ENCLOSURE 1 TO NL-13-028

Radioactive Effluent Release Report: 2012

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT 1, 2, and 3 NUCLEAR POWER PLANTS
DOCKET Nos. 50-03, 50-247, and 50-286

Radioactive Effluent Release Report: 2012

Facility Indian Point Energy Center (Indian Point Units 1, 2, and 3)

Licensee Entergy Nuclear Operations, Inc (Entergy)

This information is provided in accordance with the requirements of Regulatory Guide 1.21. The numbered sections of this report reference corresponding sections of the subject Guide, pages 10 to 12. This report includes effluent information from Indian Point Units 1, 2, and 3. Units 1 and 2 share effluent processing equipment and Technical Specifications. In this site report, releases from Unit 1 are included with Unit 2, while Unit 3 releases are calculated and shown separately.

A. Supplemental Information

1. Regulatory Limits

Indian Point Energy Center is subject to limits on radioactive waste releases that are set forth in the Offsite Dose Calculation Manual (ODCM), Parts I and II, as defined in the Technical Specifications. ODCM Part I, also known as the Radiological Effluent Controls (or RECS) contains the specific requirements and controls, while ODCM Part II (calculational methodologies) contains the details necessary to perform offsite dose calculations from the sampling and monitoring outlined in the RECS.

2. Maximum Permissible Concentration

a) Airborne Releases

Maximum concentrations and compliance with 10CFR20 release rate limits are controlled by the application of Radiation Monitor setpoints, preliminary grab sampling, and conservative procedural guidance for batch and continuous releases. These measures, in conjunction with plant design, preclude approaching release rate limits, per the ODCM.

b) Liquid Effluents

Proximity to release rate and total release limits is controlled through the application of a calculated Allowed Diluted Concentration (ADC) and ALARA guidance with regard to dilution flow and maximum tank concentration. The ADC is used to determine a Radiation Monitor setpoint associated with an estimated amount of non-gamma activity (H-3, Ni-63, Fe-55, Sr-89/90 etc), as well as the measured gamma activity. ADC is defined in the station ODCM as a means of assuring compliance with the release rate limits of 10CFR20, as defined by the application of ten times the Effluent Concentrations of the new 10CFR20.

Liquid effluents are further controlled by the application of proceduralized ALARA limits such as a MINIMUM dilution flow of 100,000 gpm required for batch discharges, a maximum gamma concentration of 5E-5 uCi/ml (without gas) for routine effluents, and procedural guidance for optimizing decay and treatment of liquid waste.

3. Average Energy

The average energies ($\bar{E}$) of the radionuclide mixtures in releases of fission and activation gases were as follows:

Units 1 and 2:

1st Quarter	$\bar{E}_\beta$ =	1.93E-01 Mev/dis	$\bar{E}_\gamma$ =	1.84E-01 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	2.31E-01 Mev/dis	$\bar{E}_\gamma$ =	4.04E-01 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	1.59E-01 Mev/dis	$\bar{E}_\gamma$ =	1.11E-01 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	1.68E-01 Mev/dis	$\bar{E}_\gamma$ =	1.67E-01 Mev/dis

Unit 3:

1st Quarter	$\bar{E}_\beta$ =	4.13E-01 Mev/dis	$\bar{E}_\gamma$ =	1.09E+00 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	3.98E-01 Mev/dis	$\bar{E}_\gamma$ =	1.04E+00 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	3.56E-01 Mev/dis	$\bar{E}_\gamma$ =	8.77E-01 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	3.04E-01 Mev/dis	$\bar{E}_\gamma$ =	6.81E-01 Mev/dis

4. Measurements and Approximations of Total Radioactivity

a) Fission and Activation Gases

Analyses of effluent gases are performed in compliance with the requirements of the RECS (ODCM Part I). In the case of isolated tanks (batch releases), the total activity discharged is based on an isotopic analysis of each batch with the volume of gas in the batch corrected to standard temperature and pressure.

Vapor containment purge and pressure relief (vent) discharges, which routinely total less than 150 hours/quarter in duration, have been treated as batch releases. However, both types of releases from the Vapor Containment are performed randomly with regard to time of day and duration (release periods were not dependant solely on time of day or atmospheric condition). Therefore, determination of doses due to Vapor Containment releases includes the use of annual average dispersion data, as defined in NUREG 0133, Section 3.3.

At least one complete isotopic concentration analysis of containment air is performed monthly and compared to a process monitor's reading. Pressure reliefs are quantified by scaling subsequent releases with the monitor's reading, applying the mixture from the grab sample. In this fashion, the base grab sample defines the mixture and the activity released. The monitor scales the release up or down and provides continuous indication of potential leaks.

Isotopic analyses for each vapor containment purge are taken prior to and during the purge. This information is combined with the volume of air in each discharge to calculate the quantity of activity released from these discharges.

The continuous building discharges are based on weekly samples of ventilation air analyzed for isotopic content. This information is combined with total air volume discharged and the process radiation monitor readings to determine the quantity of activity from continuous discharges.

b/c) Iodines and Particulates

Iodine and particulate releases are quantified by collecting a continuous sample of ventilation air on a Triethylenediamine (TEDA) impregnated, activated charcoal cartridge and a glass-fiber filter paper. These samples are changed weekly as required in the RECS. The concentration of isotopes found by analysis of these samples is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged.

If no I-131 is identified in weekly vent samples, "-" is entered in Table 1A. A typical Minimum Detectable Activity (MDA) for weekly I-131 analyses is 1.0E-13 uCi/cc, which is 100 times lower than ODCM requirements.

If I-131 is identified in any routine weekly sample, it is added to the table and other iodine isotopic concentrations (I-133, I-135) are then determined on a 24-hour sample at least once per month. The concentration of each isotope is analytically determined by ratioing the activities with weekly media for I-131. This activity is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged.

A compositing method of analyzing for gross alpha, Sr-89, and Sr-90 is used per the station ODCMs. An absence of any positive activity is identified as "-".

d) Carbon-14

C-14 release quantification details are discussed in Section E.

e) Liquid Effluents

A sample of each batch discharge is taken and an isotopic analysis is performed in compliance with requirements specified in the ODCM. Proportional composite samples of continuous discharges are taken and analyzed per the ODCM, as well. Isotopic concentration data are combined with the information on volume discharged to determine the amount of each isotope discharged.

A compositing method of analyzing for non-gamma emitters is used per the station ODCM (Gross Alpha, Sr-89, Sr-90, Fe-55 and Ni-63). When there has been no positive activity, "-" is entered.

Liquid Effluent volumes of waste released on Table 2A are differentiated between processed fluids (routine liquid waste and Unit 1's North Curtain Drain), and water discharged through monitored pathways identified in the ODCM, but NOT processed (SG Blowdown and Unit 1's Sphere Foundation Drain Sump). The unprocessed water may still contain trace levels of contamination (generally only tritium) and as such, is identified as liquid waste. Curie and dose data from unprocessed fluid is included in the following tables, along with all other liquid effluent, continuous or batch, processed or not. Processed and unprocessed water is differentiated only to prevent confusion with regard to measures undertaken to convert liquid to solid waste (resin cleanup). Therefore, volumes of processed and unprocessed liquid waste are reported separately on Table 2A.

5. Batch Releases

Airborne:

Unit 1 and 2 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012
Number of Batch Releases		87	74	72	67	300
Total Time Period	(min)	4360	3410	2970	3340	14100
Maximum Time Period	(min)	135	99	326	101	326
Average Time Period	(min)	50.1	46.1	41.3	49.9	46.9
Minimum Time Period	(min)	1	2	1	5	1

Unit 3 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012
Number of Batch Releases		20	19	21	20	80
Total Time Period	(min)	2120	2500	2210	2060	8890
Maximum Time Period	(min)	197	233	241	191	241
Average Time Period	(min)	106	131	105	103	111
Minimum Time Period	(min)	1	4	1	1	1

Liquid:

Unit 1 and 2 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012
Number of Batch Releases		40	23	0	17	80
Total Time Period	(min)	3840	2300	0	1740	7880
Maximum Time Period	(min)	133	120	0	117	133
Average Time Period	(min)	95.9	100	0	102	98.5
Minimum Time Period	(min)	20	82	0	95	20

Unit 3 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012
Number of Batch Releases		24	18	20	28	90
Total Time Period	(min)	2760	1970	2210	2970	9920
Maximum Time Period	(min)	155	125	121	125	155
Average Time Period	(min)	115	109	111	106	110
Minimum Time Period	(min)	98	55	101	14	14

Average Stream Flow :

Regulatory Guide 1.21 includes a section to report average stream flows. This data, for some plants, is used to determine dilution volume. However, at IPEC, the Hudson River stream flow is not applied to dilution calculations, in favor of the more conservative method of using only the dilution in the discharge canal, running north to south, parallel to the river, and servicing the plant.

This conservative dilution volume is determined quarterly, applied for liquid offsite dose calculations (and all other determinations of diluted effluent), and reported on Tables 2A, in Section B of this report.

Hudson River flow information remains available, however, from the Department of the Interior, United States Geological Survey (USGS), or from web sites such as:

http://ny.water.usgs.gov/projects/dialer_plots/Hudson_R_at_Poughkeepsie_Freshwater_Discharge.htm

6. Abnormal Releases

a) Liquid

General Groundwater

IPEC's groundwater quantification model involves a verification/calibration such that the annual release to the environment remains a function of annual precipitation. Understandably then, the calculation for 2012 resulted in lower release values than that of 2011, which had significantly greater precipitation.

The offsite dose associated with the groundwater pathway remains small (<0.02% of the NRC's annual limit), with routine liquid effluent contributing <0.1% of the annual limit. Groundwater and storm water effluent flow rates and source term data are further described in Section H of this report. A breakdown of the total dose from the groundwater and storm water pathways is provided in Section E of this report (Radiological Impact on Man).

Storm Drain Monitoring, 2012

A storm drain (B-1) in the Unit 3 transformer yard has been identified with elevated tritium levels. Investigation is ongoing, but has not yielded a specific origin. Current hypotheses include increased condensation from routine plant vent releases after repairs were completed on the FSB exhaust fan, and general capture of groundwater tritium in the bottom of the storm drain basin. The consistent concentration of tritium from water vapor vented off the spent fuel pool (and directed up the plant vent as it should) provides a credible source of some condensed vapor and tritium discovered in this storm drain (directly west of the FSB and main plant vent exhaust). Investigation for other possible contributing factors is ongoing. Water in storm drain B-1 averaged 1.05E-5 uCi/ml tritium.

Effluent analyses of the water indicated no positive gamma emitters. For investigative purposes, periodic samples from this drain were also added to our groundwater (GW) sampling regime, for analyses at environmental levels by our GW vendor. These samples occasionally indicate trace (environmental) levels of Cs-137 in the water (approximately 0.00000003 uCi/ml), consistent with the legacy Cs-137 in the sediment.

An increase in the tritium levels was also noted in Manhole 5, located in the Unit 2 Auxiliary Feed Building. The tritium increase has been isolated to the pipe leading to the Vapor Containment Building Foundation Drain (MH-5 VCFD). This pipe also carries drainage from roof drains and floor drains from the Auxiliary Feed Building. Tritium levels exhibited substantial variability during the year. The root cause of this transient tritium increase is still being investigated. One hypothesis involves the same understanding as that of the increased levels in B-1, which is the local condensation of main plant vent vapor being released after evacuating the area above the Spent Fuel Pool.

Effluent impact of trace contamination in these upstream drains was evaluated. Both the liquid and airborne tritium effluent contribution from the above events proved insignificant with respect to monthly totals and effluent limits (less than 0.0000001 mrem). However, station procedures and policies with regard to indoor spills were improved, and other sources for the trace tritium contamination continue to be investigated.

All effluent from GW or Storm Drains is quantified and included in the GW assessment section of this report (Section H). The offsite dose impact from all GW and Storm water pathways is demonstrated to be well below 0.1% of the effluent ALARA design limits of 10CFR50, with contribution from B-1 and MH-5 representing a small portion of this total.

6. Abnormal Releases (continued)

b) Airborne

Vent Header Leak to Primary Auxiliary Building (PAB)

On May 23, 2012, approximately 2300 cubic feet of low level noble gas leaked out a valve stem on a gas decay tank relief valve following maintenance. The leak was discovered and isolated, and the valve repaired. The composition of the noble gas was determined to be similar to another tank, which was sampled for an effluent evaluation (4.4E-6 uCi/cc, 96% Xe-133, and 4% Xe-135). Approximately 0.00028 curies of gas entered the primary auxiliary building, which was eventually ventilated to the plant vent discharge point. Radiation monitors throughout the period did not indicate any deflection from baseline. An offsite dose evaluation from this event indicated a maximum beta air dose of 0.00000005 mrad, or less than 0.0000003 % of the ODCM annual limit. The event was captured in the corrective action program (CR-IP3-2012-01569).

7. ODCM Reporting Requirements

ODCM Part I requires reporting of various conditions during the year. These include effluent monitoring equipment out of service for periods exceeding 30 consecutive days, notification of any changes in the land use census, changes in the Radiological Environmental Monitoring Program (REMP), any time total curie content limitations in outdoor tanks is exceeded, or any other changes in the ODCM or Process Control Program (PCP).

During this reporting period, the following ODCM required effluent monitoring equipment was out of service (OOS) for periods greater than 30 consecutive days:

Instrument	Effected Interval	Details
Unit 3 Liquid Waste Monitor, R-18	Oct 12 to Nov 19 38 days	The detector was removed from service due to unexplained spiking. The extended outage was due to difficulty in researching, finding, and correcting the source of the spiking. Many detector parts and connections were replaced. Then the detector was calibrated and tested prior to returning to service. During this interval, 14 tanks were released with compensatory sampling completed.
Unit 3 Condenser Off-gas Monitor, R-15	Oct 20 to Dec 10 51 days	The detector was removed from service due to unexplained spiking. The extended outage was due to difficulty in researching, finding, and correcting the source of the spiking. The vendor was brought in twice to help research the problem. Connecters were eventually discovered to be faulty. Many detector parts and connections were replaced. Then the detector was calibrated and tested prior to returning to service. During this interval, compensatory sampling was performed per the ODCM, with one exception (see note below).
Unit 2 Liquid Waste Monitor, R-54	Aug 29 to Oct 15 47 days	This monitor was declared inoperable while the entire Unit 1/Unit 2 Liquid Waste Cleanup system was tagged out for upgrades. There were no liquid effluent tanks released during this interval, and there was no problem with the monitor. It was declared out of service only due to missing the monthly and quarterly surveillances while tagged out. After the planned upgrades to the associated liquid waste processing system were completed, it was tested and returned to service. No compensatory sampling was required.

7. ODCM Reporting Requirements (continued)

Missed Condenser Off Gas compensatory sample 10/30/12

On 10/30/12, a compensatory sample for R-15, U3 Condenser Off Gas, was not collected within the required interval (12 hours +/- 25%). The plant had been shutdown in preparation of Hurricane Sandy at approximately 00:00. The steam stops remained open, with condenser vacuum maintained. Individual Steam Generator samples were collected to check for S/G integrity, but watch-standers incorrectly assumed a condenser off-gas compensatory sample was not required. When day-shift staff arrived at 08:00, the confusion was corrected, but approximately 16 hours had passed since the previous sample.

SG samples and other secondary fluid samples during this interval did not indicate evidence of any secondary contamination, nor was there any evidence of a leak from physical plant parameters. Therefore, it was concluded that Steam Generator integrity was not challenged. Condition Report IP3-2012-03437 was written to document the missed sample, corrective actions, and lessons learned.

Other Reporting Criteria:

Tank Curie Limits

During this reporting period, no tank curie limits in outdoor tanks were exceeded.

Land Use Census

During this reporting period, there were no changes to the Land Use Census.

PCP changes:

During this reporting period, there were no changes to the Process Control Program.

ODCM changes:

The ODCM was updated to Revision 4 in 2012.

Changes included updates to the Radiological Ground Water Monitoring Program (RGWMP), adding an additional well in the Unit 3 transformer yard, and verifying/re-calibrating the GW flux model with all accumulated data to date. Another change involved the use of Effective Full Power Days in the determination of C-14 effluent.

This ODCM revision was reviewed by the Onsite Safety Review Committee (OSRC) on Sep 5, 2012. It was effective Oct 4, 2012.

A complete copy of the ODCM Rev 4 is attached to this report. Changes are marked with month and date in the right-hand margin. The justification package is also attached.

