;ions	Changes	Cause #1	Cause #2	Cause #3
		U2 Fuel Pool liner is breached	***Ground water is draining out as the wall is exposed.***	***Small leak in weld at corner of pool traps water behind steel sheet which then experiences mixing/hold up as it leaks out in the same area, on the concrete walls.***
er is the cask- inside the SFP. : rusted and eas on or in the e corner weld.	(1)No known change (NKC) (2)No known change (NKC)	Supports		Supports
OE shows Co- : SFP leaks. ıalf-lives.	(1) NKC (2) NKC	**Fact assumed(1):** Leaking water has a delay due to transport OR is mixed with older water or is washing out contaminants in concrete.	Refutes: Groundwater would not give us the activity we are seeing in the soil and in the leaking water.	**Fact assumed(1):** Leaking water has a delay due to transport OR is mixed with older water or is washing out contaminants in concrete.
		Supports		Supports
		Supports		**Fact Assumed(9):** Compartmentalization of leak based on construction of the pool liner. (Potential conflict with (10))
		Fact assumed(2) - leakage involves SFP liner sheets in vicinity of observed leak, and the leak could affect both surfaces of corner.	Refutes: Only a specific area of wall shows moisture.	**Fact assumed(2)** - leakage involves SFP liner sheets in vicinity of observed leak, and the leak could affect both surfaces of corner.

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tions	Changes	Cause #1	Cause #2	Cause #3
		U2 Fuel Pool liner is breached	***Ground water is draining out as the wall is exposed.***	***Small leak in weld at corner of pool traps water behind steel sheet which then experiences mixing/hold up as it leaks out in the same area, on the concrete walls.***
		Supports		Supports
l support.	Excavation, currently being performed for crane installation	Supports		Supports
		Supports		Supports
		Supports		Supports
		Fact assumed(3): A very small through-liner defect.	Refutes: Leak was observed after a long period of drought and saw no increase during recent extensive rains.	**Fact assumed(3):** A very small through-liner defect.
		Fact assumed(3): A very small through-liner defect.	Refutes: Would expect to see changes in rate tied to precipitation/changes in groundwater level.	**Fact assumed(3):** A very small through-liner defect.

ions	Changes	Cause #1	Cause #2	Cause #3
		U2 Fuel Pool liner is breached	***Ground water is draining out as the wall is exposed.***	***Small leak in weld at corner of pool traps water behind steel sheet which then experiences mixing/hold up as it leaks out in the same area, on the concrete walls.***
		Fact assumed(4): Leak that has been there for some time.		**Fact assumed(4):** Leak that has been there for some time.
		Fact assumed(1): Leaking water has a delay due to transport OR is mixed with older water or is washing out contaminants in concrete.		**Fact assumed(1):** Leaking water has a delay due to transport OR is mixed with older water or is washing out contaminants in concrete.
		Fact assumed(5): The water has more recent activity in it.		**Fact assumed(5):** The water has more recent activity in it.
		Fact assumed(6): Small leak rate and removal by concrete eliminates the Co-58 by decay and removal.		**Fact assumed(6):** Small leak rate and removal by concrete eliminates the Co-58 by decay and removal.
		Fact assumed(7): Boron contamination on wall dissolved, became entrained in leak, and has washed out to the level we currently observe.		**Fact assumed(7):** Boron contamination on wall dissolved, became entrained in leak, and has washed out to the level we currently observe.
		Fact assumed(8): Concrete removes boron.		**Fact assumed(8):** Concrete removes boron.
		Fact assumed(3): A very small through-liner defect.		**Fact assumed(3):** A very small through-liner defect.

ions	Changes	Cause #1	Cause #2	Cause #3
		U2 Fuel Pool liner is breached	***Ground water is draining out as the wall is exposed.***	***Small leak in weld at corner of pool traps water behind steel sheet which then experiences mixing/hold up as it leaks out in the same area, on the concrete walls.***
		Fact assumed (9): This exceeds the volume of one void (space between steel sheet and concrete) so there must be communication between voids.		**Fact assumed(10):** Communication between voids. This amount of leakage exceeds the volume of one void (space between steel sheet and concrete) so there must be communication between voids, which may increase the areas where the leak could be. (Potential conflict with (9))
		Fact assumed(7A): Activity on wall dissolved, became entrained in leak, and has washed out to the level we currently observe.		**Fact assumed(7A):** Activity on wall dissolved, became entrained in leak, and has washed out to the level we currently observe.

/U2%20SFP%20concrete%20wall%20leaks/IsIsNots.aspx

lress the assumption. Record the results on the web page.

ed by inspection results.

