, processed and released using plant water treatment systems and discharge points.
- Minimize the spread on contamination within the site boundary such that there is no significant effect on groundwater or the scope of soil remediation required.
- Ensure open air demolition activities can be conducted using conventional demolition techniques with minimal radiological restrictions or controls.

As noted previously, the test cubicles were sealed and no engineering controls or ventilation was used during the demolition tests. Air samples were obtained in the cubicles during the tests. As seen in Table 25, although Test 3 had Am-241 present which resulted in 5.56 ECf in the test area, all air samples remained well below the 0.3 DAC airborne radioactivity area limit at which posting and evaluation of respiratory protection would be required. In addition all results would be well below an effluent concentration at the site boundary when the ground release dispersion coefficient (X/Q) is considered.

Test	Pre-Test Max Contact mR/hr	Post- Test Max Contact mR/hr	Delta Max Contact mR/hr	Air Sample μCi/cc	DAC Fraction	Effluent Conc. Fraction ECf	Without TRU ECf	Without TRU ECf per ∆ mR/hr
Test 1	1.50	0.70	0.80	8.66E-12	1.63E-04	4.66E-02	4.66E-02	5.83E-02
Test 2	2.00	0.50	1.50	2.47E-11	4.94E-04	1.38E-01	1.38E-01	9.20E-02
Test 3	2.50	1.90	0.60	1.17E-10	3.51E-02	5.56E+00	6.46E-01	1.08E+00
Test 4a	6.00	8.00	-2.00	4.14E-11	1.18E-03	2.94E-01	2.94E-01	N/A
Test 4b	9.50	22.00	-12.50	N/A	N/A	N/A	N/A	N/A

#### Table 25 - Summary of CY Demolition Test Air Sample Results

Test	Pre-Test Max Contact mR/hr	Post- Test Max Contact mR/hr	Delta Max Contact mR/hr	Air Sample μCi/cc	DAC Fraction	Effluent Conc. Fraction ECf	Without TRU ECf	Without TRU ECf per ∆ mR/hr
Test 5	17.00	0.70	16.30	4.50E-10	9.08E-03	2.13E+00	2.13E+00	1.30E-01
Test 6	2.30	0.60	1.70	2.41E-11	4.36E-04	1.27E-01	1.27E-01	7.45E-02
Combined Results Test 1 - 3	6.00	3.10	2.90	1.50E-10	3.57E-02	5.75E+00	8.31E-01	2.87E-01
All Results Test 4 Excluded	25.30	4.40	20.90	6.24E-10	4.53E-02	8.00E+00	3.08E+00	1.47E-01
Target Average	1	ECf						
Combined Test 1 - 3	3.5	mR/hr						
All Results Except Test 4	6.8	mR/hr						

When results from Tests 1, 2 and 3 are treated as a composite result, they indicate that concrete up to 3.5 mR/hr can be demolished without generating greater than 1 ECf for cobalt and cesium radionuclides. All test results except Tests 4a and 4b indicate a cut off dose rate of up to 7 mR/hr would be acceptable.

With regard to the objective of maintaining removable contamination well below the Contaminated Area limits of 1000 dpm/100 cm<sup>2</sup> beta/gamma and 20 dpm/100 cm<sup>2</sup> alpha, only the Tests 1 through 3 results are meaningful for calculating a dose rate cut off level. Test area dose rates increased during Tests 4a and 4b invalidating the data and pre-test contamination levels were too high in Tests 5 and 6 resulting in minimal to negative increases in post-test contamination levels. However, Test 5 results do indicate that overall contamination levels were not significantly elevated despite the high delta in pre-test and post-test maximum dose rates.

Another goal of the open air demolition criteria is to allow demolition to proceed without protective clothing being required to prevent personnel contaminations. Tests 1, 2, 3, and 6 indicate that the contamination levels in the area can be maintained below 300 dpm/100 cm<sup>2</sup> when maximum dose rates on the concrete are remediated to less than 2 mR/hr prior to open air demolition. Test 5 resulted in a maximum beta/gamma removable contamination level of 681 dpm/100 cm<sup>2</sup> which is approaching the Contaminated Area limit and is in the range that can be reliably detected by personnel contamination monitoring equipment. The data based upon Tests 1 through 3 as shown in Table 26 indicates that maximum area contamination levels can be maintained in the range of 300 dpm/100 cm<sup>2</sup> at open air demolition cut off dose rates of 2 mR/hr contact on concrete. If all of the test results except 4a and 4b are considered relative to the maximum dose rates and maximum removable contamination levels, a cut off dose rate of 10 mR/hr is calculated. However, there is not enough test data at the dose rates exceeding 2 mR/hr to reliably demonstrate that contamination levels can be maintained under those at which personnel contaminations would occur.

Test	Pre-Test Max Contact mR/hr	Post-Test Max Contact mR/hr	Delta Max Contact mR/hr	Max Pre-Test dpm/100 cm <sup>2</sup>	Max Post- Test dpm/100 cm <sup>2</sup>	Delta Max dpm/100 cm <sup>2</sup>	Delta Max dpm/100 cm <sup>2</sup> per Delta Max mR/hr
Test 1	1.50	0.70	0.80	122.8	235.5	112.69	140.9
Test 2	2.00	0.50	1.50	0.0	261.5	261.53	174.4
Test 3	2.50	1.90	0.60	69.0	200.2	131.20	218.7
Test 4a	6.00	8.00	-2.00	295.2	132.5	-162.70	<i>81.4</i>
Test 4b	9.50	22.00	-12.50	<i>99.2</i>	355.8	256.60	-20.5
Test 5	17.00	0.70	16.30	427.1	681.3	254.20	15.6
Test 6	2.30	0.60	1.70	379.0	220.8	-158.18	-93.0
Combined Results Test 1 – 3	6.00	3.10	2.90	191.84	697.26	505.42	174.3
All Results Test 4 Excluded	25.30	4.40	20.90	997.94	1599.38	601.44	28.8
Target Average	300	$dpm/100 cm^2$					
Combined Test $1-3$	1.7	mR/hr					
All Results Except Test 4	10.4	mR/hr					

# Table 26 - Summary of Test Result Maximum Dose Rates and<br/>Maximum Beta/Gamma Removable Contamination

Similarly, a cut off value of 7.4 mR/hr can be calculated based upon the pre and post test contact dose rate averages and pre and post-test cubicle removable contamination averages as seen in Table 27. The negative results in Table 27 for Tests 5 and 6 are due to dilution by concrete dust from the test. However, as stated above there is insufficient data at contact dose rates exceeding 2 mR/hr to establish the frequency at which personnel performing open air demolition on concrete above 2 mR/hr would be exposed to removable contamination levels exceeding 300 dpm/100 cm<sup>2</sup>.

				e Containn			
	Dre				Max		
	Pre-	<b>-</b>			Post-		
	Test	Post-	Delta	Max Pre-	Test	Delta	
	Avg	Test Avg	Avg.	Test Avg	Avg	Avg	dpm/100
	Contact	Contact	Contact	dpm/100	dpm/100	dpm/100	cm <sup>2</sup> per
Test	mR/hr	mR/hr	mR/hr	cm <sup>2</sup>	cm <sup>2</sup>	cm <sup>2</sup>	mR/hr
Test 1	0.66	0.43	0.23	12.9	16.1	3.15	13.9
Test 2	1.42	0.37	1.06	0.0	56.2	56.16	53.2
Test 3	1.78	1.17	0.60	11.8	29.3	17.53	29.0
Test 4a	3.37	4.67	-1.30	55.9	33.2	-22.65	17.4
Test 4b	4.26	10.40	-6.14	21.9	35.2	13.25	-2.2
Test 5	5.19	0.46	4.74	150.5	96.6	-53.87	-11.4
Test 6	1.09	0.40	0.69	81.7	51.5	-30.22	-43.7
Results Test 1 - 3	3.86	1.97	1.89	24.69	101.53	76.84	40.8
All Results Test 4 Excluded	10.14	2.83	7.32	256.91	249.66	-7.26	-1.0
Target Average		300	dpm/1	$100 \text{ cm}^2$			

 Table 27 - Summary of Test Result Average Dose Rates and Average

 Cubicle Beta/Gamma Removable Contamination

Test 1 – 3	7.4	mR/hr
All Results Except Test 4	-302.4	mR/hr

As seen in Table 28 the embedded source term was predominantly Cs-137 at the CY test locations. Therefore, significant TRU or non-gamma high energy beta emitters (e.g., Sr/Y-90) could result in a cutoff dose rate lower than 2 mR/hr contact on concrete in order to maintain work area airborne radioactivity and contamination levels within the target ranges.

	Test 1	Test 2	Test 3	Test 4	Test 4	Test 4	Test 5	Test 6
Nuclide	μCi/g	dpm/sample	μCi/g	μCi/g	μCi/g	dpm/smear	µCi/ml	μCi/g
Co-60	2.77E-05	2.15E+02	1.13E-04	2.90E-05	2.90E-05	2.18E+02	1.29E-05	7.13E-05
Cs-134	1.01E-05	5.89E+01	3.54E-05	1.12E-05	1.12E-05	2.12E+01	<mda< td=""><td>4.11E-06</td></mda<>	4.11E-06
Cs-137	1.04E-03	5.24E+03	3.04E-03	1.13E-03	1.13E-03	1.59E+03	7.02E-03	4.07E-03
Am-241	<mda< td=""><td><mda< td=""><td>1.34E-06</td><td>0.00E+00</td><td><mda< td=""><td>1.32E+01</td><td><mda< td=""><td><mda< td=""></mda<></td></mda<></td></mda<></td></mda<></td></mda<>	<mda< td=""><td>1.34E-06</td><td>0.00E+00</td><td><mda< td=""><td>1.32E+01</td><td><mda< td=""><td><mda< td=""></mda<></td></mda<></td></mda<></td></mda<>	1.34E-06	0.00E+00	<mda< td=""><td>1.32E+01</td><td><mda< td=""><td><mda< td=""></mda<></td></mda<></td></mda<>	1.32E+01	<mda< td=""><td><mda< td=""></mda<></td></mda<>	<mda< td=""></mda<>
Total	1.08E-03	5.51E+03	3.19E-03	1.17E-03	1.17E-03	1.84E+03	7.03E-03	4.15E-03
% Cs-137	97%	95%	95%	97%	97%	86%	100%	98%

 Table 28 - Summary of Post Remediation Gamma Spectroscopy Results

# 3.4. LACBWR Concrete Gamma Spectroscopy Results

RS-TD-313196-001 (8) evaluated results from twelve (12) concrete core samples from the La Crosse end state structures, six (6) in the Reactor Building, three (3) in the Waste Treatment Building (WTB) and three (3) in the Piping Tunnel. The WTB had the highest concentrations up to 10,450 pCi/g of Cs-137. Cs-127 was 87% of the mix in this core as well as in the mean distribution of all 12 cores. Most of the remaining activity was Ni-63, a weak pure beta emitter, at 8% to 9% of the mix. Co-60 was just over 1% of the mix. Thus contact dose rates are driven by Cs-137.

 Table 29 - La Crosse Highest Concrete Core Sample and Average

	WTB	WTB	
	(selected)	(selected)	Mean
	Avg Conc.	Avg	Distribution
Nuclide	pCi/g	Fraction	Fraction
H-3	1.219E+00	0.01%	0.07%
C-14	6.083E+00	0.05%	0.07%
Fe-55	1.379E+01	0.11%	0.29%
Ni-59	1.629E+02	1.36%	1.04%
Co-60	1.345E+02	1.12%	1.22%
Ni-63	1.083E+03	9.02%	8.05%
Sr-90	1.089E+02	0.91%	0.91%
Nb-94	5.403E-01	0.00%	0.01%
Tc-99	6.330E-01	0.01%	0.02%
Cs-137	1.045E+04	87.03%	87.74%
Eu-152	7.413E+00	0.06%	0.09%
Eu-154	4.983E+00	0.04%	0.08%
Eu-155	3.553E+00	0.03%	0.05%

Np-237	4.840E-02	0.00%	0.00%
Pu-238	1.408E+00	0.01%	0.02%
Pu-239/240	1.329E+00	0.01%	0.01%
Pu-241	2.205E+01	0.18%	0.31%
Am-241	4.206E+00	0.04%	0.04%
Am-243	2.768E-01	0.00%	0.00%
Cm-243/244	3.275E-01	0.00%	0.01%
Total	1.201E+04		

The sample with the highest activity in the first column of Table 29 was modeled using MicroShield 8.03 with embedded contamination in the first  $\frac{1}{2}$  inch of a 72 inch diameter source at 1.045E+4 pCi/g. The input parameters and results are provided in Table 30 and the MicroShield report is provided in Attachment 6.

Source Parameters	Value	Units	Value	Units		
Radius	36	inches	91.44	cm		
Thickness	0.5	inches	1.27	cm		
Volume	2035.8	in3	33360	cm3		
Source Density	N/A	N/A	2.35	g/cc		
Source Mass	N/A	N/A	78396	grams		
Cs-137	N/A	N/A	1.05E+04	pCi/g		
Source Cs-137 Activity	8.192E-04	Ci	8.192E+08	pCi		
Co-60	N/A	N/A	1.345E+02	pCi/g		
Source Co-60	1.054E-05	N/A	1.054E+07	pCi/g		
Contact Dose Rate	1.91	mR/hr				
Open Air Demo Concentration	1.09E+04	pCi/g				

Table 30 - MicroShield Dose Rate Model Parameters

The contact dose rate calculated for the WTB Floor sample with a 1.045E+4 pCi/g source term was 1.91 mrem/hr. Based upon this, the 2 mR/hr contact open air demo limit equals approximately 1.09E+4 pCi/g of Cs-137 in the first half inch of concrete.

### 4. CONCLUSION

Based upon the comparison to other facilities open air demolition limits, the results of the Connecticut Yankee tests, and the La Crosse concrete data, the following open air demolition limits are recommended for La Crosse.

Demolition Category	Total Surface Contamination	Loose Surface Contamination						
	β/γ	β/γ	α					
R2 <sup>Open Air</sup>	Less than 2 mR/hr contact on concrete Greater than 2 mR/hr contact on material other than concrete as authorized by RP	1000 dpm/100cm <sup>2</sup> Max 300 dpm/100cm <sup>2</sup> Avg.	20 dpm/100cm <sup>2</sup> Max					

 Table 31 – Recommended Open Air Demolition Limits

#### 5. **REFERENCES**

- 1. San Onofre Unit 1, HP&E Position Paper, Airborne Effluent Controls During Decommissioning, September 27, 2000.
- 2. Maine Yankee, Technical Evaluation TE-013-01, Radiological Consequences of Hotside Building Demolition, October 10, 2002.
- 3. Yankee Rowe, RP-Memo File No. 03-024, Airborne Effluent Dose Consequences of Building Demolition, September 3, 2003.
- 4. SAFSTOR/Decommissioning Offsite Dose Calculation Manual, Vol. 4, Rev. 22, Humboldt Bay Power Plant, July 23, 2012.
- 5. Technical Support Document CY-HP-0029, Rev. 0, HEPA Units Environmental Release Evaluation February 9, 1999.
- 6. LACBWR Decommissioning Plan and Post-Shutdown Decommissioning Activities Report, March 12, 2014.
- 7. Technical Support Document CY-HP-0175, Rev. 0, Technical Basis for Structure/Building Open Air Demolition January 19, 2005.
- 8. Energy*Solutions* Technical Support Document RS-TD-313196-001, "Radionuclides of Concern During the Decommissioning of the La Crosse Boiling Water Reactor".
- 9. 10 CFR 20 Standards for Protection Against Radiation, Subpart E—Radiological Criteria for License Termination http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/.
- 10. NUREG-1575, Rev. 1, Multi-Agency Radiation Survey And Site Investigation Manual (MARSSIM), August 2000.
- 11. Canberra 31013E V4.2 Technical Reference Manual, Model S573 ISOCS Calibration Software.
- 12. NRC ML112140119, Containment Liner Corrosion, Darrell Dunn, U.S.N.R.C, August 2011.
- 13. Lacrosse Restoration Project License Termination Plan.

# 6. **ATTACHMENTS**

- 6.1. Attachment 1.A CY Test 1 "B" Charging Pump Cubicle Survey
- 6.2. Attachment 1.B CY Test 1 "B" Charging Pump Cubicle Sample Data
- 6.3. Attachment 2 CY Test 2 "B" Charging Pump Cubicle Survey and Sample
- 6.4. Attachment 3.A CY Test 3 "B" Charging Pump Cubicle Survey
- 6.5. Attachment 3.B CY Test 3 "B" Charging Pump Cubicle Sample Data
- 6.6. Attachment 4.A CY Tests 4a and 4b "B" Charging Pump Cubicle Survey
- 6.7. Attachment 4.B CY Tests 4a and 4b "B" Charging Pump Cubicle Sample Data
- 6.8. Attachment 5.A CY Tests 5 Metering Pump Cubicle Survey and Sample Data
- 6.9. Attachment 5.B CY Tests 5 Metering Pump Cubicle Survey and Sample Data
- 6.10. Attachment 6.A CY Tests 6 Metering Pump Cubicle Survey
- 6.11. Attachment 6.B CY Tests 6 Metering Pump Cubicle Sample Data
- 6.12. Attachment 7 MicroShield Model Embedded Cs-137 for Half Inch Thick Concrete Source

# Attachment 1.A

RS-TD-313196-005 Revision 0

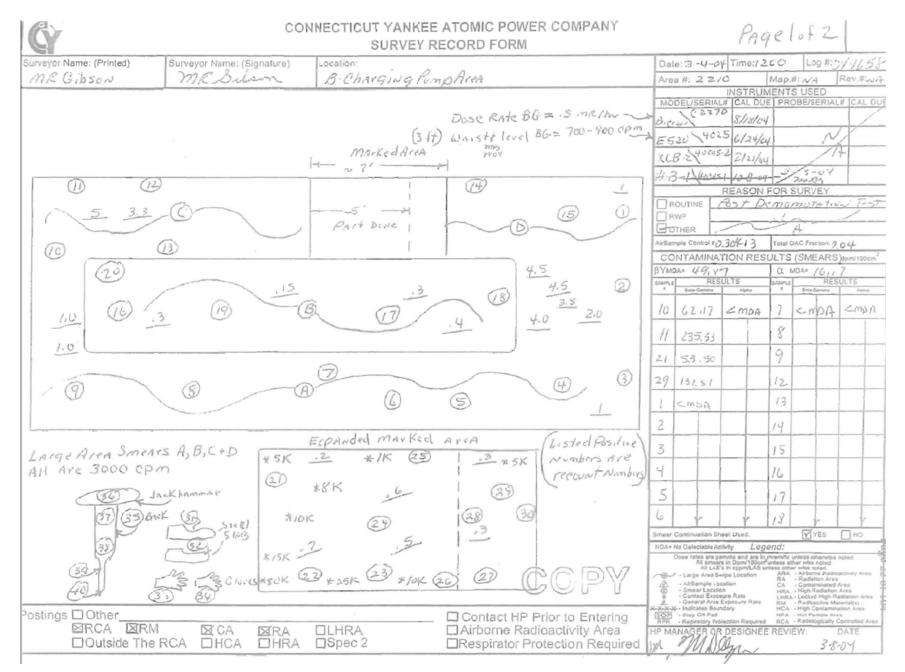
# CY Test 1 "B" Charging Pump Cubicle Survey

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## Attachment 1.B CY Test 1 "B" Charging Pump Cubicle Sample Data

Health F	hysics Procedure		r oper		Atta	C	O			CY-H	P-0175 Revis Page 24 of		
Control Numbe		)413	Air Sample Counting Sheet Section 1 - Collection Data							Sample Taken By	Gi	bson	
Sample 4-	Mar-04		ocation an lies Perform		PAB-Charg	ing Pur	mp Cut	oicle 'A': C	oncrete '	Tetn			
RWP / Job Step	4149-1	Routine:	D W	r M	Sampler Serial 90 Sampler Mumber: 90					ras	Sampler Cal Due Date:	6/15	2004
Sample Tir On: 03/04/04 10:55	0ff: 03/04/04 13:30	Collec	tion Time ( 15		Flow Rate		1 cfm	1			Sample Volume 155 Cu. Ft.		
Gross Beta-Gamm	Convers	ion Factors:	L	iters 4.5	E-10 liters uCi / ml		oncentratio		ity of ≤ 6.0 E- 1.6E-11 cub clicc requires	ic feet uCi /	ml dpm		
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Section	3 Gros	s Alpl Seria			Cal Due		S	MGCA results		llice Co-60 ne	= 3.28E-12 quires alpha count ross α. Concentr	ation (uC	Ci/cc)
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Gross Counts	Count Time (min	Gross	CPM	Bk	gd. CPM	MD	CR	Net CPI	M Ef	f. Factor	Conv. Factor	Volume	SAF
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Section	5 Meas	sured	DAC	Frac	tions								
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Reviewed	By:								Dat	te:			