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT RELEASE REPORT

B. GASEOUS EFFLUENTS

2012

TABLE 1A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012	Est. Total % Error
1. Total Release	Ci	1.87E+00	3.37E-01	4.79E-01	2.17E-01	2.90E+00	± 25
2. Average release rate	uCi/sec	2.38E-01	4.29E-02	6.02E-02	2.73E-02	9.18E-02	

B. Iodines							
1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	

C. Particulates							
1. Total Release, with half-life > 8 days	Ci	4.57E-06	-	-	-	4.57E-06	± 25
2. Average release rate	uCi/sec	5.81E-07	-	-	-	1.45E-07	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25

D. Tritium							
1. Total release	Ci	2.77E+00	4.80E+00	4.08E+00	2.60E+00	1.43E+01	± 25
2. Average release rate	uCi/sec	3.53E-01	6.11E-01	5.14E-01	3.27E-01	4.51E-01	

E. Carbon-14						
1. Total release	Ci	2.48E+00	2.48E+00	2.48E+00	2.48E+00	9.93E+00
2. Average release rate	uCi/sec	3.16E-01	3.16E-01	3.12E-01	3.12E-01	3.14E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 **CONTINUOUS** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Xe-133	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2) Iodines						
I-131	Ci	-	-	-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3) Particulates						
Co-58	Ci	4.57E-06	-	-	-	4.57E-06
	Ci	4.57E-06	0.00E+00	0.00E+00	0.00E+00	4.57E-06

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 - **BATCH** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Ar-41	Ci	1.43E-01	9.67E-02	2.10E-02	2.08E-02	2.81E-01
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	7.11E-03	1.14E-04	1.89E-04	1.45E-05	7.43E-03
Kr-87	Ci	1.72E-06	1.06E-04	1.59E-04	1.10E-05	2.78E-04
Kr-88	Ci	8.59E-03	2.16E-04	3.26E-04	2.64E-05	9.16E-03
Xe-131m	Ci	-	1.99E-04	-	0.00E+00	1.99E-04
Xe-133	Ci	1.37E+00	2.37E-01	4.29E-01	1.94E-01	2.23E+00
Xe-133m	Ci	2.31E-02	5.59E-04	5.30E-03	4.56E-07	2.90E-02
Xe-135	Ci	3.20E-01	2.75E-03	2.22E-02	2.12E-03	3.47E-01
Xe-135m	Ci	4.59E-06	2.24E-04	2.96E-04	2.03E-05	5.45E-04
Xe-138	Ci	-	5.92E-07	-	-	5.92E-07
Total for Period	Ci	1.87E+00	3.37E-01	4.79E-01	2.17E-01	2.90E+00

2) Iodines

Not Applicable for Batch Releases

'- indicates < MDA

3) Particulates

Not Applicable for Batch Releases

TABLE 1A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012	Est. Total % Error
1. Total Release	Ci	1.30E-02	2.01E-02	1.88E-02	3.02E-02	8.22E-02	± 25
2. Average release rate	uCi/sec	1.66E-03	2.56E-03	2.37E-03	3.80E-03	2.60E-03	

B. Iodines							
1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	

C. Particulates							
1. Total Release, with half-life > 8 days	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25

D. Tritium							
1. Total release	Ci	3.56E+00	3.03E+00	3.80E+00	4.38E+00	1.48E+01	± 25
2. Average release rate	uCi/sec	4.53E-01	3.85E-01	4.78E-01	5.51E-01	4.67E-01	

E. Carbon-14						
1. Total release	Ci	2.70E+00	2.70E+00	2.70E+00	2.70E+00	1.08E+01
2. Average release rate	uCi/sec	3.43E-01	3.43E-01	3.40E-01	3.40E-01	3.42E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2012

- Indicates < MDA

TABLE 1C
INDIAN POINT 3 - CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Ar-41	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	-	-	-	0.00E+00
Xe-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

2) Iodines						
I-131	Ci	-	-	-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3) Particulates						
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

- indicates < MDA

TABLE 1C
INDIAN POINT 3 - BATCH GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

Nuclides Released

1) Fission Gases

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Ar-41	Ci	1.10E-02	1.61E-02	1.26E-02	1.55E-02	5.53E-02
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	-	-	-	-	0.00E+00
Kr-87	Ci	-	-	-	-	0.00E+00
Kr-88	Ci	-	-	-	-	0.00E+00
Xe-131m	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	2.01E-03	4.03E-03	6.15E-03	1.47E-02	2.69E-02
Xe-133m	Ci	-	-	-	-	0.00E+00
Xe-135	Ci	-	-	2.70E-06	-	2.70E-06
Xe-135m	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	1.30E-02	2.01E-02	1.88E-02	3.02E-02	8.22E-02

2) Iodines

Not Applicable for Batch Releases

3) Particulates

Not Applicable for Batch Releases

- Indicates < MDA

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

C. LIQUID EFFLUENTS

2012

TABLE 2A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	1.40E-02	1.01E-02	4.97E-04	1.91E-03	2.65E-02	± 25
2. Average Diluted Conc	uCi/ml	2.97E-11	1.29E-11	5.75E-13	2.65E-12	9.32E-12	

B. Tritium

1. Total Release	Ci	6.32E+02	9.64E+01	7.95E-02	1.21E+02	8.49E+02	± 25
2. Average Diluted Conc	uCi/ml	1.34E-06	1.23E-07	9.19E-11	1.68E-07	2.99E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	2.24E-04	-	-	-	2.24E-04	± 25
2. AverageDiluted Conc	uCi/ml	4.74E-13	-	-	-	7.88E-14	

D. Gross Alpha

1. Total Release	Ci	-	-	-	-	0.00E+00	± 25

E. Volume of Waste Released

1. Processed Waste (LW & NCD)	liters	3.18E+06	3.36E+06	1.46E+06	2.32E+06	1.03E+07	± 10
2. Unprocessed (SGBD, SFDS, U1FD)	liters	3.26E+07	5.33E+07	4.59E+07	4.39E+07	1.76E+08	± 10

F. Volume of Dilution Water	liters	4.72E+11	7.85E+11	8.65E+11	7.22E+11	2.84E+12	± 10

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

CONTINUOUS RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Cs-137	Ci	1.13E-03	8.07E-04	4.48E-04	1.72E-04	2.56E-03
Ni-63	Ci	-	-	-	-	0.00E+00
Sr-89	Ci	-	-	-	-	0.00E+00
Sr-90	Ci	5.16E-05	1.38E-05	4.84E-05	1.69E-05	1.31E-04
Total for Period	Ci	1.18E-03	8.21E-04	4.97E-04	1.89E-04	2.69E-03

H-3 (only)	Ci	1.31E-02	6.91E-02	7.95E-02	1.40E-01	3.02E-01

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

BATCH RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012
Ag-110m	Ci	3.46E-04	2.15E-04	-	-	5.61E-04
Co-58	Ci	1.31E-03	1.05E-03	-	1.04E-04	2.46E-03
Co-60	Ci	1.16E-04	1.40E-04	-	2.06E-05	2.77E-04
Cs-137	Ci	8.05E-05	-	-	5.83E-06	8.63E-05
Ni-63	Ci	1.72E-03	3.94E-04	-	2.84E-04	2.40E-03
Sb-124	Ci	5.90E-04	5.22E-05	-	-	6.42E-04
Sb-125	Ci	8.67E-03	7.39E-03	-	1.31E-03	1.74E-02
Te-123m	Ci	2.77E-06	1.87E-05	-	-	2.15E-05
Total for Period	Ci	1.28E-02	9.25E-03	0.00E+00	1.73E-03	**2.38E-02**

Dissolved & Entrained Gas

Kr-85	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	2.24E-04		-	-	2.24E-04
Total for Period	Ci	2.24E-04	0.00E+00	0.00E+00	0.00E+00	**2.24E-04**

- Indicates < MDA

TABLE 2A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2012	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	2.67E-03	1.43E-03	6.34E-03	1.04E-02	2.08E-02	± 25
2. Average Diluted Conc	uCi/ml	5.66E-12	1.82E-12	7.33E-12	1.44E-11	7.33E-12	

B. Tritium

1. Total Release	Ci	4.02E+02	2.13E+02	4.23E+01	4.80E+02	1.14E+03	± 25
2. Average Diluted Conc	uCi/ml	8.52E-07	6.44E-08	4.89E-08	6.65E-07	4.00E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	4.16E-04	5.25E-06	2.43E-05	1.77E-03	2.22E-03	± 25
2. AverageDiluted Conc	uCi/ml	8.81E-13	6.69E-15	2.81E-14	2.45E-12	7.79E-13	

D. Gross Alpha

1. Total Release	Ci	-	-	-	-	0.00E+00	± 25

E. Volume of Waste Released

1. Processed Fluids (Mon Tanks)	liters	6.26E+05	4.70E+05	1.07E+06	7.03E+05	2.87E+06	± 10
2. Unprocessed Fluids (SGs)	liters	2.00E+06	2.93E+06	1.64E+06	7.03E+06	1.36E+07	± 10

F. Volume of Dilution Water	liters	4.72E+11	7.85E+11	8.65E+11	7.22E+11	2.84E+12	± 10

'- indicates < MDA

TABLE 2B
INDIAN POINT 3 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2012)
BATCH and CONTINUOUS RADIOACTIVE LIQUID EFFLUENT

Batch Fission/Activation Products	Units	**Qtr 1**	**Qtr 2**	**Qtr 3**	**Qtr 4**	**2012**
Co-58	Ci	1.79E-04	6.61E-05	6.73E-05	2.40E-04	5.52E-04
Co-60	Ci	3.21E-04	9.91E-05	1.01E-03	5.97E-03	7.40E-03
Cs-134	Ci	-	-	-	5.72E-06	5.72E-06
Cs-137	Ci	-	3.07E-05	9.58E-05	2.45E-04	3.71E-04
Fe-55	Ci	-	-	-	3.13E-04	3.13E-04
Mn-54	Ci	2.57E-06	-	5.17E-06	1.08E-04	1.16E-04
Ni-63	Ci	1.42E-03	1.02E-03	4.74E-03	2.71E-03	9.90E-03
Sb-124	Ci	3.52E-06	-	-	-	3.52E-06
Sb-125	Ci	7.36E-04	2.11E-04	4.19E-04	8.11E-04	2.18E-03
Sn-113	Ci	-	2.83E-06	-	7.04E-06	9.87E-06
Total for Period	Ci	2.67E-03	1.43E-03	6.34E-03	1.04E-02	2.08E-02

Dissolved and Entrained Gas (Batch)

Xe-133	Ci	4.16E-04	5.25E-06	2.43E-05	1.77E-03	2.22E-03
		-	-	-	-	0.00E+00
		-	-	-	-	0.00E+00
Total for Period	Ci	4.16E-04	5.25E-06	2.43E-05	1.77E-03	2.22E-03

Continuous Releases (SG Blowdown)

H-3 (only)	Ci	3.58E-03	6.21E-03	3.30E-03	2.47E-03	1.56E-02

'- indicates < mda

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

D. SOLID WASTE

2012

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms — LWS Resin
Plant Resin 8-120 — 2011 Filters WMG — Rx Cavity/SFP Demin

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	5.43E+02	1.54E+01	9.11E+00	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	1.95E+02	5.51E+00	2.94E+02	+/- 25%
All	7.38E+02	2.09E+01	3.03E+02	+/- 25%

Waste Stream : Dry Active Waste — Soil / Bebris Intermodal
Scrap Metal 20' Sea Land — DAW /Dirt; B-25 Box — DAW 20' Sea Land

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.81E+04	7.97E+02	3.41E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.81E+04	7.97E+02	3.41E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream: Other Waste — Combined Packages

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	2.83E+01	8.02E-01	4.88E+01	+/-25%
All	2.83E+01	8.02E-01	4.88E+01	+/-25%

Waste Stream: Sum of All 4 Categories — LWS Resin — Soil/Debris Intermodal
Combined Packages — DAW 20' Sea Land — 2011 Filters WMG
DAW /Dirt; B-25 Box — Plant Resin 8-120
Scrap Metal 20' Sea Land — Rx Cavity / SFP Demin

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.87E+04	8.12E+02	9.45E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	2.23E+02	6.31E+00	3.43E+02	+/-25%
All	2.89E+04	8.19E+02	3.52E+02	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown
The Unit 1 Stack was reduced in height in 2012, resulting in an increase of dry active waste.

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Number of Shipments		Mode of Transportation	Destination
12		Hittman Transport	Energy Solutions - Bear Creek
3		Eastern Technologies Inc.	Impact Services Inc.
1		Hubbard Trucking	Impact Services Inc.
1	*	Horwith Trucks	Studsvik Processing - Memphis
15	*	R & R Trucking Inc.	Studsvik Processing - Memphis
2		Hittman Transport	Studsvik Processing Facility
2		Hittman Transport	ToxCo Incorporated

* Material from Unit 1 Stack reduction, for processing and recycling.

Resins, Filters, and Evaporator Bottoms
Waste Class A

Nuclide Name	% Abundance	Curies
H-3	0.94%	8.57E-02
C-14	18.37%	1.67E+00
Cr-51	0.23%	2.09E-02
Mn-54	0.33%	2.96E-02
Fe-55	12.88%	1.17E+00
Fe-59	0.07%	6.01E-03
Co-57	0.10%	8.88E-03
Co-58	10.00%	9.10E-01
Co-60	12.13%	1.10E+00
Ni-63	34.27%	3.12E+00
Zn-65	0.10%	8.71E-03
Sr-90	0.02%	1.33E-03
Zr-95	0.07%	5.91E-03
Ag-110m	3.09%	2.81E-01
Sb-124	0.04%	3.46E-03
Sb-125	2.94%	2.68E-01
Cs-134	0.18%	1.59E-02
Cs-137	4.27%	3.89E-01

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Resins, Filters, and Evaporator Bottoms
Waste Class C

Nuclide Name	% Abundance	Curies
Be-7	0.00%	7.23E-05
C-14	0.02%	6.46E-02
Cr-51	0.00%	4.04E-07
Mn-54	0.06%	1.77E-01
Fe-55	2.27%	6.68E+00
Fe-59	0.00%	1.23E-06
Co-57	0.03%	8.42E-02
Co-58	0.03%	9.75E-02
Co-60	3.61%	1.06E+01
Ni-59	0.22%	6.41E-01
Ni-63	82.39%	2.42E+02
Zn-65	0.00%	2.60E-04
Sr-89	0.00%	1.69E-06
Sr-90	0.09%	2.67E-01
Zr-95	0.00%	2.04E-04
Nb-94	0.02%	4.55E-02
Nb-95	0.00%	3.78E-06
Ag-110m	0.09%	2.66E-01
Sn-113	0.00%	3.39E-04
Sb-125	0.41%	1.21E+00
Cs-134	0.90%	2.64E+00
Cs-137	9.82%	2.89E+01
Ce-144	0.03%	7.74E-02
Pu-238	0.00%	1.84E-03
Pu-239	0.00%	3.76E-04
Pu-241	0.01%	2.70E-02
Am-241	0.00%	2.43E-03
Cm-242	0.00%	3.23E-07
Cm-243	0.00%	7.48E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Resins, Filters, and Evaporator Bottoms

Waste Class All

Nuclide Name	% Abundance	Curies
H-3	0.03%	8.57E-02
Be-7	0.00%	7.23E-05
C-14	0.57%	1.74E+00
Cr-51	0.01%	2.09E-02
Mn-54	0.07%	2.07E-01
Fe-55	2.59%	7.85E+00
Fe-59	0.00%	6.01E-03
Co-57	0.03%	9.31E-02
Co-58	0.33%	1.01E+00
Co-60	3.87%	1.17E+01
Ni-59	0.21%	6.41E-01
Ni-63	80.94%	2.45E+02
Zn-65	0.00%	8.97E-03
Sr-89	0.00%	1.69E-06
Sr-90	0.09%	2.69E-01
Zr-95	0.00%	6.11E-03
Nb-94	0.02%	4.55E-02
Nb-95	0.00%	3.78E-06
Ag-110m	0.18%	5.47E-01
Sn-113	0.00%	3.39E-04
Sb-124	0.00%	3.46E-03
Sb-125	0.49%	1.48E+00
Cs-134	0.88%	2.66E+00
Cs-137	9.65%	2.93E+01
Ce-144	0.03%	7.74E-02
Pu-238	0.00%	1.84E-03
Pu-239	0.00%	3.76E-04
Pu-241	0.01%	2.70E-02
Am-241	0.00%	2.43E-03
Cm-242	0.00%	3.23E-07
Cm-243	0.00%	7.48E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	0.63%	2.15E-03
Mn-54	0.88%	3.01E-03
Fe-55	11.64%	3.96E-02
Co-57	0.05%	1.81E-04
Co-58	1.06%	3.62E-03
Co-60	55.58%	1.89E-01
Ni-63	22.02%	7.50E-02
Sr-90	0.04%	1.32E-04
Tc-99	0.02%	6.85E-05
Sb-125	0.90%	3.05E-03
Cs-134	0.44%	1.50E-03
Cs-137	6.56%	2.23E-02
Ce-144	0.07%	2.51E-04
Pu-238	0.00%	8.88E-06
Pu-239	0.00%	2.83E-06
Pu-241	0.11%	3.56E-04
Am-241	0.00%	6.61E-06
Cm-243	0.01%	1.74E-05