REV 0

Condition Report Number:	Assigned Department:
CR-IP2-2005-03986 and IP2-2005-04151	Radiation Protection Radiation Protection

PROBLEM STATEMENT: (The **WHAT**)

Onsite monitoring wells indicated elevated to trace levels of tritium radioactivity. MW-111(IP2 transformer yard well) showed tritium concentrations of 211,000 pCi/l and IP3 wells(near the Unit 3 turbine bldg. and discharge canal) showed tritium concentrations ranging from 417 to 960 pCi/l, and two core bore wells beneath the Unit 3 turbine bldg showed tritium concentrations ranging from 703 to 1,590 pCi/l. No other plant related radioisotopes were identified in all samples.

A four hour notification report was made to the NRC pursuant to 10CFR50.72, and several other governmental agencies and other stake-holders were also notified.

EXPLANATION OF PROBLEM: (The **HOW**)

On September 29,2005(date of sample), tritium radioactivity from an onsite monitoring well was found to have 211,000 pCi/l tritium, which is above the ODCM reporting limit of 30,000 pC/l. This well was previously established in early 2000 for the monitoring of contaminates such as oil and PCBs, in preparation for the sale of IP2 to Entergy. The well (MW-111), is located inside the site protective area in the Unit 2 transformer yard, an area near both the Unit 1 and 2 facilities. The well was last sampled for radioactivity (tritium and gamma spectra analysis) in March 2000, and the results showed no detectable plant related radioisotopes. In addition, three other onsite monitoring wells were sampled (MW-107,108 and 111) to investigate past leakage associated with the Unit 1 spent fuel pools. These samples also showed no detectable plant related radioisotopes. None of these wells were subsequently sampled for radioactivity until October 2005 as part of the investigation into the apparent Unit 2 spent fuel pool liner leak. These wells were sampled periodically for oil and PCBs only. In mid October 2005; five additional wells were sampled in the general vicinity of the Unit 3 turbine bldg. and discharge canal. Trace concentrations of tritium were identified as discussed above. On November 3, 2005, a 30-day report was filed with the NRC describing these issues and future corrective actions. For perspective, the EPA drinking water regulations (40CFR141) limits tritium to 20,000 pCi/l. All of the onsite wells are for monitoring only and not sources for drinking water for onsite workers or the public

Since discovery of elevated tritium activity in these wells, a weekly sampling program was established. Tritium concentrations in MW-111 have essentially remained constant except for a one week period of heavy rains in mid October. During that period, tritium concentrations significantly dropped to 6,820 pCi/l. However, one week later, its concentration returned to 284,000 pCi/l, and has generally remained constant between 250,000 to 300,000 pCi/l as of November 10, 2005. Tritium concentrations in the other Unit 3 wells also varied somewhat since discovery. U3-1, U3-2, and U3-4 wells now are less than detectable and have been for the last four weeks. U3-3 well is still exhibiting very low levels of tritium at 471 pCi/l, and the two core bore well samples beneath the Unit 3 turbine bldg. are showing low levels of tritium at 563(T-1) and 1635(T-2) pCi/l respectively. T-1 samples were less than detectable for the last four weeks and now(11/10/05) is detectable, where as T-2 has consistently showed tritium concentrations ranging from 1420 to 1600 pCi/l. T-2 is at the north end of the five foot elevation and T-1 is at

the south end five foot elevation. Of interest, is T-2 tritium concentrations did not vary significantly after the site heavy rains from mid-October 2005.

IPEC has an offsite radiological environmental monitoring program (REMP) which routinely samples offsite drinking water sources and other special water sources for radioactivity. Quarterly drinking water samples are taken the Campfield reservoir in Peekskill, NY and the Croton reservoir. Further, samples are taken from an abandoned well (5th street well) in Verplanck, which is no longer used as a drinking water source. Monthly special water samples are also taken from two near site outfalls (Algonquin and Gypsum streams), both of which discharge directly to the Hudson River just of the plant's owner control area. Also, samples are taken at an abandoned flooded rock quarry located in Verplanck. These special sample locations were chosen specifically to monitor any potential offsite tritium releases from the known Unit 1 SFP leakage. Historical sampling results for all of these locations have shown no detectable plant related radioactivity for the past ten years or since new monitoring locations were added to the REMP program. The Algonquin outfall was first sampled in 1996 and the 5th street well in August 2002. There are no other known well water drinking water sources near the site.