Gamma Spectroscopy Sa	mple Analysis Request Form
Gamma Specifoscopy Sa	inple Analysis Request Form
Sample Taken By: <u>MRG:650-</u>	Date / Time: / 445
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Location: Charging Pump BR	
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If from Personnel: Name:	EID 85942 RWP: 4149
Contamination Levels:	~
<u>βγCCPM/DPM</u>	<u><mi>A_</mi></u> ą CCPM / DPM_ <u>60ルR_</u> mR/hr
Sample Weight / Volume:	(cc, ml, grams, etc.)
Sample Container: 12 rter	
Is this sample for free release?	YES or (NO) (circle one)
Is this sample being shipped offsite?	YES or NO (circle one)
Save / Return sample after analysis?	YES or NO (circle one)
Other info:	
If this sample requires special storage re	quirements, please describe:
Responsible Individual for Disposal of S	ample
Name:	Dept:/ Ext:
Sample delivered to Count Room:	Date / Time:
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COUNT ROO	OM USE ONLY
Qualitative or Quantitative Analysis? Ex	plain below.
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Sample ID Number: 040304025	
Analysis Completed By: <u>Second</u>	Date:Date:
Sample Storage Location:	Date: 3-5-09

PAGE 20 01 OF

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CYAPCO HADDAM NECK STATION

#### POST NID QA ANALYSIS

TITLE : - CONCRETE SAMPLE: PAB-CHARGING PUMP CUBICLE B

SAMPLE No.: 040304025OPERATOR NAME: CASSAMPLE TYPE: DIRT/SED/VEGSAMPLE GEOMETRY: 1LMARPAPERCOUNT TIME: 4-MAR-2004 17:14:03.SAMPLE QUANTITY: 5.14000E+02SAMPLE TIME: 4-MAR-2004 14:45:00.DETECTOR: DET 2LIBRARY: CHEM\_DIRT::

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/GM	COMMENTS
K-40	1460.80	0.30	8.791E-06	QA Results OK
CO-60	1332.49	0.12	2.766E-05	QA Results OK
CS-134	604.70	-0.01	1.011E-05	QA Results OK
CS-137	661.65	-0.01	1.044E-03	QA Results OK
		$\sigma = -\frac{1}{2} (\frac{1}{2} + \frac{1}{2} + $		
AVG ENER	GY DIFF :	= 0.10	1.091E-03 =	TOTAL GAMMA ACTIVITY

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UNIDENTIFIED/REJECTED PEAKS

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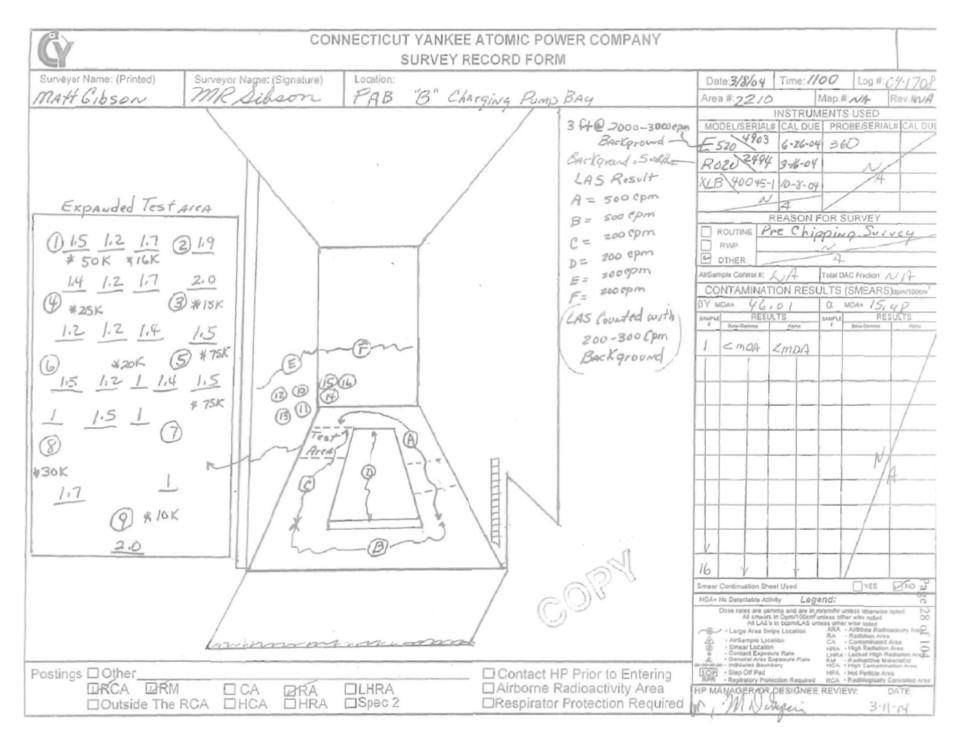
Total Unidentified/Rejected Peaks = 3 % Unidentified/Rejected Peaks = 25.00

Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis library)

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## Attachment 2 CY Test 2 "B" Charging Pump Cubicle Survey and Sample



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		loventre	mana	5 My LI	ma	mb.	14 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100		8	AirSample Lot     Smear Locald	calion		Radiation Area     Contaminated     High Radiation	
Destings 10 Other											Indicates (bbur	Exposure Rate	PIM PICA	<ul> <li>A - Locked High R</li> <li>Radioscive M.</li> <li>High Contentin</li> </ul>	Radiation Area latertal(s) hation Area
Postings Other_ RCA	[2]RM	CA	⊡ŔA	<b>LHRA</b>			home Ra	Prior to Enteri adioactivity Are		REAL ID NO	- Blep Off Ped - Repiratory Pro		HPA RCA	Hol Particle An Radiologically	rea Controlled Area
Outsid				Spec 2				Protection Requ		11	11/105	<b>1</b>	REVI		DATE:

C	<b>V</b> atabil	( »́				C	ONNEO			EE ATO			COMPANY				
Surv	eyorName:	(Printed)		Surveyor Na MA	Debs	m	Liocat	ion: <sup>O</sup> AB	"B'	'ChAr			BAY	Area #: 2	le: 3-9-04 2/0 Map.		Rev.#;wn
						MINATIC	IN RESULTS	(SMEARS) d	lpm/100	cm*		· · ·		Page	2	of 2	
SAMPL	RES Beb-Gamma	Alpha	SAMPLE	RES Bela-Gamma	Alpha	SAMPLE I	RE: Beta-Gamma	Alpha	SAMPLI 1	E RE Bela-Gamina	SULTS Apha	PAMPLE	RESULTS Bela-Gerrana Alpha	A MODEL#	SERIAL#	ENTS USE	CAL DUE
21	< MDA	< MDA											/	ROZO	1184	360	3/23/04
22														E 520	4039		6/24/04
23														XLB-2	40045-2		2-2/-05
24																	
25														-	- <u>A</u>		
26											/				2		
27																	+
28														CC	NTAMINATIO	RESULTS	(LAS) RESULTS
29								1/	1						Distriction		/
30								MA									/
31	V						/	1								$\square$	
															-	X	
		_			/	1					_				M	A	
				. /													
				/				251							1		
			1				-0	5							/		-
							9										000
	1	-															
1	/													Survey Ar	eader informa ea# etc.) Shou irvey for which eing used.	Id match the	alothe

1

## Connecticut Yankee Atomic Power Co.

Connecticut Yankee Decommissioning Project

Sample Taken By: <u>MA Cibsor</u>	Date / Time: 3/9/64 10	45
Copy of Results To: <u>Degasperi</u>		
Sample Description: Large Area S	Swipe post concrete Chipping	Tes
Location: Pumping Station 2	2 p.4	
Reason for Analysis: IN for MAtron		
f from Personnel: Name:	EIDRWP:	
Contamination Levels:		
400-800 β γ CCPM / DPM	a CCPM / DPM	mR/hr
Sample Weight / Volume:		
Sample Container:		
s this sample for free release?	YES or NO (circle one)	
s this sample being shipped offsite?		
Save / Return sample after analysis?	YES or NO (circle one)	
Other info:		
If this sample requires special storage r	equirements, please describe:	
Responsible Individual for Disposal of S	Sample	
Name:	Dept: Ext:	
Sample delivered to Count Room:	Date / Time:	
COUNT RO	OOM USE ONLY	
Qualitative or Quantitative Analysis? Ex 1000 See. Count 8	xplain below.	
TOUD dec. Count o	Sign L	<u>-</u> j
1 in En Opiller	TEORD PM	
Sample ID Number: 040205021	7	
Sample ID Number: 070309021	Data: 03-06-d	
	Date: O3-09-0	di

9-MAR-2004 15:18:14.40 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - L.A.S: PAB-PUMPING STATION #2 CONCRETE CHIPS REASON FOR ANALYSIS: Supervisor request \* SURVEY ID RWP NUMBER : N/A : N/A \* SAMPLE GEOMETRY : 47MLFILTER SAMPLE ID : 040309021 SAMPLE TIME : 9-MAR-2004 10:45: \* GEO EFFICIENCY DATE: 24-JUN-2003 SAMPLE TYPE : SMEAR \* SAMPLE QUANTITY : 1.00000E+00 SMR. DETECTOR : DET 5 \* LIBRARY : CHEM SMEAR : 9-MAR-2004 01:49: \* ENERGY TOLERANCE: 0.70000 LAST ENERGY CAL \* HALF LIFE RATIO : 9.00000 KEV/CHANNEL : 5.00670E-01 START CHANNEL : 100 \* END CHANNEL ACQ DATE & TIME : 9-MAR-2004 15:01: \* DEADTIME (%) \* END CHANNEL : 4096 : 0.0% PRESET LIVE TIME : 0 00:16:40 \* SENSITIVITY : 5.00000 \* GAUSSIAN SEN ELAPSED REAL TIME : 1000.4 Secs : 10.00000 1000.0 Secs CORRECTION FACTOR: 2.22000E+06 ELAPSED LIVE TIME : DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK; [NEU.SAMPLE.RP.NEW]040309021\_ADC5\_SMEAR.CNF;1 \*\*\*\* ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 \*\*\*\*\* Collected by : GIBSON Contains Qualitative Licensed REVIEWED BY : Analysis COMMENTS Materia) Only \* \* Post-NID Peak Search Report It Bkgnd FWHM Channel Left Pw %Err Fit Nuclides Energy Area 0 605.23 24 30 0.61 1209.42 1204 14 51.3 CS-134 10 1.48 1321.96 1315 14 2.0 0 661.53\* 2532 CS-137 0 795.73 27 . 0 1.81 1590.22 1585 10 19.2 CS-134 0 1173.26\* 81 4 1.85 2345.16 2337 14 12.7 CO-60 0 2.09 2662.95 2657 11 14.1 0 1332,13\* 56 CO-60

Summary of Nuclide Activity Sample ID : 040309021	Page : 2 Acquisition date : 9-MAR-2004 15:01:16
Total number of lines in spectrum Number of unidentified lines Number of lines tentatively identifie	5 0 d by NID 5 100.00%
Nuclide Type : AP	
CO-60 5.27Y 1.00 2.152E+02 CS-134 2.06Y 1.00 5.888E+01	Decay Corr Decay Corr 1-Sigma dpm/SMR. 1-Sigma Error %Error Flags 2.152E+02 0.209E+02 9.71 5.889E+01 1.098E+01 18.64
Total Activity : 2.741E+02	2.741E+02
Nuclide Type : FP Wtd Mean	Wtd Mean
Uncorrected	Decay Corr Decay Corr 1-Sigma dpm/SMR. 1-Sigma Error %Error Flags
Total Activity : 5.236E+03	
Grand Total Activity : 5.510E+03	
Flags: "K" = Keyline not found "E" = Manually edited	"M" = Manually accepted "A" = Nuclide specific abn. limit

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 9-MAR-2004 15:18 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - L.A.S: PAB-PUMPING STATION #2 CONCRETE CHIPS

SAMPLE No.<th::040309021</th>OPERATOR NAME: CASSAMPLE TYPESMEARSAMPLE GEOMETRY: 47MLFILTERCOUNT TIME9-MAR-2004 15:01:16.SAMPLE QUANTITY: 1.00000E+00SAMPLE TIME9-MAR-2004 10:45:00.DETECTOR: DET 5LIBRARY: CHEM\_SMEAR..

	ENERGY	DIFF (KEV)	DECAY CORR. dpm/SMR.	
			,	
CO-60	1332.49	-0.351.50	2.152E+02	QA Results OK
CS-134	604.70	0.53	5.889E+01 X	* Peak FWHM = 0.61 * Count Rate Error = 51.29
CS-137	661.65			QA Results OK
		$\omega = \omega = -$		
AVG ENER	GY DIFF =	= 0.02	5.510E+03 =	TOTAL GAMMA ACTIVITY

Qualitative	Contains
Analysis	Licensed
Only	Material

UNIDENTIFIED/REJECTED PEAKS

GAMMA/SEC POTENTIAL ENERGY NET AREA FWHM GAMMA/SEC /SMR. % ERROR FLAG ID ACTIVITY No Unidentified/Rejected Peaks

	·				
	)				
Performed by:	An			No. of Concession, Name	
Reviewed by	( L U	cb_			
**** End	OF R	nart	( 1 5	are )	* * * *
4.21 X.A	JI NO	T			
		V · .			

Gontrol Num	nber:		A	tachment A			rage 55 OF 104
		808		le Counting 1 - Collection	Sample Taken B	y: Gibson	
Sample Date:	8-Mar-04	Sample Löčälfon and Activities Parform		pit concrete chipp	ping		
RWP / Job Step	4149-1	Routine: D W	Sampler Seri	al 90	Sampler Type:	ras	Sampler Cal 6/15/2004 Due Date:
Sample	Time & Dale	Collection Time (r	nin) Flow Rat	0			Sample Volume
On: 03/08/04 13:4	Off: 5 03/08/04 15:15	90		1 cfm			90 Cu. Ft.

Gross Beta-Gamma activity of ≤ 6.0 E-11 = ≤ 0,3 Total Particulate DAC

Conversion Factors: Liters -- 4.5E-10 liters uCi/ ml dpm

Co-60 activity of  $\leq$  6.0 E-11 =  $\leq$  0.3 Total DAC Cubic Feet - 1.6E-11 cubic feet uCi / ml dpm

Section 2 -- Gross Beta-Gamma

Gross  $\beta/\gamma$ concentration of > 6.0 E -11 uCi/cc requires MGCA Count, if available

Count Time / Date	Instrument	Serial No.	Cal Due		Sample Counted B	y:	Gross β/γ Concentration (uCi/co			
3/8/04 18:42	XLB-1	40045-1	10/08/04		Conrad			2.47E-	11	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDGR	Net GPM	Eff. F	actor	Conv. Factor	Volume	
29	0.5	58.00	2.44	12.72	55.56	2	.5	1.6E-11	90 Cu, FL	
			and the second sec				MDA	= 5.65E-12		

Section 3 -- Gross Alpha

MGCA results of > 6.0E-11 uCl/cc Co-60 requires alpha count

st Count Time / Dare	Instrument	Serial No.	Cal Due	S	ample Counted B	Gross & Concentration (uCi/cc)					
N/A	N/A	N/A	N/A			N/A			N//	A	
Gross Counts_	Count Time (min)	Gross CPM	Bkgd. CPM	MD	CR	Net CPM	Eff. F	actor	Conv. Factor	Volume	SAF
N/A	N/A	N/A	N/A	N/	A	N/A	N	A	1.6E-11	10 Ga FC	1.3
								MDA =	, i		

					Initial Gro	ss alpha concentrati	ion of $\geq 1.0$	0 E-12 req	uires a decayed	recount	t.
2nd Count Time / Date	Instrument	Serial No.	Cai Due	S	ample Counted By	Gross & Concentration (uCi/cc)					
N/A.	NIA	N/A.	N/A			N/A			N//	Ą	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MD	CR	Net CPM	Eff, P	actor	Conv. Fáctor	Vólume	SAF
N/A	N/A	N/A	N/A. N/J		A	N/A	N	íA.	1.6E-11	10 Ca. Pl.	1.3

## Section 4 -- Scaled DAC Fractions

(Only for air samples (aken in area less than 200 dpm/100 cm<sup>2</sup> alpha)

MDA =

Туре	uCi/cc	DAC Fraction	Scaling Conversion	Scaled α/β/γ DAC Fraction
Co-60 or Gross B/y (DAC=1.0E-8)	2.47E-11	2.47E-03	50 X Co-60 OR Gross β/γ DAC Eraci	0.124
(			Ygios	

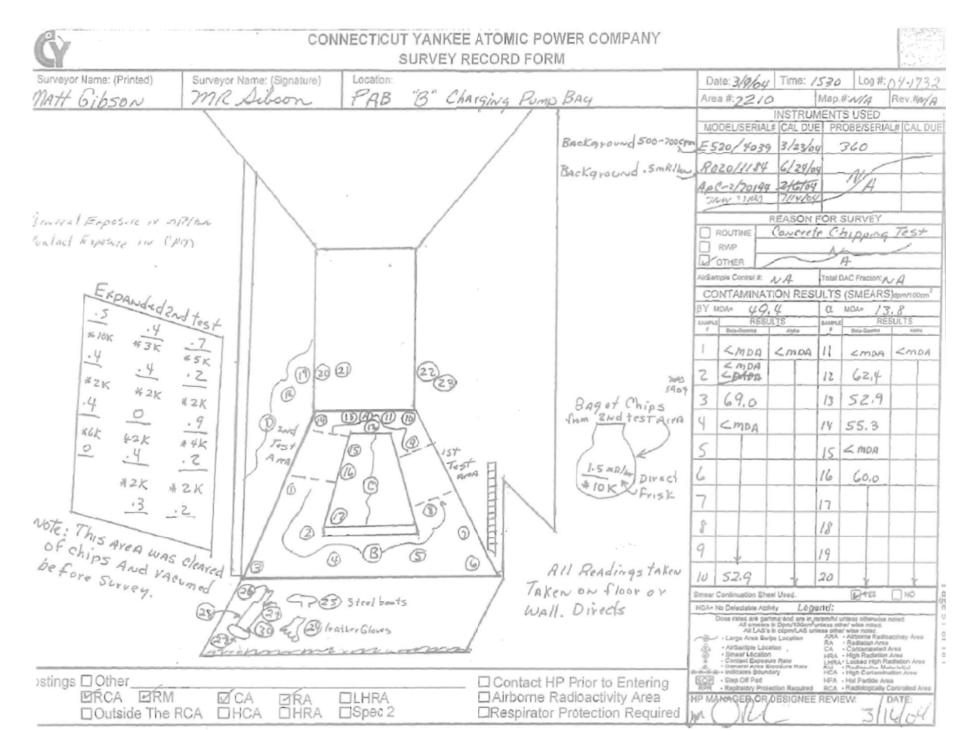
## Section 5 -- Measured DAC Fractions

Туре	Initial uCi/cc	Initial DAC Fraction	Final uCi/cc	Final DAC Fraction
MGCA or Gross B/y (DAC=1.0E-8)	N/A	N/A	N/A	N/A
Gross Alpha (DAC=3.0E-12)x1.1	N/A	N/A	N/A.	N/A
Total Measured DA(	C Fraction =	N/A		N/A