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	0.63%	2.15E-03
Mn-54	0.88%	3.01E-03
Fe-55	11.64%	3.96E-02
Co-57	0.05%	1.81E-04
Co-58	1.06%	3.62E-03
Co-60	55.58%	1.89E-01
Ni-63	22.02%	7.50E-02
Sr-90	0.04%	1.32E-04
Tc-99	0.02%	6.85E-05
Sb-125	0.90%	3.05E-03
Cs-134	0.44%	1.50E-03
Cs-137	6.56%	2.23E-02
Ce-144	0.07%	2.51E-04
Pu-238	0.00%	8.88E-06
Pu-239	0.00%	2.83E-06
Pu-241	0.11%	3.56E-04
Am-241	0.00%	6.61E-06
Cm-243	0.01%	1.74E-05

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Other Waste Waste Class C

Nuclide Name	% Abundance	Curies
H-3	0.27%	1.31E-01
C-14	0.26%	1.25E-01
Mn-54	0.53%	2.57E-01
Fe-55	32.35%	1.58E+01
Fe-59	0.00%	9.86E-05
Co-57	0.05%	2.48E-02
Co-58	1.12%	5.44E-01
Co-60	15.22%	7.43E+00
Ni-63	15.59%	7.61E+00
Zn-65	0.00%	3.82E-04
Sr-90	0.26%	1.28E-01
Zr-95	0.09%	4.25E-02
Nb-95	0.06%	2.74E-02
Ag-110m	0.14%	6.72E-02
Sn-113	0.03%	1.41E-02
Sb-125	0.08%	3.77E-02
Cs-134	3.27%	1.60E+00
Cs-137	30.60%	1.49E+01
Ce-144	0.07%	3.46E-02
Am-241	0.01%	5.05E-03
Cm-243	0.02%	7.81E-03

Other Waste Waste Class All

Nuclide Name	% Abundance	Curies
H-3	0.27%	1.31E-01
C-14	0.26%	1.25E-01
Mn-54	0.53%	2.57E-01
Fe-55	32.35%	1.58E+01
Fe-59	0.00%	9.86E-05
Co-57	0.05%	2.48E-02
Co-58	1.12%	5.44E-01
Co-60	15.22%	7.43E+00
Ni-63	15.59%	7.61E+00
Zn-65	0.00%	3.82E-04
Sr-90	0.26%	1.28E-01
Zr-95	0.09%	4.25E-02
Nb-95	0.06%	2.74E-02
Ag-110m	0.14%	6.72E-02
Sn-113	0.03%	1.41E-02
Sb-125	0.08%	3.77E-02
Cs-134	3.27%	1.60E+00
Cs-137	30.60%	1.49E+01
Ce-144	0.07%	3.46E-02
Am-241	0.01%	5.05E-03
Cm-243	0.02%	7.81E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	0.91%	8.57E-02
C-14	17.73%	1.68E+00
Cr-51	0.22%	2.09E-02
Mn-54	0.35%	3.26E-02
Fe-55	12.84%	1.21E+00
Fe-59	0.06%	6.01E-03
Co-57	0.10%	9.06E-03
Co-58	9.68%	9.14E-01
Co-60	13.70%	1.29E+00
Ni-63	33.82%	3.20E+00
Zn-65	0.09%	8.71E-03
Sr-90	0.02%	1.46E-03
Zr-95	0.06%	5.91E-03
Tc-99	0.00%	6.85E-05
Ag-110m	2.97%	2.81E-01
Sb-124	0.04%	3.46E-03
Sb-125	2.87%	2.71E-01
Cs-134	0.19%	1.74E-02
Cs-137	4.36%	4.11E-01
Ce-144	0.00%	2.51E-04
Pu-238	0.00%	8.88E-06
Pu-239	0.00%	2.83E-06
Pu-241	0.00%	3.56E-04
Am-241	0.00%	6.61E-06
Cm-243	0.00%	1.74E-05

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class C

Nuclide Name	Percent Abundance	Curies
H-3	0.04%	1.31E-01
Be-7	0.00%	7.23E-05
C-14	0.06%	1.90E-01
Cr-51	0.00%	4.04E-07
Mn-54	0.13%	4.34E-01
Fe-55	6.56%	2.25E+01
Fe-59	0.00%	9.98E-05
Co-57	0.03%	1.09E-01
Co-58	0.19%	6.42E-01
Co-60	5.27%	1.80E+01
Ni-59	0.19%	6.41E-01
Ni-63	72.87%	2.50E+02
Zn-65	0.00%	6.43E-04
Sr-89	0.00%	1.69E-06
Sr-90	0.12%	3.95E-01
Zr-95	0.01%	4.27E-02
Nb-94	0.01%	4.55E-02
Nb-95	0.01%	2.74E-02
Ag-110m	0.10%	3.33E-01
Sn-113	0.00%	1.44E-02
Sb-125	0.36%	1.25E+00
Cs-134	1.24%	4.24E+00
Cs-137	12.78%	4.38E+01
Ce-144	0.03%	1.12E-01
Pu-238	0.00%	1.84E-03
Pu-239	0.00%	3.76E-04
Pu-241	0.01%	2.70E-02
Am-241	0.00%	7.48E-03
Cm-242	0.00%	3.23E-07
Cm-243	0.00%	1.53E-02

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Sum of All 4 Categories

Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.06%	2.17E-01
Be-7	0.00%	7.23E-05
C-14	0.53%	1.87E+00
Cr-51	0.01%	2.09E-02
Mn-54	0.13%	4.67E-01
Fe-55	6.73%	2.37E+01
Fe-59	0.00%	6.11E-03
Co-57	0.03%	1.18E-01
Co-58	0.44%	1.56E+00
Co-60	5.49%	1.93E+01
Ni-59	0.18%	6.41E-01
Ni-63	71.82%	2.53E+02
Zn-65	0.00%	9.36E-03
Sr-89	0.00%	1.69E-06
Sr-90	0.11%	3.96E-01
Zr-95	0.01%	4.86E-02
Nb-94	0.01%	4.55E-02
Nb-95	0.01%	2.74E-02
Tc-99	0.00%	6.85E-05
Ag-110m	0.17%	6.14E-01
Sn-113	0.00%	1.44E-02
Sb-124	0.00%	3.46E-03
Sb-125	0.43%	1.52E+00
Cs-134	1.21%	4.26E+00
Cs-137	12.56%	4.42E+01
Ce-144	0.03%	1.12E-01
Pu-238	0.00%	1.85E-03
Pu-239	0.00%	3.79E-04
Pu-241	0.01%	2.73E-02
Am-241	0.00%	7.49E-03
Cm-242	0.00%	3.23E-07
Cm-243	0.00%	1.53E-02

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms
Primary Resin 8-120

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/- 25%
B	1.95E+02	5.52E+00	1.30E+02	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	1.95E+02	5.52E+00	1.30E+02	+/- 25%

Waste Stream : Dry Active Waste
Unit 3 DAW-20' Sealand 20' Intermodal Soil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	3.50E+03	9.91E+01	8.89E-03	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	3.50E+03	9.91E+01	8.89E-03	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Sum of All 4 Categories Primary Resin 8-120
Unit 3 DAW -20' Sealand 20' Intermodal Soil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	3.50E+03	9.91E+01	8.89E-03	+/-25%
B	1.95E+02	5.52E+00	1.30E+02	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	3.70E+03	1.05E+02	1.30E+02	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport	Energy Solutions Bear Creek
3	Horwith Trucks	Studsvik Processing - Memphis
2	Hittman Transport	Studsvik Processing Facility

Resins, Filters, and Evaporator Bottoms (No Class A or C)

Waste Class B

Nuclide Name	Percent Abundance	Curies
C-14	0.008%	1.04E-02
Mn-54	0.865%	1.13E+00
Fe-55	8.995%	1.17E+01
Co-57	0.061%	7.96E-02
Co-58	0.094%	1.23E-01
Co-60	9.989%	1.30E+01
Ni-59	0.445%	5.80E-01
Ni-63	73.371%	9.56E+01
Sr-89	0.004%	5.79E-03
Sr-90	0.033%	4.26E-02
Tc-99	0.003%	3.33E-03
Sb-125	1.189%	1.55E+00
Cs-134	0.769%	1.00E+00
Cs-137	4.147%	5.40E+00
Ce-144	0.013%	1.72E-02
Pu-238	0.000%	1.95E-04
Pu-241	0.013%	1.67E-02
Am-241	0.000%	1.58E-04
Cm-243	0.000%	3.35E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Dry Active Waste (No Class B or C)

Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	0.757%	6.73E-05
Cr-51	1.167%	1.04E-04
Mn-54	0.322%	2.86E-05
Co-57	0.098%	8.75E-06
Co-58	19.061%	1.69E-03
Co-60	16.644%	1.48E-03
Ni-63	38.485%	3.42E-03
Zr-95	5.076%	4.51E-04
Nb-95	9.152%	8.13E-04
Sn-113	0.206%	1.83E-05
Sb-125	0.943%	8.38E-05
Cs-134	0.968%	8.60E-05
Cs-137	7.119%	6.33E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	0.757%	6.73E-05
Cr-51	1.167%	1.04E-04
Mn-54	0.322%	2.86E-05
Co-57	0.098%	8.75E-06
Co-58	19.061%	1.69E-03
Co-60	16.644%	1.48E-03
Ni-63	38.485%	3.42E-03
Zr-95	5.076%	4.51E-04
Nb-95	9.152%	8.13E-04
Sn-113	0.206%	1.83E-05
Sb-125	0.943%	8.38E-05
Cs-134	0.968%	8.60E-05
Cs-137	7.119%	6.33E-04

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	0.757%	6.73E-05
Cr-51	1.167%	1.04E-04
Mn-54	0.322%	2.86E-05
Co-57	0.098%	8.75E-06
Co-58	19.061%	1.69E-03
Co-60	16.644%	1.48E-03
Ni-63	38.485%	3.42E-03
Zr-95	5.076%	4.51E-04
Nb-95	9.152%	8.13E-04
Sn-113	0.206%	1.83E-05
Sb-125	0.943%	8.38E-05
Cs-134	0.968%	8.60E-05
Cs-137	7.119%	6.33E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2012 to 12/31/2012

Percent Cutoff: 0

Sum of All 4 Categories Waste Class B

Nuclide Name	Percent Abundance	Curies
C-14	0.008%	1.04E-02
Mn-54	0.865%	1.13E+00
Fe-55	8.995%	1.17E+01
Co-57	0.061%	7.96E-02
Co-58	0.094%	1.23E-01
Co-60	9.989%	1.30E+01
Ni-59	0.445%	5.80E-01
Ni-63	73.371%	9.56E+01
Sr-89	0.004%	5.79E-03
Sr-90	0.033%	4.26E-02
Tc-99	0.003%	3.33E-03
Sb-125	1.189%	1.55E+00
Cs-134	0.769%	1.00E+00
Cs-137	4.147%	5.40E+00
Ce-144	0.013%	1.72E-02
Pu-238	0.000%	1.95E-04
Pu-241	0.013%	1.67E-02
Am-241	0.000%	1.58E-04
Cm-243	0.000%	3.35E-04

Sum of All 4 Categories Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	0.008%	1.05E-02
Cr-51	0.000%	1.04E-04
Mn-54	0.865%	1.13E+00
Fe-55	8.994%	1.17E+01
Co-57	0.061%	7.96E-02
Co-58	0.096%	1.25E-01
Co-60	9.990%	1.30E+01
Ni-59	0.445%	5.80E-01
Ni-63	73.368%	9.56E+01
Sr-89	0.004%	5.79E-03
Sr-90	0.033%	4.26E-02
Zr-95	0.000%	4.51E-04
Nb-95	0.001%	8.13E-04
Tc-99	0.003%	3.33E-03
Sn-113	0.000%	1.83E-05
Sb-125	1.189%	1.55E+00
Cs-134	0.769%	1.00E+00
Cs-137	4.147%	5.40E+00
Ce-144	0.013%	1.72E-02
Pu-238	0.000%	1.95E-04
Pu-241	0.013%	1.67E-02
Am-241	0.000%	1.58E-04
Cm-243	0.000%	3.35E-04

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

E. RADIOLOGICAL IMPACT ON MAN

Jan 1, 2012 - Dec 31, 2012

RADIOLOGICAL IMPACT ON MAN

Routine Effluent Dose Calculations:

The Radiological Impact on Man due to radioactive effluent from the site is determined from NRC approved modeling, per Reg Guide 1.109 and NUREG 0133. Calculations are divided into 3 categories: Noble Gases, Particulates and Iodine, and Liquid Releases (fish and invertebrate consumption). This modeling involves conservative dose calculations to Adult, Teen, Child, and Infant age groups. Furthermore, dose modeling is performed for six separate organs as well as the total body dose. This well-established industry model provides doses (as a result of plant effluent) to a hypothetical maximally exposed individual offsite. While ALL age groups and organs are considered, it is this ***maximum value*** that is provided in the tables that follow.

An approved computer code is used to perform liquid and gaseous dose calculations according to the models and parameters presented in the Indian Point Offsite Dose Calculation Manual (ODCM). This information is stored in a database on site to enhance dose tracking and information management. Site airborne effluent dose calculations include annual average dispersion and deposition factors, averaged from data collected over approximately ten year periods. When new data is averaged (approximately every ten years) the modeling is updated and used in subsequent airborne effluent calculations.

Liquid offsite dose calculations involve fish and invertebrate consumption pathways only, as determined appropriate in the ODCM. While the ODCM identified some site-specific dose factors, the bulk of this information is obtained directly from Regulatory Guide 1.109 and NUREG 0133. Details of the calculations, site-specific data, and their bases are presented in the ODCM.

Carbon-14 (C-14):

Concentrations and offsite dose from C-14 were determined from sampling at Indian Point #3 from August 1980 to June 1982, during a study conducted by the NY State Department of Health (C. Kunz, later published and incorporated into NCRP 81). The annual C-14 curies released, as determined from this study, were consistent with NUREG 0017, Rev. 1. Data was then normalized to a maximum expected annual total, based on rated electrical capacity, (approximately 1000 MW(e) maintained for the entire year). Once the curies released were established, dose calculations were performed per the station ODCM, which uses all C-14 released to determine inhalation doses, and 26% of the total (determined to be Carbon Dioxide form), to determine the ingestion doses, in accordance with Reg Guide 1.109.

In 2010, IPEC and other facilities combined historical data with the application of an EPRI model designed to estimate C-14 releases, given some key site-specific plant parameters (mass of the primary coolant, average thermal neutron cross section, rated MW, etc). The estimates from this model, for IPEC, closely match the measured observations of 1982.

The maximum annual C-14 release information is as follows:

Maximum (Bounding) Annual C-14 releases from IPEC		Unit 2	Unit 3
Liquid Effluent C^{14} Released	Curies	**0.07**	**0.07**
Total Airborne C^{14} Released	Curies	**11.19**	**11.05**
Airborne C^{14} as CO_2	Curies	**2.91**	**2.87**

Airborne Eff Child TB Dose, C^{14}	mrem	**0.0690**	**0.0675**
Airborne Eff Child Bone Dose, C^{14}	mrem	**0.346**	**0.338**
Liquid Eff Child TB Dose, C^{14}	mrem	**0.00117**	**0.00116**
Liquid Eff Child Bone Dose, C^{14}	mrem	**0.00583**	**0.00577**

The bounding values were then normalized with actual effective full power days (EFFD) to yield more accurate year to year annual airborne curies and mrem for each unit. A small liquid effluent component is maintained at IPEC as a result of data accumulated in the 1983 study (Kunz). Tables 1A (shown earlier) include the airborne curie data for the current year. The following section (Radiological Impact on Man) includes the dose information.

C-14 doses are grouped with "Iodine and Particulate" and reported in Table D in the following Radiological Impact on Man tables, for each unit. Table "C" provides doses from this category *excluding* C-14, to facilitate historical comparisons. However, since C-14 is grouped as a particulate, the total dose for this isotope needs to be added to all other iodines and particulates, for comparison of the singular dose limit for this category.

Therefore, table "D" includes dose from all categories of this group (Iodine, Particulate, Tritium, and Carbon-14), for appropriate comparison of the dose limits.

C-14 doses (alone) for the current year are provided (for information) in the following table:

Calculated Annual C-14 releases from IPEC, **2012**		**Unit 2**	**Unit 3**
Airborne Eff Child TB Dose, C^{14}	mrem	**0.0613**	**0.0663**
Airborne Eff Child Bone Dose, C^{14}	mrem	**0.307**	**0.332**

The airborne effluent dose from C-14 is distributed evenly over the year and applied to a total Iodine and Particulate dose in Table "D" following this section.