Special independent samples of MW-111 were analyzed by Teledyne and confirmed the accuracy of IPEC's laboratory and Fitzpatrick's laboratory for tritium and gamma spectra analysis. Further this well was sampled for Sr-90 and Ni-63, two additional hard-to-detect isotopes of interest as it relates to plant operations, and no detectable activity was identified. The NY Department of Conservation split samples with IPEC at all wells where tritium was detected and their results were in very good agreement with IPEC's results.

To date, IPEC has contracted with a hydrologist firm and other knowledgeable consultants to determine the source(s) of groundwater contamination, the general groundwater flow direction and flow rates, and to determine what additional monitoring is necessary. Currently, an onsite well monitoring modification project has been approved for the installation of nine new wells. These wells are currently being installed.

An evaluation of the potential radiation doses to offsite receptors from the ground water contamination was done assuming the water went directly to the Hudson River and was not diluted via the discharge canal. Only near site dilution was considered. The exposure pathways considered are the ingestion of contaminated drinking water and of fresh-water fish. The calculations showed potential doses to any organs of an offsite receptor were less than 1.0 E-04 mrem/quarter, significantly lower than the ODCM quarterly limits of 1.5 mrem to the whole body and 5.0 mrem to any organ.

The following actions are necessary in order to determine final cause(s) of the tritium groundwater contamination to onsite monitoring wells;

- Complete the K-T root cause analysis already underway to determine final causes of tritium contamination to onsite monitoring wells—Engineering/WPO
- Complete installation of the onsite monitoring well modification project, Phase one—Facilities
- Complete hydrologist study of site ground water physical parameters such as water flow

rate, direction and discharge points to offsite environment-Eng
- Determine if additional onsite monitoring wells are necessary(Phase 2) in order to determine more accurate ground water flow/direction and sources of ground water contamination, plume definition, and potential site remediation-Eng
- Determine if tritium ground water contamination warrants remediation--RP
- Develop and implement ground water tracer program for various onsite systems or facilities of interest to determine sources of ground water contamination-Eng
- Develop a long term onsite well monitoring program including sample frequency, training, procedures methodology, equipment needs, and sampling types-RP.
- Update site licensing documents(FSAR, drawings, etc.) to capture onsite monitoring well modification--Eng
- Identify all onsite underground piping or equipment/tanks, which contain radioactive liquids which may be a contributor to tritium ground water contamination-Eng.
- Update 30-day report to NRC-Licensing
- Update ODCM and RG 1.21 report to reflect needed changes/outcomes from the well monitoring program results, tracer study results and hydrologist report as it relates to offsite dose calculations from HTO releases not previous accounted for--Chem.
- Identify existing site unlined sumps and radioactive storage tanks(i.e., RWST, Waste Distillate tanks, etc.) which may contribute to ground water contamination for inspection, repair(if necessary) and ongoing PM--Eng.
- Update 10CFR50.75(g) file based on outcome of this investigation--RP
- Operations to benchmark other PWRs/BWRs SFP inventory practices as it relates to pool inventory, boron mass balance and leak/level monitoring capabilities--Ops.
- Add new monitoring well, MW-138(P-9) to the offsite REMP program and revise sampling procedure as necessary. Well shall be sampled to the same criteria as the other eight onsite wells—RP/NEM.
- Obtain technical assistance from EPRI organization as it relates to their experience in onsite well monitoring programs and procedures—RP
- RP, Chemistry, Operations and Engineering to discuss this CR during its continual training programs
- Develop OE package for dissemination to INPO—CA&A.

APPARENT/CONTRIBUTING CAUSE(S): (The **WHY**)

AC1 The apparent cause(s) of this event is currently undetermined. A special investigation team has been established to investigate these issues and a K-T root cause investigation is currently underway. The team has met several times and continues to meet as new information becomes available. A separate corrective action is issued to WPO engineering to complete the K-T analysis and issue additional corrective actions, if necessary, not discussed in this report.

Contributing causes were as follows:

CC-1)--Ineffective utilization of existing onsite monitoring wells for radioactive contamination of ground water

EXTENT OF CONDITION:
The EOC is limited to onsite ground water contamination only as no offsite contamination of any plant related isotopes was identified. The site never had any onsite well monitoring program for testing for radioactivity.