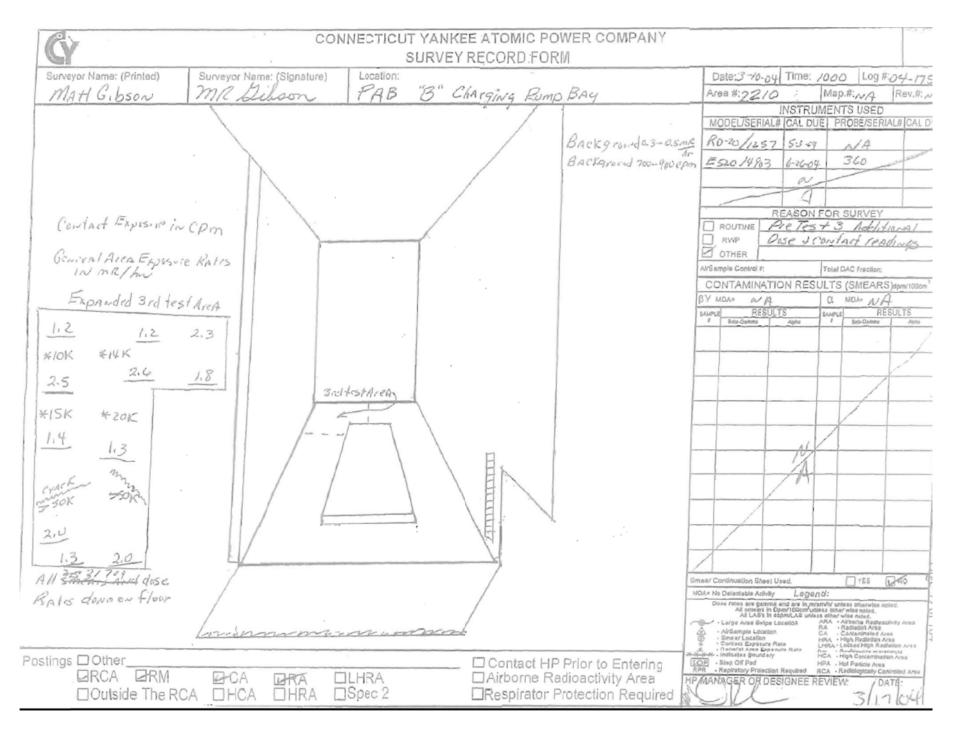
Reviewed By

1-25-04 Date:

## Attachment 3.A CY Test 3 "B" Charging Pump Cubicle Survey



10	<b>Y</b> dina					(	CONNE				MIC POW		COMPANY					<b>新闻</b>
Surv ()	eyor Name	:(Printed) Crbson	,	Surveyor I MR	Name: (Sign Sebsor	~		ation:	B" (	harg	ING ASP				Survey Dat Area #; 2, Page	a: 3/9/04 210 Map	Survey Tim #: NA of 2	е: /530 Rev.#жд
SAMPL	RE	SULTS	SAMPL	e Rê	SULTS	SAMPLE		ESULTS	SAMPL		ESULTS	SAMPL	RESULTS	3	Fage		IENTS USED	
1	Bele-Gamma	Alpha	1	Bela-Gamma	Alpha	1	Bela-Qamme	a Alpha	1	Bele-Gamm	Alpha		Bela-Gamma	Apha	MODEL#	SERIAL#	PROBE TYP	E CAL DUE
21	< mDA	< MDA												/	E 570	4039	360	3-23-04
22				•									X		R020	1184	NA	6-24-04
25												1			APC-Z	70194	3/12/14	2-6-04
24												V						
25											/	1					N	en den 15.00000 (1.000000 #1.00000 #1.0000
26											/					/	TA	
27										/								
28									17			1			CO	NTAMINATIO	N RESULTS (	LAS)
			1					1.7	1							RESULTS		RESULTS
29			-			$\left  \right $		P/				-			A 229	ccpm		
30	Y	Y	-				/	A	_						B 155	copm		/
			-												C 225	cipm		
						4									D 175	ccpm	N	
_									_								A	
				/				-										
				/														
_															/			
7															Survey Area	ader informat # etc.) Shoul rey for which a ng used.	d match that	of the



CY	CON		NKEE ATOMIC P	OWER COMPANY						a straining and a straining astraining and a straining and a straining and a straining and a straining astraining and a straining astrain astraining
Surveyor Name: (Printed) MAH Gibson	Surveyor Name: (Signature) M. R. Dibson	Location:	Charging Pun			Date3/10/0 rea #:221	10	Ma	p.#: NA	1:
Expanded Test. Here Standed Test. Here Kark 1.3 1.2 HER KARK 1.0 1.9 Out No.	3Area C	OPY		BREKGROUND - SMRIA BREKGROUND 500-7000 BREKGROUND FOR LANG AITA Swijd Reading WAS 125 CPM LANGE AITA Swijts		DELISER	INSTRU AL# CAL DI 3 5-5- 3 6-26-0 94 7-14-0 REASON P3-5+ C 50 ry	JMEN UE P 09 24 24 24 24 24 24 24 24 24 24 24 24 24	SURVEY	Test
× 2.5K +8K 425K +7k 1.0 1.0 ×1K +9K			3	A 12500pm B 12500pm C 200 00pm D 17500pm E 12500pm G 200 00pm	1 2 3 4 5 6 7	а <u>RES</u> <u>Bin-Canad</u> <mda <mda 200.2 86.2 71.9 СтDA</mda </mda 	Apha Apha Company	111 12 13 14	e RE Beis-Gemme	SULTS Agen S MD A
ostings 🗆 Other □RCA □RM □Outside The RC		LHRA Spec 2	Contact H	P Prior to Entering Radioactivity Area Protection Required		90.9 171.7 79.8 Continuation She to Detectable Acto She Amage And And Antidampic Long Antidampic Long	Vity Lege Initia and are in m in Open/100em/w in open/LAS unit ps Location nition re Rate reporter Rate rey clion Required	ARA PLA PLA PLA PLA PLA PLA PLA PL	Illess olihervise n ef vise naled, Alfborte Radius Radialien Arna Contaminutes Ar High Radiviton A Locked Heph Radi High Centuminuti Hol Patilais Arus Radiadojiculy Co	

## Attachment 3.B CY Test 3 "B" Charging Pump Cubicle Sample Data

	18, 2004	8000				W = w			-			****
A UUD A				and BETA								
SAMPLE	COUNT	BETA	BKGB	BETA	BETA	BETA	ALPHA	BKGA	ALPHA	ALPHA	ALPHA	1.0.D.
ND,	TIME	COUNTS	CPM	CPM	CCPM	DPM	COUNTS	CPM	CPM	CCPN	DPN	CLOCK
		77.0	00.7	22.4	7.0	17.2						10.00.14
2 18 × 18	1.0	37.0 47.0	29.7	37.0	7.2	17.3 41.0	0	8.8	9 9	-0.0	-0.1 -0.1	15:55:41 15:57:50
3 84	1.0		29.7	44.8	14.2	33.9	0	0.0	0	-0.0	-0.1	15:59:58
4 20	1.0	114.0	29.7	114.0	84.2	(288.2)	0	0.0	0	-0.0	-0.1	16:02:07
5 26	1.0	66.0	29.7	66.0	36.2	85.2	0	0.0	8	-0.0	-0.1	16:04:15
6 58	1.0	68.0	29.7	68.0	38.2	(71,9)	1.0	0.0	1.0	0.9	3.9	15:86:24
7 47	1.8	49.0	29.7	49.0	19.2	45.8	0	8.9	0	-8.8	-0.1	16:08:33
8 11	1.8		29.7	68.8	38,2	98.9	0	0.0	0	-0.0	-0.1	16:10:41
9 38	1.0		29.7	102.0	72.2	171.2	0	8.0	8	-0.0	-0.1	16:12:50
10 79	1.0	63.0	29.7	63.0	33.2	(79.B)	0	0.0	8	-0.0	-0.1	16:14:59
11 96	1.0		29.7	41.0	11.2	26.8	0	8.0	8	-0.0	-0.1	16:17:07
12 98	1.8	35.0	29.7	35.0	5.2	12.5	8	0.0	8	-8.0	-8.i	16:19:16
/ 3 23	1.0	85.0	29.7	85.8	55.2	131.3)	8	0.0	8	-8.8	-0.1	16:21:25
/ 4/ 19	1.0		29.7	107.0	77.2	(183,6)	1.0	8.0	1,0	0.9	3.9	16:23:33
15 18	1.0		29.7	21.0	-8.7	-29.6	0	8.0	8	-0.0	-0.1	16:25:42
16 94	1.8	32.0	29.7	32.0	2.2	5.4	0	0.0	8	-8.0	-8.1	16:27:51
17 46	1.0		29.7	22.0	-7.7	-18,3	8	0.0	0	-0.0	-8.1	16:29:59
18 86	1.8	27.8	29.7	27.0	-2.7	-6.4	1.8	8.8	1,0	8.9	3.9	16:32:00
19 30	1.0	45.8	29.7	45.0	15.2	36.3	8	8.0	8	-0.0	-0.1	16:34:17
20 32	1.8	57.0	29.7	57.8	27.2	64.80	0	0.8	0	-8.6	-8.1	16:36:25
2/ 41	1.0	60,0	29.7	68.0	30.2	(71.9)	0	0.0	0	-8.8	-8.1	16:38:34
22 27	1.8		29.7	68.8	38.2	(98.9)	8	0.0	0	-0.0	-0.1	16:48:43
2335	1.0		29.7	48.0	18.2	43.4	0	0.0	8	-0.0	-0.1	16:42:51
z 4 28	1.8	62.0		62.0	35*5	(76.2)	1.8	0.0	1.0	8.9	3.9	16:45:00
25 100	1.0		29.7	41.0	11.2	26.8	0	0.0	0	-0.0	-8.1	16:47:09
26 68	1.0		29.7	44.B	14.2	33.9	0	0.8	0	-0.0	-0.1	16:49:17
27 21	1.0	32.0		32.0	5.5	5.4	0	0.0	0	-0.0	-0.1	16:51:26
28 11	1.0		29.7	38.0	8.2	19.6	8	0.0	8	-0.0	-0.1	16:53:34
29 24	1.0		29.7	41.0	11.2	26.8	8	9.8	0	-0.0	-8.1	16:55:43
30 4	1.8		29.7	41.0	11.2	26.8	8	0.0	8	-0.0	-8.1	16:57:52
31 18 32 50	1.0		29.7 29.7	44.8	14.2	33.9	0	8.8	0	-0.0	-0.1	17:00:00
3 2 38			29.7	28.8	-1.7	-4.0		0.6	0	-0.0	-0.1	17:82:89
	1.0			78.0	48.2	114.7	0 0	8.0	8	-0.0	-0.1	17:04:18
34 19	110	37.0	6711	37.0	7,2	17.3	0	8.8	8	-0.0	-0,1	17:06:27

COPY

Gamma Spectroscopy Sam	ple Analysis Request Form
Sample Taken By: MRG: 650-	
Copy of Results To:	
/	som Concrete Jackhamaar Test
Location: Charging pump B Res	
Reason for Analysis: Untran Content	
If from Personnel: Name:	EID 83942 RWP: 4149
Contamination Levels:	
<u> </u>	2 IPA a CCPM / DPM 60 mR/hr
Sample Weight / Volume:	_ (cc, ml, grams, etc.)
Sample Container: 12 / ter-	
Is this sample for free release?	YES or NO (circle one)
Is this sample being shipped offsite?	YES or NO (circle one)
Save / Return sample after analysis?	YES or NO (circle one)
Other info:	
If this sample requires special storage requ	irements, please describe:
Responsible Individual for Disposal of Sam Name:	
Sample delivered to Count Room:	/_Q
COUNT ROOM	USE ONLY
Qualitative or Quantitative Analysis? Expla	
Sample ID Number:	Qual Ana
Analysis Completed By: Tourd	Date:O
Sample Storage Location:	Aut
Radiochemistry Supervisor Review:	Lice Mate

PAGE 1 OF

BPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 10-MAR-2004 20:42 REQUESTOR : CAS

.

CYAPCO HADDAM NECK STATION

#### POST NID QA ANALYSIS

TITLE : - PAB B-CHG PIT CONCRETE CHIPS

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/GM	COMMENTS
12 40	1460 00	0.00	C 0400 0C	03 December 07
K-40	1460.80	0.22	6.249E-06	QA Results OK
CO-60	1332.49	-0.10	1.129E-04	QA Results OK
CS-134	604.70	-0.10	3.539E~05	QA Results OK
CS-137	661.65	-0.13	3.038E-03	QA Results OK
TH-228	84.37	-0.10	3.011E-057.	QA Results OK
AM-241	59.54	-0.11	1.341E-06	QA Results OK
AVG ENER	GY DIFF :	-0.05	3.224E-03 = TO'	TAL GAMMA ACTIVITY

#### Contains Licensed Material

# UNIDENTIFIED/REJECTED PEAKS

				GAMMA/SEC			POTENTIAL	
ENERGY	NET AREA	FWHM	GAMMA/SEC	/GM	% ERROR	FLAG	ID	ACTIVITY
			~ ~ ~ ~ ~ ~ ~ ~ ~ ~					
74.96	3188.	0.89	3.367E+01	2.403E-02	14.7	R	PB_X~RAY	0.000E+00
						Ř	PB X-RAY	0.000E+00
						Ú,	TL-208	1.912E-05
						R	PB-212	6.130E-06.
						R	PB-214	1.042E-05
475.38	4966.	1.99	1.111E+02	7.927E-02	12.9	P	CS-134	1.468E-04
						R	BI-214	1.810E-03
651.26	1018.	1.41	2.950E+01	2.105E-02	23.2	U		
693.04	808.	1.35	2.468E+01	1.761E-02	22.1	X	EU-154	2.817E-05
038.75	336.	1.53	1.444E+01	1.030E-02	34.9	P	- CS-134	2.786E-05
167.91	866.	1.99	4.090E+01	2.919E-02	14.4	8	-CS-134	4.384E-05
322.20	4676.	2.71	2.435E+02	1.738E-01	2.43	B	-	
365.06	1529.	2.15	8.159E+01	5.824E-02	4.53	R	CS-134	5.179E-05
400.42	1386.	1.89	7.540E+01	5.382E-02	4.37	0/	CSSUM	0.000E+00
764.09	106.	3.88	6.772E+00	4.834E-03	35.4	R/	BI-214	8.241E-07
833.55	233.	2.17	1.528E+01	1.090E-02	17.4	6/	/	Children and and and
993.32	118.	1.98		5.807E-03	25.3	K		ULPI
						$-\Delta i$	-	~ 1 ]
						/ /	Nº. D	
						A.	IN.	
						v~ (		

Control N	umber:		Attac	hment A		L	age ++ or ro+
	031	1023 A	Air Sample Counting Sheet Section 1 - Collection Data				Gibson
Sampte Date:	10-Mar-04	Sample Location and Work Activities Performed:	PAB-Charging	g Pump 'B': Chi	pping Cor	ncrete	
RWP / Job Step	4149-1	Routine: D W M	Sampler Serial Number:	90	Sampler Type:	ras	Sampler Cal 6/15/2004 Due Date:
Samp	ple Time & Date	Collection Time (min)	Flow Rate				Sample Volume
On:	Off:	120		1 cfm			120 Cu. Ft.
03/10/04 5	1:00 03/10/04 13:00						

Gross Beta-Gamma activity of ≤ 6.0 E-11 = ≤ 0.3 Total Particulate DAC

Conversion Factors: Liters - 4.5E-10 liters uCi / ml dpm

Co-60 activity of  $\leq$  6.0 E-11 =  $\leq$  0.3 Total DAC Cubic Feet -- 1.6E-11 cubic feet uCl / ml dpm

Section 2 -- Gross Beta-Gamma

Gross  $\beta/\gamma$  concentration of > 6.0 E -11 uCl/cc requires MGCA Count, if available

Count Time / Date	Instrument	Serial No.	Cal Due Sample Counted By:		Gro	Gross β/γ Concentration (uCl/cc)			
3/10/04 16:20	XLB-1	40045-1	10/08/04		Brigham			2.04E-	
Gross Counts	Count Time (min)	Gröss CPM	Bkgd. CPM	MDCR	Net CPM	Eff. F	actor	Conv. Factor	Volume
307	0.5	614.00	2.44	12.72	611.56	2	.5	1.6E-11	120 Cu. Fl.
					1		MDA	= 4.24E-12	

## Section 3 -- Gross Alpha

MGCA results of > 6.0E-11 uCl/cc Co-60 requires alpha count

Count Time / Date	Instrument	Serial No.	Cal Due Sample Counted By:		Gross $\alpha$ Concentration (uCi/cc)			Ci/cc)		
3/12/04 12:28	XLB-1	40045-1	10/8/2004		Brigham			<md< th=""><th>A</th><th></th></md<>	A	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR	Net CPM	Eff. F	actor	Conv. Factor	Volume	SAF
0	2.5	0.00	0.09	1.72	<mdcr< td=""><td>4.</td><td>16</td><td>1.6E-11</td><td>128 Cu. FL</td><td>1.3</td></mdcr<>	4.	16	1.6E-11	128 Cu. FL	1.3
	for some some some some some some some some						MDA :	= 1.24E-12		

Count Time / Date	Instrument	Serial No.	Cal Due Sample Counted By:		Gross a Concentration (uCi/cc)					
N/A	N/A	N/A	N/A		N/A			N//	4	
Grass Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR	Net CPM	Eff. F	actor	Conv. Factor	Volume	SAF
N/A	N/A	N/A	N/A	N/A	N/A	N	/A	1.6E-11	129 Ca. Pl.	1.3

## Section 4 -- Scaled DAC Fractions

(Only for air samples taken in area less than 200 dpm/100 cm<sup>2</sup> alpha)

Туре	Type uCi/cc OAC Fraction Scaling Conversion		Scaling Conversion	Scaled a/β/γ DAC Fractio		
Co-60 or Gross β/γ (DAC=1.0E-8)	1.63E-11	1.63E-03	50 X Co-60 OR Gross β/γ DAC Fraction	<	0.082	
C	recult is loss	than MDA				

Туре	Initial uCi/cc	Initial DAC Fraction	Final uCl/cc	Final DAC Fraction	
MGCA & Gross BAY (DAC=1.0E-8)	2.04E-10 (By Gross Analysis)	0.020	See Printout (By MCGA)	< 0.002	
Gross Alpha (DAC=3.0E-12)x1.1	<mda< td=""><td><mda< td=""><td>N/A</td><td>N/A</td></mda<></td></mda<>	<mda< td=""><td>N/A</td><td>N/A</td></mda<>	N/A	N/A	
Total Measured DAC	C Fraction =	0.020		0.002	

CS-137

1 Mgw 10 VI 1V 1 10-MAR-2004 16:43:13.67 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - PAB-CHARGING PUMP B: CONCRETE CHIPPING REASON FOR ANALYSIS: Air Filter count for Beta Limit RWP NUMBER : 4149-1 \* SURVEY ID : 031023 SAMPLE ID : 040310046 \* SAMPLE GEOMETRY : 47MLFILTER GEO EFFICIENCY DATE : 13-OCT-1998 \*\*\*\*\* AIR SAMPLER ID# : 90 \* CAL DUE DATE : 15-JUN-2004 \* END TIME START TIME : 10-MAR-2004 11:00 : 10-MAR-2004 13:00 START FLOW RATE: 1.0000 \* END FLOW RATE : 1.0000 SAMPLE TIME : 10-MAR-2004 13:00:00.00 SAMPLE TYPE : AIR PARTICULATE \* SAMPLE QUANTITY : 3.39802E+06 CC DETECTOR : DET 1 \* LIBRARY : CHEM\_SMEAR LAST ENERGY CAL : 10-MAR-2004 00:54 \* ENERGY TOLERANCE: 1.00000 : 5.00418E-01 \* HALF LIFE RATIO : 9.00000 KEV/CHANNEL START CHANNEL : 100 \* END CHANNEL : 4096 ACQ DATE & TIME : 10-MAR-2004 16:32 \* DEADTIME (%) : 0.0% PRESET LIVE TIME : 0 00:10:00 \* SENSITIVITY : 5.00000 ELAPSED REAL TIME : 600.03 Secs \* GAUSSIAN SEN : 10.00000 ELAPSED LIVE TIME : 600.00 Secs \* CORRECTION FACTOR : 1.00000E+00 DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.RP.NEW]040310046 ADC1 AIR.CNF;1 ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WIMEAN V1.8 COLLECTED BY : GIBSON REVIEWED BY : COMMENTS : Post-NID Peak Search Report Bkgnd FWHM Channel Left Pw %Err īτ Energy Area Fit Nuclides 0.58 154.23 9 6 32 -214 77.05 20 152 202 8 36.4 4 0.97 206.96 0 103.44 14 3 2.37 299.89 295 12 28.0 149.93 21 1 1.37 699.32 698 10 22.4 1.96E-01 349.74 10 5 1.44 702.50 12 698 10 46.4 351.33 PB-214 2 1.58 1218.08 1213 10 20.6 609,15\* 31 BI-214