Members of the Public:

Members of the public visiting the site receive minimal dose as a result of onsite releases because of the relatively insignificant total amount of time they are on site, as well as the immeasurably low levels of dose at the critical receptors. Their doses can be calculated from standard ODCM methodology, with typical occupancy factors employed. These factors are determined by comparing a conservative assumption for their expected hours on site, to 8760 hours (the number of hours in a year, used in calculations in the ODCM).

example 1: Several students visit the site for an 8-hour guided tour.

Their occupancy factor is: 8 / 8760 or **.0009**.

example 2: A man drives his wife to work and drops her off at the security gate each morning, with a total stay-time on site for 2 minutes per day. His occupancy factor is calculated as follows:

2 min/60 min/hr =.0333 hr; 0.0333 / 8760 = **3.8E-6.**

While onsite meteorological factors (dispersion and deposition) may be as high as a factor of ten higher than those used by the ODCM for routine effluents, these occupancy factors, when multiplied by doses calculated per the ODCM, demonstrate that dose to MEMBERS OF THE PUBLIC within the site boundary is negligible.

Groundwater:

Curies and dose contribution from activity discovered in onsite groundwater and storm drain pathways during the year are discussed in more detail in Section H. The offsite dose calculation involves multiple source term measurements, as well as computations for release and dilution flow. A summary of the quantification methodology, and the resulting calculated doses, is provided at the end of Section H. The Total Dose table below provides a means to compare ground water doses with those of other components making up the total offsite dose.

Total Dose:

Unit and pathway-specific dose data can be found on the Radiological Impact on Man tables following this discussion. For simplicity and to demonstrate compliance with 40CFR190, the following table indicates the maximum hypothetical Total Dose to an individual from operation of the facility, including any measured direct shine component from the site property:

Year: 2012		Total Body	Max Organ
40 CFR 190 limit ===→	**IPEC**	**25 mrem**	**75 mrem**
Routine Airborne Effluents[1]	**Units 1 and 2**	**2.69E-03**	**2.69E-03**
Routine Liquid Effluents	**Units 1 and 2**	**3.12E-04**	**3.60E-04**
Liquid Releases of C^{14}	Units 1 and 2	1.17E-03	5.83E-03
Airborne Releases of C^{14}	Units 1 and 2	6.13E-02	3.07E-01
Routine Airborne Effluents[1]	**Unit 3**	**2.47E-03**	**2.47E-03**
Routine Liquid Effluents	**Unit 3**	**2.64E-04**	**4.32E-04**
Liquid Releases of C^{14}	Unit 3	1.17E-03	5.83E-03
Airborne Releases of C^{14}	Unit 3	6.63E-02	3.32E-01
Ground Water & Storm Drain Totals	**IPEC[2]**	**7.11E-05**	**2.89E-04**
Direct Shine from areas such as dry cask storage, radwaste storage, SG Mausoleum, etc.	**IPEC[3]**	**1.06E-01**	**1.06E-01**
Indian Point Energy Center Total Dose, per 40 CFR 190	**IPEC**	**2.42E-01**	**7.63E-01**

Note 1: Routine airborne dose in this table is conservatively represented as a sum of Iodine, Particulate, and Tritium dose (excluding C-14, in mrem) with a mrem term added from noble gas beta air energy (mrad, expressed as mrem). This 'addition' does not represent a real dose and is listed here solely to help demonstrate compliance with 40CFR190. (Doses by type of release and comparison to the specific limits of 10CFR50 Appendix I are summarized on the following pages.)

Note 2: Groundwater curie and dose calculations are provided in Section H.

Note 3: 40CFR190 requires the reporting of total dose, including that of direct shine. Direct shine dose from sources other than dry cask are indistinguishable from background. Direct shine dose is determined from TLDs near the dry cask area and site boundary, compared with REMP TLDs and historical values, and corrected with occupancy factors to determine a bounding, worst case assessment of direct shine dose to a real individual. These doses are slightly higher than those of the previous year due to additional storage on the Independent Spent fuel Storage Installation (ISFSI). Details of each year's dose evaluation are available on site from Radiation Protection.

INDIAN POINT UNITS 1 and 2 NUCLEAR POWER PLANTS
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2012

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	2.74E-04	5.98E-05	2.79E-05	2.94E-05	**3.60E-04**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	5.48E-03	1.20E-03	5.58E-04	5.88E-04	3.60E-03
Age Group		Adult	Adult	Child	Adult	Adult
Critical Organ		GILLI	GILLI	Bone	Liver	GILLI
Adult Total Body	(mrem)	2.30E-04	3.93E-05	1.47E-05	2.81E-05	**3.12E-04**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	1.53E-02	2.62E-03	9.80E-04	1.87E-03	1.04E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	1.24E-04	4.30E-05	2.02E-05	1.25E-05	**2.00E-04**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	2.48E-03	8.60E-04	4.04E-04	2.50E-04	2.00E-03
Beta Air	(mrad)	1.95E-04	4.05E-05	4.12E-05	1.95E-05	**2.96E-04**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	1.95E-03	4.05E-04	4.12E-04	1.95E-04	1.48E-03

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	4.66E-04	8.05E-04	6.84E-04	4.35E-04	**2.39E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	6.21E-03	1.07E-02	9.12E-03	5.80E-03	1.59E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		GILLI	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.58E-02	1.61E-02	1.60E-02	1.58E-02	**6.37E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.11E-01	2.15E-01	2.13E-01	2.10E-01	4.25E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	7.68E-02	7.68E-02	7.68E-02	7.68E-02	**3.07E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.02E+00	1.02E+00	1.02E+00	1.02E+00	2.05E+00

INDIAN POINT 3 NUCLEAR POWER PLANT
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2012

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	1.18E-04	4.01E-05	1.69E-04	1.92E-04	**4.32E-04**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	2.36E-03	8.02E-04	3.38E-03	3.84E-03	4.32E-03
Age Group		Adult	Child	Child	Adult	Child
Critical Organ		GILLI	Bone	Bone	GILLI	Bone

Adult Total Body	(mrem)	1.08E-04	3.55E-05	1.42E-05	1.06E-04	**2.64E-04**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	7.20E-03	2.37E-03	9.47E-04	7.07E-03	8.79E-03

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	3.17E-06	4.67E-06	3.75E-06	4.80E-06	**1.64E-05**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	6.34E-05	9.34E-05	7.50E-05	9.60E-05	1.64E-04

Beta Air	(mrad)	5.43E-06	8.10E-06	6.80E-06	9.39E-06	**2.97E-05**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	5.43E-05	8.10E-05	6.80E-05	9.39E-05	1.49E-04

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	5.88E-04	5.00E-04	6.27E-04	7.23E-04	**2.44E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	7.84E-03	6.67E-03	8.36E-03	9.64E-03	1.63E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.72E-02	1.71E-02	1.72E-02	1.73E-02	**6.87E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.29E-01	2.28E-01	2.29E-01	2.31E-01	4.58E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	8.30E-02	8.30E-02	8.30E-02	8.30E-02	**3.32E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.11E+00	1.11E+00	1.11E+00	1.11E+00	2.21E+00

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOLOGICAL EFFLUENT REPORT

F. METEOROLOGICAL DATA

Jan 1, 2012 - Dec 31, 2012

This data is stored onsite and is available in printed or electronic form.

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

G. OFFSITE DOSE CALCULATION MANUAL, REMP SAMPLING LOCATIONS, PROCESS CONTROL PROGRAM, OR LAND USE CENSUS LOCATION CHANGES

2012

There were no changes to the REMP Sampling Locations in 2012.

There were no changes in the Land Use Census in 2012.

There were no changes to the Entergy Fleet PCP in 2012.

The IPEC ODCM was updated to Revision 4 in 2012.
See the attached summary of changes and full copy
of ODCM Revision 4, with rev lines & dates

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

H. GROUNDWATER and STORM WATER REPORT

ACTIVITY ON SITE and OFFSITE DOSE CALCULATION

FOR THE PERIOD:

Jan 1, 2012 - Dec 31, 2012

Summary of IPEC Groundwater and Storm Water Activity, 2012

The precipitation mass balance model applied in previous years was applied for offsite dose calculations in 2012, with some minor calibration updates performed by the contractor with regard to the distribution of groundwater flow through the site. Groundwater elevation readings continued to validate the model throughout the year.

As defined in the ODCM, a conservative method of source term selection is used for determining offsite dose from Groundwater and Storm Water. If a result is *below MDC* (whether positive or negative) it is *not* included in the computed average. This computed average is therefore biased high (more conservative from a dose computation perspective) relative to an average computed using all of the data (many of which indicate no activity). In cases where all the sampling locations assigned to a given stream tube provided results below the MDC, then an average activity value of zero was assigned to the effected portion of the stream tube. (This mathematically allows the calculation to proceed in the absence of positive detections).

Historical average precipitation at IPEC has been approximately 3 feet per year. In 2011, precipitation was unusually high (over 6 feet). In 2012, precipitation was measured at 2.7 feet per year (or inches per month, as an average). This reduction in precipitation, along with general continued natural attenuation, resulted in a reduction of effluent from the groundwater and storm water pathways from 2011 to 2012.

Results of 2012 Groundwater and Storm water offsite dose evaluation

The results of the assessment are shown on the following table. These dose values are a small portion of the annual limits (<0.005%), and were added to the Total Dose table in the opening summary of the Dose to Man section of this report (Section E).

Groundwater (GW) and storm water tritium released from IPEC in 2012 totaled approximately 0.118 curies, resulting in a total body dose of significantly less than 0.1 mrem (1.9E-7 mrem). It is evident that tritium alone, whether from ground water or routine effluents, does not arithmetically contribute to integrated offsite dose.

While trace levels of Co-60, Cs-137, and Ni-63 were identified in a few upstream wells in 2012, sampling near the effluent points identified only trace levels of Tritium and Strontium-90. These data, as part of the Monitored Natural Attenuation analyses, show a continuation of the decreasing trends established with the termination of the identified Unit 2 SFP leaks (tritium plume) and the defueling and draining of Unit 1 SFPs (strontium plume). Sr-90, a legacy isotope from Unit 1, contributed approximately 0.0000352 curies to site effluent from the groundwater pathway. Combined GW releases from IPEC in 2012 (all radionuclides) resulted in a calculated annual dose of less than 0.003% of the annual limits for whole body and critical organ:

IPEC Groundwater and Storm Water Effluent Dose, 2012

0.0000711 mrem to the total body	(0.00237% limit)
0.000289 mrem to the critical organ, adult bone	(0.00289% limit)

The annual dose from combined groundwater and storm water pathways remains well below applicable limits. When combined with routine liquid effluents (Section E), the total dose also remains significantly below ALARA limits of 3 mrem total body, and 10 mrem to the critical organ.

IPEC Summary for Storm & Ground Water releases (H-3, Co-60, Ni-63, Sr-90, and Cs-137)

2012
year

Northern Clean Zone

Adult Doses,in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.18E+02
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.56E-09	3.18E+02

Unit 2 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	9.22E-09	9.22E-09	9.22E-09	9.22E-09	9.22E-09	9.22E-09	5.30E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	9.22E-09	9.22E-09	9.22E-09	9.22E-09	9.22E-09	9.22E-09	5.30E+04

Unit 1/2

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	5.01E-08	5.01E-08	5.01E-08	5.01E-08	5.01E-08	5.01E-08	1.02E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	9.27E-05	0.00E+00	2.27E-05	0.00E+00	0.00E+00	0.00E+00	2.67E-06	1.08E+01
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	9.27E-05	5.01E-08	2.28E-05	5.01E-08	5.01E-08	5.01E-08	2.72E-06	1.02E+04

Unit 3 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	7.08E-08	7.08E-08	7.08E-08	7.08E-08	7.08E-08	7.08E-08	8.90E+03
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	1.29E-04	0.00E+00	3.16E-05	0.00E+00	0.00E+00	0.00E+00	3.71E-06	5.14E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	1.29E-04	7.08E-08	3.17E-05	7.08E-08	7.08E-08	7.08E-08	3.78E-06	8.90E+03

Unit 3 South

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	5.33E-08	5.33E-08	5.33E-08	5.33E-08	5.33E-08	5.33E-08	3.34E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	6.74E-05	0.00E+00	1.65E-05	0.00E+00	0.00E+00	0.00E+00	1.94E-06	1.92E+01
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	6.74E-05	5.33E-08	1.66E-05	5.33E-08	5.33E-08	5.33E-08	1.99E-06	3.35E+04

Southern Clean Zone

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	1.20E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	1.20E+04

Totals:

Adult Doses, in mrem

								Total uCis	
H-3 only	0.00E+00	1.89E-07	1.89E-07	1.89E-07	1.89E-07	1.89E-07	1.89E-07	1.18E+05	H3
	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	0.00E+00	Co
all isotopes	2.89E-04	1.89E-07	7.11E-05	1.89E-07	1.89E-07	1.89E-07	8.51E-06	0.00E+00	Ni
								3.52E+01	Sr
Adult Doses								0.00E+00	Cs
% Annual Limit	0.00289	0.000	0.00237	0.000	0.000	0.000	0.000		

INDIAN POINT
RADIOLOGICAL GROUNDWATER
MONITORING PROGRAM

2012

Summary of Results

The following pages represent the isotopic radio-analytical data for all onsite groundwater testing performed at Indian Point in 2012, as required per the ODCM and NEI 07-07.

Co-60 in Ground Water 2012

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1							8/16	7.5	10.7										7.5
B-6	1/23	-3.3	7.1	5/1	1.5	8.7	7/18	-2.8	7.5							10/16	4.6	8.3	0.0
I-2	1/24	0.6	11.2	5/18	2.2	5.9	8/1	1.9	9.3							11/12	-1.0	9.2	0.9
MH-5	1/17	2.8	10.0	4/20	-1.5	7.7	7/25	2.3	6.9							10/18	2.6	8.0	1.5
MW-107				5/29	1.4	8.3													1.4
MW-111	1/30	3.3	8.4	5/16	0.9	7.6	7/26	-0.5	6.7	8/21	-3.3	8.2	9/21	-2.7	8.7	11/2	0.6	8.6	-0.3
MW-30-69	2/1	-2.2	9.2	5/2	-0.3	8.1	8/7	-0.8	8.1	9/20	-2.5	7.4				12/3	-1.0	8.0	-1.4
MW-30-84	2/1	0.3	7.2				8/7	0.5	8.1	9/20	-2.7	7.3				12/3	-1.6	6.7	-0.9
MW-31-49	1/31	-0.8	8.4	5/11	0.0	7.2	7/25	2.3	8.9	8/23	2.8	8.5	9/19	-2.5	9.7	11/12	3.3	7.2	0.8
MW-31-63	1/31	0.2	8.0	5/11	-1.6	8.3	7/25	2.4	9.3	8/23	-3.2	7.5	9/19	1.1	7.9	11/12	-0.9	7.7	-0.3
MW-31-85	1/31	-0.5	8.5	5/11	2.6	7.8	7/25	1.0	6.9	8/23	0.3	8.4	9/19	-4.3	7.7	11/12	1.8	5.1	0.1
MW-32-149	1/31	3.1	8.1	6/1	3.4	7.2	7/25	3.3	6.3	8/23	1.7	7.4	9/17	0.1	8.0	11/1	-1.0	7.1	1.7
MW-32-173	1/31	-1.9	9.8	6/1	0.1	7.2	7/25	1.8	8.4	8/23	1.6	8.0	9/17	-1.2	7.5	11/1	-2.5	6.2	-0.3
MW-32-190	1/31	2.3	9.0	6/1	0.5	8.5	7/25	4.4	8.4	8/23	3.7	7.3	9/17	-3.6	9.8	11/1	0.0	6.5	1.2
MW-32-59	1/31	6.8	9.8	6/1	-1.6	8.8	7/25	2.1	8.2	8/23	1.8	9.2	9/17	-0.8	10.7	11/1	3.1	4.5	1.9
MW-32-85	1/31	6.5	10.4	6/1	0.0	10.0	7/25	3.7	11.1	8/23	1.2	7.5	9/17	-2.7	8.7	11/1	1.8	5.4	1.8
MW-33	1/30	0.3	6.6	5/16	7.1	8.6	7/26	1.5	7.6	8/21	-1.6	6.9	9/21	1.9	7.5				1.8
MW-35							8/21	-0.2	7.5	9/21	1.4	6.3							0.6
MW-36-24	2/24	6.7	7.1	5/21	-2.8	8.0	8/15	-0.2	7.4							11/13	0.0	4.0	0.9
MW-36-41	2/24	-4.3	5.9	5/21	-1.2	5.8	8/15	-6.6	10.4							11/13	-1.3	5.4	-3.3
MW-36-52	2/24	0.0	4.7	5/21	2.8	7.3	8/15	4.0	6.8							11/13	-0.1	5.6	1.7
MW-37-22	2/29	-4.4	6.8	5/15	0.7	7.8	8/15	-4.8	9.1							11/13	-2.0	6.0	-2.7
MW-37-32	2/29	2.1	6.2	5/15	-3.7	12.3	8/15	-0.5	6.5							11/13	0.4	6.5	-0.4
MW-37-40	2/29	0.4	4.5	5/15	0.4	7.4	8/15	4.2	8.7							11/13	-1.0	6.0	1.0
MW-37-57	2/29	-1.2	3.7	5/15	1.9	8.5	8/15	2.7	9.5							11/13	0.2	5.7	0.9
MW-39-102	2/2	-1.6	8.1	5/17	-1.2	7.3										11/5	1.4	8.0	-0.5
MW-39-124	2/2	1.9	8.0	5/17	-0.1	11.3										11/5	-3.4	8.5	-0.6
MW-39-183	2/2	0.0	6.1	5/17	-3.4	8.8										11/5	-5.0	7.8	-2.8
MW-39-195	2/2	7.3	8.7	5/17	-1.3	8.5										11/5	2.9	6.2	3.0
MW-39-67	2/2	0.1	6.7	5/17	-3.7	9.2										11/5	-1.2	6.3	-1.6
MW-39-84	2/2	-0.3	8.3	5/17	1.1	6.3										11/5	3.4	9.1	1.4
MW-40-100	3/1	0.8	3.5	5/31	2.3	7.0	8/17	2.5	10.5							11/16	0.2	6.8	1.5
MW-40-127	3/1	0.0	6.2	5/31	-3.2	8.5	8/17	1.5	11.9							11/16	-0.4	8.2	-0.5
MW-40-162	3/1	1.1	7.4	5/31	4.5	10.0	8/17	6.9	7.8							11/16	-4.9	9.2	1.9
MW-40-27	3/1	1.9	4.1	5/31	-0.6	10.5	8/17	1.9	6.5							11/16	-3.3	7.9	0.0
MW-40-46	3/1	-4.1	8.0	5/31	2.1	11.0	8/17	2.2	8.0							11/16	-2.5	10.4	-0.6
MW-40-81	3/1	-2.9	4.1	5/31	-1.0	7.7	8/17	-1.2	10.8							11/16	2.8	9.7	-0.6