COMPLETED CORRECTIVE ACTION(S): (see Procedure step 5.4[2](e))

ISSUE / PROBLEM	SOLUTION / RESOLUTION / ACTION / COMPLETED [note any Work Orders, MODs, other]
CA1.determine offsite dose impact to public from HTO contamination	.Completed—offsite dose assessment made and radiological impact was determined to be significantly lower than the ODCM quarterly limits.
CA2.determine initial EOC of HTO ground water contamination	Establish weekly monitoring program for all wells were HTO was identified
	.
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PROPOSED/ASSIGNED CORRECTIVE ACTIONS

ITEM #	ISSUE/CAUSE	SOLUTION / RESOLUTION [note any Work Orders, MODs, other]	TYPE CA	Assigned Department	Due Date	PCRS CA#
CA1	.determine apparent cause(s)	Complete the initial K-T root cause analysis already underway to determine final causes of tritium contamination to onsite monitoring wells—Engineering/WPO	Perform	Eng	12/15/05	
CA2	Need additional onsite monitoring wells to characterize plume, water flow and direction	Complete installation of the onsite monitoring well modification project, Phase one—Construction	Perform	Faclities	2/28/06	
CA3	Need additional site hydrology information	Complete hydrologist study of site ground water	Perform	Eng	3/31/06	

		physical parameters such as water flow rate, direction and discharge points to offsite environment-Eng				
CA4	Are the new additional nine wells sufficient to characterize site ground water flow?	Determine if additional onsite monitoring wells are necessary(Phase 2) in order to determine more accurate ground water flow/direction and sources of ground water contamination, plume definition, and potential site remediation-Eng	Perform	Eng	6/25/06	
CA5	HTO ground contamination exceeds EPA standards	Determine if tritium ground water contamination warrants remediation--RP	Perform	RP	4/15/2006	
CA6	Identify which HTO source is contaminating MW-111	Develop and implement ground water tracer program for various onsite systems or facilities of interest to determine sources of ground water contamination-Eng	Perform	Eng	3/31/2006	
CA7	Need site well monitoring program to meet objectives	Develop a long term onsite well monitoring program including sample frequency, training, procedures methodology,	Perform	RP	2/28/2006	

		equipment needs, and sampling types-RP				
CA8	Well modification program needs to be reflected in licensing bases	Update site licensing documents(FSAR, drawings, etc.) to capture onsite monitoring well modification--Eng	Perform	Eng	4/15/2006	
CA9	Several underground piping systems contain HTO and may be a contributor	Identify all onsite underground piping or equipment/tanks, which contain radioactive liquids which may be a contributor to tritium ground water contamination-Eng	Perform	Eng	3/31/2006	
CA10	NRC 30-day report needs updating	Update 30-day report to NRC-Licensing	Perform	Licensing	4/15/2006	
CA11	ODCM may need updating/modification if HTO is identified as new release point	Update ODCM and RG 1.21 report to reflect needed changes/outcomes from the well monitoring program results, tracer study results and hydrologist report as it relates to offsite dose calculations from HTO releases not previous accounted for--Chem	Perform	Chem	4/15/2006	
CA12	Several liquid waste sumps are unlined and holding tanks may also be degraded all of which contain significant levels of HTO	Identify existing site unlined sumps and radioactive storage tanks(i.e., RWST, Waste Distillate tanks, etc.) which may contribute to ground water	Perform	Eng	2/28/2006	

		contamination for inspection, repair(if necessary) and ongoing PM--Eng				
CA13	Wells identified with HTO are not captured in 10CFR50.75(g)	Update 10CFR50.75(g) file based on outcome of this investigation--RP	Perform	RP	4/14/2006	
CA14	U2 SFP does not have a tell-tail drain to quickly identify a leak and SFP water inventory practices need to be re-evaluated	Operations to benchmark other PWRs/BWRs SFP inventory practices as it relates to pool inventory, boron mass balance and leak/level monitoring capabilities--Ops	Perform	Ops	4/15/2006	
CA15	One of the new nine wells is located offsite and represents a potential indicator for offsite radiological impact	Add new monitoring well, MW-38(P-9) to the offsite REMP program and revise sampling procedure as necessary. Well shall be sampled to the same criteria as the other eight onsite wells—RP/NEM.	Perform	RP/NEM	3/31/2006	
CA16	IPEC lacks experience in onsite ground water monitoring for HTO	Obtain technical assistance from EPRI organization as it relates to their experience in onsite well monitoring programs and procedures—RP	Perform	RP	3/31/2006	
CA17 CA18 CA19 CA20	Varies department need to brief staff on lessons learned from this CR	RP, Chemistry, Operations and Engineering to discuss this CR during its continual training programs	Perform	RP Eng Chem Ops	4/15/2006	

CA21	Share OE with industry	Develop OE package for dissemination to INPO—CA&A.	Perform	CA&A	3/31/2006	