6 1.53 1322.64 1317 10 8.1

661.43\*

172

Derived Air Concentration Report Sample ID : 040310046			Acquis	sition date :	Page : 2 10-MAR-2004 16:32:57
Nuclide Type	: NP				
Nuclide			DAC (uCi/CC)		
BI-214 PB-214	3.342E-11 1.179E-13	21.0 33.2	- 0 - (-) - 0 - (-)	- 0 -	
Totals:	4.521E-11		an 10 40 kd 11 kh 16 10 an 16 10 an 1	0.000E+00	
Nuclide Type	: FP				
Nuclide			DAC (uCi/CC)		
CS-137	1.114E-10	8.8	6E-08 (D)	1.857E-03	
Totals:	1.114Ė-10			1.857E-03	
Grand Totals:	1.566E-10			1.857E-03	

PAGE 1 OF

REPORT NAME : DET LIM (V1.1) REPORT DATE : 10-MAR-2004 16:43 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

#### DETECTION LIMIT CONFIRMATION REPORT

Sample Title Sample Time Count Time Sample Qauntity Nuclide Library Analyzed By Sample Media Sample Shelf	: CHEM_SMEAR : CAS	CHIPPING
	: CAS_LLD: PGE_HP_PART.DAT - HEALT	H PHYSICS AIR PARTICUL
	quired Measured (uCi/CC) VALUE (uCi/CC)	LLD MET
CO~60 6.	000E-11 < 1.631E-11	Passed
* * *	* End Of Report ( 1 Page ) ****	

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 10-MAR-2004 16:43 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - PAB-CHARGING PUMP B: CONCRETE CHIPPING

SAMPLE No.: 040310046OPERATOR NAME: CASSAMPLE TYPE: AIR PARTICULATESAMPLE GEOMETRY: 47MLFILTERCOUNT TIME: 10-MAR-2004 16:32:57SAMPLE QUANTITY: 3.39802E+06SAMPLE TIME: 10-MAR-2004 13:00:00DETECTOR: DET 1LIBRARY: CHEM\_SMEAR::

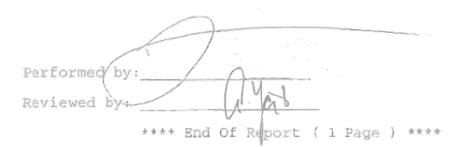
ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/CC	COMMENTS
			$(a_1,b_2,\ldots,a_{n-1},a_{n-1},\ldots,a_{n-1},a_{n-1},\ldots,a_{n-1},a_{n-1},\ldots$	
CS-137	661.65	-0.22	1.114E-10	QA Results OK
BI-214	609.31	-0.16	3.342E-11	QA Results OK
PB-214	351.92	-0.59	1.1795-11	QA Results OK
AVG ENERG	GY DIFF =	-0.32	1.5662-10 =	TOTAL GAMMA ACTIVITY

#### UNIDENTIFIED/REJECTED PEAKS

				GAMMA/SEC			
ENERGY	NET AREA	F'WHM	GAMMA/SEC	/CC	% ERROR	FLAG I	D ACTIVITY
		/	/			/	239 8.354E-12
103.44	14.	0.97/	2.381E-01	7.007E-08	36\4	R NP-	2 <u>39</u> 8.354E-12
149.93				1.041E-07			
349.74	10.	1.37	3.656E-01	1.076E-07	22,4	Č.	

Total Unidentified/Rejected Peaks = 3 % Unidentified/Rejected Peaks = 42.86

Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis library)



#### Page 61 of 116

## Attachment 4.A CY Tests 4a and 4b "B" Charging Pump Cubicle Survey

	CV//	CONNECTIO		KEE ATOMIC PO				PAG	e 1	ofz	
	Surveyor Name: (Prinled) MATE Gibson	Surveyor Name: (Signature) Location MR Subson PAI	n:	Charging Pump		_	ate:3-11-0 **:2210	+ Time:/	3 31 Maj	U Log #; p.#:∼.4	04 1810 Rev.#~A
	Fitpawded 4th test Area (4th test Area (5) (5) (5) (5) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7		0 9 15 1 0 9 15		BACKGround for MASS. Jum Count = 125 clm A 200 ccpm B 75 ccpm C 225 ccpm E 25 ccpm F 675 ccpm H 225 ccpm H 225 ccpm H 225 ccpm	MCCO MCCO MARSon GO BY M ARSon GO BY M I I I I I I I I I I I I I	DELISERIA 5-29'5016 5-29'5016 5-29'5016 5-29'5016 1-257 	INSTRU INSTRU IF GAL DU G-24-00 S-5-0 % 7-74-05 E REASON Pre CF SJ, vc TION RESI C TION	MEN FOR FOR JULTS III III III III III III III III III I	TS USED ROBE/SERI/ 360 // SURVEY aLarg tes Bac Friction. S (SMEARS MOAr / 3.8 Bio-Dams 71,9 < A DA 55.3 4 mi),4 6 2.4 6 2.4 6 2.4 52.9 <mb></mb> 2.9 <mb></mb> 2.9	ALE CAL DU
Po	stings □ Other ØŔCA ØŔM □Outside The RC	CA CA CRA LHRA CA LHCA HRA Spec 2	2	□ Airborne Ra	i nor to Entorning	SOF RPR	Contract Exposur Contract Area So- Indinates Bounda Step Off Pad Repiratory Protect IAGER OR D	ry ilgt Required	HCA HCA	<ul> <li>Locked High Red Radoech-a Maie</li> <li>High Cestaminatio</li> <li>Hel Particle Area</li> <li>Radiologically Col</li> </ul>	Mallon Area

G				CON		URVEY RE			OMPANY			04-18-10	
Surveyor Nam	e: (Printed)	Surveyor M.C	Name: (Signa	lure)	Location:	"B" Chn.			ų	Survey Da Area #: 2	te: 3-11-04		
1			CONTAM	INATION RE	SULTS (SMEARS	SI dom/100cm*				Page		of z_	
SAMPLE RI	ESULTS	SAMPLE RE	ESULTS	SAMPLE	RESULTS	533896	RESULTS Gamme Alph	144PLE	RESULTS Bela-Gerana Apte		INSTRUM	ENTS USED	)
- pro-currie	Apra	2eta-Gamma	Aphe	" Cela	-Gamma Alpha	/ Dela-	Gamme Alph		Bela-Genma Apha	MODEL#	SERIAL#	PROBE TYP	CALDUE
21 AMBA	=mDA		_						/	ESZD	5016	360	62409
22 20012										APC-11	1257		5-5-04
23 2.1000									/	MPL-II	70 194	~	17-14-04
24 EMDA									1		1 7	1	
25 55.3		1							/		/		
26 112.3								J	/		+_/		
27 EMDA							OP'			17			
	+			1		G	9			-1			
28 21234										CO	N TAMINATION		LAS) RESULTS
29 2004	+ $+$ $+$									_			
30 Empa	4					N.							
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								_		Survey Area	ader Information # etc.) Should ey for which th ng used.	match that	of the

Gy		EE ATOMIC POWER COMPANY	Pa	gelot2	
Surveyor Nome (Printed) Surveyor Na Matt Gibson MRL	me: (Signature) Location:	Charging Rump BAY	Date:3/15/04 Area #:2210	Map.#: N	
	$ \begin{array}{c c} \hline \\ \hline \\$	Charging Rump BAY Background Heartski Background Heartski Background Ir hok Background Ir hok Exposure in Cpm BG I SQU CPM This Arisa B B B B B B B B B B B B B	Area #:2210 MODEL/SERIAL# ***020/1022 # 522/ 5520 # 020/1022 # 522/ 5520 # 01/70194 RVP RVP POTHER Arisemple Control #:03 CONTAMINATION BY MOA* 48,3 # 0704 BED-Denne 1 G 8.4 2 2 MDA 3 G 6,8 4 77.9 5 7 m DA G 1 7 1 8 1 9 7 3.1 102 4 m Cn. Smeat ContinueIon SheetU	Мар.#: л/           INSTRUMENTS US           CAL DUE         PROBE/S           1/2.5/64         1/2           6/2.7/64         360           7/11/64         375           7/11/64         375           7/11/64         375	A Rev. # 104
Postings  Other Postings  Other Protect Outside The RCA Other	BRA DLHRA DHRA DSpec 2	Contact HP Prior to Entering Airborne Radioactivity Area	Alarge Alas Birlipe Li     Alasse Alasse Alasse Alasse Alasse     Alasse Alasse Alasse Alasse Alasse     Alasse Alasse Alasse Alasse Alasse     Alasse Alasse Alasse Alasse     Alasse Alasse Alasse     Alasse Alasse Alasse     Alasse Alasse     Alasse Alasse     Alasse Alasse     Alasse Alasse     Al	ARA + Arbanne R RA + Radialión CA - Contambu HRA + High Radia UnitA - Loches M HRA - High Conta HRA - High Conta Required RCA - Radiologica	Afflorectively Afree Vea Ind Afree Non Afree Anna Afree Manufaction Afree Afree

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		XOUP A	COUNT	BETA	ALPHA BKGB	and BETA BETA	COUNTING	BETA	ALPHA	BKGA	ALPHA	ALPHA	ALPHA	T.O.D.	
		WD.	TINE	COUNTS	CPM	CPI	CCPN	DPH	COUNTS	CPM	CPM	CCPM	DPN	CLOCK	
	1	56	1.8	57.0	28.2	57.0	28.7	68.4	8	0.0	8	-0.0	-0.2	14:41:34	
	2	15	1.0		28.2	39,8	18.7	25,6	θ	8.8	8	-0.0	-8,2	14:43:42	
	3	36-	1.8	56.0	28.2	56.9	27.7	66.B	8	0.0	8	-0.0	-0.2	14:45:51	
	4	48	1.0	61.0	28.2	61.0	32.7	77.9	0	0.0	8	-8.8	-0.2	14:48:00	-
COPY	5	96	1.0	41.0	28.2	41.8	12.7	30.3	0	0.0	8	-0.0	-0.2	14:50:00	6
UPY	6	85	1.8	32.8	28.2	32,8	3.7	9.0	8	0.0	0	-0.0	-0.2	14:52:17	
	7	55	1.0	39.0	28.2	39. B	18.7	25.6	8	0.0	0	-0.0	-0.2	14:54:25	
	8	23	1.8	45.0	28.2	45.8	16.7	39.8	1.0	0.0	1.0	0.9	3.8	14:56:34	
	9	94	1.0		28.2	59.8	38.7	73.1	1.0	0.0	1.9	8.9	3.8	14:58:43	
	10	31	1.8	44.0	28.2	44.8	15,7	37.5	8	0.0	0	-0.0	-0,2	15:00:51	
	11	56	1.0	55.0	5.85	55.0	26.7	63.6	0	0.0	8	-0.0	-0.2	15:03:00	
	12	86	1.8		28.2	44,8	15.7	37.5	1.8	0.0	1,0	0.9	3.8	15:05:09	
		27	1.0		28.85	56.0	27.7	66.8	8	8.8	0	-0.0	-0.2	15:07:17	
	14	31	1,8		28.2	37.0	8.7	20.8	8	0.0	8	-0.0	-8.2	15:09:26	
	15	38	1.0		28.2	35.0	6.7	16.1	8	8.0	8	-0.0	-0.2	15:11:34	
	16	24	1.8	42.0	28.2	42.0	13.7	32.7	8	8,8	8	-0.0	-0.2	15:13:43	
		25	1.9	44.9	28.2	44.0	15.7	37.5	8	0.0	9	-0.0	-0.2	15:15:52	
		28	1.8		28.2	68.0	31.7	75.5	1.8	8.8	1.8	0.9	3.8	15:18:00	
		41	1.0		28.2	84.0	55.7	132.5	1.0	8.8	1.8	8.9	. 3.8	15:20:09	
		91	1.8		28.2	43.0	14.7	35.1	8	8.8	8	-0.0	-0.2	15:22:18	
	21	83	1.0		28.2	72.0	43.7	184.8	8	8.8	8	-8.8	-0.2	15:24:26	(
	22	98	1.0		28.2	53.6	24.7	58.8	2.0	0.8	2.8	1.9	7.9	15:26:35	
	23	37	1.0	84.0	28.2	84.0	55.7	132.5	3.0	0.0	3.0	2.9	12.0	15:28:44	
	24	48	1,8	42.8	28.2	42.0	13.7	32.7	8	0.0	0	-0.0	-0.2	15:38:52	
	25	44	1.0	48.0	28.2	48.0	11.7	28.0	8	0.0	0	-0.8	-0.2	15:33:01	
		10	1.8		28.2	68.8	39.7	94.5	8	0.0	8	-0.0	-0.2	15:35:10	
	20	- 59	1.8		28.2	17.0	-11.2	-26.6	0	8.8	0	-0.0	-0.2	15:37:19	
	28	59 3 43	1.0		28.2	36.0	7.7	18.5	8	8.8	8	-0.0	-0.2	15:39:27	
	29	9	1.0	26.0	28.85	26.0	-2.2	-5.2	0	0.0	. 0	-0.8	-0.2	15:41:36	
		95	1.0		28.2	46.0	17.7	42.2	8	0.0	0	-0.0	-0.2	15:43:45	
	00	28	1.0	48.9	28.2	48.0	11,7	28.8	0	0.0	8	-0.0	-0.2	15:45:53	
	3	18	1,8	54.8	28.2	54.8	25.7	61.2	8	0.0	0	-0.0	-0.2	15:48:02	
	33	18	1.0		28.85	49.8	28.7	49.3	0	0.0	8	-0.0	-0.2	15:50:11	
	34		1.0		28.2	49.8	28.7	43.3	8	0.0	8	-8.8	-0.2	15:52:20	
	25	97	1.0		28.2	58.0	23.7	56.5	0	0.0	8	-0.8	-0.2	15:54:28	
	36	97 108	1,0		28.2	23.8	-5.2	-12.3	8	0.0	8	-0.0	-8.2	15:56:37	
	37	28	1.1		28.2	72.0	43.7	194.8	0	8.8	0	-8.8	-0.2	15:58:46	
	38	34	1.0		28.2	35,8	6.7	16.1	0	0.0	8	-8.8	-0.2	16:00:55	
	39	10	1.1		28.2	49.0	28,7	49.3	1.0	8.0	1.0	8.9	3.8	16:03:03	
	40	11	1.4		28.2	44.8	15.7	37.5	8	0.0	6	.0.0	6.0	27 AP 10	

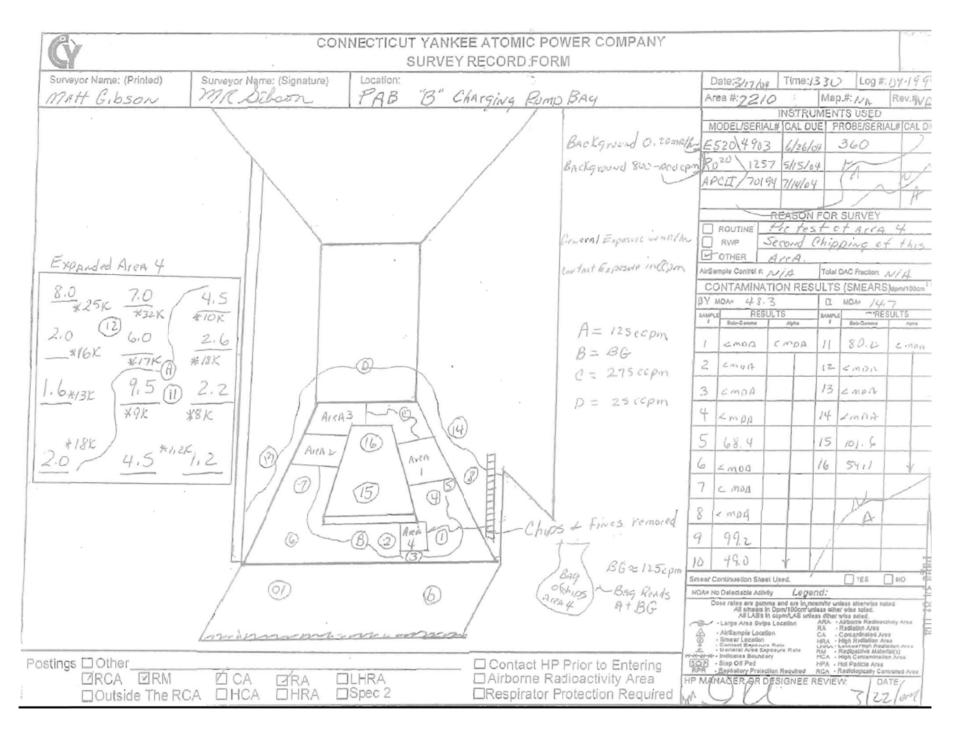
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Cy		EE ATOMIC POWER COMPANY ( RECORD FORM	Page 1 of 2
Surveyor Name: (Printed)	Surveyor Name: (Signature) Location:		Date: 5-17-04 Time: 1430 Log #:04-20.30
MAT Gibson	me Silson PAB "B" C	Charging Rump BAY	Area #:2210: Map.#: NA Rev.#, NA INSTRUMENTS USED MODELISERIAL# CAL DUE PROBEISERIAL# CAL DUI Row/1022 42804 AUA E Stu 1 4903 6-26-04 360
		E520 BAELGICUND	APCILIAD 194 7/14/09 DA REASON FOR SURVEY ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE ROUTINE CONCRETE TEST Areiz 4 CONCRETE TEST Areiz 4 ROUTINE RO
*32X #38K *1 8 20	12 K 8	Bureral Expositer MRI he Contract Exposite in CCP in	CONTAMINATION RESULTS (SMEARS) opin/100cm <sup>2</sup> BY MDA# 48,3 FAMPLE RESULTS AMPLE RESULTS BEN-Gamma Apple FESULTS 1 130,1 CMDA 11 < MOA CADA
\$30K+ \$30K+ 5 18	13 0 E OL		2 < MOA 12 3 < MOA 13 Y
48K #45K	418K 0 Area3 500 0	00	4 CMAP 11 49.3
8 22	8 Areaz 20 (2) Areal		5 355.8 15 MOA 6 348.9 16
*50K+ 127K	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		7 189.5 17
5 13	2.8 3 0 0 Army Test		8 170.5 18
		BB = BACKGYOUNd	9 113.5 19 10 < mod 7 20 49.3 4 -
	Med 5385 Sous Barris 63 63 Concinent and	E 86 = 3-4 mR/42 @3.FT	
Postings Other PRCA RM Outside The F	RCA DRA DLHRA RCA DHCA DHRA DSpec 2	Contact HP Prior to Entering Airborne Radioactivity Area Respirator Protection Required	Addames - Indicates Boundary     Acc - High Contembration Area     SOP     Step Dil Pad     HPA     Hot Partica Area     RCA - Rediviologitativ Controlled Area     RCA - Rediviologitativ Controlled Area     A     DATE:     A     C     C     C

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Bigne .	Surve	yor Name	(Printed	)	Surveyor	Name: (Sigi	alure)	Loca		IRVE	RECO	HD FOR	IM		0	1	Sugar To	
		intt.			ma	Schol	ature)	1000	OAR	"R'	NI		0	0		10:3-17-04	#: NA	Rev.#:WA
		MIL	21050	210	111165			ALDESULT	S (SMEARS)	D dam HOD	(hAr	SING	Pum	0 BAY	Area #: 2 Page	and the second se		
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÷	-	Bete-Gamme	Alpha		Bela-Qamma	Abha	-	Bela-Ganina	Alpha	1	Bela-Gamma	Alpha	5 <u>66</u> 55	Bela-Gamma Alpha	MODEL	SERIAL#	PROBE TY	PEL CAL DUE
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## Attachment 4.B CY Tests 4a and 4b "B" Charging Pump Cubicle Sample Data