Co-60 in Ground Water 2012

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-41-40	2/3	1.2	8.5	4/30	0.6	9.2	8/9	-1.9	7.2							11/9	-0.4	6.7	-0.1
MW-41-63	2/3	-1.9	7.0	4/30	1.3	8.0	8/9	-3.1	10.5							11/9	2.4	8.5	-0.3
MW-42-49	1/19	-0.8	6.6	4/27	4.0	10.1	7/31	-1.0	6.7							10/22	-5.0	16.6	-0.7
MW-42-78	1/19	1.2	6.9	4/27	3.6	7.8	7/31	-0.3	7.0							10/22	3.9	6.8	2.1
MW-43-28	2/17	0.8	5.9	5/14	-0.9	8.0	8/13	-2.8	6.5							10/18	4.5	6.8	0.4
MW-43-62	2/17	1.8	6.4	5/14	3.4	8.6	8/13	4.5	9.0							10/18	-1.2	6.4	2.1
MW-44-102	2/21	0.7	8.6	5/17	-2.6	10.5	8/3	3.9	7.9							11/5	1.0	8.5	0.8
MW-44-66	2/21	8.3	9.0	5/17	3.4	8.1	8/27	0.7	7.6							11/5	2.7	8.7	3.8
MW-45-42	2/3	1.5	8.2	4/30	-2.9	8.2	8/6	-0.5	10.5							11/9	3.4	10.1	0.4
MW-45-61	2/3	0.3	8.1	4/30	0.9	5.8	8/6	-3.3	8.1							11/9	-1.3	10.1	-0.9
MW-46	2/13	0.4	9.2	4/20	-2.0	9.6	8/1	-0.7	8.3							10/23	-1.7	6.6	-1.0
MW-47-56	1/25	2.7	7.7	5/3	-1.1	6.3													0.8
MW-47-80	1/25	-0.7	5.5	5/3	-1.5	8.1													-1.1
MW-49-26	2/22	-1.7	8.3	4/26	-2.7	8.3	8/2	-4.3	7.5							10/17	0.6	6.3	-2.0
MW-49-42	2/22	-2.6	6.7	4/26	0.4	6.8	8/2	1.6	7.4							10/17	1.7	7.0	0.3
MW-49-65	2/22	-4.1	6.9	4/26	0.1	7.6	8/2	-0.4	7.4							10/17	-1.4	6.8	-1.5
MW-50-42	2/24	-0.5	4.0	5/1	-1.9	8.2	8/16	-8.8	11.3							11/14	-5.4	9.5	-4.1
MW-50-66	2/24	-4.9	8.4	5/1	1.6	7.4	8/16	0.2	8.0							11/14	-1.1	7.6	-1.0
MW-51-104	3/2	3.0	8.1	5/30	3.9	9.8	8/17	4.5	8.3							11/15	-0.9	8.6	2.6
MW-51-135	3/2	1.4	6.4	5/30	-1.8	7.1	8/17	3.9	8.6							11/15	1.1	9.2	1.2
MW-51-163	3/2	3.5	9.8	5/30	-1.3	6.8	8/17	4.5	9.6							11/15	-0.7	9.2	1.5
MW-51-189	3/2	-3.2	9.5	5/30	2.6	9.1	8/17	-2.1	8.2							11/15	3.3	7.9	0.1
MW-51-40	3/2	0.9	8.4	5/30	2.3	6.8	8/17	1.1	7.9							11/15	-17.8	14.0	-3.4
MW-51-79	3/2	6.0	7.9	5/30	1.7	9.2	8/17	-1.1	7.5							11/15	1.2	9.0	2.0
MW-52-11				5/9	1.4	6.7													1.4
MW-52-122				5/9	4.1	6.5													4.1
MW-52-162				5/9	3.8	8.4													3.8
MW-52-18				5/9	1.7	8.3													1.7
MW-52-181				5/9	-5.2	9.5													-5.2
MW-52-48				5/9	-3.9	7.7													-3.9
MW-52-64				5/9	-1.1	6.9													-1.1
MW-53-120	2/17	-3.1	8.0	5/11	5.1	8.7	7/30	1.6	8.0							10/22	3.3	7.1	1.7
MW-53-82	2/17	0.3	7.7	5/11	-2.9	12.6	7/30	2.4	8.8							10/22	0.4	6.9	0.0
MW-54-123	2/16	-1.9	8.5	5/8	0.6	6.0	7/20	0.9	7.2							11/7	6.0	7.9	1.4
MW-54-144	2/16	1.4	5.5	5/8	4.6	9.1	7/20	-4.8	7.9							11/7	-0.8	10.3	0.1
MW-54-173	2/16	1.3	8.3	5/8	-3.6	6.6	7/20	2.6	9.8							11/7	-15.6	14.2	-3.8
MW-54-190	2/16	4.7	8.3	5/8	-0.2	8.2	7/20	1.6	9.4							11/7	-3.1	12.2	0.7

Co-60 in Ground Water 2012

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-54-37	2/16	1.6	7.8	5/8	1.6	9.4	7/20	3.4	7.5							11/7	-0.6	8.9	1.5
MW-54-58	2/16	1.8	8.3	5/8	-0.9	8.0	7/20	-3.4	7.5							11/7	-0.6	4.5	-0.6
MW-55-24	1/30	1.1	10.9	5/18	-0.2	8.6	8/16	-6.0	8.6							11/2	-2.5	8.9	-1.9
MW-55-35	1/30	1.9	7.5	5/18	-5.0	8.2	8/16	-0.6	7.8							11/2	1 6	6.3	-0.5
MW-55-54	1/30	-1.7	7.0	5/18	2.9	12.5	8/16	-1.6	8.6							11/2	-1.9	9.5	-0.6
MW-56-53	1/20	6.8	7.9	5/3	0.7	7.4	8/8	0.2	6.7							11/8	6 0	12.6	3.4
MW-56-83	1/20	-2.1	9.7	5/3	-0.6	8.8	8/8	0.5	10.7							11/8	-3.9	10.0	-1.5
MW-57-11				5/15	-1.4	10.6													-1.4
MW-57-20				5/15	-7.4	7.9													-7.4
MW-57-45				5/15	2.0	6.2													2.0
MW-58-26				4/19	2.1	6.3										11/8	-2.5	9.1	-0.2
MW-58-65				4/19	-1.2	7.6										11/8	2.9	8.9	0.9
MW-60-135	2/14	3.3	5.6	5/4	0.5	10.1	7/30	-0.3	8.6							10/26	3.7	6.5	1.8
MW-60-154	2/14	4.5	7.4	5/4	-6.4	8.9	7/30	0.1	9.3							10/26	-0.5	7.8	-0.6
MW-60-176	2/14	-1.4	9.5	5/4	-4.8	8.0	7/30	6.1	9.5							10/26	0.6	6.2	0.1
MW-60-35	2/14	-0.6	8.9	5/4	1.2	7.7	7/30	5.0	8.0							10/26	-3.8	9.2	0.4
MW-60-53	2/14	-0.4	8.4	5/4	0.5	8.5	7/30	-2.9	9.2							10/26	0.6	8.0	-0.6
MW-60-72	2/14	1.4	4.8	5/4	1.1	6.3	7/30	-1.9	8.9							10/26	-0.9	8.9	-0.1
MW-62-138	2/23	-0.6	6.2	4/25	-5.5	7.7	7/19	5.8	8.7							10/25	-2.4	10.1	-0.7
MW-62-18	2/23	4.3	9.5	4/25	4.6	7.1	7/19	-4.8	10.7							10/25	1.6	9.6	1.4
MW-62-182	2/23	-5.8	7.7	4/25	7.8	8.4	7/19	-1.7	8.1							10/25	-0.3	7.7	0.0
MW-62-37	2/23	1.8	3.7	4/25	-1.1	9.6	7/19	1.4	8.7							10/25	4.8	11.3	1.7
MW-62-53	2/23	-1.7	4.3	4/25	-0.3	9.7	7/19	-0.6	6.7							10/25	-1.4	7.2	-1.0
MW-62-71	2/23	0.6	4.2	4/25	1.5	9.5	7/19	-4.6	9.5							10/25	0.5	8.6	-0.5
MW-62-92	2/23	-0.9	6.8	4/25	-0.2	9.0	7/19	4.0	9.2							10/25	1.2	9.5	1.0
MW-63-112	2/9	-0.8	7.3	4/24	-2.6	8.5	7/23	1.2	7.5							10/24	0.1	5.9	-0.5
MW-63-121	2/9	0.3	7.6	4/24	1.2	7.0	7/23	1.0	7.5							10/24	-2.6	7.1	0.0
MW-63-163	2/9	-3.2	7.7	4/24	-0.2	9.8	7/23	-2.1	11.4							10/24	1.9	8.0	-0.9
MW-63-174	2/9	2.5	9.9	4/24	4.3	7.8	7/23	2.2	7.3							10/24	-1 4	5.9	1.9
MW-63-18	2/9	5.4	7.0	4/24	0.5	8.5	7/23	0.0	7.2							10/24	1.4	7.2	1.8
MW-63-34	2/9	-0.6	9.1	4/24	-0.3	7.2	7/23	-1.8	7.1							10/24	-1.8	10.4	-1.1
MW-63-50	2/9	-6.3	8.6	4/24	0.8	9.5	7/23	-3.5	7.5							10/24	0.8	7.2	-2.0
MW-63-93	2/9	-0.1	5.1	4/24	-0.4	8.2	7/23	1.0	8.4							10/24	-0.5	5.7	0.0
MW-66-21	2/28	-3.6	9.0	5/7	6.1	8.5	7/24	3.3	7.5							10/31	2.9	7.6	2.1
MW-66-36	2/28	0.1	8.9	5/7	5.9	8.4	7/24	1.5	7.7							10/31	-1.6	6.7	1.5
MW-67-105	2/15	-1.3	9.8	5/7	0.7	7.0	7/24	-1.0	7.5							10/31	3.7	7.7	0.5
MW-67-173	2/15	0.5	9.1	5/7	-1.8	10.8	7/24	0.4	6.7							10/31	-0.5	10.9	-0.3

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-67-219	2/15	-0.6	4.7	5/7	0.6	7.3	7/24	1.6	6.5							10/31	3.1	8.7	1.1
MW-67-276	2/15	-0.2	3.8	5/7	-0.8	8.0	7/24	3.1	9.8							10/31	4.3	4.6	1.6
MW-67-323	2/15	3.6	4.1	5/7	5.0	6.4	7/24	2.6	10.1							10/31	2.7	7.8	3.5
MW-67-340	2/15	-3.7	4.2	5/7	2.5	8.2	7/24	0.0	6.7							10/31	-1.8	6.8	-0.7
MW-67-39	2/15	-2.6	8.3	5/7	1.7	8.3	7/24	1.4	8.7							10/31	1.3	7.3	0.4
MW-68-103				5/22	-1.4	7.5	8/14	3.2	7.3							11/6	1.3	6.5	1.0
MW-68-132				5/22	1.4	7.0	8/14	1.5	7.6							11/6	2.2	7.2	1.7
MW-68-19				5/22	-5.5	11.6	8/14	0.5	7.7							11/6	-1.8	11.6	-2.3
MW-68-29				5/22	0.5	8.4	8/14	-0.6	8.2							11/6	2.1	7.7	0.7
MW-68-57				5/22	0.9	10.5	8/14	4.4	8.9							11/6	-2.0	9.3	1.1
CSS				5/1	1.9	6.1										11/7	0.7	9.5	1.3
NCD	3/19	1.7	5.7	7/2	6.7	9.7	9/3	7.1	9.1							11/26	0.7	13.5	4.1
SFDS	3/21	-0.2	10.0	6/13	-0.4	4.4	9/5	1.6	8.8							11/28	-0.4	6.8	0.1
U3-4D	2/8	1.5	8.6	4/18	-0.9	7.9	7/27	-3.1	9.7							10/16	0.9	7.4	-0.4
U3-4S	2/8	2.6	8.7	4/18	-0.3	6.7	7/27	-1.3	9.1							10/16	0.7	6.3	0.5
U3-T1	1/17	3.5	9.8	4/23	-1.9	9.2	8/10	-1.1	7.1							10/19	-4.1	8.2	-0.9
U3-T2	1/27	5.3	8.1	4/23	-1.1	8.1	8/10	-2.7	11.8							10/19	-0.7	8.3	0.2