Gamma Spectroscopy San	nple Analysis Request For
Sample Taken By: <u>AR C. 650</u>	Date / Time: 0800
Copy of Results To: Degasper1	
Sample Description: <u>Concrete</u> Chips	
Location: PAB B- pumpi	
Reason for Analysis:	
If from Personnel: Name:	EIDRWP: <u>4/49-1</u>
Contamination Levels:	
	<u>a CCPM / DPM <u>~ mont</u> mR/</u>
Sample Weight / Volume: Sample Container:	
	10000
Is this sample for free release?	
Is this sample being shipped offsite?	
Save / Return sample after analysis?	YES on NO (circle one)
Other info:	
If this sample requires special storage req	luirements, please describe:
Responsible Individual for Disposal of Sa	mple
Name:	Dept: Ext:
Sample delivered to Count Room:	Date / Time:
COUNT ROO	M USE ONLY
Qualitative or Quantitative Analysis? Exp	lain below.
3600 Sec. Come on	
Using 47 melliter Se	earstry
Sample ID Number: 040318605	
	Data: AZ-18-05
Analysis Completed By: Brinker	Date. 0 75 - /
Analysis Completed By: Sample Storage Location: Radiochemistry Supervisor Review:	Ram Iral

Only

\*\*\*\*\* 18-MAR-2004 11:12:10.45 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - L.A.S.: PAB-CHARGING PUMP B CUBICLE REASON FOR ANALYSIS: Site Characterization RWP NUMBER : N/A \* SURVEY ID : N/A : 040318005 SAMPLE ID \* SAMPLE GEOMETRY : 47MLFILTER SAMPLE TIME : 18-MAR-2004 08:00 \* GEO EFFICIENCY DATE: 24-JUN-2003 SAMPLE TYPE : ŚMEAR \* SAMPLE QUANTITY : 1.00000E+00 SMR. DETECTOR : DET 5 \* LIBRARY : CHEM SMEAR LAST ENERGY CAL : 18-MAR-2004 01:39 \* ENERGY TOLERANCE: 0.70000 KEV/CHANNEL : 5.00592E-01 \* HALF LIFE RATIO : 9.00000 START CHANNEL : 100 \* END CHANNEL ACQ DATE & TIME : 18-MAR-2004 10:11 \* DEADTIME (%) \* END CHANNEL : 4096 ACQ DATE & TIME : 18-MAR-2004 10:11 \* DEADTIME (%) : 0.0% PRESET LIVE TIME : 0 01:00:00 \* SENSITIVITY : 5.00000 ELAPSED REAL TIME : 3600.7 Secs \* GAUSSIAN SEN : 10.00000 ELAPSED LIVE TIME : 3600.0 Secs . . . CORRECTION FACTOR: 2.22000E+06 DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.RP.NEW] 040318005\_ADC5\_SMEAR.CNF;1 \*\*\*\* ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WIMEAN V1.8 Collected by : GIBSON REVIEWED BY -COMMENTS 医无外的 医间隙的 的复数 Post-NID Peak Search Report . Area Bkgnd FWHM Channel Left Pw %Err Fit Nuclides Ιt Energy 0 605.25 45 30 1.12 1209.63 1204 11 28.0 CS-134 44 2211 609.75 34 0.91 1218.61 1214 11 30.3 0 BI-214 21 1.38 1322.40 1317 12 2.2 CS-137 Ũ 661.66\* 6 1.54 2345.39 2339 12 7.4 0 1173.23\* 232 CO-60 236 0 1.58 2664.37 2659 12 7.0 0 1332.68\* CO-60

Summary of Nuclide Activí Sample ID : 040318005	ty	Page : 2 Acquisition date : 18-MAR-2004 10:11:57									
Total number of lines in spectrum5Number of unidentified lines0Number of lines tentatively identified by NID5100.00%											
Nuclide Type : AP	Wtd Mean	WEd Moor									
Nuclide Hlife Decay CO-60 5.27Y 1.00 CS-134 2.06Y 1.00	Uncorrected dpm/SMR. 2.091E+02	Decay Corr dpm/SMR. 2.091E+02 2.065E+01	Decay Corr 1-Sigma Error 0.115E+02 0.583E+01	%Error Flags 5.49							
Total Activity :											
Nuclide Type : FP	Wtd Mean Uncorrected		Decay Corr	1 - Cioma							
Nuclide Hlife Decay CS-137 30.17Y 1.00	dpm/SMR.	dpm/SMR.	1-Sigma Error 0.056E+03	%Error Flags							
Total Activity :	1.270E+03	1.270E+03									
Nuclide Type : NP	Wtd Mean	WEd Mean									
Nuclide Hlife Decay BI-214 4.47E+09Y 1.00	Uncorrected dpm/SMR.	Decay Corr dpm/SMR.	Decay Corr 1-Sigma Error 1.305E+01	%Error Flags							
Total Activity :	4.278E+01	4.278E+01									
Grand Total Activity :	1.542E+03	1.542E+03									
Flags: "K" = Keyline not found "E" = Manually edited "A" = Nuclide specific abn. limit											

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 18-MAR-2004 11:12 REQ<sup>TT</sup>ESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - L.A.S.: PAB-CHARGING PUMP B CUBICLE

SAMPLE NO. SAMPLE TYPE				OPERATOR NAME SAMPLE GEOMETRY		
COUNT TIME	:	18-MAR-2004		SAMPLE QUANTITY DETECTOR	:	1.00000E+00
LIBRARY	-		00.00.00	mination		DBI J

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR dpm/SMR.	COMMENTS
$\cdots \cdots = \cdots = \cdots = \cdots$			$\phantom{aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa$	
CO-60	1332.49	0.20	2.091E+02	QA Results OK
CS-134	604.70	0.55	2.065E+01	QA Results OK
CS-137	661.65	0.02	1.270E+03	QA Results OK
BI-214	609.31	0.43	4.278E+01	QA Results OK
			·,	
AVG ENER	GY DIFF :	= 0.30	1.542E+03 =	TOTAL GAMMA ACTIVITY

Contains	
Licensed	Qualitative
Material	Analysis
	Only

UNIDENTIFIED/REJECTED PEAKS

GAMMA/SEC POTENTIAL ENERGY NET AREA FWHM GAMMA/SEC /SMR. % ERROR FLAG ID ACTIVITY No Unidentified/Rejected Peaks

Performed by: Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

Control Num	ber:		Attacl	hment A			age 01 01 104
	03	1588	Air Sample C Section 1 - C	-		Sample Taken By	Ayer
Sample 1	5-Mar-04	Sample Location and Wo Activities Performed	<sup>ik</sup> pab a chrg pu	mp remove ve	ntilation		
RWP / Job Step	4113-1	Routine: D W M	Sampler Serial Number;	7813	Sampler Type:	Radeco	Sampler Cal 6/23/2004 Due Date: 6/23/2004
Sample 1	Time & Date	Collection Time (min)	Flow Rate				Sample Volume
On: 03/15/04 17:55	Off: 03/15/04 19:25	90		2 cfm			180 Cu. Ft.

Gross Beta-Gamma activity of ≤ 6.0 E-11 = ≤ 0.3 Total Particulate DAC

Conversion Factors: Liters ~ 4.5E-10 liters uCi / ml dpm

Co-60 activity of  $\leq$  6.0 E-11 =  $\leq$  0.3 Total DAC Cubic Feet ~ 1.6E-11 cubic feet uCi / ml dpm

Section 2 -- Gross Beta-Gamma

Gross β/γconcentration of > 6.0 E -11 uCl/cc requires MGCA Count, If available

st Count Time / Date	Instrument	Serial No.	Cal Due	Sample Counted By:		y:	Gro	ss β/γ Concentr	ation (uCi/cc)
3/15/04 20:40	XLB-2	40045-2	02/21/05		Conrad			4.98E-	-11
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR	Net CPM	Eff. F	actor	Conv. Factor	Volume
109	0.5	218.00	2.70	13,10	215.30	2.	6	1.6E-11	180 Cu. Ft.
							MDA =	3,03E-12	

## Section 3 -- Gross Alpha

1st Count Time / Oate Instrument Serial No. Cal Due Sample Counted By: Gross & Concentration (uCi/cc) N/A N/A N/A N/A N/A N/A Count Time (min Gross CPM Bkgd. CPM MDCR Net CPM Eff. Factor Conv. Factor Volume SAF Gross Counts N/A N/A N/A N/A N/A N/A 1.6E-11 N/A 189 Ca. PL 1.3

	MPN =	
Initial Gross alpha concentration of	f ≥ 1.0 E-12 requires a decayed recount	

d Cours Time / Date	Instrument	Serial No.	Cal Due		Sample Counted B	y: (	Grass & Concen	tration (u	(Ci/cc)
N/A	N/A	N/A	N/A		N/A		N//	4	
Grass Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR	Net_CPM	Eff. Facto	Conv. Factor	Volume	SAF
N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.6E-11	188 Ga.PL	1.3

## Section 4 -- Scaled DAC Fractions

(Only for air samples taken in area less than 200 dpm/100 cm<sup>2</sup> alpha)

Туре	uCi/cc	DAC Fraction	Scaling Conversion	Scaled α/β/γ	DAC Fraction
Co-60 or G/pts B/y (DAC=1.0E-8)	4.98E-11	4.98E-03	50 X Co-60 OR Gross B/r DAC Francis	DV	0.249
P					

## Section 5 -- Measured DAC Fractions

Туре	Initial uCi/cc	Initial DAC Fraction	Final uGi/cc	Final DAC Fraction
MGCA or Gross p/y (DAC=1.0E-8)	N/A	N/A	N/A	N/A
Gross Alpha (DAC=3.0E-12)x1.1	N/A	N/A	N/A	N/A
Total Measured DAC	C Fraction =	N/A		N/A
	Q 46		Date: 4-2	2.67

MGCA results of > 6.0E-11 uCl/cc Co-60 regulres alpha count

Control N	Number:			Attacl	nment A		1	age 62 of 104
	03	031590		Air Sample Counting Sheet Section 1 - Collection Data			Sample Taken B	
Sample Date:	15-Mar-04		ocation and Work lies Performed:	b chrg pump p	ab vent remo	val		
RWP / Job Step	4113-1	Routine:	D W M	Sampler Serial Number;	90	Sampler Type:	ras	Sampler Cal 6/15/2004
San	nple Time & Date	Collec	tion Time (min)	Flow Rate				Sample Volume
On:	Off:		100		1 cfm			100 Cu. Ft.
03/15/04	20:30 03/15/04 22:10							
Gross Beta-	-Gamma activity of < 6.0	E-11 = ≤ 0.3	Total Particulate D	AC		Co-60 activity of $\leq 6.0$	0 E-11 = ≤ 0.3 T	otal DAC
	Convers	ion Factors:	Liters - 4.	SE-10 liters uCi / ml dpm	(	Cubic Feet 1,6E-11	cubic feet vCi /	ml dpm

Section 2 -- Gross Beta-Gamma

Gross  $\beta$ /yconcentration of > 6.0 E -11 uCl/cc requires MGCA Count, II available

Count Time / Date	Instrument	Serial No.	Cal Due	Cal Due Sample Counted By:		y: Gr	oss β/γ Concentra	ation (uCi/cc)
3/16/04 0:53	XLB-1	40045-1	10/08/04		Conrad		4.14E-	11
Gross Counts	Count Time (min)	Gross CPM	8kgd. CPM	MDCR	Net CPM	Eff. Factor	Conv. Factor	Volume
53	0.5	106.00	2.58	12.92	103.42	2.5	1.6E-11	100 Cu. Ft.
						MDA	= 5.17E-12	

## Section 3 -- Gross Alpha

MGCA results of > 6.0E-11 uCl/cc Co-10 requires alpha count

tst Count Time / Oate	Instrument	Serial No.	Cal Due		S	ample Counted B	y:	Gro	ss a Concenti	ration (u	Ci/cc)
N/A	N/A	N/A	N/A			N/A			N//	4	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MD	CR	Net CPM	Eff. F	actor	Conv. Factor	Volume	SAF
N/A.	N/A	N/A	N/A	N/	A	N/A	N	/A	1.6E-11	100 Cn. PL	1.3
						L		MDA =			

td. Count Time / Date	Instrument	Serial No.	Cal Due		Sample Counted B	y:	Gros	s α Concent	tration (u	(Ci/cc)
N/A	N/A	N/A	N/A		N/A		100	N//	A	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR	Net CPM	Eff. F	actor	Conv. Factor	Volume	SAF
N/A	N/A	N/A	N/A	N/A	N/A	N	/A	1.6E-11	100 Ca. FL	1.3
							MDA =			

## Section 4 -- Scaled DAC Fractions

(Only for air samples taken in area less than 200 dpm/100 cm<sup>2</sup> alpha)

00011011 1 000100 D7	0 1 1 01 0 01 0 11	-		,	( )
Type	uCi/cc DAC Fraction		Scaling Conversion	Scaled α/β/γ	DAC Fraction
CO-60 or Gross By (DAC=1.0E-8)	4.14E-11	4.14E-03	50 X Co-60 OR Gross B/y DAC Frestion	5	0.207
$/ \cup$			COI	- U	

## Section 5 -- Measured DAC Fractions

Туре	Initial uCi/cc	Initial DAC Fraction	Final uCi/cc	Final DAC Fraction
MGCA or Gross \$/y (DAC=1.0E-8)	N/A	N/A	N/A	N/A
Gross Alpha (DAC=3.0E-12)x1,1	N/A	N/A	N/A	N/A
Total Measured DA	C Fraction =,	N/A		N/A

ø Reviewed By

Date: 4-2-04

## Connecticut Yankee Atomic Power Co.

Radiochemistry Count Room ,

# Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: <u>MR Cibson</u>		
Copy of Results To: <u>Mile DegaSP</u>	Dept:	Ext:
Sample Description:		
Location: Pump B Concrete	5tudy .	
Reason for Analysis:		
f from Personnel: Name:	EID	RWP:
Contamination Levels:		
<u> βγ CCPM / DPM</u>	n.DA ą CCPM / DF	MmR/hr
Sample Weight / Volume:/ 4 2	_ (cc, ml, grams, et	c.)
Sample Container:		· · ·
Is this sample for free release?	YES or NO circle of	one)
Is this sample being shipped offsite?		-
Save / Return sample after analysis?	TES OF NU (CITCLE O	nej
Other Info:		
	uirements, please d	escribe:
If this sample requires special storage req		escribe:
If this sample requires special storage req Responsible Individual for Disposal of Sar	mple	
If this sample requires special storage req Responsible Individual for Disposal of Sar Name:	mple Dept:	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name:	mple Dept:	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room:	mple Dept: Date / Time:	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room: COUNT ROOM	mple Dept: Date / Time: M USE ONLY	Ext:
COUNT ROOM Qualitative or Quantitative Analysis? Exp	mple Dept: Date / Time: M USE ONLY	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room:	mple Dept: Date / Time: M USE ONLY	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name:	mple Dept: Date / Time: M USE ONLY	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room: COUNT ROOM Qualitative or Quantitative Analysis? Exp Mysum Ryurt Sample ID Number: <u>040315 020</u>	mple Dept: Date / Time: M USE ONLY lain below.	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room: COUNT ROOM Qualitative or Quantitative Analysis? Exp Manna Rount Sample ID Number: <u>040315 020</u> Analysis Completed By: <u>J. Manual</u>	mple Dept: Date / Time: M USE ONLY lain below.	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name:	mple Dept: Date / Time: M USE ONLY lain below.	Ext:
If this sample requires special storage req Responsible Individual for Disposal of Sar Name: Sample delivered to Count Room: COUNT ROOM Qualitative or Quantitative Analysis? Exp Maunin Ryunt Sample ID Number: <u>040315 020</u> Analysis Completed By: <u>Jury Cound</u>	mple Dept: Date / Time: M USE ONLY lain below.	Ext:

Page 64 of 104 PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 15-MAR-2004 23:50 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

FOST NID QA ANALYSIS

TITLE : - PUMP B CONCRETE STUDY

SAMPLE No.<th:040315020</th>OPERATOR NAME: CASSAMPLE TYPEDIRT/SEDIMENTSAMPLE GEOMETRY: 1LMARSANDCOUNT TIME15-MAR-2004 23:25:24SAMPLE QUANTITY: 1.48700E+03SAMPLE TIME15-MAR-2004 15:40:00DETECTOR: DET 5LIBRARY: CHEM\_CONCRETE..

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/GM	COMMENTS
K-40	1460.80	-0.41:	7.087E-06	QA Results OK
CO-60	1332.49	-0.18	2.900E-05	QA Results OK
CS-134	604.70	-0.12	1.123E-05	QA Results OK
CS-137	661.65	-0.14	1.128E-03	QA Results OK
		the same and the same of		
AVG ENER	GY DIFF :	-0.21	1.175E-03 =	TOTAL GAMMA ACTIVITY

Contains Licensed Material

UNIDENTIFIED/REJECTED PEAKS

				GAMMA/SEC					
ENERGY	NET AREA	FWHM	GAMMA/SEC	/GM	010	ERROR	FLAG	ID	ACTIVITY
								)	
1322.66	180.	2.53	3.487E+01	2.345E-02		14.6	U/	CSSUM	0.000E+00
1365.61	146.	1.76	2.903E±01	1.952E-02		13.5	P/	ĆS-134	1.736E-05
1400.18	125.	1.66	2.532E+01	1.703E-02		16.0	TT	CSSUM	0.000E+00

Total Unidentified/Rejected Peaks = 3 % Unidentified/Rejected Peaks = 25.00

Flags: U - Unknown Line
 R - Rejected During Analysis
 P - Positively Identified (line not in analysis library)

Performed by: Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

## Connecticut Yankee Atomic Power Co.

Radiochemistry Count Room

# Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: MR Cibion Date / Time: 3/15/09 1590	,
Copy of Results To: <u>Mile Degaspri</u> Dept: Ext:	
Sample Description:	,
Location: Pump B Concrete study	
Reason for Analysis:	
If from Personnel: Name: EID RWP:	-
Contamination Levels:	
β γ CCPM / DPM ą CCPM / DPM mDA mR/h	r
Sample Weight / Volume: 144 (cc, ml, grams, etc.)	
Sample Container:	
Is this sample for free release? YES or NO (circle one)	
Is this sample being shipped offsite? YES or (NO (circle one)	
Save / Return sample after analysis? YES or NO (circle one)	
Other info:	-
If this sample requires special storage requirements, please describe:	
Permancible Individual for Dispessel of Comple	-
Responsible Individual for Disposal of Sample	
Name:Dept:Ext:	
Sample delivered to Count Room: Date / Time:	-
COUNT ROOM USE ONLY	-
	-
Qualitative or Quantitative Analysis? Explain below.	
Ausumon Recurst	
	-
Sample ID Number: 0403 15 020	Cont Lice
Analysis Completed By: Date: Date: Date: Date:	- Mat
Sample Storage Location:	
Radiochemistry Supervisor Review: Date: Date:	-

15-MAR-2004 23:50:32,20 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - PUMP B CONCRETE STUDY REASON FOR ANALYSIS: Supervisor request SAMPLE ID : 040315020 \* SAMPLE GEOMETRY : 1LMARSAND SAMPLE TIME : 15-MAR-2004 15:40 \* GEO EFFICIENCY DATE: 30-JUL-2003 SAMPLE TYPE : DIRT/SEDIMENT \* SAMPLE QUANTITY : 1.48700E+03 GM : DET 5 \* LIBRARY : CHEM\_CONCRETE DETECTOR : 15-MAR-2004 16:20 \* ENERGY TOLERANCE: 1.00000 LAST ENERGY CAL KEV/CHANNEL : 5.00722E-01 \* HALF LIFE RATIO : 9.00000 START CHANNEL : 100 \* END CHANNEL : 4096 : 15-MAR-2004 23:25 \* DEADTIME (%) ACQ DATE & TIME : 10% PRESET LIVE TIME : 0 00:10:00 \* SENSITIVITY : 5.00000 668.25 Secs \* GAUSSIAN SEN ELAPSED REAL TIME : : 10.00000 ELAPSED LIVE TIME : 600.00 Secs \* CORRECTION FACTOR: 1.00000E+00 DECAYED TO 0 DAYS HOURS : CAS\$DISK: [NEU.SAMPLE.RP.NEW]040315020 ADC5 DIRTSEDIMENT.CNF;1 FILE IDENT \*\*\*\* ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 Collected by : GIBSON REVIEWED BY Ū 5 COMMENTS Post-NID Peak Search Report Energy FWHM Channel Left Pw %Err Fit Nuclides Ιt Area Bkgnd 1.04 1124.88 562.99 410 3754 1121 9 27.4 CS-134 0 569.08 1006 4335 1:44 1137.06 1132 11 13.1 CS-134 5852 0 604.58 3380 1.44 1207.98 1203 11 2.3 CS-134 661.51 484023 2937 1.47.1321.76 1314 16 0.1 CS-137 1.51 1590.02 0 795.71 4203 554 1584 14 2.0 CS-134 801.76 423 433 1.83 1602.10 1598 11 10.7 CS-134 241 13 1.1 1173.05 9085 1.88 2344.47 2339 CO-60 1322.66 180 100 2.53 2643.68 2633 17 14.6 65 0 1332.30 8160 1.96 2662.97 2653 20 1.1 CO~60 146 401.76 2729.59 2722 18 13.5 1365.61 125 55 1.66 2798.75 2792 1400.18 16 16.0 199 15 2.00 2919.20 1460.39 2913 12 8.1 K-40