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1							8/16	23.2	15.7										23.2
B-6	1/23	6.0	14.5	5/1	8.5	7.6	7/18	4.6	9.1							10/16	0.2	7.1	4.8
I-2	1/24	3.0	9.1	5/18	0.1	7.1	8/1	-0.6	8.2							11/12	-4.5	9.0	-0.5
MH-5	1/17	2.3	9.5	4/20	-0.5	8.3	7/25	-0.9	7.1							10/18	-2.4	7.8	-0.4
MW-107				5/29	4.5	9.5													4.5
MW-111	1/30	1.1	8.6	5/16	0.3	8.5	7/26	-3.0	7.3	8/21	4.4	7.9	9/21	2.0	7.7	11/2	-4.6	9.1	0.0
MW-30-69	2/1	-4.3	9.1	5/2	10.6	10.7	8/7	0.7	8.6	9/20	0.7	8.8				12/3	5.2	8.6	2.6
MW-30-84	2/1	0.7	6.4				8/7	18.3	10.9	9/20	3.7	8.6				12/3	6.8	9.5	7.4
MW-31-49	1/31	0.5	7.4	5/11	-1.1	6.8	7/25	-3.7	8.9	8/23	-0.6	7.7	9/19	0.9	9.5	11/12	1.2	10.8	-0.5
MW-31-63	1/31	-2.7	7.9	5/11	3.8	8.9	7/25	-1.5	9.9	8/23	3.3	7.5	9/19	1.6	10.0	11/12	1.0	8.0	0.9
MW-31-85	1/31	5.5	10.4	5/11	-0.5	8.1	7/25	1.2	8.0	8/23	3.2	9.8	9/19	4.7	9.4	11/12	0.4	5.2	2.4
MW-32-149	1/31	-3.3	9.2	6/1	-2.9	7.4	7/25	6.8	7.7	8/23	0.5	8.1	9/17	3.6	8.0	11/1	2.2	6.5	1.1
MW-32-173	1/31	4.1	8.3	6/1	3.2	7.2	7/25	0.1	6.4	8/23	4.4	9.6	9/17	0.6	7.4	11/1	3.3	6.8	2.6
MW-32-190	1/31	-1.0	9.6	6/1	-0.1	7.7	7/25	-2.4	7.1	8/23	2.9	6.8	9/17	-2.9	8.3	11/1	3.1	6.9	-0.1
MW-32-59	1/31	1.6	8.3	6/1	0.3	7.5	7/25	0.6	7.6	8/23	-1.4	8.4	9/17	1.5	8.2	11/1	4.6	6.5	1.2
MW-32-85	1/31	0.8	14.4	6/1	3.8	7.5	7/25	5.6	10.3	8/23	3.3	6.5	9/17	0.2	10.7	11/1	-0.2	5.6	2.2
MW-33	1/30	-1.1	7.7	5/16	3.6	7.1	7/26	0.7	9.7	8/21	-2.2	9.1	9/21	1.8	8.0				0.5
MW-35							8/21	-0.6	6.9	9/21	3.0	6.9							1.2
MW-36-24	2/24	-0.5	6.1	5/21	-3.1	8.8	8/15	2.4	7.7							11/13	2.4	5.5	0.3
MW-36-41	2/24	2.4	6.7	5/21	-4.4	7.3	8/15	10.4	9.9							11/13	1.2	7.6	2.4
MW-36-52	2/24	-1.4	5.4	5/21	-1.5	7.9	8/15	1.0	7.7							11/13	1.6	5.8	-0.1
MW-37-22	2/29	3.7	6.3	5/15	0.7	7.1	8/15	-0.7	7.5							11/13	2.0	4.7	1.4
MW-37-32	2/29	-1.2	5.5	5/15	-0.5	10.3	8/15	4.0	6.9							11/13	4.2	6.9	1.6
MW-37-40	2/29	3.6	4.6	5/15	0.6	7.4	8/15	0.4	7.2							11/13	0.3	5.6	1.2
MW-37-57	2/29	-0.6	4.1	5/15	2.8	7.7	8/15	3.4	8.6							11/13	0.1	8.3	1.4
MW-39-102	2/2	1.1	7.4	5/17	4.4	7.1										11/5	-1.6	7.5	1.3
MW-39-124	2/2	-2.0	9.2	5/17	-1.0	8.9										11/5	1.6	9.2	-0.5
MW-39-183	2/2	1.6	7.2	5/17	1.2	7.7										11/5	0.0	7.5	0.9
MW-39-195	2/2	2.1	20.2	5/17	-2.8	7.8										11/5	1.7	8.2	0.3
MW-39-67	2/2	5.5	6.8	5/17	-1.0	7.6										11/5	0.4	5.6	1.6
MW-39-84	2/2	5.9	7.4	5/17	1.9	6.5										11/5	-2.0	9.0	1.9
MW-40-100	3/1	0.7	3.6	5/31	1.5	7.7	8/17	5.0	8.5							11/16	4.5	7.0	2.9
MW-40-127	3/1	-5.5	10.7	5/31	4.1	7.5	8/17	-2.5	9.6							11/16	-2.7	9.0	-1.7
MW-40-162	3/1	0.4	7.4	5/31	-1.0	10.1	8/17	0.2	7.8							11/16	0.7	7.6	0.1
MW-40-27	3/1	0.5	3.9	5/31	0.5	8.3	8/17	3.1	6.7							11/16	-2.6	8.0	0.4
MW-40-46	3/1	-3.7	10.1	5/31	-2.8	10.3	8/17	6.0	7.2							11/16	0.0	15.8	-0.1
MW-40-81	3/1	0.7	4.1	5/31	6.7	9.1	8/17	0.1	9.5							11/16	3.8	7.6	2.8
MW-41-40	2/3	0.7	8.4	4/30	428.0	67.8	8/9	9.1	10.7							11/9	-0.4	7.4	109

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-41-63	2/3	-3.3	8.8	4/30	11.3	11.9	8/9	5.2	10.0							11/9	-4.2	8.0	2.3
MW-42-49	1/19	12200	1560	4/27	70600	8760	7/31	27600	3450							10/22	10900	369	30325
MW-42-78	1/19	-1.7	9.3	4/27	1.6	10.0	7/31	1.1	7.4							10/22	2.2	7.0	0.8
MW-43-28	2/17	-0.8	9.4	5/14	1.2	7.3	8/13	2.2	7.9							10/18	3.3	8.1	1.5
MW-43-62	2/17	0.3	6.2	5/14	4.1	9.0	8/13	1.4	9.2							10/18	1.9	8.1	1.9
MW-44-102	2/21	-2.3	8.0	5/17	-0.9	8.6	8/3	-1.2	6.8							11/5	-0.7	8.3	-1.3
MW-44-66	2/21	2.8	17.5	5/17	3.1	11.3	8/27	2.0	8.4							11/5	-1.2	5.8	1.6
MW-45-42	2/3	-0.9	9.4	4/30	-7.3	9.1	8/6	0.8	9.4							11/9	-2.8	7.7	-2.6
MW-45-61	2/3	-2.7	8.7	4/30	1.7	7.7	8/6	4.4	8.6							11/9	-2.7	8.4	0.2
MW-46	2/13	-1.9	9.3	4/20	5.0	8.8	8/1	0.4	8.3							10/23	4.2	7.4	1.9
MW-47-56	1/25	16.8	11.9	5/3	3.5	9.2													10.1
MW-47-80	1/25	-2.7	6.7	5/3	-2.7	8.3													-2.7
MW-49-26	2/22	2.1	7.5	4/26	-4.1	9.8	8/2	-1.2	9.1							10/17	-2.0	5.8	-1.3
MW-49-42	2/22	-0.2	7.7	4/26	2.2	7.2	8/2	2.8	8.1							10/17	-0.9	8.3	1.0
MW-49-65	2/22	-3.3	9.2	4/26	-1.9	7.0	8/2	-1.3	7.1							10/17	-2.0	7.7	-2.1
MW-50-42	2/24	-1.2	4.1	5/1	26.4	13.9	8/16	4.4	9.8							11/14	2.6	10.4	8.0
MW-50-66	2/24	-3.2	9.1	5/1	-0.2	6.8	8/16	2.7	8.8							11/14	1.2	8.3	0.1
MW-51-104	3/2	-1.9	8.0	5/30	0.3	10.4	8/17	1.8	7.3							11/15	4.6	8.0	1.2
MW-51-135	3/2	-1.2	6.6	5/30	-2.7	7.5	8/17	1.6	8.1							11/15	-2.3	8.6	-1.1
MW-51-163	3/2	5.1	8.2	5/30	1.1	9.6	8/17	0.3	8.4							11/15	4.3	10.7	2.7
MW-51-189	3/2	1.3	7.5	5/30	-0.5	8.1	8/17	10.5	10.0							11/15	-1.1	9.0	2.6
MW-51-40	3/2	2.2	7.1	5/30	-0.8	8.1	8/17	-1.4	8.8							11/15	6.4	10.8	1.6
MW-51-79	3/2	-0.9	7.1	5/30	-0.4	9.5	8/17	1.9	7.1							11/15	4.4	9.7	1.3
MW-52-11				5/9	2.2	8.8													2.2
MW-52-122				5/9	-1.8	8.1													-1.8
MW-52-162				5/9	-0.5	5.9													-0.5
MW-52-18				5/9	4.8	8.9													4.8
MW-52-181				5/9	1.7	8.3													1.7
MW-52-48				5/9	1.4	7.3													1.4
MW-52-64				5/9	-0.6	6.7													-0.6
MW-53-120	2/17	-3.2	9.4	5/11	3.3	7.5	7/30	-2.3	8.0							10/22	1.7	6.4	-0.1
MW-53-82	2/17	0.0	8.5	5/11	1.6	12.3	7/30	3.9	9.2							10/22	-0.5	7.7	1.2
MW-54-123	2/16	-1.8	7.6	5/8	3.4	8.7	7/20	1.7	7.1							11/7	-2.3	6.5	0.3
MW-54-144	2/16	-0.3	6.0	5/8	-3.2	7.7	7/20	2.7	7.4							11/7	1.5	9.6	0.2
MW-54-173	2/16	8.7	19.2	5/8	4.7	7.6	7/20	3.8	9.2							11/7	7.3	9.5	6.1
MW-54-190	2/16	0.2	8.5	5/8	3.4	8.8	7/20	-1.0	7.4							11/7	3.8	8.4	1.6
MW-54-37	2/16	1.5	8.7	5/8	5.2	9.4	7/20	1.2	10.9							11/7	-1.6	8.3	1.5
MW-54-58	2/16	-5.1	9.1	5/8	4.5	8.2	7/20	1.3	6.9							11/7	2.2	3.8	0.7

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-55-24	1/30	1.4	9.2	5/18	-0.2	8.9	8/16	-0.7	9.0							11/2	0.2	7.1	0.2
MW-55-35	1/30	3.7	9.2	5/18	3.0	8.2	8/16	-2.6	8.9							11/2	-5.4	8.7	-0.3
MW-55-54	1/30	3.3	7.6	5/18	1.2	8.9	8/16	-0.6	11.5							11/2	3.0	7.6	1.7
MW-56-53	1/20	4.1	6.2	5/3	6.2	8.3	8/8	0.8	6.6							11/8	0.3	9.7	2.9
MW-56-83	1/20	2.5	8.7	5/3	4.1	9.6	8/8	-1.9	9.5							11/8	-0.2	9.2	1.1
MW-57-11				5/15	3.1	9.1													3.1
MW-57-20				5/15	0.9	8.6													0.9
MW-57-45				5/15	-2.5	7.6													-2.5
MW-58-26				4/19	4.3	7.6										11/8	1.0	8.5	2.7
MW-58-65				4/19	-3.0	9.1										11/8	-3.9	7.6	-3.4
MW-60-135	2/14	2.4	5.0	5/4	2.0	10.0	7/30	0.9	8.0							10/26	3.4	8.2	2.2
MW-60-154	2/14	-0.7	7.4	5/4	0.2	8.8	7/30	5.1	8.4							10/26	-3.6	8.7	0.3
MW-60-176	2/14	-0.7	7.1	5/4	169.0	33.9	7/30	3.0	8.4							10/26	-1.0	7.0	42.6
MW-60-35	2/14	5.4	7.4	5/4	1.0	5.3	7/30	4.2	7.4							10/26	-2.6	9.4	2.0
MW-60-53	2/14	-1.9	8.0	5/4	-2.1	8.6	7/30	-4.5	9.5							10/26	-0.1	6.7	-2.1
MW-60-72	2/14	0.1	9.2	5/4	-0.5	6.9	7/30	-5.1	8.0							10/26	-0.4	7.4	-1.5
MW-62-138	2/23	-7.3	8.9	4/25	-3.0	11.0	7/19	-2.8	8.5							10/25	5.0	10.0	-2.0
MW-62-18	2/23	-0.5	8.7	4/25	-0.8	7.9	7/19	2.7	9.1							10/25	5.8	6.7	1.8
MW-62-182	2/23	-0.3	8.2	4/25	-0.9	8.3	7/19	-2.5	10.3							10/25	-2.2	8.9	-1.5
MW-62-37	2/23	-0.9	4.0	4/25	2.8	6.8	7/19	5.9	10.1							10/25	-2.4	9.8	1.3
MW-62-53	2/23	0.5	7.2	4/25	1.8	8.9	7/19	-3.5	8.2							10/25	-4.7	9.1	-1.4
MW-62-71	2/23	-0.1	4.4	4/25	3.7	9.6	7/19	2.2	10.2							10/25	-2.9	8.2	0.7
MW-62-92	2/23	2.4	8.3	4/25	4.2	9.3	7/19	7.4	10.5							10/25	-1.4	9.5	3.1
MW-63-112	2/9	3.4	7.1	4/24	5.7	9.3	7/23	2.6	6.7							10/24	0.5	7.4	3.0
MW-63-121	2/9	3.4	6.9	4/24	-5.4	9.3	7/23	-3.3	7.8							10/24	0.3	11.2	-1.2
MW-63-163	2/9	0.9	7.6	4/24	0.0	10.9	7/23	0.1	9.9							10/24	-1.9	7.1	-0.2
MW-63-174	2/9	-3.4	9.3	4/24	-0.9	7.6	7/23	0.1	9.2							10/24	2.5	7.1	-0.4
MW-63-18	2/9	-1.8	7.8	4/24	4.2	7.6	7/23	2.5	7.6							10/24	8.5	8.1	3.3
MW-63-34	2/9	2.2	7.7	4/24	1.3	6.2	7/23	5.5	7.2							10/24	-1.0	9.2	2.0
MW-63-50	2/9	-0.7	8.0	4/24	5.4	9.0	7/23	-3.9	8.8							10/24	-4.1	6.8	-0.8
MW-63-93	2/9	2.9	6.0	4/24	0.9	8.4	7/23	1.0	11.1							10/24	-1.7	9.0	0.8
MW-66-21	2/28	-2.9	10.0	5/7	-0.5	8.4	7/24	4.9	13.9							10/31	-0.1	7.3	0.4
MW-66-36	2/28	6.5	9.3	5/7	3.2	8.4	7/24	1.1	8.0							10/31	0.7	7.7	2.9
MW-67-105	2/15	0.7	8.8	5/7	2.4	7.1	7/24	4.2	7.9							10/31	2.9	8.3	2.5
MW-67-173	2/15	3.2	10.3	5/7	-1.3	10.1	7/24	-1.6	7.9							10/31	1.3	9.5	0.4
MW-67-219	2/15	-0.2	4.5	5/7	-0.3	9.3	7/24	0.4	9.5							10/31	-4.7	8.4	-1.2
MW-67-276	2/15	1.7	3.7	5/7	2.7	6.2	7/24	1.3	8.7							10/31	1.6	8.0	1.8
MW-67-323	2/15	0.0	3.9	5/7	0.9	7.1	7/24	-0.2	9.1							10/31	2.2	10.9	0.7

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-67-340	2/15	-0.7	3.9	5/7	0.7	8.4	7/24	-1.5	7.1							10/31	2.7	7.0	0.3
MW-67-39	2/15	-1.6	8.2	5/7	3.4	7.4	7/24	1.8	8.7							10/31	1.3	9.1	1.2
MW-68-103				5/22	4.3	9.1	8/14	-0.4	7.6							11/6	0.1	6.6	1.3
MW-68-132				5/22	-1.6	8.0	8/14	-3.6	9.2							11/6	0.6	10.1	-1.5
MW-68-19				5/22	-3.6	9.9	8/14	-2.6	9.0							11/6	-0.9	9.6	-2.4
MW-68-29				5/22	0.9	7.4	8/14	7.0	8.0							11/6	1.0	7.6	3.0
MW-68-57				5/22	0.4	8.1	8/14	-0.5	6.8							11/6	-0.1	8.4	0.0
CSS				5/1	0.8	6.9										11/7	-1.0	9.0	-0.1
NCD	3/19	19000	2376	7/2	14000	1758	9/3	14000	1730							11/26	15100	417	15525
SFDS	3/21	8.0	8.2	6/13	2.6	4.5	9/5	0.4	7.8							11/28	1.2	7.1	3.0
U3-4D	2/8	2.8	7.7	4/18	2.1	7.8	7/27	-1.6	10.8							10/16	2.7	8.7	1.5
U3-4S	2/8	2.4	8.5	4/18	0.4	7.1	7/27	-0.8	8.4							10/16	-1.3	7.0	0.2
U3-T1	1/17	-2.3	7.8	4/23	3.2	6.1	8/10	3.5	9.7							10/19	-1.4	9.0	0.7
U3-T2	1/27	5.1	8.1	4/23	1.3	8.6	8/10	3.6	9.6							10/19	4.3	8.6	3.6

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1	2/22	7310	699				8/16	4040	681										5675
B-6	1/23	260	357	5/1	304	402	7/18	189	357							10/16	209	223	241
I-2	1/24	167	351	5/18	-118	372	8/1	223	381							11/12	108	202	95
MH-5	1/17	1570	549	4/20	129	345	7/25	2040	720							10/18	1190	387	1232
MW-107				5/29	139	339													139
MW-111	1/30	4520	747	5/16	9050	984	7/26	9610	1070	8/21	4280	717	9/21	338	288	11/2	5700	753	5083
MW-30-69	2/1	86900	2660	5/2	73600	2380	8/7	64600	2330	9/20	87800	2960				12/3	68300	2470	76240
MW-30-84	2/1	6200	795				8/7	5840	774	9/20	6430	855				12/3	6750	849	6305
MW-31-49	1/31	550	471	5/11	173000	3630	7/25	80100	2900	8/23	4590	651	9/19	5410	792	11/12	33100	1820	49458
MW-31-63	1/31	17000	1270	5/11	78900	2490	7/25	55700	2390	8/23	22400	1480	9/19	19300	1400	11/12	18300	1320	35267
MW-31-85	1/31	2590	591	5/11	24600	1400	7/25	15700	1280	8/23	1860	528	9/19	3790	666	11/12	9150	987	9615
MW-32-149	1/31	197	432	6/1	539	396	7/25	301	283	8/23	199	339	9/17	145	354	11/1	280	390	277
MW-32-173	1/31	325	405	6/1	332	363	7/25	323	287	8/23	181	345	9/17	243	268	11/1	336	393	290
MW-32-190	1/31	1540	507	6/1	1760	519	7/25	1300	426	8/23	1330	468	9/17	1070	459	11/1	1170	480	1362
MW-32-59	1/31	6460	852	6/1	7070	861	7/25	33800	1710	8/23	7560	900	9/17	21200	1460	11/1	33100	1800	18198
MW-32-85	1/31	8960	924	6/1	11100	1070	7/25	11900	1120	8/23	12300	1060	9/17	12100	1130	11/1	12900	1120	11543
MW-33	1/30	15700	1220	5/16	28000	1500	7/26	4800	750	8/21	24400	1530	9/21	24800	1580				19540
MW-35							8/21	376	393	9/21	515	312							446
MW-36-24	2/24	118	312	5/21	36	318	8/15	3540	654							11/13	1090	444	1196
MW-36-41	2/24	282	270	5/21	1290	444	8/15	3470	648							11/13	2360	579	1851
MW-36-52	2/24	2170	396	5/21	3110	573	8/15	6000	795							11/13	5280	768	4140
MW-37-22	2/29	6050	564	5/15	3810	612	8/15	4370	699							11/13	3780	669	4503
MW-37-32	2/29	3840	594	5/15	2940	570	8/15	5160	759							11/13	4030	693	3993
MW-37-40	2/29	4520	630	5/15	5800	732	8/15	5410	750							11/13	5180	756	5228
MW-37-57	2/29	4260	627	5/15	5310	696	8/15	5820	777							11/13	5520	783	5228
MW-39-102	2/2	655	438	5/17	993	417										11/5	542	351	730
MW-39-124	2/2	97	381	5/17	846	405										11/5	166	369	370
MW-39-183	2/2	419	366	5/17	-51	295										11/5	42	354	137
MW-39-195	2/2	2200	477	5/17	2110	513										11/5	815	393	1708
MW-39-67	2/2	583	432	5/17	349	351										11/5	490	411	474
MW-39-84	2/2	62	381	5/17	877	408										11/5	297	384	412
MW-40-100	3/1	147	306	5/31	364	366	8/17	-250	357							11/16	223	366	121
MW-40-127	3/1	-159	275	5/31	52	324	8/17	-119	369							11/16	51	357	-44
MW-40-162	3/1	0	292	5/31	11	324	8/17	-15	378							11/16	-100	336	-26
MW-40-27	3/1	59	309	5/31	325	366	8/17	-69	360							11/16	164	375	120
MW-40-46	3/1	232	312	5/31	128	339	8/17	42	381							11/16	188	360	147
MW-40-81	3/1	91	300	5/31	136	348	8/17	83	384							11/16	34	351	86

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-41-40	2/3	-145	324	4/30	483	366	8/9	451	384							11/9	392	333	295
MW-41-63	2/3	599	384	4/30	812	405	8/9	412	411							11/9	352	390	544
MW-42-49	1/19	697	447	4/27	743	483	7/31	633	384							10/22	732	423	701
MW-42-78	1/19	280	375	4/27	434	354	7/31	951	480							10/22	673	426	585
MW-43-28	2/17	130	336	5/14	372	453	8/13	86	363							10/18	296	381	221
MW-43-62	2/17	157	333	5/14	63	414	8/13	173	384							10/18	318	381	178
MW-44-102	2/21	801	402	5/17	835	492	8/3	794	408							11/5	582	408	753
MW-44-66	2/21	557	348	5/17	996	513	8/27	143	357							11/5	221	378	479
MW-45-42	2/3	1840	453	4/30	6790	954	8/6	4120	645							11/9	7530	900	5070
MW-45-61	2/3	1940	486	4/30	1530	552	8/6	1320	504							11/9	2270	546	1765
MW-46	2/13	1680	456	4/20	2650	675	8/1	2700	561							10/23	2700	486	2433
MW-47-56	1/25	1670	441	5/3	1850	591													1760
MW-47-80	1/25	42700	1690	5/3	25200	1610													33950
MW-49-26	2/22	5100	777	4/26	5670	870	8/2	4020	711							10/17	3910	573	4675
MW-49-42	2/22	4980	807	4/26	5880	855	8/2	6110	849							10/17	6150	717	5780
MW-49-65	2/22	5010	771	4/26	5470	843	8/2	4970	774							10/17	5250	660	5175
MW-50-42	2/24	278	414	5/1	186	438	8/16	823	411							11/14	750	286	509
MW-50-66	2/24	6870	867	5/1	6890	924	8/16	6850	885							11/14	6710	747	6830
MW-51-104	3/2	25	303	5/30	228	354	8/17	-10	357							11/15	81	186	81
MW-51-135	3/2	101	309	5/30	329	360	8/17	-32	366							11/15	95	183	123
MW-51-163	3/2	60	309	5/30	52	324	8/17	-174	339							11/15	115	192	13
MW-51-189	3/2	59	306	5/30	158	333	8/17	-65	354							11/15	51	175	51
MW-51-40	3/2	8	284	5/30	119	339	8/17	141	375							11/15	116	194	96
MW-51-79	3/2	138	324	5/30	308	366	8/17	-108	345							11/15	153	201	123
MW-52-11				5/9	136	420													136
MW-52-122				5/9	171	432													171
MW-52-162				5/9	-83	390													-83
MW-52-18				5/9	213	435													213
MW-52-181				5/9	202	435													202
MW-52-48				5/9	158	426													158
MW-52-64				5/9	123	411													123
MW-53-120	2/17	7200	888	5/11	8430	1020	7/30	8590	885							10/22	7510	777	7933
MW-53-82	2/17	1800	579	5/11	1450	543	7/30	757	405							10/22	400	243	1102
MW-54-123	2/16	4640	792	5/8	6710	915	7/20	7300	876							11/7	7410	774	6515
MW-54-144	2/16	6090	834	5/8	6200	882	7/20	6980	867							11/7	7050	762	6580
MW-54-173	2/16	2480	618	5/8	3400	594	7/20	4280	723							11/7	4630	624	3698
MW-54-190	2/16	7320	948	5/8	8920	876	7/20	9310	978							11/7	8670	849	8555

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-54-37	2/16	17900	1310	5/8	15400	1340	7/20	11800	1080							11/7	8470	825	13393
MW-54-58	2/16	5840	855	5/8	5610	867	7/20	6200	831							11/7	7210	762	6215
MW-55-24	1/30	1270	498	5/18	389	342	8/16	944	423							11/2	1250	573	963
MW-55-35	1/30	1600	525	5/18	529	360	8/16	2640	582							11/2	1450	594	1555
MW-55-54	1/30	6500	819	5/18	8620	864	8/16	7600	834							11/2	6160	960	7220
MW-56-53	1/20	291	345	5/3	473	459	8/8	299	390							11/8	232	402	324
MW-56-83	1/20	34500	1580	5/3	2990	651	8/8	14500	1200							11/8	12700	1300	16173
MW-57-11				5/15	4960	693													4960
MW-57-20				5/15	12000	981													12000
MW-57-45				5/15	12000	1010													12000
MW-58-26				4/19	2500	666										11/8	1270	450	1885
MW-58-65				4/19	2080	609										11/8	1690	615	1885
MW-60-135	2/14	83	375	5/4	313	420	7/30	253	275							10/26	286	402	234
MW-60-154	2/14	488	417	5/4	563	447	7/30	399	297							10/26	642	504	523
MW-60-176	2/14	968	468	5/4	993	456	7/30	866	363							10/26	1330	453	1039
MW-60-35	2/14	84	378	5/4	285	417	7/30	104	245							10/26	305	408	194
MW-60-53	2/14	170	435	5/4	200	420	7/30	170	408							10/26	317	411	214
MW-60-72	2/14	-110	351	5/4	144	396	7/30	93	247							10/26	64	375	48
MW-62-138	2/23	4510	504	4/25	4930	924	7/19	4480	933							10/25	4190	693	4528
MW-62-18	2/23	348	333	4/25	213	414	7/19	251	272							10/25	730	522	386
MW-62-182	2/23	414	420	4/25	736	420	7/19	613	567							10/25	751	342	629
MW-62-37	2/23	221	390	4/25	268	417	7/19	192	258							10/25	1650	492	583
MW-62-53	2/23	289	390	4/25	446	438	7/19	298	280							10/25	289	405	331
MW-62-71	2/23	642	438	4/25	794	549	7/19	954	606							10/25	1660	483	1013
MW-62-92	2/23	633	426	4/25	617	408	7/19	1140	630							10/25	1420	432	953
MW-63-112	2/9	2480	552	4/24	2210	573	7/23	1810	702							10/24	1700	468	2050
MW-63-121	2/9	4160	726	4/24	3840	666	7/23	3020	789							10/24	2920	585	3485
MW-63-163	2/9	719	408	4/24	716	420	7/23	767	573							10/24	759	342	740
MW-63-174	2/9	607	399	4/24	690	420	7/23	648	564							10/24	1340	498	821
MW-63-18	2/9	318	357	4/24	445	435	7/23	370	363							10/24	149	240	321
MW-63-34	2/9	496	372	4/24	424	423	7/23	428	363							10/24	382	279	433
MW-63-50	2/9	258	354	4/24	462	435	7/23	467	369							10/24	517	300	426
MW-63-93	2/9	566	381	4/24	599	441	7/23	954	411							10/24	819	357	735
MW-66-21	2/28	161	420	5/7	1090	420	7/24	680	453							10/31	688	324	655
MW-66-36	2/28	3900	702	5/7	3860	633	7/24	3340	651							10/31	2800	597	3475
MW-67-105	2/15	2460	603	5/7	2340	507	7/24	2760	615							10/31	3110	600	2668
MW-67-173	2/15	537	447	5/7	536	378	7/24	689	459							10/31	549	303	578

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-67-219	2/15	911	489	5/7	1010	417	7/24	1020	489							10/31	1030	378	993
MW-67-276	2/15	1210	510	5/7	968	417	7/24	860	480							10/31	801	342	960
MW-67-323	2/15	423	441	5/7	347	351	7/24	390	432							10/31	435	272	399
MW-67-340	2/15	545	459	5/7	534	378	7/24	336	411							10/31	456	275	468
MW-67-39	2/15	3880	702	5/7	3300	576	7/24	1910	555							10/31	1970	540	2765
MW-68-103				5/22	1330	510	8/14	1310	477							11/6	1470	420	1370
MW-68-132				5/22	1610	531	8/14	1470	486							11/6	1400	423	1493
MW-68-19				5/22	1680	537	8/14	5630	771							11/6	3450	627	3587
MW-68-29				5/22	3340	648	8/14	11800	1090							11/6	9410	930	8183
MW-68-57				5/22	2580	612	8/14	3070	597							11/6	5250	741	3633
CSS				5/1	5570	720										11/7	1700	519	3635
NCD	3/19	7740	909	7/2	8010	969	9/3	5950	1040							11/26	5640	738	6835
SFDS	3/21	-63	333	6/13	412	381	9/5	83	384							11/28	216	230	162
U3-4D	2/8	965	510	4/18	1280	477	7/27	848	603							10/16	831	348	981
U3-4S	2/8	1920	576	4/18	1820	549	7/27	534	312							10/16	331	252	1151
U3-T1	1/17	1470	549	4/23	1190	504	8/10	174	333							10/19	453	411	822
U3-T2	1/27	3130	597	4/23	2640	615	8/10	1680	507							10/19	1720	453	2293

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-42-49	1/19	176.0	25.9	4/27	504.0	41.1	7/31	1070.0	57.3	10/22	291.0	23.7	510
MW-42-78	1/19	-1.2	20.6	4/27	-3.1	17.1	7/31	-2.6	17.5	10/22	13.1	19.6	2
MW-49-26	2/22	2.2	14.9	4/26	2.0	16.0	8/2	1.6	17.9	10/17	8.4	17.7	4
MW-49-42	2/22	0.1	14.2	4/26	1.6	17.6	8/2	-3.3	17.9	10/17	10.5	21.0	2
MW-49-65	2/22	0.1	12.8	4/26	-3.9	17.6	8/2	-2.6	18.0	10/17	8.4	17.3	1
MW-50-42	2/24	16.2	17.0	5/1	-0.3	17.9	8/16	-2.3	18.1	11/14	5.5	18.3	5
MW-50-66	2/24	-0.7	12.8	5/1	-1.3	17.3	8/16	0.3	18.1	11/14	1.2	17.2	0
MW-53-120	2/17	3.7	13.6	5/11	15.9	17.4	7/30	5.8	18.3	10/22	8.6	17.3	9
MW-53-82	2/17	-3.5	14.2	5/11	-1.1	15.3	7/30	-1.3	17.8	10/22	4.4	16.9	0
MW-54-123	2/16	6.1	14.3	5/8	-1.2	16.4	7/20	13.7	18.9	11/7	9.9	17.9	7
MW-54-144	2/16	2.0	12.3	5/8	2.6	16.1	7/20	15.3	20.4	11/7	1.6	17.8	5
MW-54-173	2/16	-1.4	12.1	5/8	-2.2	15.2	7/20	15.6	20.2	11/7	8.4	23.6	5
MW-54-190	2/16	-3.2	13.8	5/8	-0.3	15.1	7/20	19.1	20.7	11/7	5.7	18.9	5
MW-54-37	2/16	1.6	14.9	5/8	2.5	15.6	7/20	4.3	19.9	11/7	3.6	17.0	3
MW-54-58	2/16	-4.4	12.5	5/8	1.7	16.1	7/20	15.0	20.4	11/7	-0.2	17.3	3
MW-55-24	1/30	7.2	20.3	5/18	-3.7	15.7	8/16	-3.5	17.1	11/2	4.4	18.2	1
MW-55-35	1/30	-3.8	20.1	5/18	3.7	17.3	8/16	-3.5	17.4	11/2	-2.6	16.5	-2
MW-55-54	1/30	2.0	19.8	5/18	16.5	20.8	8/16	-3.2	17.2	11/2	2.7	18.7	4
MW-57-11				5/15	-1.8	16.7							-2
MW-57-20				5/15	2.5	18.2							3
MW-57-45				5/15	-2.9	16.9							-3
MW-60-53	2/14	5.6	17.4	5/4	2.3	16.1	7/30	11.9	19.9	10/26	5.7	17.1	6
MW-66-21	2/28	5.5	15.9	5/7	3.9	18.1	7/24	-0.3	18.1	10/31	2.2	17.4	3
MW-66-36	2/28	5.0	14.5	5/7	3.4	16.9	7/24	17.1	21.4	10/31	1.0	14.7	7
MW-67-105	2/15	-4.9	20.0	5/7	4.8	16.5	7/24	0.0	18.1	10/31	4.8	15.8	1
MW-67-173	2/15	-1.1	16.1	5/7	13.2	17.3	7/24	20.0	19.7	10/31	4.9	9.4	9
MW-67-219	2/15	12.5	15.8	5/7	9.4	16.9	7/24	18.5	19.6	10/31	2.9	15.9	11
MW-67-276	2/15	1.3	15.3	5/7	3.8	15.5	7/24	16.6	19.4	10/31	2.1	16.4	6
MW-67-323	2/15	4.6	15.0	5/7	6.6	14.1	7/24	18.0	20.6	10/31	-0.1	14.0	7
MW-67-340	2/15	1.3	15.4	5/7	0.0	15.3	7/24	9.4	18.9	10/31	0.5	15.6	3
MW-67-39	2/15	-0.5	18.4	5/7	3.3	16.6	7/24	4.5	18.7	10/31	-4.7	15.3	1
CSS				5/1	13.5	18.1				11/7	3.9	15.0	9
NCD	3/19	285	33	7/2	346.0	34.2	9/3	461.0	40.2	11/26	431.0	28.6	381
SFDS	3/21	3.5	21.1	6/13	9.5	19.5	9/5	14.1	18.9	11/28	4.0	14.9	8