PAGE 1 OF

REPORT NAME : DET LIM (V1.1) REPORT DATE : 15-MAR-2004 23:50 REQUESTOR : CAS

#### CYAPCO HADDAM NECK STATION

#### DETECTION LIMIT CONFIRMATION REPORT

Sample Title Sample Time Count Time	: 15-MAR-2004 23:25 : 1.48700E+03 GM : CHEM_CONCRETE : CAS : 1LMARSAND : 0
	CAS_LLD:PGE_SAND_RELEASE.DAT - SEDIMENT 1LMARSAND0 FR
	nired Measured

Nuclide	LLD (uCi/GM)	VAL	UE (uCi/GM)	LLD MET
MIN - 54	1.500E-07		1.393E-07	Passed
CO - 57	1.000E-06		2.450E-07	Passed
CO - 58	1.000E-06		1.364E-07	Passed
CO - 60	1.500E-07		2.900E-05	Okay
CS - 134	1.500E-07		1.123E-05	Okay
CO - 58	1.000E-06.	~	1.364E-07	Passed
CO - 60	1.500E-07		2.900E-05	Okay

\*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

S. . . . .

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 15-MAR-2004 23:50 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - PUMP B CONCRETE STUDY

SAMPLE No. : 040315020OPERATOR NAME : CASSAMPLE TYPE : DIRT/SEDIMENTSAMPLE GEOMETRY : 1LMARSANDCOUNT TIME : 15-MAR-2004 23:25:24SAMPLE QUANTITY : 1.48700E+03SAMPLE TIME : 15-MAR-2004 15:40:00DETECTOR : DET 5LIBRARY : CHEM\_CONCRETECHEM\_CONCRETE

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/GM	COMMENTS
- $    -$				
K-40	1460.80	-0.41	7.087E-06	QA Results OK
CO-60	1332.49	-0.18	2.900E-05	QA Results OK
CS-134	604.70	-0.12	1.123E-05	QA Results OK
CS-137	661.65	-0.14	1.128E-03	QA Results OK
AVG ENER	GY DIFF :	-0.21	1.175E-03 =	TOTAL GAMMA ACTIVITY

Contains Licensed Material

#### UNIDENTIFIED/REJECTED PEAKS

						POTENTIAL	
ENERGY	NET AREA	FWHM	GAMMA/SEC	/GM	% ERROR	FLAG ID	ACTIVITY
1322.66	180.	2.53	3.487E+01	2.345E-02	14.6	U / CSSUM	0.000E+00
1365.61	146.	1.76	2.903E+01	1.952E-02	13.5	P/ CS-134	1.736E-05
1400.18	125.	1.66	2.532E+01	1.703E-02	16.0	U CSSUM	0.000E+00

Total Unidentified/Rejected Peaks = 3 % Unidentified/Rejected Peaks = 25.00

Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis library)

Performed by: Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

Page 80 of 116

## Connecticut Yankee Atomic Power Co.

Radiochemistry Count Room

Connecticut Yankee Decommissioning Project

<u>Gamma Spectroscopy Sar</u>	nple Analysis R	equest Form
Sample Taken By: <u>MR C. bsn</u>	Date / Time: 3	3-16-04
Copy of Results To: Re Dimans		
Sample Description: Massilem from		
ocation: Pump Station & p.f		
Reason for Analysis: _ UNKnown		
f from Personnel: Name:		
Contamination Levels:		
βγCCPM / DPM	mpa a CCPM / DPM	mR/hr
Sample Weight / Volume:		
Sample Container:		
	YES or NO (circle one)	
Is this sample being shipped offsite?		
Save / Return sample after analysis?		
Other info:		
If this sample requires special storage rec	quirements, please desc	ribe:
Responsible Individual for Disposal of Sa	mple	
Name:	Dept:	Ext:
Sample delivered to Count Room:	Date / Time:	
COUNT ROOM	MUSEONLY	
Qualitative or Quantitative Analysis? Exp	lain below.	
3600 sec. Comt on che	- Sealer libr	ry Lising
47 mlf. Her Seometry	3.	
Sample ID Number:		
Analysis Completed By: Dryka	Date: (	53.16.04
Sample Storage Location:	for Ivash	0.1
Radiochemistry Supervisor Review:	Date:	3-16.04
U		
	V	

\* 16-MAR-2004 15:22:18.26 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - MASSLINE; PAB-CHARGING PUMP B CUBICLE REASON FOR ANALYSIS: Site Characterization \* SURVEY ID RWP NUMBER : N/A : N/A : 040316029A SAMPLE ID \* SAMPLE GEOMETRY : 47MLFILTER SAMPLE TIME : 16-MAR-2004 00:00 \* GEO EFFICIENCY DATE: 24-JUN-2003 \* SAMPLE QUANTITY : 1.00000E+00 SMR. SAMPLE TYPE : SMEAR DETECTOR : DET 5 \* LIBRARY : CHEM SMEAR : 16-MAR-2004 09;32 LAST ENERGY CAL \* ENERGY TOLERANCE: 0.70000 : 5.00679E-01 \* HALF LIFE RATIO : 9.00000 KEV/CHANNEL \* END CHANNEL START CHANNEL : 100 : 4096 ACQ DATE & TIME : 16-MAR-2004 14:22 \* DEADTIME (%) : 0.1% \* SENSITIVITY PRESET LIVE TIME : 0 01:00:00 : 5.00000 ELAPSED REAL TIME : 3602.0 Secs \* GAUSSIAN SEN : 10.00000 3600.0 Secs ....\* CORRECTION FACTOR: 2.22000E+06 ELAPSED LIVE TIME : DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.RP.NEW] 040316029A ADC5 SMEAR.CNF;1 \* ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 Collected by : GIBSON REVIEWED BY 1 COMMENTS Post-NID Peak Search Report FWHM Channel Left Pw %Err Fit Nuclides It Energy Area Bkgnd 8 51.9 0 59.70 37 113 1.34 119.39 115 AM-241 103 2.02 1022.07 1015 17 21.6 0 511.50 120 50 1.62 1209.23 .1206 11 43.0 0 605.16 35 CS-134 53 1:43 1322.24 1315 661.70\* 2764 15 2.0 CS-137 1585 43 23 1.42 1591.64 15 28.6 795.47 CS-134 3 1.76 2345.13 0 1173.31\* 290 2339 12 6.4 CO-60 0 1332.66\* 202 4 1.57 2663.84 2657 14 7.9 CO-60

Summary of Nuclide Activity Sample ID : 040316029A	Page : 2 Acquisition date : 16-MAR-2004 14:22:01
Total number of lines in spectrum Number of unidentified lines Number of lines tentatively identif	7 1 Fied by NID 6 85.71%
Nuclide Type : AP	
Wtd Mean           Uncorrected           Nuclide         Hlife         Decay         dpm/SMR.           CO-60         5.27Y         1.00         2.177E+02           CS-134         2.06Y         1.00         2.121E+01           AM-241         432.20Y         1.00         1.321E+01           Total Activity : 2.521E+02	dpm/SMR. 1-Sigma Error %Error Flags 2.177E+02 0.117E+02 5.39 2.122E+01 0.532E+01 25.08 1.321E+01 0.689E+01 52.15
Nuclide Type : FP	
Wtd Mean Uncorrecte Nuclide Hlife Decay dpm/SMR. CS-137 30.17Y 1.00 1.588E+03	dpm/SMR. 1-Sigma Error %Error Flags 1.588E+03 0.069E+03 4.32
Total Activity : 1.588E+03	3 1.588E+03
Grand Total Activity : 1.840E+03	3 I.840E+03
Flags: "K" = Keyline not found "E" = Manually edited	"M" = Manually accepted "A" = Nuclide specific abn. limit

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 16-MAR-2004 15:22 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - MASSLINE: PAB-CHARGING PUMP B CUBICLE

SAMPLE No. : 040316029AOPERATOR NAME : CASSAMPLE TYPE : SMEARSAMPLE GEOMETRY : 47MLFILTERCOUNT TIME : 16-MAR-2004 14:22:01SAMPLE QUANTITY : 1.00000E+00SAMPLE TIME : 16-MAR-2004 00:00:00DETECTOR : DET 5LIBRARY : CHEM\_SMEARCHEM\_SMEAR

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR dpm/SMR.	COMMENTS	
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CO-60	1332.49	0.18	2.177E+02	QA Results OK	
CS-134	604.70	0.46	2.122E+01	QA Results OK QA Results OK	
CS-137	661.65	0.05	1.588E+03	QA Results OK	
AM-241	59.54	0100	the star and the had a first the	Vox Count Rate Error = 5	2.
AVG ENER	GY DIFF :	= 0.21	1.840E+03	= TOTAL GAMMA ACTIVITY	

Qualitative	Contains
Analysis	Licensed
Only,	Material

#### UNIDENTIFIED/REJECTED PEAKS

GAMMA/SEC POTENTIAL ENERGY NET AREA FWHM GAMMA/SEC /SMR. % ERROR FLAG ID ACTIVITY 511.50 120. 2.02 7.678E-01 7.678E-01 21.6 U ANN-RD 0.000E+00

> Total Unidentified/Rejected Peaks = 1 % Unidentified/Rejected Peaks = 14.29

Performed by Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

### Page 84 of 116

Connecticut Yankee	Atomic Power Co.
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5hru

Radiochemistry Count Room . Connecticut Yankee Decommissioning Project

## Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: MRG. bsow \_\_\_\_\_ Date / Time: 3-16-09 Copy of Results To: Milke Damages Dept: Ext: Sample Description: Massilum from Converte Chiadian Location: Punn Station 8 D.t Reason for Analysis: Uarkanan If from Personnel: Name: \_\_\_\_\_ EID RWP: 4199-1 Contamination Levels: <mon By CCPM / DPM < mon g CCPM / DPM < mon mR/hr</pre> Sample Weight / Volume: \_\_\_\_\_ (cc, ml, grams, etc.) Sample Container: Is this sample for free release? YES or NO (circle one) Is this sample being shipped offsite? YES or NO (circle one) Save / Return sample after analysis? YES or NO (circle one) Other info: If this sample requires special storage requirements, please describe: Responsible Individual for Disposal of Sample Name: Dept: Sample delivered to Count Room: Date / Time: COUNT ROOM USE ONLY Qualitative or Quantitative Analysis? Explain below. 5600 Sec. Comp on Chen- Seneur 47 mlf. Her Seometry Oualita Analys Sample ID Number: 04.31602917 Only Analysis Completed By: Deck Date: 03-16-05 Sample Storage Location: 1 vash Conta Val Radiochemistry Supervisor Review: Date: Licens Mater

CI-III -017.5 INEVISION V PAGE Page 74 of 104 . QA CHECK (V9.1) : 16-MAR-2004 15:22 : CAS CYAPCO HADDAM NECK STATION POST NID QA ANALYSIS .ITLE : - MASSLINE: PAB-CHARGING PUMP B CUBICLE OPERATOR NAME : CAS SAMPLE GEOMETRY : 47MLFILTER SAMPLE No. : 040316029A SAMPLE TYPE : SMEAR COUNT TIME : 16-MAR-2004 14:22:01 SAMPLE QUANTITY : 1.00000E+00 SAMPLE TIME : 16-MAR-2004 00:00:00 DETECTOR : DET 5 LIBRARY : CHEM SMEAR PEAK ENERGY DECAY CORR ENERGY DIFF (KEV) dpm/SMR. COMMENTS ISOTOPE - - - - - - - -- 

 CO-60
 1332.49
 0.18
 2.177E+02
 QA Results OK

 CS-134
 604.70
 0.46
 2.122E+01
 QA Results OK

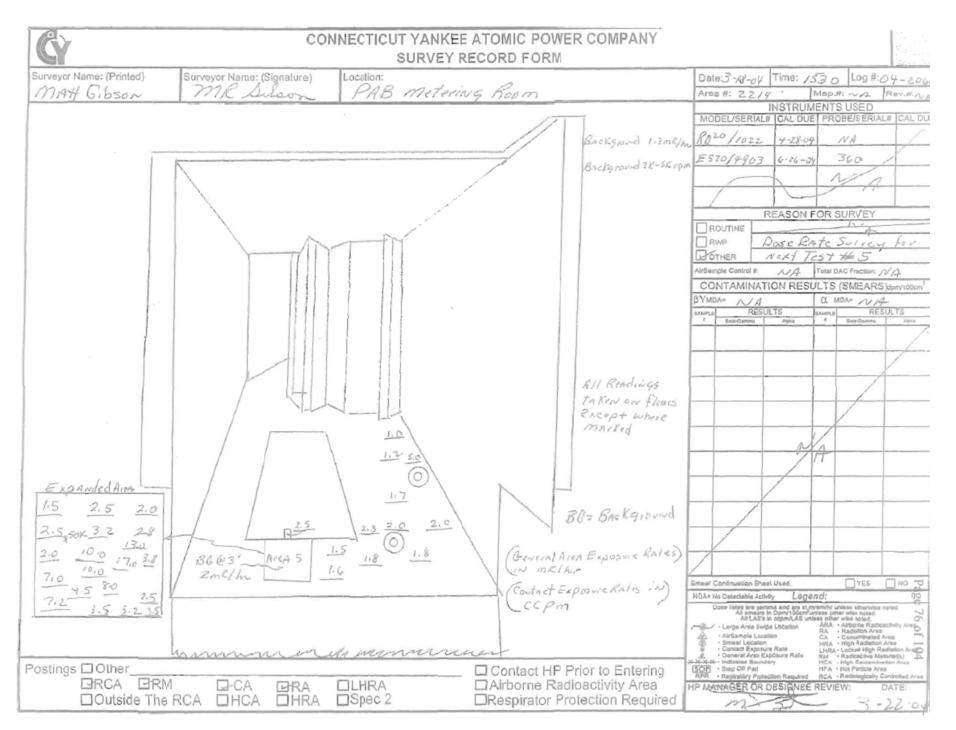
 CS-137
 661.65
 0.05
 1.588E+03
 QA Results OK

 AM-241
 59.54
 0.16
 1.321E+01
 QA Results OK

 QA Results OK QA Results OK 1.321E+01 V Ma Count Rate Error = 52. 우리는 유민은 것 같은 것 같은 것 같은 것 같은 것 같이 많이 봐. AVG ENERGY DIFF = 0.21 1.840E+03 = TOTAL GAMMA ACTIVITY Oualitative Contains Analysis Licensed Only. Material UNIDENTIFIED/REJECTED PEAKS POTENTIAL GAMMA/SEC ENERGY NET AREA FWHM GAMMA/SEC /SMR. % ERROR FLAG ID ACTIVITY liller islen hereite terregiet, beigesket \_\_\_\_\_ \_\_\_\_\_ ......... 21.6 511.50 120. 2.02 7.678E-01 7.678E-01 ANN-RD 0.000E+00 -0 Total Unidentified/Rejected Peaks = 1 % Unidentified/Rejected Peaks = 14.29 Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis lik Performed by Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

Page 86 of 116

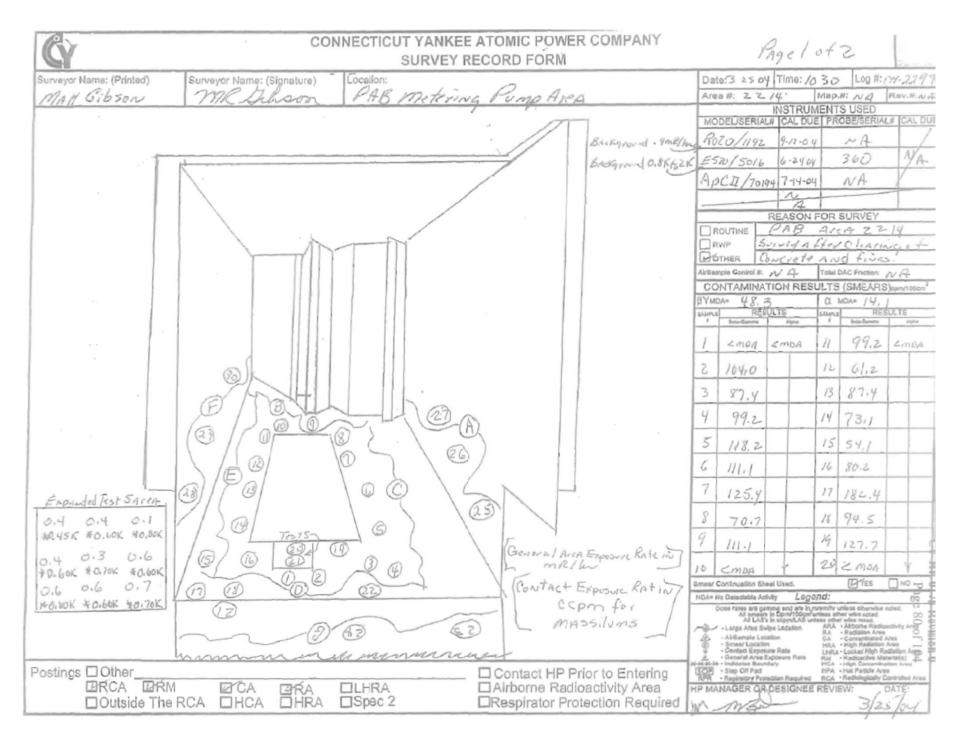
## Attachment 5.A CY Tests 5 Metering Pump Cubicle Survey



CONNECTICUT YANKEE	ATOMIC POWER COMPANY
SURVEY RF	ECORD FORM
Surveyor Name: (Printed) Surveyor Name: (Signature) Location: MATT Gibson MIR Dilson PAG Meterin	Pump Area Beer Hor Rev. Hor Re
	INSTRUMENTS USED MODEL/SERIAL# [CAL DUE] PROBE/SERIAL# [CAL D E140/1634 8-26-04 360 APC/II/70194 7-14-04 A
	BASKGIOUVEL LA COUNTRY BASKGIOUVEL LA COUNTRY BASKGI
	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
Test Arch (S)	8 80.2 18 187.1 9 144.4 19 123.0
A CO 3 CA	10     10 L. 4     20     85.0       Simear Continuation Sheet Used.     VES     VES       NDA* No Detectable Advity     Legend:     VE       All AA* is in signification Area     All AA* is in signification Area     All AA*       All AA* is in signification Area     All AA*     All AA*       Binear Continuation Sheet Used.     VES     Notes       All AA*     In Contraction     All AA*       And Barge Location     All A*     All AA*       All AA*     All AA*     All AA*       All AA*     All AA*     All AA*       All A*     Contraction     All A*       All AA*     All A*     All A*       Barget Location     Contraction     All A*       All AA*     All A*     All A*       All A*     All A*     All A*       A*     Contraction     All A*       A*     Contraction
Postings Other SRCA ORM OCA ORA OLHRA Outside The RCA OHCA OHRA OSpec 2	Contact HP Prior to Entering Airborne Radioactivity Area Reprisor Protection Required

Cy	CON		EE ATOMIC POW	ER COMPANY			Pag	e l	of 2	S
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*8K #46K #45K	6325310	(11)	CCP"	n for massilvin	NDA#	No Delečiable Act Dose rales are ga	time and are in m	mem/h/	utiess etherwise (	And And
2.2 4.5 4.5	CONS CE	~ ~	32		~	All smears All LAS's - La/ge Aria Sw	In Dpm/100cm/u In copm/LAS uni	nless of less oth ARA	her wise noted. Ir wise noted. • Airbente Radio	~ ~
Background for This Area, 8000pm	want TE and TE	50 (S)	(hZ)		-	AirSainple Loc     Smear Locallo     Contact Expen	noliti	CA	Rediation Area     Contaminated /     High Rediation	Area The
	hommenter	a minn	unert	Diants Fatadas	-	- Genelal Area 8 K- Indidalas Beun	xposure Rale		Locked Yigh Ra     Redissolve Ma     High Contamina	Indef(s) 04
Postings Other PRCA PRM	PCA PRA			Prior to Entering dioactivity Area		- Blep Oft Pad - Replationy Prot			Radiologically C	Caniralled Area
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23	80.2														APCIT	70194	NA	7-14-04
24	70.7											1						2
25	SMPA											1				/	14-	
26	379.4																	
27	104.0									/					-/-	1		
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							ZA.								C 120			/
						4									D 220		1	1/ -
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_			4													N		
		_/														A		
_		/																
															Survey Area	a# etc.) Shoul vey for which	ld match th	me, Signature, hat of the r Continuation

## Attachment 5.B CY Tests 5 Metering Pump Cubicle Sample Data

Connecticut Yankee Atomic Power Co.

Radiochemistry Count Room

# Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: <u>MR G.bsen</u>		
Copy of Results To:		
Sample Description: <u>Coursete</u> Chips		
-ocation: Pab metering		
Reason for Analysis:Kawawas		
f from Personnel: Name:	EID	RWP: <u>4149-1</u>
Contamination Levels:		
<u> </u>		
Sample Weight / Volume: 1295- (d	cc, ml, grams etc.	)
Sample Container: <u>) le mar</u>		
s this sample for free release? Y	ES or NO circle on	e)
	ES or NO circle on	
Save / Return sample after analysis? Y	ES or NO (circle one	
Save / Return Sample after analysis:		·)
		cribe:
Other info: If this sample requires special storage require Responsible Individual for Disposal of Sample Name:	ements, please des	
If this sample requires special storage require Responsible Individual for Disposal of Sample Name:	ements, please des	Ext:
If this sample requires special storage require Responsible Individual for Disposal of Sample Name:	e Dept:	Ext:
If this sample requires special storage require Responsible Individual for Disposal of Sample Name: Sample delivered to Count Room:D	ements, please des	Ext:
If this sample requires special storage require Responsible Individual for Disposal of Sample Name: Sample delivered to Count Room: D COUNT ROOM US	ements, please des	Ext:
If this sample requires special storage require Responsible Individual for Disposal of Sample Name: Sample delivered to Count Room: D COUNT ROOM US	ements, please des	Ext:
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If this sample requires special storage require Responsible Individual for Disposal of Sample Name:	e Dept:	Ext:
If this sample requires special storage require Responsible Individual for Disposal of Sample Name:	e Dept:	Ext:

23-MAR-2004 15:55:29.29 CONNECTICUT YANKEE HADDAM NECK STATION \*\*\*\*\*\*\*\*\*\*\*\*\* SAMPLE TITLE : - CONCRETE CHIPS: PAB METERING PUMP CUBICLE SAMPLE ID : 040323020 \* SAMPLE GEOMETRY : 11mar SAMPLE TIME : 23-MAR-2004 15:00 \* GEO EFFICIENCY DATE: 30-JUL-2003 SAMPLE TYPE : LIQUID \* SAMPLE QUANTITY : 1.29800E+03 ML DETECTOR : DET 2 \* LIBRARY : CHEM RELEASE LAST ENERGY CAL : 23-MAR-2004 00:58 \* ENERGY TOLERANCE: 1.00000 KEV/CHANNEL : 5.00584E-01 \* HALF LIFE RATIO : 9.00000 : 100 START CHANNEL \* END CHANNEL : 4096 ACQ DATE & TIME : 23-MAR-2004 15:50 \* DEADTIME (%) : 28% \* SENSITIVITY PRESET LIVE TIME : 0 00:03:20 : 5.00000 ELAPSED REAL TIME : 277.38 Secs \* GAUSSIAN SEN : 10.00000 ELAPSED LIVE TIME : 200.00 Secs \* CORRECTION FACTOR: 1.00000E+00 DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.CHEM.NEW] 040323020 ADC2 LIQUID.CNF;1 ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 Licensed Collected by : GIBSON Material REVIEWED BY COMMENTS Post-NID Peak Search Report It Energy Area Bkgnd FWHM Channel Left Pw %Err Fit Nuclides 2 661.65\* 644314 10888 1.82 1322.77 43 0.1 2.30E+02 CS-137 1314 1.73 1339.69 9.5 2 670.10 2126 10741 1314 43 0 1173.57\* 845 1171 2.16 2346.97 2340 16 9.8 CO-60 866 2635 5.9 0 1321.97 1373 3.41 2644.04 18 476 7.8 0 762 2.08 2665.62 2655 19 1332.75\* CO-60

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 23-MAR-2004 15:55 REQUESTOR : CAS

#### CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - CONCRETE CHIPS: PAB METERING PUMP CUBICLE

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR uCi/ML	COMMENTS
				~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
CO-60 CS-137	1332.49		1.286E-05	QA Results OK QA Results OK
Caled and I	001.00		here a second	ga itestites on
AVG ENER	GY DIFF :	= 0.1.3	7.028E-03 =	TOTAL GAMMA ACTIVITY

#### UNIDENTIFIED/REJECTED PEAKS

POTENTIAL GAMMA/SEC ENERGY NET AREA FWHM GAMMA/SEC /ML % ERROR FLAG ID ACTIVITY --------------\_\_\_\_ 670.102126.1.739.566E+027.370E-019.49.321.971373.3.411.107E+038.529E-015.85 U Contains 1321.97 Licensed Material Total Unidentified/Rejected Peaks = 2 % Unidentified/Rejected Peaks = 40.00 Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis library)

Operator Overrode Dead Time Limit

Performed by Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

Control N	umber:		Attac	Page 85 of 104					
	032	2320	Air Sample ( Section 1 - (	Sample Taken					
Sample Date:	23-Mar-04	Sample Location and Work Activities Performed:	k pab metering-	concrete chip	ping				
RWP / Job Step	4149/1	Routine: D W M	Sampler Serial Number:	90	Sampler Type:	ras	Sampler Cal 6/15/2004 Due Date: 6/15/2004		
Sam	ple Time & Date	Collection Time (min)	Flow Rate				Sample Volume		
On: 03/23/04 _1	Off: 4:15 03/23/04 15:20	65		1 cfm			65 Cu. Ft.		

Gross Beta-Gamma activity of < 6.0 E-11 = < 0.3 Total Particulate DAC

Conversion Factors: Liters -- 4.5E-10 liters uCi / ml dpm

Co-60 activity of  $\leq 6.0$  E-11 =  $\leq 0.3$  Total DAC

Cubic Feet -- 1.6E-11 cubic feet vCi / ml dpm

Gross Blyconcentration of > 6.0 E -11 uCi/cc requires MGCA Count, It available

## Section 2 -- Gross Beta-Gamma

at Count Time / Date Instrument Serial No. Cal Due Sample Counted By: Gross β/r Concentration (uCi/cc) MCGA Count I 1.42E-10 3/23/04 20:15 XLB-1 40045-1 10/08/04 ash Gross Counts Count Time (min) Gross CPM Bkgd. CPM MDCR Net CPM Eff. Factor Conv. Factor Volume 117 0.5 234.00 2.58 12.92 231.42 2.5 1.6E-11 65 Cu. Ft. MDA = 7,96E-12

## Section 3 -- Gross Alpha

MGCA results of > 0.9E-11 uCl/cc Co-60 requires alpha count

st Count Time / Date	Instrument	Serial No.	Cal Due		Sample Counted By:			Gross α Concentration (uCi/cc)					
N/A	N/A	N/A	N/A	A N/A			N/A						
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCR		R Net CPM Eff.		actor	Conv. Factor	Volume	SAF		
N/A N/A		N/A	N/A	N/J	A.	N/A	N/	A	1.6E-11	15 Ga Pa	1.3		
	d							MDA					

1	Initial Gross	alpha	concentration	101 2	1.0	E-12 re	quires :	a decayed	recoun	t
					-					

nd Count Time / Date	Instrument	Serial No.	Cal Due	Sample Counted By:			Gross a Concentration (uCi/cc)				
N/A	N/A	N/A	NIA			N/A			N//	1	
Gross Counts	Count Time (min)	Gross CPM	Bkgd. CPM	MDCF	R	Net CPM	Eff. P	actor	Conv. Factor	Volume	5AF
N/A	N/A	N/A.	N/A.	N/A		N/A	N	IA.	1.6E-11	65 Co. PL	1.3
			L			-		MDA =	L		

### Section 4 -- Scaled DAC Fractions

(Only for air samples taken in area less than 200 dpm/100 cm² alpha)

Туре	uCí/cc	DAC Fraction	Scaling Conversion	Scaled a/β/γ	DAC Fraction
0-60 or Gross (My (DAC=1.0E-8)	1.95E-11	1.95E-03	50 X Co-60 OR Gross β/γ DAC Fraction	<	0.098

Co-60 result is less than MDA

## Section 5 -- Measured DAC Fractions

Туре	InitialuCi/cc	Initial DAC Fraction	Final uCi/cc	Final DAC Fraction
s (Vy (DAC=1.0E-8)	N/A.	N/A	N/A	N/A
(DAC=3.0E-12)x1.1	N/A	N/A	N/A	N/A
Measured DAC F	raction =	N/A		, N/A.
Measured DAC F	Fraction =	N/A	Date: 3	, NIA

Page 96 of 116

rage ou or ivy 23-MAR-2004 21:15:49.42 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - PAB METERING PMP RM- CHIP CONCRETE REASON FOR ANALYSIS: Air Filter count for Beta Limit RWP NUMBER : 4149/1 \* SURVEY ID : 032320 : 040323026 SAMPLE ID \* SAMPLE GEOMETRY : 47MLFILTER GEO EFFICIENCY DATE : 24-JUN-2003 AIR SAMPLER ID# : 90 \* CAL DUE DATE : 15-JUN-2004 START TIME : 23-MAR-2004 14:15 : 23-MAR-2004 15:20 \* END TIME \* END FLOW RATE START FLOW RATE: 1.0000 : 1.0000 SAMPLE TIME : 23-MAR-2004 15:20:00.00 SAMPLE TYPE : AIR PARTICULATE \* SAMPLE QUANTITY : 1.84059E+06 CC \*\*\*\*\*\* DETECTOR : DET 5 \* LIBRARY : CHEM SMEAR LAST ENERGY CAL : 23-MAR-2004000:38 \* ENERGY TOLERANCE: 1.00000 KEV/CHANNEL : 5,00482E-01 dealer t\* HALF LIFE RATIO : 9,00000 START CHANNEL : 100 \* END CHANNEL : 4096 : 0.0% ACQ DATE & TIME : 23-MAR-2004 21:05 \* DEADTIME (%) \* SENSITIVITY PRESET LIVE TIME : 0 00:10:00 : 5.00000 : 10.00000 ELAPSED REAL TIME : 600.09 Secs \* GAUSSIAN SEN ELAPSED LIVE TIME : 600.00 Secs \* CORRECTION FACTOR : 1.00000E+00 DECAYED TO 0 DAYS HOURS FILE IDENT : CASSDISK: [NEU.SAMPLE.RP.NEW]040323026 ADC5 AIR.CNF;1 ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 COLLECTED BY : GIBSON Ð REVIEWED BY COMMENTS Post-NID Peak Search Report Fit FWHM Channel Left Pw %Err Nuclides It Area Bkgnd Energy 7 124 7 76.3 0 63.48× 0 1.18 126.96 15 5 1.10 467.90 462 10 38.0 234.08 1.61 1322.10 0 1318 9 6.8 219 CS-137 661.38\*

Derived Air ( Sample ID :		n Report	-		Page : 2 23-MAR-2004 21:05:33
Nuclide Type	: FP				
Nuclide	Activity (uCi/CC)	1-Sigma % Error	DAC (uCi/CC)	Fractional DAC	
CS-137	1.850E-10	7.8	6E-08 (D)	3.083E-03	
Totals:	1.850E-10			3,083E-03	
Grand Totals:	1.850E-10			3.083E-03	

PAGE 1 OF

REPORT NAME : DET LIM (V1.1) REPORT DATE : 23-MAR-2004 21:15 REQUESTOR : CAS

#### CYAPCO HADDAM NECK STATION

#### DETECTION LIMIT CONFIRMATION REPORT

Sample Title Sample Time Count Time Sample Qauntit Nuclide Librar Analyzed By Sample Media Sample Shelf Detector	: 47MLFILTER : 0
Keduired ppp -	ine : cro_hb.roi_nintrone - inhaith intoiteo Air intriteob
Nuclide L	Required Measured LD (uCi/CC) VALUE (uCi/CC) LLD MET
CO-60	6.000E-11 < 1.947E-11 Passed
	**** End Of Report ( 1 Page ) ****

PAGE 1 OF

REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 23-MAR-2004 21.15 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - PAB METERING PMP RM- CHIP CONCRETE

SAMPLE No. : 040323026OPERATOR NAME : CASSAMPLE TYPE : AIR PARTICULATESAMPLE GEOMETRY : 47MLFILTERCOUNT TIME : 23-MAR-2004 21:05:33SAMPLE QUANTITY : 1.84059E+06SAMPLE TIME : 23-MAR-2004 15:20:00DETECTOR : DET 5LIBRARY : CHEM\_SMEARCHEM\_SMEAR

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	IN MACHINE CONTRACT	COMMENTS
CS-137	661.65	-0.27	1.850E-10	QA Results OK
AVG ENER	GY DIFF =	-0.27	1.850E-10 =	TOTAL GAMMA ACTIVITY

9 de 19 d

UNIDENTIFIED/REJECTED PEAKS

POTENTIAL GAMMA/SEC ENERGY NET AREA FWHM GAMMA/SEC /CC % ERROR FLAG ID ACTIVITY PB X-RAY 0.000E+00 7. 1.18 8,260E-02 4,488E-08 63.48 76.3 k TH-234 3.141E-11 10 15. 1.10 3.017E-01 1.639E-07 38.0 234.08 Total Unidentified/Rejected Peaks = 2

% Unidentified/Rejected Peaks = 66.67

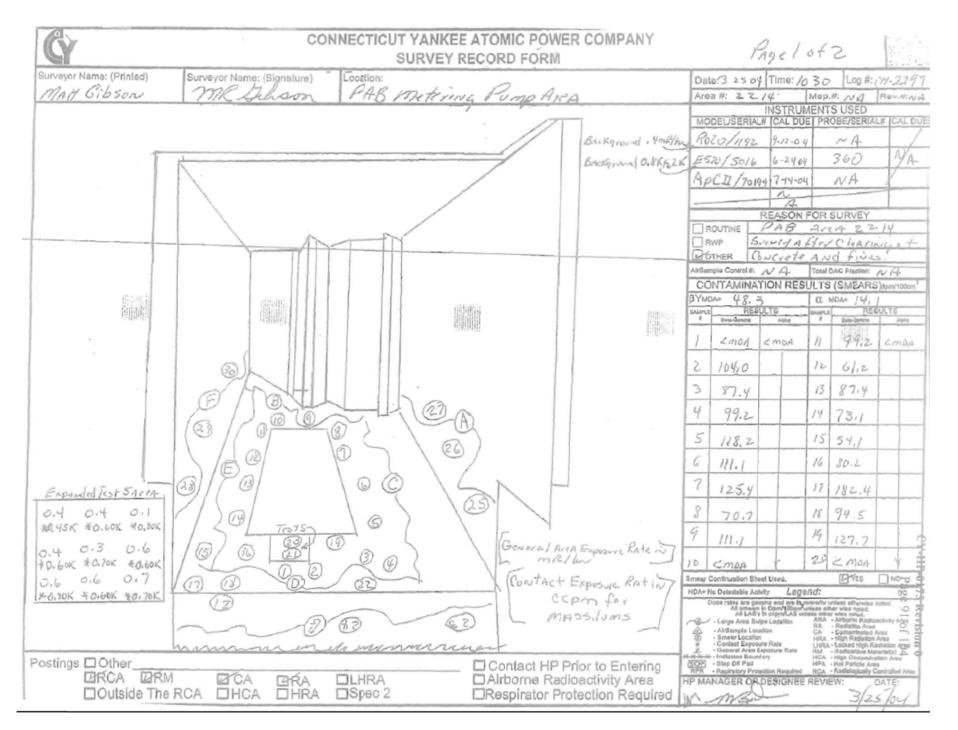
Flags: U - Unknown Line

R - Rejected During Analysis

P - Positively Identified (line not in analysis library)

Performed by: Reviewed by: \*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

## Attachment 6.A CY Tests 6 Metering Pump Cubicle Survey

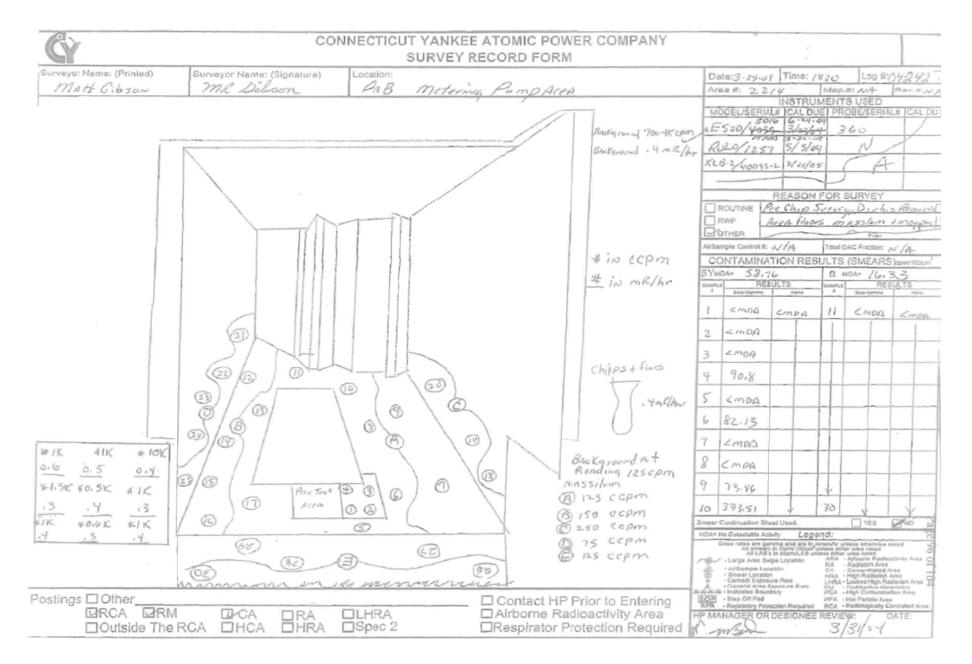


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					CONTA		N RESULTS	(SMEARS)	dpm/100	cm <sup>547</sup>		(11)			Page	2	2 1		2	1101.000	<u>r</u>
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CONNECTICUT YANKEE ATOMIC POWER COMPANY	Tradition and the
SURVEY RECORD FORM	Start Bi
Surveyor Name: (Printed) Surveyor Name: (Signature) - Location:	09#04:233C
Matt Gibson MR Subarn PAB metering Pump Area Area H: 2214 Map. #: M	
INSTRUMENTS US MODEL/SERIAL# CAL DUE   PROBES	SERIAL # ICAL DU
BACKGROUNDU.8-3.0KCpm ES20/SOLL 6/24/04 36	0
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Pedistal.	IT
TC/OOTTOT OOT	
ROUTINE LAYOUT For	Next
DOTHER TOTAL	
	action: NA
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	RESULTS
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WWW-W-Indicates Boundary HCA - High	Contamination Area Particle Area alogically Controlled Area
A RCA RAN A CA RAN LHRA Airborne Radioactivity Area HP MANAGER OR DESIGNEE REVIEW:	DATE:
Outside The RCA HCA HCA Spec 2 Respirator Protection Required 3/3d	0-1