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
B-1		0.7	1.4				8/16	0.5	1.7										0.6
B-6	1/23	0.3	1.5	5/1	-0.4	1.0	7/18	0.0	1.4							10/16	-0.2	1.2	-0.1
I-2	1/24	0.1	1.4	5/18	0.1	1.0	8/1	0.1	1.7							11/12	-0.4	1.6	0.0
MH-5	1/17	0.0	1.5	4/20	0.7	1.4	7/25	0.3	1.7							10/18	-0.1	1.6	0.2
MW-107				5/29	0.8	1.8													0.8
MW-111	1/30	-0.4	1.3	5/16	0.6	1.5	7/26	0.8	1.7	8/21	-0.4	1.6	9/21	-0.4	0.9	11/2	0.3	1.6	0.1
MW-30-69	2/1	0.4	1.6	5/2	0.3	1.6	8/7	0.3	1.5	9/20	1.1	1.8				12/3	0.4	1.1	0.5
MW-30-84	2/1	0.2	1.7				8/7	0.0	1.3	9/20	0.5	1.2				12/3	0.2	1.0	0.2
MW-31-49	1/31	0.2	1.1	5/11	0.9	1.7	7/25	-0.4	1.5	8/23	-0.1	1.6	9/19	-0.7	1.4	11/12	-0.4	0.9	-0.1
MW-31-63	1/31	-0.1	1.6	5/11	0.3	1.6	7/25	0.6	1.7	8/23	0.5	1.6	9/19	-0.4	1.5	11/12	-0.2	1.0	0.1
MW-31-85	1/31	0.5	1.7	5/11	-1.4	1.4	7/25	0.3	1.7	8/23	-0.1	1.5	9/19	0.1	1.3	11/12	0.9	1.3	0.1
MW-32-149	1/31	1.7	1.9	6/1	1.1	1.8	7/25	0.8	1.8	8/23	-0.3	1.4	9/17	-0.1	1.7	11/1	0.6	1.2	0.6
MW-32-173	1/31	0.5	1.6	6/1	0.5	1.7	7/25	-0.3	1.5	8/23	0.9	1.8	9/17	0.2	1.7	11/1	0.8	1.3	0.4
MW-32-190	1/31	1.9	2.0	6/1	0.0	1.6	7/25	0.7	1.6	8/23	0.1	1.6	9/17	-0.1	1.6	11/1	-0.4	1.0	0.4
MW-32-59	1/31	-0.1	1.5	6/1	-0.5	1.7	7/25	0.1	1.6	8/23	-0.3	1.3	9/17	0.3	1.4	11/1	-0.1	1.0	-0.1
MW-32-85	1/31	-0.1	1.6	6/1	0.1	1.6	7/25	-1.1	1.4	8/23	1.4	1.9	9/17	-0.4	1.5	11/1	-0.5	1.1	-0.1
MW-33	1/30	-0.5	1.4	5/16	0.2	1.6	7/26	0.0	1.5	8/21	-0.6	1.5	9/21	0.0	1.2				-0.2
MW-35							8/21	-0.5	0.8	9/21	0.3	1.3							-0.1
MW-36-24	2/24	0.6	1.7	5/21	0.5	1.7	8/15	0.2	1.4							11/13	0.2	1.1	0.4
MW-36-41	2/24	1.5	1.9	5/21	1.5	1.8	8/15	1.2	1.6							11/13	1.9	1.5	1.5
MW-36-52	2/24	1.7	1.8	5/21	2.9	1.9	8/15	2.0	1.6							11/13	1.8	1.4	2.1
MW-37-22	2/29	11.6	3.6	5/15	8.7	2.9	8/15	8.9	2.7							11/13	9.1	2.5	9.6
MW-37-32	2/29	9.0	2.5	5/15	13.5	3.4	8/15	12.4	3.5							11/13	9.7	2.5	11.2
MW-37-40	2/29	15.2	3.1	5/15	7.1	2.5	8/15	23.2	4.2							11/13	13.1	2.6	14.7
MW-37-57	2/29	16.4	3.0	5/15	18.1	2.8	8/15	15.8	3.7							11/13	12.9	2.6	15.8
MW-39-102	2/2	0.6	1.7	5/17	0.3	1.7										11/5	0.5	1.1	0.5
MW-39-124	2/2	-0.8	1.3	5/17	3.6	2.2										11/5	0.8	1.3	1.2
MW-39-183	2/2	0.4	1.6	5/17	0.7	1.8										11/5	0.0	1.2	0.4
MW-39-195	2/2	-0.2	1.5	5/17	-0.8	1.6										11/5	0.4	1.3	-0.2
MW-39-67	2/2	2.0	2.0	5/17	-0.5	1.6										11/5	1.0	1.3	0.8
MW-39-84	2/2	0.2	1.6	5/17	1.3	1.9										11/5	1.1	1.4	0.9
MW-40-100	3/1	0.8	1.7	5/31	-0.4	1.4	8/17	0.3	1.5							11/16	-0.2	1.3	0.1
MW-40-127	3/1	0.2	1.5	5/31	0.3	1.5	8/17	1.3	1.8							11/16	0.9	1.4	0.7
MW-40-162	3/1	-0.1	1.2	5/31	-0.8	1.4	8/17	-0.3	1.3							11/16	-0.1	1.0	-0.3
MW-40-27	3/1	-0.3	1.5	5/31	0.0	1.6	8/17	-0.7	1.2							11/16	0.2	1.1	-0.2
MW-40-46	3/1	-0.1	1.4	5/31	0.4	1.7	8/17	-0.2	1.4							11/16	0.2	1.2	0.1

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-40-81	3/1	0.6	1.7	5/31	1.6	1.7	8/17	0.8	1.7							11/16	1.0	1.5	1.0
MW-41-40	2/3	0.4	1.6	4/30	0.6	1.8	8/9	0.3	1.2							11/9	0.8	1.4	0.5
MW-41-63	2/3	1.3	1.7	4/30	7.2	2.8	8/9	1.6	1.8							11/9	0.9	1.1	2.7
MW-42-49	1/19	14.9	4.0	4/27	38.8	3.8	7/31	2.1	1.1							10/22	-0.4	1.4	13.9
MW-42-78	1/19	-0.1	1.6	4/27	-0.8	1.3	7/31	0.3	1.6							10/22	-0.3	1.0	-0.2
MW-43-28	2/17	0.1	1.6	5/14	1.7	1.7	8/13	-0.2	1.6							10/18	1.0	1.3	0.7
MW-43-62	2/17	1.2	1.8	5/14	-0.1	1.4	8/13	1.5	1.7							10/18	-0.3	1.0	0.6
MW-44-102	2/21	0.9	1.7	5/17	1.1	1.3	8/3	-0.1	1.6							11/5	0.5	1.1	0.6
MW-44-66	2/21	0.2	1.5	5/17	-0.3	1.2	8/27	-0.8	1.4							11/5	-0.3	1.0	-0.3
MW-45-42	2/3	1.3	1.7	4/30	1.3	1.7	8/6	0.6	1.6							11/9	0.1	1.2	0.8
MW-45-61	2/3	1.4	1.7	4/30	0.1	1.7	8/6	0.5	1.6							11/9	1.1	1.3	0.8
MW-46	2/13	0.7	1.1	4/20	1.8	1.6	8/1	1.3	1.8							10/23	-0.4	1.2	0.9
MW-47-56	1/25	1.4	1.6	5/3	0.3	1.7													0.9
MW-47-80	1/25	3.2	2.0	5/3	2.1	1.7													2.7
MW-49-26	2/22	10.2	3.2	4/26	12.2	2.6	8/2	9.0	3.0							10/17	15.4	3.5	11.7
MW-49-42	2/22	13.4	3.1	4/26	17.8	3.2	8/2	14.2	3.3							10/17	12.3	3.9	14.4
MW-49-65	2/22	11.0	3.3	4/26	9.1	2.8	8/2	9.0	2.8							10/17	10.5	3.9	9.9
MW-50-42	2/24	3.0	2.3	5/1	4.7	2.5	8/16	9.7	2.8							11/14	7.9	3.1	6.3
MW-50-66	2/24	17.2	4.0	5/1	17.7	3.4	8/16	18.4	4.0							11/14	20.6	3.9	18.5
MW-51-104	3/2	-0.5	1.4	5/30	-0.5	1.2	8/17	-0.3	1.4							11/15	0.8	1.8	-0.1
MW-51-135	3/2	0.6	1.7	5/30	-0.4	1.5	8/17	-0.4	1.1							11/15	0.7	1.2	0.1
MW-51-163	3/2	0.2	1.7	5/30	0.5	1.7	8/17	-0.6	1.3							11/15	-0.6	1.5	-0.1
MW-51-189	3/2	0.1	1.6	5/30	-0.5	1.3	8/17	-0.6	1.1							11/15	1.0	1.6	0.0
MW-51-40	3/2	0.1	1.6	5/30	-1.0	1.2	8/17	1.5	1.8							11/15	0.0	1.2	0.1
MW-51-79	3/2	1.0	1.7	5/30	0.4	1.5	8/17	-0.3	1.4							11/15	-0.7	1.4	0.1
MW-52-11				5/9	-0.3	1.2													-0.3
MW-52-122				5/9	-0.6	1.1													-0.6
MW-52-162				5/9	0.1	1.4													0.1
MW-52-18				5/9	-0.9	1.4													-0.9
MW-52-181				5/9	0.4	1.4													0.4
MW-52-48				5/9	0.2	1.2													0.2
MW-52-64				5/9	1.5	1.8													1.5
MW-53-120	2/17	33.7	5.5	5/11	29.5	3.5	7/30	29.9	4.4							10/22	29.0	4.1	30.5
MW-53-82	2/17	0.2	1.6	5/11	1.1	1.8	7/30	-0.8	1.3							10/22	1.5	1.9	0.5
MW-54-123	2/16	1.5	1.9	5/8	1.3	1.9	7/20	2.0	1.7							11/7	1.3	1.2	1.5
MW-54-144	2/16	7.0	2.7	5/8	12.6	2.8	7/20	7.0	2.2							11/7	6.1	2.2	8.2

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Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-54-173	2/16	5.6	2.7	5/8	4.5	2.0	7/20	3.7	1.9							11/7	5.5	3.0	4.8
MW-54-190	2/16	15.9	3.9	5/8	19.7	3.1	7/20	14.4	2.6							11/7	15.8	4.1	16.5
MW-54-37	2/16	0.7	1.5	5/8	3.0	2.0	7/20	3.1	1.9							11/7	1.7	1.4	2.1
MW-54-58	2/16	2.6	2.0	5/8	0.8	1.8	7/20	1.5	1.7							11/7	1.3	1.8	1.5
MW-55-24	1/30	11.1	3.3	5/18	10.3	2.5	8/16	8.9	3.0							11/2	7.6	2.4	9.5
MW-55-35	1/30	18.8	4.4	5/18	16.6	3.3	8/16	18.1	4.1							11/2	8.9	2.6	15.6
MW-55-54	1/30	12.7	3.3	5/18	17.9	3.4	8/16	14.7	3.5							11/2	14.6	3.4	15.0
MW-56-53	1/20	0.8	1.8	5/3	1.8	1.4	8/8	1.1	1.6							11/8	0.6	1.4	1.1
MW-56-83	1/20	3.8	2.0	5/3	-0.3	1.1	8/8	1.2	1.5							11/8	2.0	1.5	1.7
MW-57-11				5/15	17.7	3.1													17.7
MW-57-20				5/15	1.0	1.7													1.0
MW-57-45				5/15	1.9	1.8													1.9
MW-58-26				4/19	-0.7	0.8										11/8	-0.5	1.0	-0.6
MW-58-65				4/19	0.0	1.3										11/8	-0.5	0.9	-0.2
MW-60-135	2/14	0.8	1.5	5/4	0.0	1.2	7/30	-0.9	1.3							10/26	0.0	1.0	0.0
MW-60-154	2/14	-0.4	1.4	5/4	1.6	1.4	7/30	0.1	1.3							10/26	-0.3	1.1	0.3
MW-60-176	2/14	0.0	1.5	5/4	0.2	1.6	7/30	0.3	1.6							10/26	0.1	0.9	0.1
MW-60-35	2/14	0.1	1.4	5/4	0.3	1.7	7/30	-0.3	1.4							10/26	0.6	1.4	0.2
MW-60-53	2/14	0.4	1.7	5/4	-0.9	1.1	7/30	0.3	1.4							10/26	-1.0	1.3	-0.3
MW-60-72	2/14	0.5	1.6	5/4	0.7	1.7	7/30	-1.1	1.1							10/26	-0.2	0.9	0.0
MW-62-138	2/23	2.0	2.0	4/25	-0.5	1.6	7/19	2.1	2.0							10/25	0.1	1.0	0.9
MW-62-18	2/23	-0.5	1.6	4/25	1.2	1.9	7/19	1.0	1.7							10/25	-1.0	1.1	0.2
MW-62-182	2/23	0.3	1.7	4/25	0.3	1.5	7/19	0.9	1.5							10/25	-0.6	0.8	0.2
MW-62-37	2/23	1.6	1.8	4/25	1.3	1.8	7/19	-0.4	1.5							10/25	-0.9	1.2	0.4
MW-62-53	2/23	0.4	1.6	4/25	0.4	1.6	7/19	0.2	1.6							10/25	-0.5	1.5	0.1
MW-62-71	2/23	-0.1	1.3	4/25	0.1	1.5	7/19	-0.3	1.5							10/25	1.1	1.7	0.2
MW-62-92	2/23	1.1	1.8	4/25	0.5	1.7	7/19	-0.3	1.4							10/25	0.5	1.1	0.4
MW-63-112	2/9	0.8	1.7	4/24	0.7	1.6	7/23	0.3	1.6							10/24	0.7	1.3	0.6
MW-63-121	2/9	0.6	1.6	4/24	1.4	1.8	7/23	1.1	1.7							10/24	0.3	1.1	0.9
MW-63-163	2/9	0.7	1.5	4/24	1.3	1.7	7/23	0.5	1.6							10/24	-0.1	1.3	0.6
MW-63-174	2/9	0.3	1.5	4/24	0.6	1.6	7/23	0.5	1.7							10/24	0.1	1.4	0.4
MW-63-18	2/9	-0.2	1.4	4/24	1.5	1.9	7/23	-0.1	1.7							10/24	0.0	1.5	0.3
MW-63-34	2/9	-0.1	1.4	4/24	0.4	1.5	7/23	0.2	1.6							10/24	0.0	1.5	0.1
MW-63-50	2/9	0.8	1.7	4/24	0.6	1.6	7/23	-0.6	1.7							10/24	0.4	1.1	0.3
MW-63-93	2/9	0.7	1.6	4/24	-0.9	1.5	7/23	0.9	1.5							10/24	0.7	1.4	0.3
MW-66-21	2/28	0.7	1.4	5/7	0.1	1.6	7/24	1.6	1.8							10/31	0.2	1.0	0.6

Sr-90 in Ground Water 2012

Well ID	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	Sample Date	Result	3σ Error	average
MW-66-36	2/28	8.9	2.6	5/7	6.1	1.9	7/24	8.9	2.3							10/31	8.0	2.3	8.0
MW-67-105	2/15	1.5	1.7	5/7	-0.5	1.7	7/24	0.8	1.4							10/31	-0.2	0.8	0.4
MW-67-173	2/15	-0.3	1.5	5/7	0.3	1.0	7/24	-0.4	1.4							10/31	-0.7	1.3	-0.3
MW-67-219	2/15	0.4	1.5	5/7	-0.2	1.7	7/24	1.5	1.8							10/31	0.0	0.8	0.4
MW-67-276	2/15	0.2	1.7	5/7	-0.3	1.0	7/24	0.9	1.5							10/31	-0.2	1.6	0.2
MW-67-323	2/15	1.2	1.8	5/7	-0.1	1.5	7/24	1.5	1.8							10/31	-0.4	0.9	0.5
MW-67-340	2/15	1.4	1.8	5/7	-0.4	1.4	7/24	0.6	1.4							10/31	-0.8	1.0	0.2
MW-67-39	2/15	9.9	2.6	5/7	8.5	2.5	7/24	10.6	2.4							10/31	12.4	3.0	10.3
MW-68-103				5/22	0.3	1.3	8/14	1.3	1.6							11/6	0.9	1.8	0.8
MW-68-132				5/22	0.3	1.5	8/14	0.2	1.7							11/6	0.1	1.7	0.2
MW-68-19				5/22	-0.6	1.5	8/14	0.3	1.6							11/6	-0.6	1.2	-0.3
MW-68-29				5/22	0.7	1.8	8/14	0.7	1.8							11/6	-0.5	1.5	0.3
MW-68-57				5/22	2.5	2.1	8/14	-0.7	1.5							11/6	-0.3	1.5	0.5
CSS				5/1	19.3	3.7										11/7	2.9	1.9	11.1
NCD	3/19	78.3	2.7	7/2	64.2	7.2	9/3	52.9	5.7							11/26	70.1	7.7	66.4
SFDS	3/21	-0.5	0.4	6/13	5.8	2.7	9/5	1.1	1.7							11/28	1.7	1.9	2.0
U3-4D	2/8	-0.4	1.2	4/18	1.5	1.8	7/27	-2.0	1.5							10/16	0.7	1.2	0.0
U3-4S	2/8	-0.7	1.0	4/18	0.7	1.4	7/27	0.5	1.6							10/16	0.9	1.8	0.4
U3-T1	1/17	-0.6	1.2	4/23	0.8	1.6	8/10	0.1	1.6							10/19	-0.4	0.9	0.0
U3-T2	1/27	0.1	1.4	4/23	0.0	1.0	8/10	-0.1	1.6							10/19	-0.3	1.3	-0.1