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	ØRCA ØRM		<b>Ø</b> RA	LHRA		Contact HP I Airborne Rad	loactiv		RPR	Repiratory Pro	DESIGNEE	RCA .	Hol Particle Area Radiologically Co	anirolled Area
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## Attachment 6.B CY Tests 6 Metering Pump Cubicle Sample Data

Control Numb						Attachment A Page 97 of 104									
		2911		A	Section 1		0				Sample Takan By		Gibs	on	
Sample 29 Date:	-Mar-04		Location a rities Perfo		PAB-Mete	ring Pu	mp Cub	icle: C	oncrete	)					
RWP / Job Slep	4149-1	Routine:	D	N M	Sampler Serial Number:		90		Sampler Type:	F6	is	Sampler ( Due Date:	Cal	8/15/2004	
Sample Ti	me& Date	Colle	ction Time	(min)	Flow Rate							Sample Volu	ne		
On: 03/29/04 7:55	Off: 03/29/04 9:55		1	20			1 cfm					120 Cu, Ft.			
Gross Beta-Gamma activity of ≤ 6.0 E-11 = ≤ 0.3 Total Particulate DAC Conversion Factors: Liters 4.5E-10 liters uCi									activity of <u>&lt;</u> Feet ~ 1.6E-						
Section	2 Gros	s Bet	a-Gar	nma		Gross β/γc	oncentration	r of > 6.0 E	-11 uCl/cc re	iquires MG	CA Count,	lf avallable			
1# Count Time / Date	Instrument	Seria	I No.		Cal Due		S	ample Co	ounted By	:	Gros	is β/γ Conce	ntratio	on (uCi/cc)	
3/29/04 16:26	XLB-1	400	45-1		10/08/04			Brig	ham			2.41	E-1	1	
Gross Counts	Count Time (min)	Gross	CPM	Bk	gd. CPM	MD	CR	Net	CPM	Eff. F	actor	Conv. Facto	or	Volume	
39	0.5	78	.00		5.67	16	.55	72	.33	2	.5	1.6E-11		120 Cu. Ft.	
Section	3 Gros	s Alp	ha					MGCA res	uits ol > 6.0E	-11 uCl/cc		5.52E-12	nt		
1st Count Time / Date	Instrument										n (uCi/cc)				
N/A	N/A	N	IA.		N/A	N/A			'A		R.	N	Ά		
Gross Counts	Count Time (min)	Gross	CPM	Bk	gd. CPM	MD	IDCR Net CPM		Eff. Factor		Conv. Facto	r Volu	me SAF		
N/A	N/A	N	A		N/A	N	/A	N	/A	N	A	1.6E-11	128 C	n 1.3	
							Initial Gros	is alpha c	oncentratio	on of > 1.0	MDA =	uires a decay	ed reco	ount	
2rd Count Time / Date	Instrument	Seria	l No.		Cal Due				ounted By:			s α Conce			
N/A	N/A	N	A		N/A			N	A		Steel N	N	A	Ser The	
Gross Counts	Count Time (min)	Gross	CPM	Bk	gd. CPM	MD	CR	Net	CPM	Eff. F	actor	Conv. Facto	r Volt	me SAF	
N/A	N/A	N	A		N/A	N	A	N	/A	N		1.6E-11	128 0	1.3	
Section	4 Scale	d DA	C Fra	ction	S			(Only for	air sample:	s taken in	MDA =	than 200 dp	m/100	cm² alpha)	
	Туре			i/cc	DAC Fraction			_	nversion		_			AC Fraction	
Co-60 or G	OSS BAY (DAC=1.0	E-8)	2.41	E-11	2.41E-03	50	) X Co-60	OR Gros	is β/γ DAC	Fractio	n			0.121	
Section	E Maaa	uno el	DAC	Eroot	lana										
Section	Type	ured			ıCi/cc	Initial	DAC Frac	tion	Fin	al uCi/	cc	Final	DAC	Fraction	
MGCA or Gro	ss β/γ (DAC=1	.0E-8)		N/A		nintial	N/A		1110	N/A		r inal	5.40	N/A	
Gross Alpha (DAC=3.0E-12)x1.1 N/A						N/A				N/A		N/A			
Tota	Measur	ed DA	. <u>C</u> Fra	action	=	N/A N/A									
Reviewed	By: Control #00007-02	MI.	3.2						. (	Date:	3/3	20/04			

## Connecticut Yankee Atomic Power Co.

### Radiochemistry Count Room

Connecticut Yankee Decommissioning Project

# Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: <u>Matt</u> Gibson Copy of Results To: <u>Pe Gasper</u>				
Sample Description: Chips v				
Location: Pass meter P				
Reason for Analysis: Un Kargeres				
If from Personnel: Name:			RWP:	4149-1
Contamination Levels:				
<u> </u>	CMPR 8	CCPM / DPM	1 CMDA	mR/hr
Sample Weight / Volume:) 3 つ	<u> </u>	grams, etc.	)	
Sample Container: l mm	<u>^_</u>			
Is this sample for free release?		NO (circle on	e)	
Is this sample being shipped offsite		NO circle on	· ·	
is the sumple being simpled shore		i i e Acircie on	(0)	
		$\leq$		
Save / Return sample after analysis		NO circle one	). )	
Save / Return sample after analysis Other info:			3)	
	? YES or			
Other info:	? YES or			-
Other info: If this sample requires special stora Responsible Individual for Disposal	? YES or ge requirement of Sample	s, please des	scribe:	
Other info:	? YES or ge requirement of Sample	s, please des	scribe:	
Other info: If this sample requires special stora Responsible Individual for Disposal	? YES or ge requirement of Sample	Dept:	scribe: Ext:	
Other info: If this sample requires special stora Responsible Individual for Disposal Name: Sample delivered to Count Room:	? YES or ge requirement of Sample Date /	Dept:	scribe: Ext:	
Other info: If this sample requires special stora Responsible Individual for Disposal Name: Sample delivered to Count Room:	? YES or ge requirement of Sample	Dept:	scribe: Ext:	
Other info:	? YES or ge requirement of Sample Date / <u>ROOM USE Of</u> ? Explain below	Dept:	scribe: Ext:	
Other info:	? YES or ge requirement of Sample Date /	Dept:	scribe: Ext:	
Other info:	? YES or ge requirement of Sample Date / <u>ROOM USE Of</u> ? Explain below	Dept:	scribe: Ext:	
Other info:	? YES or age requirement of Sample Date / <u>Date /</u> ? Explain below مر آن حر	S, please des	scribe:	
Other info:	? YES or age requirement of Sample Date / Date / ROOM USE ON Explain below MISC	S, please des	scribe: Ext:	o d Cor
Other info:	? YES or ge requirement of Sample Date / TROOM USE ON ? Explain below 2000 023	s, please des Dept: Time: NLY wDate:	scribe:	

mise IL MAR- Chem

\*\*\*\*\*\*\*\*\*\* 30-MAR-2004 20:26:40.02 CONNECTICUT YANKEE HADDAM NECK STATION SAMPLE TITLE : - PAB METERING PMP ROOM- CHIPS/FINES SAMPLE ID : 040330023 \* SAMPLE GEOMETRY : 11mar SAMPLE TIME : 29-MAR-2004 14:00 \* GEO EFFICIENCY DATE: 30-JUL-2003 SAMPLE TYPE : LIOUID \* SAMPLE QUANTITY : 1.37000E+03 GM : DET 2 \* LIBRARY DETECTOR : CHEM RELEASE : 30-MAR-2004 01:49 \* ENERGY TOLERANCE: 1.00000 LAST ENERGY CAL : 5.00711E-01 KEV/CHANNEL \* HALF LIFE RATIO : 9.00000 : 4096 : 100 START CHANNEL \* END CHANNEL ACQ DATE & TIME : 30-MAR-2004 20:06 \* DEADTIME (%) : 17% PRESET LIVE TIME : 0 00:16:40 \* SENSITIVITY : 5.00000 ELAPSED REAL TIME : 1205.9 Secs \* \* GAUSSIAN SEN : 10.00000 ELAPSED LIVE TIME : 1000.0 Secs \* CORRECTION FACTOR: 1.00000E+00 DECAYED TO 1 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.CHEM.NEW]040330023\_ADC2\_LIQUID.CNF;1,\* \*\*\*\* ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WIMEAN V1.8 Contains Collected by : HP Licensed REVIEWED BY 2 Material COMMENTS Post-NID Peak Search Report Area Bkgnd FWHM Channel Left Pw %Err Fit Nuclides It Energy Ô. 604.65 2778 21681 1.79 1208.47 1204 10 10.1 CS-134 0 661.51\* 1973685 57413 1.66 1322.15 1314 17 0.1 CS-137 8377 1.58 1590.65 1586 10 11.5  $\cap$ 795.78 1527 CS-134 4038 2.05 2345.47 2336 19 0.9 0 1173.10\* 24530 CO-60 1318.87 253 1322.23 1841 1.29 2637.21 2634 17 19.3 2.47E+00 6 977 3.02 2643.93 2634 17 5.3 б 1492 0 1332.36\* 22496 1526 2.19 2664.20 2654 21 0.8 CO-60 \* counted under 1000 Sec.

PAGE 1 OF REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 30-MAR-2004 20:26 REQUESTOR : CAS CYAPCO HADDAM NECK STATION POST NID QA ANALYSIS TITLE : - PAB METERING PMP ROOM- CHIPS/FINES SAMPLE No. : 040330023OPERATOR NAME : CASSAMPLE TYPE : LIQUIDSAMPLE GEOMETRY : 11marCOUNT TIME : 30-MAR-2004 20:06:16SAMPLE QUANTITY : 1.37000E+03SAMPLE TIME : 29-MAR-2004 14:00:00DETECTOR : DET 2 LIBRARY : CHEM RELEASE PEAK ENERGY DECAY CORR ISOTOPE ENERGY DIFF (KEV) uCi/GM COMMENTS 
 CO-60
 1332.49
 -0.13
 7.133E-05
 QA Results OK

 CS-134
 604.70
 -0.05
 4.109E-06
 QA Results OK

 CS-137
 661.65
 -0.14
 4.072E-03
 QA Results OK
 -------\_ \_ \_ \_ \_ \_ \_ AVG ENERGY DIFF = -0.11 4.148E-03 = TOTAL GAMMA ACTIVITY Contains Licensed Material UNIDENTIFIED/REJECTED PEAKS GAMMA/SEC POTENTIAL ENERGY NET AREA FWHM GAMMA/SEC /GM % ERROR FLAG ID ACTIVITY POTENTIAL \_\_\_ \_\_\_ 1318.87 253. 1.29 4.070E+01 2.970E-02 19.3 1322.23 1841. (3.02) 2.970E+02 2.168E-01 5.30 JF (5-5~~ Total Unidentified/Rejected Peaks = 2 % Unidentified/Rejected Peaks = 28.57 Flags: U - Unknown Line R - Rejected During Analysis P - Positively Identified (line not in analysis library) Operator Overrode Dead Time Limit - ADDE Performed by: Reviewed by:

\*\*\*\* End Of Report ( 1 Page ) \*\*\*\*

### Connecticut Yankee Atomic Power Co.

Radiochemistry Count Room

# Gamma Spectroscopy Sample Analysis Request Form

Sample Taken By: C. hsow	Data / Timor	3-02-04 /	
Copy of Results To: De Gasperi		/	
Sample Description: <u>Massilum</u>			
Location: <u>MAB</u> metering	221 Shipping		
Reason for Analysis: $U \sim K \sim - \leq$			
If from Personnel: Name:			
Contamination Levels:	LID	NWF: 41971	
β γ CCPM / DPM	Calla CCDM/DD	M 6 m P/hr	
Sample Weight/Volume: Sample Container:	(cc, m, grams, etc	-)	
Is this sample for free release?			
Is this sample being shipped offsite?	YES or NO (circle or	ne)	
Save / Return sample after analysis? Other info:	$\bigcirc$		
If this sample requires special storage r			
Responsible Individual for Disposal of S	Sample		
Name:	Dept:	Ext:	
Sample delivered to Count Room:	Date / Time:		
COUNT RO	OOM USE ONLY		
Qualitative of Quanțitative Analysis? E			
/	* / .		Contains
Sample ID Number: 04032302 Analysis Completed By:	12 1	3-23-04	Licensed
Sample Storage Location:/A		0	
Radiochemistry Supervisor Review:	Date:	3-24-08	Qualitative Analysis Only

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rage to a vition \*\*\*\*\*\* 23-MAR-2004 19:22:26.28 CONNECTICUT YANKEE HADDAM NECK STATION \*\*\*\* SAMPLE TITLE : - PAB METERING- POST CHIPPING MASSLIN REASON FOR ANALYSIS: Qualitative Analysis RWP NUMBER : NA \* SURVEY ID : NA \* SAMPLE GEOMETRY : 47MLFILTER SAMPLE ID : 040323023 SAMPLE TIME : 23-MAR-2004 15:00 \* GEO EFFICIENCY DATE: 24-JUN-2003 SAMPLE TYPE : SMEAR \* SAMPLE QUANTITY : 1.00000E+00 SMR. \*\*\*\*\* : DET 5 \* LIBRARY DETECTOR : CHEM SMEAR : 23-MAR-2004 00:38 \* ENERGY TOLERANCE: 0.70000 LAST ENERGY CAL \* HALF LIFE RATIO : 9.00000 KEV/CHANNEL : 5.00482E-01 \* END CHANNEL : 100 START CHANNEL : 4096 ACQ DATE & TIME : 23-MAR-2004 18:22 \* DEADTIME (%) : 0.2% 
 PRESET LIVE TIME : 0 01:00:00
 \* SENSITIVITY
 : 5.00000

 ELAPSED REAL TIME : 3606.0 Secs
 \* GAUSSIAN SEN
 : 10.00000
 : 5.00000 ELAPSED LIVE TIME : 3600.0 Secs \* CORRECTION FACTOR: 2.22000E+06 DECAYED TO 0 DAYS HOURS FILE IDENT : CAS\$DISK: [NEU.SAMPLE.RP.NEW]040323023 ADC5 SMEAR.CNF;1 ANALYSES : PEAK V16.8 NID V3.2 MINACT V2.8 WTMEAN V1.8 Collected by : GIBSON REVIEWED BY : COMMENTS Post-NID Peak Search Report Fit Nuclides Ιt Area Bkgnd FWHM Channel Left Pw %Err Energy 1147 1.12 119.14 0 59.57 260 .115 9 24.3 AM-241 604.49 90 301 1.18 1208.36 1205 9 36.2 0.00E+00 CS-134 49330 392 1.46 1322.04 1315 15 0.5 0 661.35\* CS-137 128 216 3.65 1589.84 1584 15 26.5 CS-134 0 795.27 106 1.80 2344.94 2339 14 1.5 1172.77\* 4727 0 CO-60 17 1.91 2663.47 1.6 0 1331.96\* 4242 2655 16 CO-60

Summary of Nuclide Activity Sample ID : 040323023	Acquisition d	Page : 2 late : 23-MAR-2004 18:22:04
Total number of lines in spectr Number of unidentified lines Number of lines tentatively ide	0	100.00%
Nuclide Type : AP Wtd M	Mean Wtd Mean	
Nuclide         Hlife         Decay         dpm/S           CO-60         5.27Y         1.00         4.016           CS-134         2.06Y         1.00         5.498           AM-241         432.20Y         1.00         9.171	3MR. dpm/SMR. 1- 5E+03 4.016E+03 3E+01 5.499E+01 1E+01 9.171E+01	Decay Corr 1-Sigma Sigma Error %Error Flags 0.092E+03 2.29 1.267E+01 23.04 2.274E+01 24.80
Nuclide Type : FP		
	SMR. dpm/SMR. 1-	ecay Corr 1-Sigma Sigma Error %Error Flags 0.109E+04 3.86
Total Activity : 2.833	3E+04 2.833E+04	
Grand Total Activity : 3.250	)E+04 3.250E+04	
Flags: "K" = Keyline not found "E" = Manually edited	"M" = Manually "A" = Nuclide	vaccepted specific abn. limit

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REPORT NAME : QA\_CHECK (V9.1) REPORT DATE : 23-MAR-2004 19:22 REQUESTOR : CAS

> CYAPCO HADDAM NECK STATION

POST NID QA ANALYSIS

TITLE : - PAB METERING- POST CHIPPING MASSLIN

SAMPLE No. : 040323023OPERATOR NAME : CASSAMPLE TYPE : SMEARSAMPLE GEOMETRY : 47MLFILTERCOUNT TIME : 23-MAR-2004 18:22:04SAMPLE QUANTITY : 1.00000E+00SAMPLE TIME : 23-MAR-2004 15:00:00DETECTOR : DET 5LIBRARY : CHEM\_SMEARCHEM\_SMEAR

ISOTOPE	PEAK ENERGY	ENERGY DIFF (KEV)	DECAY CORR dpm/SMR.	COMMENTS	
CO-60	1332.49	-0.52	4.016E+03	QA Results OK	
CS-134	604.70	-0.20	5.499E+01	QA Results OK	
CS-137	661.65	~0.30	2.833E+04	QA Results OK	
AM-241	59.54	0.03	9.171E+01	QA Results OK	
AVG ENER	GY DIFF	-0.25	3.250E+04 =	TOTAL GAMMA ACTIVITY	
				Contains	

Qualitative Analysis Only	Licensed Material
Only	

## UNIDENTIFIED/REJECTED PEAKS

GAMMA/SEC POTENTIAL ENERGY NET AREA FWHM GAMMA/SEC /SMR. % ERROR FLAG ID ACTIVITY No Unidentified/Rejected Peaks

Performed by: Reviewed by: \*\*\*\* En*f*y Of Report ( 1 Page ) \*\*\*\*

## ATTCHMENT 7 LACBWR Concrete Sample MicroShield Model

		Rad	iation Sa		Shield 8.0 ontrol Sei		8.03-0(	000)			
	Date By Checked										
Filename					Run Date Run Ti				ime Duration		tion
LaCrosse Ope Air Demo.msd				Se	eptember 26, 2015 8:49:07 A			7 AM	00:00	:00	
				Pro	ject Info						
C	ase Title				WTB D	isk Sou	irce				
De	escription		Radiu	is 36 Inch	es 1/2 Incl	n Thick	10,045	pCi/g	Cs-137		
Geometry 8 - Cylinder Volume - End Shields											
			So	urce Dim	ensions					_	
	Heigh	t			1.27 ci	n (0.5 i	n)			_	
	Radiu	S			91.44	cm (3 f	t)			_	
				Dose Po	ints					_	
A X			Y			Z			_		
#1 0.0 cm (0 in)			2.54 cm (1.0 in)				0.0 cm (0 in)				
				Shield						-	
	Shield N		Dimension			Material		Density		-	
Source			2035.752					2.35			
Air Gap Air 0.00122											
			iput: Gro		lethod - A						
Nuclide		Ci		Bq		μCi/cr				Bq/cm <sup>3</sup>	
	-137m						230e-002		8.5952e+002		
Co-60         1.0540e-00           Ca 127         8 1020a 00			3.8998e+005		3.1595e-004 2.4556e-002		1.1690e+001				
Cs-137         8.1920e-004         3.0310e+007         2.4556e-002         9.0859e+002           Buildup: The material reference is Source											
			-		on Param		Source	-			
Radial 20											
Circumferential								1(	)		
			ΥD	Direction (	axial)					1(	)

Results										
Energy (MeV)	Activity (Photons/sec)	MeV/cm <sup>2</sup> /sec		mR/hr	Exposure Rate mR/hr With Buildup					
0.0045	2.977e+05	1.003e-03	1.028e-03	6.875e-04	7.047e-04					
0.0318	5.936e+05	1.194e-01	1.441e-01	9.946e-04	1.201e-03					
0.0322	1.095e+06	2.294e-01	2.785e-01	1.846e-03	2.241e-03					
0.0364	3.986e+05	1.249e-01	1.615e-01	7.098e-04	9.175e-04					
0.6616	2.580e+07	6.298e+02	9.331e+02	1.221e+00	1.809e+00					
0.6938	6.361e+01	1.643e-03	2.413e-03	3.173e-06	4.660e-06					
1.1732	3.900e+05	1.887e+01	2.545e+01	3.372e-02	4.548e-02					
1.3325	3.900e+05	2.197e+01	2.908e+01	3.811e-02	5.045e-02					
Totals	2.897e+07	6.712e+02	9.882e+02	1.297e+00	1.910e+00					